The Ontario Curriculum Grades 9-12

# Environmental Education

Scope and Sequence of Expectations

2017 Edition



support every child reach every student



## CONTENTS

Preface	2
The Arts	5
Business Studies	
Canadian and World Studies	
Classical Studies and International Languages	66
Computer Studies	77
English	81
English as a Second Language and English Literacy Development	
French as a Second Language – Core French, Extended French, French Immersion	
Guidance and Career Education	111
Health and Physical Education	114
Interdisciplinary Studies	126
Mathematics	
Native Languages	131
Native Studies	133
Science	141
Social Sciences and Humanities	
Technological Education	224

The Ontario Public Service endeavours to demonstrate leadership with respect to accessibility in Ontario. Our goal is to ensure that Ontario government services, products, and facilities are accessible to all our employees and to all members of the public we serve. This document, or the information that it contains, is available, on request, in alternative formats. Please forward all requests for alternative formats to Service Ontario at 1-800-668-9938 (TTY: 1 0-268-7095).

Une publication équivalente est disponible en français sous le titre suivant : Le curriculum de l'Ontario de la  $9^e$  à la  $12^e$  année – Éducation environnementale : Portée et enchaînement des attentes et contenus d'apprentissage, 2017.

This publication is available on the Ministry of Education's website, at www.ontario.ca/edu.

## PREFACE

This resource guide supersedes *The Ontario Curriculum, Grades 9–12: Environmental Education Scope and Sequence of Expectations, 2011.* This resource has been updated to reflect the release of the following secondary curriculum documents:

- The Ontario Curriculum, Grades 9 and 10: Canadian and World Studies, 2013
- The Ontario Curriculum, Grades 11 and 12: Canadian and World Studies, 2015
- The Ontario Curriculum, Grades 9 to 12: Classical Studies and International Languages, 2016
- The Ontario Curriculum, Grades 9 to 12: French as a Second Language Core French, Extended French, French Immersion, 2014
- The Ontario Curriculum, Grades 9 to 12: Health and Physical Education, 2015
- The Ontario Curriculum, Grades 9 to 12: Social Sciences and Humanities, 2013

#### \*\*\*\*

In the document *Shaping Our Schools, Shaping Our Future: Environmental Education in Ontario Schools*, released by the Working Group on Environmental Education in June 2007, environmental education is defined as:

... education about the environment, for the environment, and in the environment that promotes an understanding of, rich and active experience in, and an appreciation for the dynamic interactions of:

- The Earth's physical and biological systems
- The dependency of our social and economic systems on these natural systems
- The scientific and human dimensions of environmental issues
- The positive and negative consequences, both intended and unintended, of the interactions between human-created and natural systems.

(Shaping Our Schools, Shaping Our Future, p. 6)

The document *Acting Today, Shaping Tomorrow: A Policy Framework for Environmental Education in Ontario Schools*, released in 2009, provides a guide to the implementation of environmental education in boards and schools across the province. One of the goals of this policy framework is as follows:

By the end of Grade 12, students will acquire knowledge, skills, and perspectives that foster understanding of their fundamental connections to each other, to the world around them, and to all living things.

(Acting Today, Shaping Tomorrow, p. 11)

The policy framework emphasizes the necessity of ensuring that young people become environmentally active and responsible citizens. Students need to have the knowledge and skills that will enable them to understand and deal with complex issues that affect the environment now and in the future. For example, students need to develop skills in problem solving, inquiry, decision making, action planning, higher-level thinking, systems thinking, and critical literacy. They also need to be able to identify issues and perspectives, carry out research, and communicate their ideas in meaningful ways.

To help achieve this goal, the Ministry of Education has ensured that environmental education is included, as appropriate, in all grades and in all subjects or disciplines of the Ontario curriculum. Expectations that relate directly to environmental education as well as expectations that encompass opportunities for learning about the environment are now embedded in the curriculum. The scope and sequence resource guides for Kindergarten to Grade 8 and Grades 9 to 12 identify these embedded expectations with the aim of assisting teachers in bringing environmental education into the classroom in every subject area and discipline. The guides are updated as needed to reflect changes in the revised curriculum documents.

## **Considerations for Program Planning**

This scope and sequence document identifies the learning expectations in the curriculum that relate to, or provide opportunities for, environmental education. Educators in every discipline can use it to inform program planning, in order to take advantage of opportunities to support students' development of related skills and knowledge.

Most of the expectations in the secondary curriculum that relate explicitly to aspects of environmental education are found in the science, geography, and technological education curricula. In other disciplines, connections to environmental topics or issues are often found in the examples or teacher prompts that accompany curriculum expectations. Broad opportunities for environmental education exist in most disciplines, as noted at the start of each discipline's section in this guide.<sup>1</sup>

### Learning in the Outdoors

Another important consideration for program planning in many disciplines is to incorporate learning in the outdoors as a component of environmental education. Learning in the outdoors not only offers a unique context for learning but also provides experiential learning outside the classroom to foster a connection to local places and to develop a greater understanding of ecosystems. Natural and human-built environments can be used as sites for discovery, problemsolving, and active learning, as well as for first-hand experiences that put students in touch with nature. Educators must always consider safety issues when students engage in learning in the outdoors, assessing potential dangers and implementing measures to protect students from risk. When planning for learning in the outdoors, educators must meet the requirements of all board and ministry policies, including those related to safety.

<sup>1.</sup> In the front matter of every Ontario curriculum policy document published since 2007, there is a section under "Considerations for Program Planning" that supports environmental education in that subject or discipline. Excerpts from those sections are provided at the start of the relevant disciplines in this guide.

## **Organization of the Document**

The expectations identified in this resource guide are taken from the current Ontario curriculum policy document(s) for each discipline in Grades 9 to 12.

The guide includes a section for each discipline, ordered alphabetically. The year of publication of the curriculum policy document(s) is given in the heading at the start of the section. Within each section, expectations are presented by discipline area included in the curriculum document (where applicable), then by course and by strand. Examples and teacher prompts are included only if they have a connection to environmental education.

## THE ARTS, GRADES 9 AND 10 (2010) AND GRADES 11 AND 12 (2010)

#### From "Environmental Education and the Arts" in the curriculum policy documents:

There are many opportunities to integrate environmental education into the teaching of the arts. Nature often provides an inspirational starting point for creativity in both representational and more abstract art forms. Indeed, a sense of connection to the immediate environment and the natural world is frequently reflected in the arts – from Paleolithic cave paintings of animals and traditional dances and performances that evoke aspects of nature to landscape painting and Impressionist music. To facilitate these connections, arts teachers are encouraged to take students out of the classroom and into the world beyond the school to help students observe, explore, and investigate nature, and to design activities that allow students to integrate natural materials into their creative works. Performances and installations that take place in the natural environment can also provide students with unique insights into environmental issues, as well as stimulate creative opportunities.

The arts can also be powerful forms of expression for students to use to explore and articulate the social and political impact of issues related to the environment. Art works can also be used to advocate protection of and respect for the environment. As well, the actual use of arts materials can be related to environmental education. Many safety guidelines are followed to reduce harmful effects arising from the interaction of potentially hazardous substances with the environment. As students learn about the safe handling and disposal of substances used in the arts, they have opportunities to explore how everyday human interactions with the environment can have significant consequences.

#### **GRADES 9 AND 10**

## Dance, Grade 9, Open (ATC1O)

#### A. Creating, Presenting, and Performing

#### A2. Choreography and Composition

- A2.2 construct a short dance composition based on a given stimulus (e.g., ... use a process or form observed in nature as the basis for a short dance composition; create a short dance based on images from nature in Aboriginal art) ...
- A2.3 use experimentation to enhance the communicative power of their dance compositions ... *Teacher prompts:* ... "What are some familiar movements we associate with different animals? How might you experiment with other types of movements for communicating new or different ideas about the animals?"

#### B. Reflecting, Responding, and Analysing

#### **B2. Dance and Society**

**B2.4** explain how dance can contribute to a sense of community (e.g., a dance performance can help draw attention to or raise funds for a social or environmental cause in the school or local community)

*Teacher prompt:* "The school is having an assembly to celebrate Earth Day. What could our dance class do to help highlight the significance of this event?"

#### C. Foundations

#### **C2.** Context and Influences

- **C2.2** identify and describe ways in which choreographers and performers use or have used dance to address social and environmental issues (e.g., identify issues raised in Danny Grossman's 1981 work Endangered Species and discuss their relevance to society today; describe how Isabel Croxatto's Revolution of the Butterflies highlights the urgent need to protect and restore the environment)
- C2.3 identify some shared characteristics of dance forms from around the world and illustrate them through performance (e.g., ... identify elements in the Aboriginal dances of two different cultures that reveal their connection to nature and the environment)
   Teacher prompts: ... "How are dances of Polynesians and Aboriginal peoples in Canada the same and/or different in the way they reflect the natural environment?"

## Dance, Grade 10, Open (ATC2O)

#### A. Creating, Presenting, and Performing

#### **A1. The Creative Process**

A1.1 use the elements of dance to create and perform a variety of movement phrases inspired by sources (e.g., ... create a short dance composition based on a personal, social, or environmental issue)

*Teacher prompts:* "What sources can you examine to enhance your exploration of this social or environmental issue?" ...

#### A2. Choreography and Composition

A2.3 use a variety of compositional approaches to extend their ability to express ideas through dance (e.g., use approaches such as guided improvisation, responding to the stimulus of a poem or a social or environmental issue ...)

#### A4. Performance

A4.2 use the tools of stagecraft in dance performances, including performances at alternative venues (e.g., suggest solutions for staging problems presented by an alternative or unconventional performance environment, such as an outdoor site)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Dance and Society

B2.3 identify and describe ways in which different types of dance reflect the cultures that produced them (e.g., ... the hoop dance reflects Aboriginal beliefs about how all living things on the earth grow, change, and are connected)
Teacher prompts: ... "What beliefs about the natural world are expressed in the Aboriginal hoop dance or animal dance?"

#### C. Foundations

#### **C2.** Contexts and Influences

C2.2 identify and describe ways in which dance addresses social questions of local and/or global interest (e.g., explain how the choreography of a dance work on a social justice or environmental theme helps communicate the intended message)
 Teacher prompts: ... "What dance programs have the CityDance Ensemble of Washington created, and what environmental messages have they presented?"

## Drama, Grade 9, Open (ADA1O)

#### A. Creating and Presenting

#### **A1. The Creative Process**

A1.3 use role play to explore, develop, and represent themes, ideas, characters, feelings, and beliefs in producing drama works (e.g., ... write in role as a character who is reflecting on the people, events, and relationships affected by a personal, social, or environmental issue)

#### A2. Elements and Conventions

A2.1 use the elements of drama to suit an identified purpose and form in drama presentations (e.g., ... use a futuristic, science-fiction setting for a mask comedy about an environmental or social issue)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Drama and Society

**B2.4** identify ways in which dramatic exploration promotes an appreciation of diverse cultures and traditions ...

*Teacher prompts:* "What did you learn about our connections to nature and the world around us from viewing or presenting dramas based on Aboriginal legends?" ...

## Drama, Grade 10, Open (ADA2O)

#### A. Creating and Presenting

#### A1. The Creative Process

A1.2 select and use appropriate forms to present identified issues from a variety of perspectives (e.g., use a radio play, improvisation, or series of tableaux to present two opposing views about a political, social, or environmental issue)

#### A3. Presentation Techniques and Technologies

A3.3 use a variety of technological tools (*e.g., light, sound, set design, props, models*) to enhance the impact of drama works

*Teacher prompts:* ... "How could you use sound to suggest a natural setting such as a forest or a rocky ocean shore?"

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.2** describe how drama is used for various purposes in a range of social contexts (*e.g.*, ... to raise awareness of social, environmental, and political issues ...)

#### **C3.** Responsible Practices

**C3.1** identify and follow safe and ethical practices in drama activities (e.g., ... follow procedures for the environmentally responsible use of materials and energy; ...)

## Integrated Arts, Grade 9 or 10, Open (ALC10/ALC20)

#### A. Creating and Presenting

#### A1. The Creative Process

A1.3 use the appropriate stages of the creative process to produce and present preliminary integrated art works, individually and/or collaboratively, in response to creative challenges *(e.g., a multidisciplinary art work on a topic such as ... the environment; ...)*, and revise their works on the basis of peer- and self-assessment ...

*Teacher prompts:* "Which arts disciplines might you combine in a work on an environmental theme?" ...

#### A3. Tools, Techniques, and Technologies

A3.1 integrate media/materials, tools, and techniques from more than one arts discipline to create an integrated art work/production that communicates a specific message (e.g., in the style of Barbara Kruger or Jenny Holzer, create a work that conveys a message on an issue such as ... the causes and/or effects of global warming ...)

#### C. Foundations

#### **C3.** Conventions and Responsible Practices

**C3.4** identify environmental issues associated with the arts, and apply environmentally responsible practices when creating and presenting art works, including integrated art works/productions *(e.g., dispose of paint containers in an environmentally responsible way; recycle batteries and toner cartridges; source environmentally friendly materials)* 

*Teacher prompts:* "How can art affect the environment? How can the environment affect art?" "What are some ways in which an individual artist can contribute to the environment?"

## Media Arts, Grade 10, Open (ASM2O)

#### A. Creating and Presenting

#### A2. The Principles of Media Arts

A2.2 design and produce original media art works on a specific theme (*e.g., an environmental issue*) by combining one or more of the principles of media arts and a variety of elements from the contributing arts ...

#### B. Reflecting, Responding, and Analysing

#### **B2.** Identity and Values

B2.3 identify and describe ways in which media art works can influence community or societal values (e.g., the impact on their school community of a media art work on combating climate change)Teacher prompt: "Can you identify some media artists who deal with issues related to nature or the environment in their work? What do you see as the potential of these or similar media artists to help society address environmental challenges in the future?"

#### **B3.** Connections Beyond the Classroom

B3.3 identify and describe skills and understandings acquired through the creative and critical analysis processes in the media arts ..., and describe how they can be applied in everyday life *(e.g., ... to create a slide show for an environmental organization)* 

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.3** describe ... how sociocultural trends have contributed to the development of an aspect of media arts (*e.g.*, ... how social issues such as global warming have influenced content)

#### **C3.** Responsible Practices

**C3.3** identify and apply responsible environmental practices associated with the media arts workplace (e.g., dispose of chemicals and batteries in environmentally safe ways; use energy conservation practices; recycle used materials when possible)

*Teacher prompt:* "Are you working with any chemicals or other materials that could damage the environment? What practices could you adopt to minimize the environmental impact of your work?"

## Music, Grade 9, Open (AMU1O)

#### A. Creating and Performing

#### **A1. The Creative Process**

A1.2 apply the creative process when composing and/or arranging music (e.g., ... explore sounds from the human-created or natural environment as possible inspiration for a musical composition; ...)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Music and Society

**B2.1** identify and describe ways in which traditional music reflects the society in which it was created and how it has affected communities or cultures ...

*Teacher prompts:* ... "Why are First Nation musical ceremonies and celebrations often connected to aspects of nature? What do these themes tell us about the Aboriginal societies in question?"

#### **B3.** Skills and Personal Growth

**B3.1** identify and describe how the study of music has contributed to their personal growth (including the development of their values), their ability to express themselves, their awareness of the aural world around them (both human-created and natural), and their awareness of others (*e.g.*, ... how musical study has affected their appreciation of the aesthetic value of the sounds of nature ...)

## Music, Grade 10, Open (AMU2O)

#### A. Creating and Performing

#### A2. The Elements of Music

A2.3 apply the elements of music and related concepts appropriately when composing and/or arranging simple pieces of music (e.g., ... when creating a soundscape using environmental sounds such as forest sounds ...)

#### B. Reflecting, Responding, and Analysing

#### **B3.** Skills and Personal Growth

**B3.1** explain how the study of music has contributed to their personal growth (including the development of their values), their ability to express themselves, their awareness of social and environmental issues, and their understanding of others ...

#### C. Foundations

#### **C2.** Characteristics and Development of Music

C2.2 identify and describe shared and unique characteristics of traditional and contemporary music, including Aboriginal music, from Canada and around the world ...
Teacher promote: "What are some of the characteristics of Canadian Aboriginal music? We are some of the characteristics of Canadian Aboriginal music?"

*Teacher prompts:* "What are some of the characteristics of Canadian Aboriginal music? Why does it often portray or speak about nature and the environment?" ...

## Visual Arts, Grade 9, Open (AVI1O)

#### A. Creating and Presenting

#### A2. The Elements and Principles of Design

A2.2 apply elements and principles of design to create art works that communicate ideas and information (e.g., an informational public service poster on a social issue such as bullying or protecting the environment)

#### A3. Production and Presentation

A3.1 explore and experiment with a variety of media/materials and traditional and/or emerging technologies, tools, and techniques, and apply them to produce art works ...*Teacher prompts:* "How could you use found materials to create an art work that shows your concern for the environment?" ...

#### B. Reflecting, Responding, and Analysing

#### **B3.** Connections Beyond the Classroom

- B3.1 identify types of knowledge and skills acquired in visual arts ..., and describe how they could be applied in a variety of areas of personal and professional life*Teacher prompts:* "What particular knowledge or skills do artists possess that might be used to address social or environmental problems?" ...
- **B3.3** identify, on the basis of exploration, a variety of personal opportunities in their community in cultural or other fields related to visual arts ...

*Teacher prompt:* "What types of cultural, social, or environmental events are held in your community? Could any of these provide opportunities for you to design promotional material, make costumes, design sets, or display your art works?"

#### C. Foundations

#### **C3. Responsible Practices**

**C3.3** demonstrate an understanding of how the production and presentation of art works can affect the environment, and apply environmentally responsible practices when creating and presenting art works (*e.g., reduce, reuse, and recycle when possible; limit their use of environmentally hazardous substances or non-sustainable resources; dispose of materials in environmentally responsible ways)* 

*Teacher prompts:* "Why is it important to recycle newspapers used as packing material as opposed to throwing them in the garbage?" "What is the environmentally responsible way to dispose of empty ink containers?"

## Visual Arts, Grade 10, Open (AVI2O)

#### A. Creating and Presenting

#### A2. The Elements and Principles of Design

A2.2 apply elements and principles of design as well as art-making conventions to create art works that communicate ideas, information, or messages, and/or that convey a point of view on an issue (e.g., ... incorporate symbolism to communicate a message about an environmental issue)

*Teacher prompt:* "How might you use colour, texture, and emphasis to help convey the effects of climate change? What imagery might you incorporate into this work?"

#### A3. Production and Presentation

- A3.1 explore and experiment with a variety of materials/media, including alternative media, and traditional and/or emerging technologies, tools, and techniques, and apply them to create art works (*e.g., use recycled, found, and/or handmade objects to make a mosaic or assemblage; ...) Teacher prompt:* "What sorts of objects might you combine in an art work related to the environment? ..."
- A3.3 demonstrate an understanding of a variety of ways in which art works can be presented to reach different audiences (e.g., ... in a sculpture garden or other outdoor space in the community, on the sides of buildings or in bus shelters ...)

#### C. Foundations

#### **C3.** Responsible Practices

**C3.2** demonstrate an understanding of safe and conscientious practices associated with the use of materials, tools, and technologies in visual arts, and apply these practices when creating and/ or presenting art works ...

*Teacher prompt:* "Why is it important to know about the toxicity of art materials? What are some precautions you should take when working with toxic materials?"

**C3.3** demonstrate an understanding of how the production and presentation of art works can affect the environment, and apply environmentally responsible practices when creating and presenting art works (*e.g., use recycled materials where possible; separate recyclable and hazardous materials from their waste; limit the use of environmentally hazardous substances or non-sustainable resources*)

*Teacher prompt:* "What is the most environmentally responsible way of disposing of photographic chemicals? Why? What other substances do you use that can be partially or wholly recycled?"

## DANCE, GRADES 11 AND 12

## Dance, Grade 11, University/College Preparation (ATC3M)

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.2** describe how artistic, social, political, and environmental events have influenced the evolution of local and global dance communities ...

*Teacher prompt:* "How does dance compare to drama and music as an effective way to comment on environmental issues such as pollution or global warming?"

## Dance, Grade 11, Open (ATC3O)

#### A. Creating, Presenting, and Performing

#### **A1. The Creative Process**

A1.1 use the elements of dance to develop and perform a series of connected dance phrases inspired by a source (*e.g., ... depict changes in an object from nature or the surrounding environment*)

#### A2. Choreography and Composition

- **A2.1** use a variety of choreographic forms, structures, and techniques to create and perform a series of movement phrases (*e.g.*, ... create a group composition using movement motifs that communicate a response to a natural or built environment beyond the studio)
- **A2.2** create a dance composition inspired by a source (*e.g., develop dance phrases suggested by* ... The Great Kapok Tree *by Lynne Cherry and use them as the basis for a longer composition*)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Dance and Society

B2.3 identify and describe different types of dance represented in a particular culture, and describe their purposes (e.g., the characteristics of rain dances in ancient Egypt and their relationship to environmental factors, agricultural practices, and religious beliefs)
Teacher prompt: "What are some environmental issues in the world today? Which of these issues could you comment on in a dance? How might your dance be enhanced if you studied how dances from other cultures addressed environmental issues?"

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.2** identify and describe ways in which dance is or can be used to reflect or comment on social questions in the local and/or global community (*e.g., research and report on ... how companies such as CityDance Ensemble, TRIP Dance Theater, and ODC Dance use dance to comment on environmental issues)* 

## Dance, Grade 12, University/College Preparation (ATC4M)

#### A. Creating, Presenting, and Performing

#### **A1. The Creative Process**

A1.1 use the elements of dance to create and perform abstract dance phrases inspired by a theme of personal significance (e.g., a theme suggested by an environmental or social issue or by a composition of a favourite dance group)

#### C. Foundations

#### **C2.** Contexts and Influences

C2.2 describe the influence of global artistic, social, and political events or issues (e.g., globalization, the environment, poverty, HIV/AIDS, war, political repression, refugees) on the current Canadian arts scene, including but not limited to the dance scene *Teacher prompt:* "How have Canadian choreographers used dance to raise public awareness of an important social or environmental issue?"

#### **C3.** Responsible Practices

C3.3 model safe and ethical practices in dance activities in both classroom and performance settings (e.g., ... use environmentally friendly materials and processes in dance productions; ...)
 Teacher prompts: ... "What procedures should we follow when preparing the costumes, sets, and performance venue to ensure the environmentally responsible use of materials and energy?" ...

## Dance, Grade 12, Workplace Preparation (ATC4E)

#### A. Creating, Presenting, and Performing

#### **A1. The Creative Process**

A1.2 create and perform movement phrases that use the elements of dance to express physical or emotional states (e.g., body movements and accents that reflect the emotions evoked by a piece of music or a natural or urban landscape; ...)

#### A2. Choreography and Composition

A2.3 identify and use a variety of compositional approaches to communicate ideas and feelings through dance (e.g., use structured improvisation and a combination of elements to develop a short piece about an environmental concern; ...)

#### A4. Performance

A4.2 choreograph and perform dances to meet the needs of a specific community audience or event (e.g., a retirement home "social", an environmental awareness event, a cyber-bullying awareness session)

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.2** describe the influence of some global issues on dance (e.g., ... the focus on issues such as racism, violence, the environment as themes for choreographers)

### DRAMA, GRADES 11 AND 12

### Drama, Grade 11, University/College Preparation (ADA3M)

#### A. Creating and Presenting

#### **A1. The Creative Process**

A1.2 select and use appropriate drama forms to present a variety of adapted or original drama works (e.g., ... use puppetry to adapt a children's book on a social or environmental theme, such as The Lorax [Seuss] or The Great Kapok Tree [Cherry], for a dramatic presentation)

#### B. Reflecting, Responding, and Analysing

#### **B2. Drama and Society**

- **B2.1** analyse different styles of drama and explain their influence on artistic and social conditions in diverse communities and cultures from the past and present (*e.g.*, ... assess the influence of groups such as Dreamrider Theatre and Ubon! Eastern Cape Drama Company in raising awareness of environmental issues)
- **B2.2** identify ways in which drama can influence personal growth, relationships with others, and aesthetic judgement (e.g., issue-based and whole-group drama activities can help develop empathy, self-knowledge, and environmental awareness; ...)
- B2.3 identify ways in which drama can influence the broader community*Teacher prompt:* "What social or environmental issue might you use as the basis for an anthology for a school assembly? What would be your goal in presenting this issue?"

#### C. Foundations

#### **C3.** Responsible Practices

C3.1 identify and follow safe and ethical practices in all drama activities (*e.g.*, ... follow procedures for the environmentally responsible use of materials and energy; ...) *Teacher prompts:* ... "How can we ensure that the materials used in these sets are available for re-use in future productions?" ...

## Drama, Grade 11, Open (ADA3O)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Drama and Society

B2.1 identify different purposes for drama and the forms used to achieve these purposes in diverse communities and cultures from the past and present (*e.g.*, ... to draw attention to problems or promote attitudinal change – issue-based drama)
 Teacher prompts: "What are some examples of contemporary issue-based drama (e.g.,

The Laramie Project; productions of Dreamrider Theatre or Ubom! Eastern Cape Drama Company)?" "What social purpose does issue-based theatre serve?"...

#### C. Foundations

#### **C3.** Responsible Practices

C3.1 identify and follow safe and ethical practices in all drama activities (e.g., ... follow procedures for the environmentally responsible use of materials and energy; ...) *Teacher prompts:* "How can we ensure that the materials used in our sets are available for re-use in future productions?" ...

## Drama, Grade 12, University/College Preparation (ADA4M)

#### A. Creating and Presenting

#### **A1. The Creative Process**

A1.2 select and use a variety of drama forms to present original drama works (e.g., combine forms such as dance drama, mime, and reader's theatre to dramatize or comment on a social or environmental issue)

#### B. Reflecting, Responding, and Analysing

#### **B1. The Critical Analysis Process**

B1.2 analyse a variety of contemporary and historical drama works to explain and evaluate how they communicate themes and dramatize issues*Teacher prompt:* "What are the social, environmental, and/or political issues raised in this

play? ..."

#### **B2. Drama and Society**

- **B2.1** demonstrate an understanding of how drama questions social and cultural conditions in a variety of Canadian and global drama sources and traditions *(e.g., determine the intended message in ... various "green movie dramas" such as* Erin Brockovich, Gorillas in the Mist, The Day After Tomorrow, Hoot, *and* Avatar; ...)
- B2.3 describe ways in which drama can support or influence school and/or local community goals ... *Teacher prompt:* "What are some examples of the use of drama to promote social or environmental change?"

**B2.4** describe different approaches used to explore universal concepts and themes in the drama of diverse cultures (e.g., compare and contrast the treatment of themes such as hunger, loneliness, parenthood, oppression, war, and environmental degradation in dramas from different countries or time periods)

#### C. Foundations

#### **C3.** Responsible Practices

**C3.1** identify and follow safe and ethical practices in all drama activities (*e.g.*, ... follow procedures for the environmentally responsible use of materials and energy; ...)

## Drama, Grade 12, Workplace Preparation (ADA4E)

#### C. Foundations

#### **C3. Responsible Practices**

**C3.1** identify and follow safe and ethical practices in drama activities and explain their relevance to workplace settings (*e.g.*, ... *identify and follow procedures for the environmentally responsible use of materials and energy;* ...)

## EXPLORING AND CREATING IN THE ARTS, GRADES 11 AND 12

## Exploring and Creating in the Arts, Grade 11 or 12 (AEA3O/AEA4O)

#### A. Creating and Presenting

#### **A1. The Creative Process**

A1.1 use a variety of strategies ... to generate innovative ideas and to develop and refine detailed plans to address an integrated art challenge, individually and/or collaboratively (*e.g., the challenge to create a performance piece or installation on a theme related to nature, such as water, fire, birth, or decay*)

#### A2. Elements and Principles

A2.1 select and apply a combination of elements and principles from multiple arts disciplines when creating and presenting complex integrated art works/productions (e.g., use relationship from dance, timbre and texture from music, and unity and harmony from visual arts to highlight the connections between different life forms on Earth; ...)

#### A3. Tools, Techniques, and Technologies

A3.2 use technologies, tools, and techniques associated with more than one arts discipline to create integrated art works/productions that demonstrate creativity and/or innovation (e.g., use accompaniment and animation software to create an innovative art work based on an environmental theme; ...)

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.3** demonstrate an understanding of how past and present social, economic, and/or political factors have affected artistic form and content (*e.g.*, ... how environmental issues have influenced various contemporary artists; ...)

#### **C3.** Conventions and Responsible Practices

**C3.4** describe environmental issues associated with the arts, and apply environmentally responsible practices when creating, presenting, and promoting art works, including integrated art works/ productions (*e.g., safely and appropriately dispose of paint containers, toner cartridges, and other arts supplies; recycle batteries; use the Environment Canada website as a source for an integrated arts project on the four R's [reduce, reuse, recycle, and recover]; reduce the use of paper by promoting a performance or art exhibition through the Internet) Teacher prompts: "Why is it important to check the source the supplies you use for your art works?" "A re any of the items you used in creating your art work classified as hazardous.* 

works?" "Are any of the items you used in creating your art work classified as hazardous waste? How should you dispose of them?"

## MEDIA ARTS, GRADES 11 AND 12

## Media Arts, Grade 11, University/College Preparation (ASM3M)

#### A. Creating and Presenting

#### A3. Using Technologies, Tools, and Techniques

A3.3 communicate their purpose and artistic intention when creating and presenting media art works, using a variety of approaches, tools, technologies, and techniques (e.g., create a video-based installation that uses dramatic images to encourage the audience to consider social issues related to Aboriginal rights or environmental protection)

#### C. Foundations

#### **C3.** Responsible Practices

**C3.3** identify and apply responsible environmental practices associated with the media arts workplace (*e.g., dispose of chemicals, batteries, and obsolete hardware in environmentally safe ways; use energy conservation practices; use recycled or recyclable material where possible)* 

*Teacher prompt:* "What practices should media artists put in place to ensure that they are working in environmentally friendly ways? Have you applied these practices in your recent projects?"

## Media Arts, Grade 11, Open (ASM3O)

#### A. Creating and Presenting

#### **A1. The Creative Process**

- A1.1 use a variety of strategies ... to generate and explore ideas, individually and collaboratively, for solutions to creative challenges (e.g., creating a media art work on the signs of or issues relating to climate change in their community or on a cultural theme)
- A1.4 exhibit or perform media art works, individually and/or collaboratively, using a variety of methods that are appropriate for their work (e.g., a classroom exhibition showcasing a variety of works on a social issue; an outdoor installation based on an environmental theme; ...)

#### A3. Using Technologies, Tools, and Techniques

- A3.1 explore a variety of traditional and emerging technologies, tools, and techniques, and use them to produce effective media art works (e.g., ... use a digital recording device to store sounds for a soundscape based on an environmental theme) *Teacher prompts:* ... "How does the inclusion of a soundscape enhance viewers' experience of your landscape photographs?"
- A3.3 communicate a personal message or an opinion on an issue of personal concern by creating and presenting media art works using a variety of techniques, tools, and/or technologies (e.g., an animated short to express their personal point of view on issues related to smoking; a series of ads for public spaces on reducing the size of our ecological footprint, using techniques similar to those of Adbusters)

#### B. Reflecting, Responding, and Analysing

#### **B2. Identity and Values**

B2.4 explain, using a variety of formats ..., how creating and presenting media art works has affected their personal values and their understanding of their culture and community ...
 *Teacher prompt:* "How did creating your interactive collage on climate change affect your own approach to the environment and your understanding of the values of your community?"

#### **B3.** Connections Beyond the Classroom

**B3.3** identify and describe skills and understandings acquired through the creative and critical analysis processes in the media arts (*e.g.*, ... more sophisticated understanding of social and environmental issues and anti-discrimination practices) and explain how they can be applied in everyday life ...

#### C. Foundations

#### **C3.** Responsible Practices

- **C3.1** identify and apply healthy, safe, and conscientious work practices when performing tasks related to media arts production *(e.g., use safe practices when ... using and storing chemicals ...)*
- **C3.3** identify and apply responsible environmental practices associated with the media arts workplace (*e.g.*, *reuse and recycle materials when possible; dispose of chemicals and batteries in environmentally safe ways; use energy conservation practices*)

*Teacher prompts:* "In what ways can an individual media artist contribute to the environment?" "What environmentally friendly practices can you adopt when you are creating a media art work?"

## Media Arts, Grade 12, University/College Preparation (ASM4M)

#### A. Creating and Presenting

#### A2. The Principles of Media Arts

**A2.3** investigate and analyse how media artists use the principle of duration, and apply that principle and at least one other principle in the design and production of media art works that incorporate elements from contributing arts (*e.g., using the work of Ron Haselden as inspiration, apply the principles of duration and point of view to create a multimedia, sitespecific group performance piece that is to be presented in a particular area of the school or the school grounds and that challenges or changes the space's purpose or meaning)* 

#### A3. Using Technologies, Tools, and Techniques

A3.2 create and present media art works that are highly appropriate for a variety of specific audiences and venues (*e.g.*, ... *a venue such as* ... *an outdoor site that is relevant to the particular art work*), using a range of technologies, tools, and techniques ...

#### C. Foundations

#### **C2.** Contexts and Influences

**C2.3** analyse, with reference to specific artists and their works ..., the types of roles played by media artists in various societies, and explain how their roles may vary depending on the sociocultural context in which they work

*Teaching prompt:* "Why did Annie Leonard create the video *The Story of Stuff*? What role did she adopt in making this video? Why?"

#### **C3.** Responsible Practices

**C3.3** identify and apply responsible environmental practices associated with the media arts workplace (*e.g.*, *dispose of chemicals, batteries, and obsolete hardware in environmentally safe ways; use energy conservation practices; use recycled or recyclable materials where possible; substitute more environmentally friendly materials for hazardous ones)* 

## Media Arts, Grade 12, Workplace (ASM4E)

### B. Reflecting, Responding, and Analysing

#### **B2.** Identity and Values

**B2.3** analyse how media art works influence community or societal values *(e.g., advertisements for advocacy groups; music videos; documentaries such as* Carts of Darkness, I'll Find a Way, Wapos Bay, An Inconvenient Truth, Bowling for Columbine*)* 

#### **C3.** Responsible Practices

**C3.3** identify and apply responsible environmental practices associated with the media arts workplace (*e.g., dispose of chemicals and batteries in environmentally appropriate ways; use energy conservation practices; reuse and recycle materials when possible; substitute a less harmful substance for a hazardous one)* 

## MUSIC, GRADES 11 AND 12

## Music, Grade 11, University/College Preparation (AMU3M)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Music and Society

**B2.1** analyse ways in which traditional, commercial, and art music are a response to and reflection of the community or culture in which they were created ...

*Teacher prompts:* ... "What are some of the songs associated with the environmental movement? ..."

#### C. Foundations

#### C2. Characteristics and Development of Musical Forms

C2.2 analyse, on the basis of research, and report on the characteristics of and ideas in traditional and contemporary music, including Aboriginal music, from Canada and around the world *(e.g., ... research and report on connections between music and nature; ...)Teacher prompts:* "Why might the composer of a Renaissance madrigal have imitated the sounds of nature?" ...

## Music, Grade 11, Open (AMU3O)

#### A. Creating and Performing

#### **A1. The Creative Process**

A1.1 apply the creative process when performing music and composing and/or arranging music (e.g., ... experiment with various natural and instrumental sounds when arranging music for their ensemble; ...)

#### C. Foundations

#### C2. Musical Genres and Influences

**C2.2** describe, in a research-based report or presentation, the interrelationship between nature/the environment and various kinds of music, including Aboriginal music (e.g., present a ritual or celebration using replica instruments created from natural or recycled materials; investigate how composers have used nature as a source of inspiration and ideas)

*Teacher prompts:* "What attitudes towards the environment are evident in traditional and contemporary Aboriginal music?" "How does Stravinsky represent nature in *Rite of Spring?* What are some other art music compositions that were inspired by nature?" "How can music connect us to the environment?"

## Music, Grade 12, Workplace Preparation (AMU4E)

#### B. Reflecting, Responding, and Analysing

#### **B3.** Skills and Personal Growth

**B3.1** assess how the study of music has affected their personal growth and values, their expressive capabilities, and their understanding of others, particularly within the context of the workplace and their daily life ...

*Teacher prompts:* ... "Identify some musicians and songs that have influenced your point of view on an environmental issue. How have they affected your day-to-day behaviour?"

## VISUAL ARTS, GRADES 11 AND 12

## Visual Arts, Grade 11, University/College Preparation (AVI3M)

#### A. Creating and Presenting

#### A2. The Elements and Principles of Design

A2.2 apply elements and principles of design as well as art-making conventions to create art works that comment and/or communicate their personal perspective on issues related to social justice or the environment ...

#### B. Reflecting, Responding, and Analysing

#### **B1. The Critical Analysis Process**

**B1.2** deconstruct the visual content and the use of elements and principles of design in their own art work and the work of others ...

*Teacher prompt:* "What differences are there between the landscapes of Homer Watson and those of Emily Carr with respect to the artists' use of elements/principles such as colour, value, shape, proportion, and emphasis? What impact do these differences have on the mood or meaning of the works?"

#### C. Foundations

#### **C3.** Responsible Practices

**C3.3** demonstrate an understanding of how the production and presentation of art works can affect the environment *(e.g., in small groups, prepare a role play to illustrate the environmental consequences of improper use or disposal of hazardous or toxic materials)*, and apply environmentally responsible practices when creating, presenting, and promoting art works

*Teacher prompts:* "Why is it important to know the source and content of the materials and media you are using?" "What types of materials should you avoid using in your art works because their sourcing, processing, and/or disposal can damage the environment?"

## Visual Arts, Grade 11, Open (AVI3O)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Art, Society, and Values

**B2.3** describe how creating and analysing art works has affected their personal identity and values and/or changed their perception of society (e.g., with reference to ... their relationship with the physical environment ...)

#### C. Foundations

#### **C3.** Responsible Practices

C3.3 demonstrate an understanding of how the production and presentation of art works can affect the environment, and apply environmentally responsible practices when creating, presenting, and promoting art works (e.g., use recycled materials and those made from sustainable resources when creating their works and when packing and shipping art works; dispose of waste materials, including hazardous materials, in an environmentally responsible way; reduce the use of paper by using email and the Internet to promote an exhibition) Teacher prompts: "What are some of the ways you could use found materials responsibly in the creation of an assemblage?" "What are some alternatives to styrofoam packaging?" "How can creating art works be harmful to the environment? What are some ways of ensuring that you are an environmentally friendly artist?"

## Visual Arts, Grade 12, University/College Preparation (AVI4M)

#### A. Creating and Presenting

#### A2. The Elements and Principles of Design

A2.2 apply the elements and principles of design as well as a wide range of art-making conventions with increasing skill and creativity to produce art works that comment and/or communicate a clear point of view on a variety of issues ... *Teacher prompts:* "What images or symbols might you use to comment on the impact of human behaviour on the natural environment?" ...

#### B. Reflecting, Responding, and Analysing

#### **B2.** Art, Society, and Values

**B2.3** assess the impact that the creation and analysis of art works has had on their personal identity and values and their perceptions of society (*e.g.*, *with reference to ... their appreciation for the natural and built environment around them ...*)

#### C. Foundations

#### C1. Terminology

**C1.1** extend their understanding of the elements and principles of design, and use terminology related to these elements and principles correctly and appropriately when creating or analysing a variety of art works (*e.g., when analysing how artists' manipulation of space, movement, form, and proportion affects meaning in an environmental work)* 

#### **C3.** Responsible Practices

**C3.3** explain how art works can have both a positive and negative impact on the environment (e.g., explain how art works can educate people about environmental issues; identify hazardous substances commonly used in the production of art works, explain their potential environmental impact, and identify the proper way to dispose of them; explain the pros and cons of using recycled materials in their art works)

*Teacher prompts:* "What artists can you think of who deal with environmental themes in their art work? Has their work influenced your attitudes on environmental issues? Why or why not?" "What type of art works might you create to educate your audience about an issue such as loss of habitat?"

## Visual Arts, Grade 12, Workplace Preparation (AVI4E)

#### A. Creating and Presenting

#### A2. The Elements and Principles of Design

A2.2 apply the elements and principles of design as well as art-making conventions with increasing skill to create a variety of art works that explore and/or present a point of view on contemporary social issues and/or themes ...

*Teacher prompt:* "How might you use space, proportion, and emphasis in a public service advertisement encouraging people to limit their use of plastic water bottles? ..."

#### A3. Production and Presentation

A3.1 extend their exploration of media/materials, techniques, tools, and traditional and emerging technologies, and apply them to create a variety of art works, including applied and commercial art works, for a range of purposes (*e.g.*, ... create a promotional item such as a poster or *T-shirt for a fund-raising event for an environmental advocacy group*)

#### B. Reflecting, Responding, and Analysing

#### **B2.** Art, Society, and Values

**B2.1** explain how applied and commercial art works can influence individual and community values (e.g., how the design of sustainable products such as reusable bags or bottles can encourage people to reduce and reuse packaging; ...)

*Teacher prompt:* "What are some examples of products that artists have designed or modified to encourage people to respect or protect the environment? How have these products affected practices in your family, school, or community?"

#### C. Foundations

#### **C3.** Responsible Practices

**C3.3** identify responsible environmental practices that should be used in applied arts workplaces *(e.g., safe disposal of paints, solvents, and photographic chemicals; reuse and recycling of materials; substitution of a less harmful substance for a toxic one)*, and apply these practices when creating visual art works

*Teacher prompts:* "Why is it important to source materials that have been produced with the least harm to the environment?" "What items in a graphic arts workplace can be recycled?" "What fabrics cause the least environmental damage? Why?"

## BUSINESS STUDIES, GRADES 9 AND 10 (2006) AND GRADES 11 AND 12 (2006)

The business studies curriculum identifies two critical areas of learning that can be connected with environmental education: (1) "ethical, moral, and legal considerations in business" – i.e., "the understanding and/or determination of social and environmental consequences of business practices on the local, national, and global levels" and (2) "business skills" – i.e., "the knowledge and skills necessary for success in business", when considered within an environmental context (see page 5 of the policy documents for Grades 9 and 10 and Grades 11 and 12). In addition, business courses cover one of the fundamental principles of business and economics – that is, the role of business enterprises in responding to people's needs and wants. This topic offers rich opportunities for making environmental connections, in that responding to "wants" can conflict with meeting "needs", including the need to protect the environment.

## GRADES 9 AND 10

## Introduction to Business, Grade 9 or 10, Open (BBI10/BBI20)

#### **Business Fundamentals**

- demonstrate an understanding of how businesses respond to needs, wants, supply, and demand
- demonstrate an understanding of ethics and social responsibility in business
  - explain the concepts of ethics and social responsibility as they apply to business (e.g., workplace safety, antidiscrimination issues, accessibility issues for people with disabilities, environmental responsibility, respect for labour laws, fair trade)
  - explain controversial business issues from a local, national, and international perspective (e.g., accounting scandals, environmental impact of some business practices, insider trading, fraud)
- demonstrate an understanding of the benefits and challenges for Canada in the field of international business
  - explain the potential benefits (e.g., access to markets, cheaper labour, increased quality and quantity of goods, access to resources) and social costs (e.g., outsourcing, human rights or labour abuses, environmental degradation) of international business for domestic and foreign partners

### Functions of a Business

- demonstrate an understanding of sound management practices in business
  - explain the importance of ethical behaviour with respect to employees, the environment, and communities

#### Entrepreneurship

- analyse the importance of invention and innovation in entrepreneurship
  - describe how entrepreneurs discover opportunities in people's needs, wants, and problems

Note: Environmental connections can readily be made in the context of these expectations.

## Information and Communication Technology in Business, Grade 9 or 10, Open (BTT10/BTT20)

#### Ethics and Issues in Information and Communication Technology

- assess the impact of information and communication technology on personal health and the environment
  - explain the impact of information and communication technology on the environment (e.g., disposal of hardware, recycling of paper and toner cartridges)

## ENTREPRENEURSHIP, GRADES 11 AND 12

## Entrepreneurship: The Venture, Grade 11, College Preparation (BDI3C)

#### **Enterprising People and Entrepreneurs**

- compare the characteristics and contributions of various entrepreneurs
  - outline the importance of incorporating ethical practices and social responsibility when operating a business venture
  - describe the impact that local entrepreneurs have had on the community (e.g., by creating jobs, providing community leadership, funding scholarships)
  - describe how entrepreneurs have been agents of change (e.g., by developing new products, methods of production, and ways of doing business)
  - describe the effect that changes brought about by entrepreneurs have had on the lives of people (e.g., workers, consumers, business people)

*Note:* Attention can be drawn to entrepreneurs who have made a difference with respect to the environment.

#### Ideas and Opportunities for New Ventures

- analyse various methods of generating ideas and identifying opportunities to satisfy needs and wants
  - explain how new ventures have been developed in response to consumer needs or wants
  - describe how similar needs and wants have been satisfied in different ways (e.g., alternative methods of healing, such as Aboriginal or Chinese methods, versus Western medicine; organic produce versus genetically modified produce)

- generate realistic new ideas and identify possible opportunities for a school-based or studentrun business
  - apply creative-thinking strategies (e.g., mind mapping, brainstorming) to determine possible solutions to unsatisfied needs and wants in the school or the community

#### The Benefits of a Venture Plan

- describe why it is important for a venture plan to be flexible, ethical, and adaptable

*Note:* The importance of considering the environment when creating a venture plan can be emphasized in the context of this expectation.

#### Developing and Completing a Venture Plan for the Proposed Business

#### All expectations

*Note:* Students could choose a business relating to the environment or could consider the environmental impact of their proposed business.

## Entrepreneurship: The Enterprising Person, Grade 11, Open (BDP3O)

### The Changing Nature of the Workplace

- describe the major factors affecting the labour market
- analyse the changing nature of work and the workplace

*Note:* The specific expectations corresponding to these overalls provide opportunities for making environmental connections. Societal concerns about protecting the environment and dealing with climate change will have an effect on available jobs and on the demand for various types of labour and skills, as well as on practices in the workplace.

#### Entrepreneurship and the Enterprising Employee

 describe the roles of entrepreneurs that benefit communities and society (e.g., agents of change, creators of jobs and wealth, role models of ethical behaviour, advocates for community development)

#### The Enterprising Experience: Planning and Organizing an Event

• generate and evaluate ideas for an event in the school or the community and identify a realistic event to plan and organize

Note: The event could be related to an environmental issue or concern.

# Entrepreneurship: Venture Planning in an Electronic Age, Grade 12, College Preparation (BDV4C)

#### The Venture Concept

- identify community problems, needs, or wants, and explain how selected problems, needs, or wants could be addressed
- identify community problems, needs, or wants that could best be addressed by a not-for-profit venture, and explain why

*Note:* The problems and needs identified in these two specific expectations could be related to the environment.

## INFORMATION AND COMMUNICATION TECHNOLOGY, GRADES 11 AND 12

## Information and Communication Technology: The Digital Environment, Grade 11, Open (BTA3O)

#### Digital Literacy

- identify features and benefits of a networked environment

*Note:* An environmental connection can be made in terms of reductions in the use of resources, such as paper and cables, in a networked environment.

#### E-Business

• evaluate the impact of e-business

*Note:* The topic of e-business offers opportunities for making environmental connections, particularly with respect to the potential for conserving resources.

# Information and Communication Technology: Multimedia Solutions, Grade 12, College Preparation (BTX4C)

#### The Electronic Business Environment

 describe the positive and negative effects of information and communication technology on businesses and working conditions (e.g., more efficient communication, ease of information sharing/retrieval, job loss/reassignment, technical difficulties)

*Note:* An environmental perspective could be introduced in connection with this expectation, focusing primarily on resource use.

## Information and Communication Technology in the Workplace, Grade 12, Workplace Preparation (BTX4E)

#### The Electronic Workplace Environment

- explain the ways in which workplace settings have changed as a result of recent developments in information and communication technology
- explain how information and communication technology affects the way in which business is conducted (e.g., more efficient communication, ease of information sharing and retrieval, reduced mailing costs)

Note: Content related to these expectations could be examined from an environmental perspective.

## INTERNATIONAL BUSINESS, GRADES 11 AND 12

# International Business Fundamentals, Grade 12, University/College Preparation (BBB4M)

#### Business, Trade, and the Economy

 evaluate the benefits (e.g., decreased prices, increased quantity and quality of products, technological developments) and drawbacks (e.g., loss of jobs, increased foreign ownership of Canadian companies) of international trade for Canada

*Note:* The evaluation of the risks and benefits of international trade could take environmental impacts into account.

### The Global Environment for Business

- analyse ways in which Canadian businesses have been affected by globalization
  - analyse how, in an era of globalization, consumer choices and attitudes affect Canadian business decisions
- assess the effects of current trends in global business activity and economic conditions
  - explain how globalization creates the need for standardization of products, services, and processes (e.g., through the International Organization for Standardization)

*Note:* Various environmental concerns and considerations related to globalization can be explored in the context of these expectations.

### Factors Influencing Success in International Markets

- evaluate the advantages and disadvantages in both developed countries and developing countries with regard to business opportunities (e.g., size of consumer base, government regulations, infrastructure, cost of labour)
- describe the roles corporations can play in the setting of international and domestic policy (e.g., lobbying, participating in trade missions)

#### Marketing Challenges and Approaches, and Distribution

• demonstrate an understanding of the logistics of, and challenges associated with, distribution to local, national, and international markets

*Note:* This overall expectation, supported by its corresponding specific expectations (under Distribution and Logistics), provides an opportunity to consider environmental concerns related to the transportation of goods.

#### Working in International Markets

- analyse the ways in which ethical considerations affect international business decisions
  - evaluate the ethical issues that arise for companies competing internationally, in relation to the following groups: consumers (e.g., safety, fair pricing, disclosure); stockholders (e.g., fair return, controlled risk); employees (e.g., fair wages, good working conditions, outsourcing, regulation of child labour); the host country (e.g., effects on local economy, respect for local laws and cultural preservation); and society (e.g., sustainability of development, practices to combat corruption)

*Note:* Ethical considerations would include, among other environmental concerns, the need to protect the environment of the host country. Other specific expectations in the subsection Ethical Issues also provide opportunities to make links to environmental issues.

# International Business Essentials, Grade 12, Workplace Preparation (BBB4E)

#### Canada in the Global Marketplace

- identify the advantages, disadvantages, and challenges associated with international business activity
- · determine how Canadians have been affected by international business activity
  - describe the effects of foreign investment on Canada
  - explain how the needs and wants of Canadians may present opportunities for foreign companies
  - identify Canada's current major trading partners and the products traded

*Note:* These expectations provide significant opportunities to explore the environmental concerns and implications connected with international business and trade and foreign investment in Canada.

#### **Conducting International Business**

- demonstrate an understanding of the way in which ethical considerations affect international business decisions
  - compare the code of ethics for a variety of international companies
  - summarize the ethical issues that arise for companies that are competing internationally (e.g., fair wages, regulation of child labour, cultural preservation, environmental practices)

#### International Careers and Skills

 illustrate the impact of recent international events (e.g., 9/11, the outbreak of SARS in Toronto, the discovery of BSE in Canadian cattle) on Canadian international business

*Note:* Events connected with climate change or other environmental phenomena can be considered in the context of this expectation.

## MARKETING, GRADES 11 AND 12

## Marketing: Goods, Services, Events, Grade 11, College Preparation (BMI3C)

#### Marketing Fundamentals

- summarize the factors that motivate a customer to purchase a product (e.g., discretionary income, peer pressure, social responsibility, evolving needs and wants)
- compare the purposes of marketing for profit and not-for-profit organizations (e.g., to sell products and lifestyles, to raise funds, to raise awareness about issues)
- describe, drawing on computer research, ethnocultural, linguistic, and geographical factors that firms should consider when they enter the global market (e.g., cultural variations in consumer preference and buying behaviour, language barriers, expense of delivery to distant markets)

*Note:* Environmental considerations are relevant to the topic of each of these expectations.

#### The Marketing Mix

- compare the advantages and disadvantages of the various ways of delivering goods and services (e.g., truck, train, plane, auto, the Internet) from the producer to the consumer

#### Trends in Marketing

- identify and describe various environmental, ethical, social, and legal issues that affect marketing activities
  - identify examples of businesses that include corporate social responsibility as a component of their marketing philosophy (e.g., not using animals in product testing, sponsoring charitable events, hosting children's camps, engaging in responsible environmental practices)

#### The Marketing Plan

 explain how a marketing plan can address the areas of ethics and social responsibility (e.g., by identifying diverse markets, by requiring environmentally friendly components in the product and its packaging, by incorporating positive social messages for healthy products)

*Note:* The product, service, or event chosen for marketing will determine the extent of the environmental considerations that need to be taken into account.

## Marketing: Retail and Service, Grade 11, Workplace Preparation (BMX3E)

#### Marketing Fundamentals

- summarize changes in lifestyles and consumer needs and wants over the past few decades and explain their impact on retail and service businesses (e.g., changing gender roles, consumer demand for fast food, use of portable communication and entertainment devices)
- explain how changing demographics, tastes, preferences, and psychographics of Canadian consumers have influenced their buying decisions (e.g., needs of aging population; interest in organic, green, or energy-efficient products)

#### Trends in Retail and Service Marketing

- identify and describe various environmental, ethical, social, and legal issues that affect the retail and service industries
  - describe ways in which marketing activities (e.g., packaging, labelling) have been influenced by the environmental movement
  - identify ways that federal, provincial, and municipal laws and regulations (e.g., concerning health and safety, environmental protection, product standards) can affect how retail and service businesses operate

### **BUSINESS LEADERSHIP, GRADES 11 AND 12**

## Business Leadership: Management Fundamentals, Grade 12, University/College Preparation (BOH4M)

#### Foundations of Management

- evaluate the impact of issues related to ethics and social responsibility on the management of organizations
  - evaluate the impact of major ethical issues (e.g., bribery, harassment, polluting the environment, theft in the workplace, Aboriginal land claims versus interests of resource companies) and dilemmas (e.g., for the individual, the workplace, and the local and global community) on management strategies and decision making
  - explain the nature of corporate ethical and social responsibility and analyse, on the basis
    of research, including stakeholder analysis, a particular company's commitment to it (e.g.,
    in relation to non-discriminatory hiring, promotion, and retention practices; implementing
    the Persons with Disabilities Act and the Accessibility for Ontarians with Disabilities Act;
    environmental issues; customer/supplier relationships)

# Business Leadership: Becoming a Manager, Grade 12, Workplace Preparation (BOG4E)

#### The Role of the Manager

- explain the need for ethical and socially responsible behaviour in business management

*Note:* Socially responsible behaviour in business management includes protection of the environment.
# CANADIAN AND WORLD STUDIES, GRADES 9 AND 10 (2013) AND GRADES 11 AND 12 (2015)

From "Environmental Education and Canadian and World Studies" in the curriculum policy documents:

There are many opportunities to integrate environmental education into the teaching of Canadian and world studies. In all subjects of this program, students can be encouraged to explore a range of environmental issues. In economics, students have opportunities to analyse the environmental impact of economic growth as well as issues related to the scarcity of natural resources. Students also consider how the actions of consumers and producers can affect the environment. In the geography courses, students may investigate environmental issues relating to topics such as resource management, population growth and urban sprawl, and the impact of human activity on the natural environment. Students also analyse the environmental sustainability of current behaviours and practices, explore ways in which environmental stewardship can be improved, and make connections between local, national, and global environmental issues, practices, and processes. In the history courses, students are able to explore various Canadian and international political policies and social movements related to the environment. In the Canadian and American history courses, as well as World History to the End of the Fifteenth Century, students explore how the environment affected settlement and contributed to differentiation between societies and regions. In the law courses, students explore the concept of "justice" for animal species and other living things and how human rights legislation and environmental protection legislation are interconnected. In Canadian and International Law, students evaluate the effectiveness of environmental protection legislation, both domestically and internationally. In the politics courses, students learn that the responsibilities of citizenship include the protection and stewardship of the global commons, such as air and water, on a local, national, and global scale. They are also given opportunities to explore various environmental issues of political importance.

# GEOGRAPHY, GRADE 9

## Issues in Canadian Geography, Grade 9, Academic (CGC1D)

## A. Geographic Inquiry and Skill Development

- A1. Geographic Inquiry: use the geographic inquiry process and the concepts of geographic thinking when investigating issues relating to Canadian geography
- A2. Developing Transferable Skills: apply in everyday contexts skills, including spatial technology skills, developed through the investigation of Canadian geography, and identify some careers in which a background in geography might be an asset

## B. Interactions in the Physical Environment

- **B1.** The Physical Environment and Human Activities: analyse various interactions between physical processes, phenomena, and events and human activities in Canada (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **B2.** Interrelationships between Physical Systems, Processes, and Events: analyse characteristics of various physical processes, phenomena, and events affecting Canada and their interrelationship with global physical systems (FOCUS ON: *Patterns and Trends; Interrelationships*)
- **B3.** The Characteristics of Canada's Natural Environment: describe various characteristics of the natural environment and the spatial distribution of physical features in Canada, and explain the role of physical processes, phenomena, and events in shaping them (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## C. Managing Canada's Resources and Industries

- **C1.** The Sustainability of Resources: analyse impacts of resource policy, resource management, and consumer choices on resource sustainability in Canada (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **C2.** The Development of Resources: analyse issues related to the distribution, availability, and development of natural resources in Canada from a geographic perspective (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **C3.** Industries and Economic Development: assess the relative importance of different industrial sectors to the Canadian economy and Canada's place in the global economy, and analyse factors that influence the location of industries in these sectors (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## D. Changing Populations

- **D1. Population Issues:** analyse selected national and global population issues and their implications for Canada (FOCUS ON: *Interrelationships; Patterns and Trends*)
- **D2. Immigration and Cultural Diversity:** describe the diversity of Canada's population, and assess some social, economic, political, and environmental implications of immigration and diversity for Canada (FOCUS ON: *Spatial Significance; Geographic Perspective*)
- **D3.** Demographic Patterns and Trends: analyse patterns of population settlement and various demographic characteristics of the Canadian population (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## E. Liveable Communities

- **E1.** The Sustainability of Human Systems: analyse issues relating to the sustainability of human systems in Canada (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **E2.** Impacts of Urban Growth: analyse impacts of urban growth in Canada (FOCUS ON: *Spatial Significance; Geographic Perspective*)
- **E3.** Characteristics of Land Use in Canada: analyse characteristics of land use in various Canadian communities, and explain how some factors influence land-use patterns (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## Issues in Canadian Geography, Grade 9, Applied (CGC1P)

## A. Geographic Inquiry and Skill Development

- A1. Geographic Inquiry: use the geographic inquiry process and the concepts of geographic thinking when investigating issues relating to Canadian geography;
- A2. Developing Transferable Skills: apply in everyday contexts skills, including spatial technology skills, developed through the investigation of Canadian geography, and identify some careers in which a background in geography might be an asset.

## B. Interactions in the Physical Environment

- **B1.** Natural Processes and Human Activity: analyse some interactions between physical processes, events, and phenomena and human activities in Canada (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **B2.** Influence of the Natural Environment on Human Activity: explain how physical processes and the natural environment influence human activity in Canada (FOCUS ON: *Spatial Significance; Interrelationships*)
- **B3.** Characteristics of Canada's Natural Environment: describe some natural processes and key characteristics of the natural environment in Canada (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## C. Managing Canada's Resources and Industries

- **C1. Managing Resources:** assess the influence of personal choices and community actions on the use of natural resources in Canada (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **C2.** Canadian Industries: describe the economic, environmental, social, and political significance of selected aspects of Canada's resources and industries (FOCUS ON: *Patterns and Trends; Geographic Perspective*)
- **C3.** The Use of Natural Resources: describe the distribution and use of selected natural resources in Canada (FOCUS ON: *Spatial Significance; Interrelationships*)

## D. Changing Populations

- **D1. Population Trends and Their Impacts:** assess the impact on Canadian communities of changes in the characteristics of Canada's population, and describe ways of responding to these changes (FOCUS ON: *Patterns and Trends; Geographic Perspective*)
- **D2.** Immigration Trends: analyse recent immigration trends in Canada (FOCUS ON: *Interrelationships; Patterns and Trends*)
- **D3. Population Characteristics:** describe key characteristics of population settlements in Canada and the major demographic characteristics of the Canadian population (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## E. Liveable Communities

- **E1.** Sustainable Communities: identify factors that affect the sustainability of communities, and describe strategies for improving their sustainability (FOCUS ON: *Interrelationships; Geographic Perspective*)
- **E2.** Impacts of Land Use: analyse impacts of land use in Canada on communities and the natural environment (FOCUS ON: *Spatial Significance; Interrelationships*)
- **E3.** Patterns of Land Use: describe patterns of land use in their local community (FOCUS ON: *Spatial Significance; Patterns and Trends*)

## HISTORY, GRADE 10

## Canadian History since World War I, Grade 10, Academic (CHC2D)

## C. Canada, 1929–1945

#### C1. Social, Economic, and Political Context

- **C1.1** describe some key social changes in Canada during this period (e.g., social changes brought about by ... the dustbowl during the Depression; ...), and explain their main causes as well as their impact on different groups in Canada
- C1.3 describe some key economic trends and developments in Canada during this period (e.g., ... the impact of the dustbowl on agriculture, ...), and assess their impact on different groups in Canada Sample questions: ... "What was the economic impact of the dustbowl?" ...

## D. Canada, 1945–1982

## D1. Social, Economic, and Political Context

- D1.2 identify some major developments in science and technology during this period (e.g., ... nuclear energy, plastics...), and assess their significance for different groups in Canada Sample questions: ... "What impact did insecticide use have on different groups during this period?"
- **D1.4** describe some key political developments and/or government policies in Canada during this period (*e.g.*, ... *the establishment of Environment Canada*), and assess their significance for different groups in Canada

## D2. Communities, Conflict, and Cooperation

- **D2.1** describe some significant instances of social conflict and/or inequality in Canada during this period (e.g., ... the Asbestos Strike in Quebec; protests against ... the James Bay project; conflict over the National Energy Program, ...) and analyse them from multiple perspectives
- **D2.2** describe some significant examples of social and/or political cooperation in Canada during this period, including a variety of social movements (*e.g.*, ... *environmental movements*; ...) and analyse them from multiple perspectives

**D2.5** describe some key developments in Canada's relationship with the United States during this period *(e.g., ... environmental concerns such as acid rain)*, and explain how they challenged or reinforced the nature of that relationship

#### D3. Identity, Citizenship, and Heritage

- **D3.1** describe contributions of various individuals, groups, and/or organizations to Canadian society and politics during this period *(e.g., ... Greenpeace, ...)* ...
- **D3.3** explain some significant events, developments, and/or issues that affected First Nations, Inuit, and/or Métis people in Canada during this period (*e.g.*, ... *the James Bay project and the resulting protests;* ...) ...

## E. Canada, 1982 to the Present

#### E1. Social, Economic, and Political Context

- E1.1 describe various social and cultural trends and developments in Canada since 1982 ... and assess their significance for people in Canada*Sample questions:* ... "Why have a number of environmental groups developed in Canada in the past three decades? How significant do you think they have been?"
- E1.2 identify some major developments in science and technology since 1982 (e.g., ... electric and hybrid cars, fossil fuel extraction technologies, ... genetically modified foods, developments in alternative energy), and assess their significance for people in CanadaSample questions: ... "What impact have recycling technologies had on consumer habits and attitudes?"
- E1.4 describe some key political developments and/or government policies in Canada since 1982 (e.g., ... the Kyoto Accord, ... new political parties such as ... the Green Party, ...), and assess their significance for different people in Canada

*Sample questions:* ... "How have the environmental policies of the federal government changed during this period? How might you account for the changes?"

#### E3. Identity, Citizenship, and Heritage

**E3.1** describe contributions of various individuals, groups, and/or organizations to Canadian society and politics since 1982 (*e.g.*, ... *David Suzuki, Sheila Watt-Cloutier;* ... *the Green Party,* ...), and explain the significance of these contributions for the development of identity, citizenship, and/or heritage in Canada

## Canadian History since World War I, Grade 10, Applied (CHC2P)

## D. Canada, 1945–1982

#### **D1. Social, Economic, and Political Context**

**D1.2** identify some major developments in science and/or technology during this period, and explain how they changed the lives of people in Canada (e.g., ... the advent of commercial fertilizers and pesticides helped farmers but also had consequences for the environment)

#### **D2.** Communities, Conflict, and Cooperation

- D2.2 identify some major social movements in Canada during this period (e.g., ... environmental, ...), and explain their goals and perspectives Sample questions: "What were some of the issues that motivated the early environmental movement in Canada?" ...
- **D2.4** describe some key developments in Canada's relationship with the United States during this period *(e.g., with reference to ... environmental concerns such as acid rain)*, and explain their significance

#### D3. Identity, Citizenship, and Heritage

- **D3.1** describe ways in which some individuals, symbols, and/or events during this period contributed to the development of identity, citizenship, and/or heritage in Canada *(e.g., individuals: ... David Suzuki, ...)*
- **D3.2** describe some significant developments and/or issues that affected First Nations, Métis, and Inuit people in Canada during this period *(e.g., ... the James Bay project; ...)*, and explain the impact of these developments/ issues on identity, citizenship, and/or heritage in Canada

## E. Canada, 1982 to the Present

#### E1. Social, Economic, and Political Context

- **E1.1** describe some key social trends and/or developments in Canada since 1982 (*e.g.*, ... *the growth of social advocacy groups, including environmental* ... *groups*), and assess their significance for the lives of different people in Canada
- **E1.2** identify some major developments in science and/or technology since 1982 (e.g., ... electric and hybrid cars, recycling technologies, ... genetically modified foods, new fossil fuel extraction technologies, developments in alternative energy, ...) ...
- E1.4 describe some key political developments and/or government policies in Canada since 1982 (e.g., ... new political parties such as ... the Green Party, ... fishing moratoria, the Montreal Protocol, the Kyoto Accord) and assess their impact on the lives of different people in Canada Sample questions: "How has the moratorium on cod fishing affected the lives [of] people in Atlantic Canada?" ...

#### E3. Identity, Citizenship, and Heritage

**E3.3** explain the significance of responses by Canada and Canadians to some key international events and/or developments since 1982 (e.g., ... famine in Ethiopia, natural disasters such as the Indian Ocean tsunami or the earthquake in Haiti; climate change)

# CIVICS (POLITICS), GRADE 10

## Civics and Citizenship, Grade 10, Open (CHV2O)

## A. Political Inquiry and Skill Development

#### **A1. Political Inquiry**

A1.7 communicate their ideas, arguments, and conclusions using various formats and styles, as appropriate for the intended audiences and purpose (e.g., a blog on the results of environmental action in their school; ... a petition calling for clean, safe water on First Nations reserves; ...)

#### A2. Developing Transferable Skills

A2.3 apply the concepts of political thinking when analysing current events and issues involving Canada and the world (e.g., ... to analyse the motives and objectives of a group proposing a course of action in response to a current ... environmental issue; ...)

#### **B. Civic Awareness**

#### **B1.** Civic Issues, Democratic Values

**B1.1** describe some civic issues of local, national, and/or global significance (*e.g.*, ... *water quality;* ... *the impact of consumer choices;* ...), and compare the perspectives of different groups on selected issues

*Sample questions:* ... "What positions are being voiced in your community with respect to a local transit issue?" "What are some considerations that affect people's consumer choices? Why might people who favour free trade and those who favour fair trade differ in the criteria they use when making these choices?"

- **B1.2** describe fundamental beliefs and values associated with democratic citizenship in Canada ... and explain ways in which they are reflected in citizen actions (*e.g.*, ... *environmental stewardship*, ...)
- **B1.3** explain why it is important for people to engage in civic action, and identify various reasons why individuals and groups engage in such action (*e.g.*, ... to protect the environment, ...)

#### **B2.** Governance in Canada

B2.1 identify the political parties in Canada and their position on the political spectrum, and explain how the beliefs/values that underpin them may affect their perspectives on and/or approaches to issues of civic importance (*e.g., ... environmental protection, ...*) *Sample questions:* "What are the positions of different political parties on the issue of climate change? How might you account for the differences?" ... "Where would you place the Green Party on the political spectrum? Why?" ...

#### **B3.** Rights and Responsibilities

**B3.2** analyse key responsibilities associated with Canadian citizenship (e.g., ... protecting Canada's ... natural environment, ...)

**B3.4** analyse rights and responsibilities of citizenship within a global context, including those related to international conventions, laws, and/or institutions (*e.g.*, ... *Rio Declaration on Environment and Development [1992]*, ...)

*Sample questions:* ... "What role or responsibility does an individual have in helping to protect the global commons such as air and water?" ...

## C. Civic Engagement and Action

#### **C1.** Civic Contributions

- **C1.1** assess the significance, both in Canada and internationally, of the civic contributions of some individuals *(e.g., ... Maude Barlow, ... David Suzuki)* and organizations, including NGOs and social enterprises (e.g., ... *World Wildlife Federation, ...)*
- **C1.2** describe a variety of ways in which they could make a civic contribution at the local, national, and/or global level (*e.g.*, ... by reducing the amount of solid waste they generate and by properly disposing of hazardous waste; ...by participating in community clean-up or tree-planting days; ...)
- **C1.3** explain how various actions can contribute to the common good at the local, national, and/ or global level (e.g., ... the organized boycotting of products can pressure corporations to change irresponsible practices; donating to a development NGO can help improve the lives of people affected by a natural disaster...)

*Sample questions:* "In what ways does using public transit, biking, or carpooling contribute to the common good?" ... "What impact can consumers' choices have on the natural environment?"

#### **C2.** Inclusion and Participation

- **C2.1** analyse ways in which various beliefs, values, and perspectives are represented in their communities *(e.g., with reference to ... environmentalists; ...)*, and assess whether all perspectives are represented or are valued equally
- C2.3 describe various ways in which people can access information about civic matters ... and assess the effectiveness of ways in which individuals can voice their opinions on these matters ... Sample questions: "What are some ways in which a person can communicate his or her position on an environmental issue?" ...

## ECONOMICS, GRADES 11 AND 12

# The Individual and the Economy, Grade 11, University/College Preparation (CIE3M)

## A. Economic Inquiry and Skill Development

## A1. Economic Inquiry

A1.4 interpret and analyse data, evidence, and information relevant to their investigations, using various tools, strategies, and approaches appropriate for economic inquiry (*e.g.*, ... use a supply and demand model to predict the effect on Canadian wheat prices of drought on the Prairies)

A1.5 use the concepts of economic thinking (i.e., economic significance, cause and effect, stability and variability, and economic perspective) when analysing and evaluating data, evidence, and information and formulating conclusions and/or judgements about economic issues in Canada (e.g., ... consider the concept of cause and effect when comparing the costs of fair-trade and conventional goods; ...)

*Sample questions:* "Why would it be appropriate to consider the concept of economic significance when analysing the impact of a free trade agreement on producers and/or consumers?" ...

#### A2. Developing Transferable Skills

A2.3 apply the concepts of economic thinking when analysing current events involving economic issues (*e.g.*, ... *air pollution in China from coal-burning factories; debates over North American energy pipelines*) in order to enhance their understanding of these events and their role as informed citizens

*Sample questions:* "Why is there debate between different stakeholders about the value of carbon taxes or eco fees? What concept or concepts of economic thinking might help you deepen your understanding of this issue?"

## B. Fundamentals of Economics

#### **B1. Scarcity and Choice**

**B1.4** explain how needs (e.g., clean water, food, ...), wants (e.g., ... fair-trade produce), and values (e.g., fairness, individualism, community mindedness) influence consumer decisions

#### **B3.** Political and Economic Systems

**B3.3** analyse how governments in Canada prioritize competing economic goals when responding to economic challenges ...

*Sample questions:* "Why might economic development not always be compatible with environmental stewardship? How do governments weigh these competing goals?" ...

## C. Economic Challenges and Responses

#### C1. Market Systems

C1.2 analyse how individual choices, including ethical consumerism (e.g., buying fair-trade, local, cruelty-free, and/or green products), influence markets

*Sample questions:* "To what degree are you influenced by fair-trade logos when making a purchase?" ...

C1.4 analyse how, in a market system, different stakeholders value public and collective goods *(e.g., fish stocks, air, water, parks)* 

*Sample questions:* "Why might public ground water be valued differently by an adjacent community, a bottling company, and a government department regulating natural resources? Do you think governments should allow private companies to bottle and sell such water? Why or why not?" "Do you think some public goods should be privatized, whether fully or partially?"

## D. Interrelationships among Economic Citizens

#### **D2.** Government Intervention

- D2.1 analyse government policy initiatives in Canada that respond to scarcity (e.g., progressive taxes, income transfers, carbon credits or carbon taxes, ...)
   Sample questions: "How is the value of externalities, such as pollution arising from consumption and production, determined by the government? How might that valuation affect public policy initiatives related to the environment?" "What impact do regulations that are intended to reduce electricity use have on consumption and prices?"
- **D2.3** explain various ways in which governments in Canada intervene in the economy (*e.g.*, ... *environmental protection;* ...), and analyse the impact of this intervention

#### **D3.** Economic Citizenship

**D3.3** explain competing perspectives of various economic citizens ... on the value of government services/expenditures in Canada (*e.g.*, ... *parks*, ...)

## E. Economic Interdependence

#### E1. Perspectives on Scarcity and Sustainability

**E1.1** compare the perspectives of various stakeholders with respect to scarcity in Canada and explain how these perspectives are reflected in the policies or positions of these stakeholders with respect to economic issues (*e.g.*, ... *the oil and gas industry and the alternative energy sector;* ... *environmental NGOs;* ...)

*Sample questions:* "What do the positions of different stakeholders on the development of the Alberta oil sands tell you about their views on scarcity and sustainability?" ...

**E1.2** analyse how First Nations, Métis, and/or Inuit people have responded to issues relating to scarce resources (*e.g., with reference to ... environmental degradation of Aboriginal land*), and explain similarities and differences between their responses and those of other groups in Canada, including governments (*e.g., environmental groups, ...*)

#### E2. Weighing Trade-offs, Making Choices

**E2.2** explain why governments provide financial support to corporations, non-governmental organizations, and other groups ...

*Sample questions:* "What criteria might the federal government use to determine how to allocate grant money to companies researching sustainable energy sources?" ...

#### E3. Economic Globalization

**E3.3** describe key aspects of Canadian trade policy (e.g., with reference to ... export of natural resources, ...), and explain its impact

# Analysing Current Economic Issues, Grade 12, University Preparation (CIA4U)

## A. Economic Inquiry and Skill Development

## A1. Economic Inquiry

A1.2 select and organize relevant data, evidence, and information on current Canadian and international economic issues from a variety of primary and secondary sources ..., ensuring that their sources reflect a range of perspectives

*Sample questions:* ... "If you were investigating the environmental impact of a particular company or industry, why would it be important to consult sources in addition to the company's website and reports?"

- A1.5 use the concepts of economic thinking (i.e., economic significance, cause and effect, stability and variability, and economic perspective) when analysing and evaluating data, evidence, and information and formulating conclusions and/ or judgements about current Canadian and international economic issues (e.g., ... take the concept of cause and effect into consideration when analysing supply and demand in relation to non-renewable natural resources; ...)
- A1.7 communicate their ideas, arguments, and conclusions using various formats and styles, as appropriate for the audience and purpose (e.g., ... a blog discussing global environmental issues associated with economic development)

## A2. Developing Transferable Skills

A2.3 apply the concepts of economic thinking when analysing current events involving economic issues (*e.g.*, ... *changes to government policy regarding carbon emissions*) in order to enhance their understanding of these events and their role as informed citizens*Sample questions:* "What are the positions of different stakeholders with respect to the building of energy pipelines in Canada? How might applying the concepts of economic perspective and cause and effect help you deepen your understanding of this issue?"

## B. Fundamentals of Economics

## **B2. Supply and Demand Models**

- **B2.2** explain how various factors, including taxation, affect supply and demand *(e.g., ... weather, ...) Sample questions:* ... "What are some factors that affect the supply of and demand for oil?"
- **B2.3** use supply and demand models to analyse consumer decision making ... *Sample questions:* ... "Why are all new cars not hybrids?" ...

## **B3.** Growth and Sustainability

**B3.1** describe the factors of production (i.e, ... land, ...), and analyse the implications of the scarcity of these factors for sustainable development

*Sample questions:* "What does 'land' comprise when it is considered as a factor of production? What are the implications of the scarcity of the components of land for economic development? What might be the long-term effect if land is not used in a sustainable way?" ...

B3.3 assess the benefits and costs, including the environmental costs, of economic growth (*e.g.*, ... overfishing, deforestation, air and water pollution, climate change)
Sample questions: "What are some of the environmental costs of economic growth? Can there be environmental benefits to such growth?" ...

**B3.4** explain the concepts of negative and positive externalities, and apply these concepts when analysing the third-party costs and benefits of various policies, including those intended to enhance environmental sustainability

*Sample questions:* "What negative externalities are associated with the tobacco industry? Who bears the costs associated with these externalities? What are some government policies that attempt to reduce these costs?" "What are the positive and negative externalities associated with constructing dedicated bicycle lanes in a city?"

## C. Firms, Markets, and Economic Stakeholders

#### C1. The Firm and Market Structures

**C1.4** explain ways in which businesses are regulated in different countries (*e.g.*, ... *environmental* ... *regulations;* ...), and assess the impact of this regulation on businesses, markets, workers, and consumers

*Sample questions:* ... "Why do some countries have weaker ... environmental regulations than others?"

#### C2. Economic Trade-offs and Decisions

**C2.2** analyse how different stakeholders view the trade-off between economic growth and concerns for the environment (e.g., with reference to coal-fired electrical plants to support manufacturing in China and concerns about air quality; debates about the economic and environmental impact of the North American energy pipelines and/or the continuing development of the Alberta oil sands; the expansion of farmland at the expense of rain forest; innovations such as genetically modified seeds/foods and their impact on ecosystems; firms that invest in the development of non-renewable resources and those that fund research on alternative energy)

*Sample questions:* "Why did Ottawa initially sign the Kyoto Protocol? Why did it subsequently withdraw from it?" "How do carbon taxes try to address the environmental impact of economic growth? Why are they controversial?" "How do different stakeholders view the privatization and/or sale of water?"

C2.4 assess some responses, or possible responses, to current economic issues, using cost/benefit analysis (e.g., the cost and benefits of carbon taxes, oil/gas pipelines, ...)
 Sample questions: "What are the costs and benefits of plans to build North American energy pipelines? Why is it important to take the perspectives of different stakeholders – such as the oil/gas industry, manufacturers relying on such energy, environmentalists, and First Nations, Métis, and/or Inuit peoples – into account when analysing these costs and benefits?"

## D. Macroeconomics

## **D2.** Fiscal Policy

**D2.4** explain how fiscal policies of governments in Canada influence the economic decisions of individuals and organizations, and analyse the macroeconomic consequences of some of these policies (*e.g.*, ... *eco fees*, ...)

## E. Global Interdependence and Inequalities

#### E1. Theories and Models of International Trade

E1.3 assess trade models and practices ... with reference to both economic and ethical criteria Sample questions: "Why might a free trade agreement define 'dolphin safe' tuna labels as a trade barrier? With respect to this issue, do you think that ethical/environmental or economic considerations should be paramount?"

#### **E2.** International Economic Developments

- **E2.1** explain how globalization influences economic decisions of individuals, firms, and governments (e.g., with reference to ... relaxing of environmental ... protections ... to attract investment, ...)
- **E2.2** explain the significance of a variety of international events/developments (*e.g., natural disasters, ...*) and policies (*e.g., with respect to ... the environment, energy, ...*) for the Canadian economy
- **E2.4** describe ways in which individuals and groups attempt to address problems related to international economic activities (*e.g.*, ... *environmental degradation*, ...), and assess their effectiveness

*Sample questions:* ... "How effective do you think Idle No More or other indigenous movements have been in raising awareness about the erosion on a global scale of environmental protection of publicly held and/or managed resources?"

#### E3. International Economic Power and Inequality

**E3.3** explain how various social movements and social justice organizations address global economic inequality, and assess their effectiveness (e.g., with reference to ... environmental, ... seed-saving, ... movements)

# Making Personal Economic Choices, Grade 12, Workplace Preparation (CIC4E)

#### B. Developing Financial Literacy

#### **B3.** Taxes and Government Expenditures

**B3.2** explain some of the ways in which different levels of government in Canada raise revenue ... and analyse how and why they spend these revenues (*e.g.*, *on* ... *tax incentives for some environmental programs*, ...)

*Sample questions:* ... "What is the purpose of environmental tax incentives? Do you think they are effective at influencing people's behaviour?" ...

## C. Economic Fundamentals

#### C1. Scarcity and Choice

**C1.1** demonstrate an understanding of the economic concepts of scarcity, trade-offs, and opportunity costs, analysing how they apply to various economic decisions, including some of their own decisions ...

*Sample questions:* ... "How might a community weigh the opportunity costs of a decision to turn an area into parkland rather than zoning it for business or residential use?"

### C4. Stakeholders' Views on Economic Issues

**C4.2** analyse some key economic issues related to Canada's natural resources from the perspective of different stakeholders (*e.g.*, *extracting and transporting oil and natural gas; the marketing of asbestos overseas; the use and protection of Canada's water; resource development and Aboriginal land claims; resource extraction in national parks)* 

*Sample question:* "Why might beverage companies, retailers, environmentalists, and different levels of government have differing perspectives on the bottling and selling of water?"

**C4.3** explain why various stakeholders might have different views of the costs and benefits of a project affecting the local natural environment (*e.g., a proposal for an energy pipeline, a resource-extraction or -processing proposal, an alternative energy project, highway expansion, a new housing or commercial development, the expansion of public transit, a new skateboard park)* 

*Sample questions:* "Why might a community agree to have a new landfill site in the area? What might be the benefits for the community? Would all stakeholders benefit, or benefit equally? What might be the costs? Would all stakeholders calculate the costs the same way?" "How might different stakeholders view the costs and benefits of logging a forest in a particular area? Why might some groups, including local Aboriginal communities, believe that not all costs are considered in a traditional cost-benefit analysis of such activity?"

## D. Markets, Consumers, and Producers

## D2. Rights and Responsibilities of Consumers

- D2.3 explain how various consumer choices can affect the natural environment (e.g., with reference to buying local, cruelty-free, or organic products; buying unsustainable seafood; buying bulk goods to reduce packaging; disposing of old electronics in landfill; buying Energy Star appliances; boycotting companies that are environmentally irresponsible)
  Sample questions: "In what ways do the consumer choices that you make affect the environment? What could you do to make your choices more environmentally sustainable?" "What do you do with your old cellphones, music devices, or computers? What impact do you think your method of disposal has on the environment?"
- **D2.5** explain some of the advantages and disadvantages of buying and selling fair-trade products (e.g., these products tend to be more expensive but pay a fairer price to producers in developing countries, promote sustainable development, and support healthy working conditions)

*Sample questions:* "What are the ideas behind the fair-trade movement? How successful do you think it has been in accomplishing its goals?" "Why might people choose not to buy fair trade items?" ...

#### **D3.** Responsibilities of Producers

- **D3.2** describe some unethical and/or illegal business practices (e.g., ... disregarding environmental or other regulations), and explain why they occur
- **D3.3** identify some government regulations that affect producers (*e.g., regulations related to ... the environment, ... hazardous materials, ...*), and assess the impact of regulations on different stakeholders (*e.g., ... environmentalists*)

## E. Economies of Canadian Communities

#### E3. The Local Economy

**E3.1** explain the impact, both positive and negative, that businesses can have on a community, with reference, where possible, to their local community (*e.g.*, ... *environmental damage;* ...)

## **GEOGRAPHY, GRADES 11 AND 12**

*All expectations in the Grade 11–12 geography curriculum relate to environmental education.* The curriculum comprises the following courses:

- Regional Geography, Grade 11, University/College Preparation (CGD3M)
- Forces of Nature: Physical Processes and Disasters, Grade 11, University/College Preparation (CGF3M)
- Travel and Tourism: A Geographic Perspective, Grade 11, Open (CGG3O)
- Introduction to Spatial Technologies, Grade 11, Open (CGT3O)
- World Issues: A Geographic Analysis, Grade 12, University Preparation (CGW4U)
- World Geography: Urban Patterns and Population Issues, Grade 12, University/College Preparation (CGU4M)
- The Environment and Resource Management, Grade 12, University/College Preparation (CGR4M)
- Spatial Technologies in Action, Grade 12, University/College Preparation, (CGO4M)
- World Issues: A Geographic Analysis, Grade 12, College Preparation (CGW4C)
- Living in a Sustainable World, Grade 12, Workplace Preparation (CGR4E)

## HISTORY, GRADES 11 AND 12

## American History, Grade 11, University Preparation (CHA3U)

## B. The United States, Precontact to 1791

#### **B1. Social, Economic, and Political Context**

B1.1 compare various aspects of life of different Native American nations in the United States prior to contact with Europeans (e.g., with reference to ... relationships with the environment, ...)Sample questions: ... "What were the interconnections between this group's spiritual practices and beliefs and its relationship with the environment?"

#### **B2.** Communities, Conflict, and Cooperation

**B2.4** identify some of the main challenges and opportunities presented by the environment in the United States during this period, with reference to both Native American nations and European colonists (*e.g.*, *variations in climate, land forms, natural resources*), and analyse their impact (*e.g.*, *whether communities were nomadic or settled, agricultural or hunter-based; items/materials available for trade, production, and/or consumption; impact on housing, clothing, crops, and/or transportation routes*)

*Sample questions:* "What are some ways in which the environment affected the lives of various Native American peoples in the precontact era? What are some of the ways in which they managed their environments?" "What were some of the environmental challenges colonists faced in Jamestown and Plymouth? How did they learn to overcome these challenges?" "What impact did the suitability of land for crops such as tobacco have on dominant groups in American society during this period? What were some of the long-term effects of tobacco farming?"

#### C. The United States, 1791–1877

#### C1. Social, Economic, and Political Context

**C1.2** describe the daily lives of different groups in the United States in this period ..., including how they responded to the challenges of everyday life *(e.g., environmental challenges, ...)* 

#### E. The United States since 1945

#### E1. Social, Economic, and Political Context

**E1.1** describe key social trends and developments in the United States during this period, and analyse their main causes and consequences (*e.g., with reference to ... the environmental movement; ...*)

#### E2. Communities, Conflict, and Cooperation

**E2.2** explain the context for the development of various reform movements in the United States during this period (*e.g.*, ... *environmental* ... *movements; the ideas and activism of Rachel Carson, Aldo Leopold,* ...) ...

#### E3. Identity, Citizenship, and Heritage

**E3.4** analyse the role of consumer culture in the construction of identity in the United States during this period ...

*Sample questions:* ... "In what ways have environmental concerns affected consumers and consumer choices in the United States during this period?"

# World History to the End of the Fifteenth Century, Grade 11, University/College Preparation (CHW3M)

## A. Historical Inquiry and Skill Development

#### A1. Historical Inquiry

A1.7 communicate their ideas, arguments, and conclusions using various formats and styles, as appropriate for the audience and purpose (e.g., ... a seminar on the role of the environment in the decline of the Indus Valley civilization; ...)

## B. Early Societies and Rising Civilizations

#### **B1. Early Societies**

- B1.2 explain how various factors contributed to differences in the development of early societies (e.g., climate, physical region, fertility of land, scarcity or abundance of local resources, ...)
  Sample questions: "What are some geographic/ environmental factors that affected the development of early societies? What are some ways in which geographic differences contributed to differences among societies?" "How did different local resources help shape the development of various First Nations in the precontact period?" ...
- **B1.3** identify the cradles of civilization around the world, and analyse them to determine various elements that are critical to the rise of a civilization (*e.g., favourable geographic location, ... abundant food and natural resources*)

#### **B2.** Social, Economic, and Political Context

- B2.3 describe various types of innovation in early societies ... and assess their importance to these societies and to the emergence of different civilizationsSample questions: ... "How did the development of specialized tools enable the Thule to survive in a harsh environment?"
- **B2.4** explain how various factors contributed to the economic development of some early societies and emerging civilizations (*e.g.*, ... the exploitation of natural resources, ...), and analyse the impact of these developments on the lives of different people in these societies **Sample questions:** "What types of natural resources were particularly important to early societies? Which societies were particularly rich in such resources? What impact did the availability of these resources have on the economic development of these societies?" "How did the geographic location of Persia or the Kingdom of Kush contribute to its economic development?" ...

## D. Civilizations in Decline

## D1. Social, Economic, and Political Context

**D1.2** explain the role of various economic events and developments in the decline of some societies/civilizations and how these factors affected people living in these societies (*e.g.*, ... *exhaustion of natural resources*)

*Sample questions:* "What role did farming practices play in the decline of the Mesopotamian Empire?" ...

#### **D2.** Interrelationships

- **D2. Interrelationships:** analyse how interrelationships with other societies and with the environment contributed to the decline of three or more societies/civilizations, each from a different region and different period prior to 1500 (FOCUS ON: Cause and Consequence; Continuity and Change)
- **D2.3** explain how environmental factors (e.g., drought, floods, volcanic eruptions, deforestation or depletion of other natural resources, overhunting, changes in climate) contributed to the decline of some societies/civilizations

*Sample questions:* "What impact did the eruption of Thera have on Minoan civilization?" "What impact may changes in climate have had on the Indus Valley civilization and/or some Mesoamerican societies?" "In what ways might environmental factors such as resource depletion and climate change have contributed to the decline of Cahokia?"

# Origins and Citizenship: The History of a Canadian Ethnic Group, Grade 11, Open (CHE3O)

## B. The Ethnic Group in Its Region of Origin

**B2.** Significant Interactions: analyse the impact of significant interactions, including interactions with the environment, on the selected ethnic group's country or region of origin (FOCUS ON: Historical Significance; Cause and Consequence)

## **B2.** Significant Interactions

**B2.3** analyse the impact of some natural and/or human-created environmental disasters on people *(e.g., natural events: drought, floods, earthquakes, volcanoes; human-created events: ... extreme environmental degradation, including that resulting from resource extraction; ...), with a particular emphasis, where applicable, on this ethnic group in its country or region of origin ...* 

*Sample questions:* "Whose lives were changed by this natural disaster? How significant is this event in the ethnic group's story?"

## **B3.** Culture and Identity

- **B3.2** analyse some ways in which religious/spiritual beliefs and practices in the country or region of origin contributed to the development of identity and culture in this ethnic group (*e.g.*, *with reference to ... celebrations and ceremonies related to the environment; ...*)
- **B3.3** analyse the relationship this ethnic group had with the environment in its country or region of origin and how this relationship contributed to the development of identity and culture in this group (e.g., with reference to seasonal rhythms, animism, use of land and resources, available game and/or suitability of land for particular crops, materials available for building, methods for dealing with waste and sewage)

*Sample questions:* "What connections are there between this group's religious/spiritual beliefs and the society's view of and relationship with the environment?" "What materials did these people use to build their homes? What do these materials reveal about the local environment?"

## C. Factors Influencing Migration to Canada

#### C1. Social, Economic, and Political Factors

**C1.2** describe some ways in which environmental issues, events, and/or developments, both natural and human-made, in the region of origin influenced people's decisions to emigrate (*e.g., with reference to lack of resources/land, natural or human-created environmental disasters, water shortages, land degradation*), and analyse the experience of the selected ethnic group to determine the extent to which it was influenced by these factors

*Sample questions:* "In what ways did changes in land use or agricultural practices over time affect some people's decisions to emigrate?" "What impact might a government's decision to alter the land use of a specific region have had on the decision of some people to emigrate?"

# World History since 1900: Global and Regional Interactions, Grade 11, Open (CHT3O)

## D. The Cold War Years, 1945–1991

#### D1. Social, Economic, and Political Context

**D1.4** describe some key political developments and/or government policies in two or more regions of the world during this period, and assess their impact on people's lives (*e.g., with reference to ... legislative changes related to ... environmental protection; ...)* 

## D3. Identity, Citizenship, and Heritage

D3.3 describe some of the main social movements in two or more regions of the world during this period (e.g., ... environmental, ...), and assess their significanceSample questions: ... "Why do you think that many people's attitude towards the environment changed during this period? What were some developments that reflected these changes of attitude?"

## E. A Globalizing World: Issues and Interactions since 1991

## E1. Social, Economic, and Political Context

- **E1.1** describe some key social issues, trends, and/or developments during this period, and analyse their impact on the lives of people in two or more regions of the world (*e.g., with reference to ... social changes arising from environmental concerns; ...)*
- **E1.2** describe some key developments in science and/or technology during this period, and analyse their impact on people's lives (*e.g.*, ... *biotechnology*, ...)
- E1.3 explain some of the causes of economic globalization during this period, and analyse its impact on different groups in two or more regions of the world (e.g., with reference to ... weaknesses in ... environmental regulation; ...)

*Sample questions:* "... What are some of the ... environmental consequences of the movement of manufacturing to China and other Asian countries?"

#### E2. Communities, Conflict, and Cooperation

**E2.3** analyse the role and assess the effectiveness of some key intergovernmental organizations in the global community during this period (*e.g.*, ... *the Intergovernmental Panel on Climate Change*) ...

#### E3. Identity, Citizenship, and Heritage

**E3.2** assess the contributions of some individuals and organizations from two or more regions of the world to political and/or social change during this period (*e.g.*, ... *Greenpeace*, ...)

# Canada: History, Identity, and Culture, Grade 12, University Preparation (CHI4U)

## B. CANADA, Origins to 1774

#### **B1. Setting the Context**

- B1.1 compare various aspects of life among different Aboriginal peoples in Canada prior to contact with Europeans (e.g., with reference to ... relationships with the environment, ...)Sample questions: "What do the spiritual practices of different Aboriginal peoples reveal about their relationship with the environment?" ...
- **B1.2** compare various aspects of life among people of European origin living in Canada prior to 1774 (*e.g., with reference to ... relationships with the environment, ...*), and analyse how these people responded to the challenges of life in Canada

*Sample questions:* "What were some of the differences between the lives of habitants in a settlement and those of coureurs de bois in the Pays d'en Haut? What do their views of and relationships with the environment reveal about their responses to the challenges of life in Canada?"

#### **B3.** Diversity and Citizenship

**B3.2** analyse ways in which Aboriginal culture contributed to the development of Canada prior to 1774 as well as to the development of heritage and identity in Canada (*e.g., with reference to ... relationship with the environment, ...*)

## E. Canada since 1945

#### E1. Setting the Context

- **E1.1** analyse key social/cultural trends and developments in Canada during this period, including changes in social attitudes/values (*e.g.*, *with reference to ... the development of ... environmental ... movements; ...*), and assess their significance for the development of Canada, including the development of identity in Canada
- E1.4 analyse key causes and consequences of major economic trends and developments in Canada during this period, including those related to regional economic disparities (*e.g.*, ... *fishing moratoria* ...)

#### E2. Interactions and Interdependence

**E2.1** explain the context for the development of various reform movements in Canada during this period *(e.g., ... environmental ... animal rights movements)*, and evaluate the success of some of these movements

*Sample questions:* ... "What were the roots of Greenpeace and other Canadian environmental organizations that developed during this period? What challenges have these organizations faced? What have they achieved?"

**E2.6** analyse, with reference to some major events and/or developments, the relationship between Canada and the United States during this period and how it has affected Canada, including the development of identity in Canada (*e.g., with reference to ... the environment*)

#### E3. Diversity and Citizenship

E3.4 describe the contributions of various individuals and groups, including ethnocultural and regional groups ..., to the development of culture and identity in Canada during this period ... Sample questions: ... "How are individuals such as Edward Burtynsky and David Suzuki trying to influence the values and behaviour of Canadians with respect to the environment? How effective do you think they have been?"

# World History since the Fifteenth Century, Grade 12, University Preparation (CHY4U)

#### D. The World, 1789–1900

#### D3. Identity, Citizenship, and Heritage

**D3.1** assess the impact of new social, economic, and/or political ideas on various societies during this period (*e.g.*, *with reference to the ideas of* ... *Henry David Thoreau*; ...)

## E. The World since 1900

#### E1. Social, Economic, and Political Context

- E1.1 analyse the impact of some key social trends and/or developments in various regions of the world during this period (*e.g.*, *with reference to ... environmental movements*)
- **E1.2** describe a variety of developments in science and/or technology during this period (*e.g., developments in ... biotechnology ... renewable energy*), and assess their impact ...
- **E1.3** describe dominant economic systems and some key economic policies in various regions during this period *(e.g., ... sustainable development strategies)*, and analyse the interrelationship between economic systems and political orientation ...

#### E2. Communities, Conflict, and Cooperation

**E2.5** analyse some significant developments related to colonization, decolonization, and globalization during this period, including their impact on different groups in various regions of the world (*e.g., with reference to ... the Kyoto Protocol; ...)* ...

# World History since the Fifteenth Century, Grade 12, College Preparation (CHY4C)

## D. The World, 1789–1900

### D1. Social, Economic, and Political Context

**D1.1** identify some specific developments that were fundamental to the Industrial Revolution (*e.g., the development of new technologies, the availability of capital for investment, the availability of natural and human resources*), and explain some key social, economic, and political consequences of large-scale industrialization during this period (*e.g., ... pollution, ...*) *Sample questions:* ... "What were the environmental effects of industrialization?"

## E. The World since 1900

#### E1. Social, Economic, and Political Context

E1.1 describe some key social trends and/or developments in different regions of the world during this period, and explain their impact ...

*Sample questions:* ... "What are some factors or issues that led to the birth of the environmental movement? How have these factors/issues changed over time? Have any remained constant?"

**E2.4** explain some significant developments related to colonization, decolonization, and globalization during this period, with a focus on the impact of these developments on different groups or societies (*e.g.*, *with reference to ... the Kyoto Protocol; ...*) ...

# Adventures in World History, Grade 12, Workplace Preparation (CHM4E)

## A. Historical Inquiry and Skill Development

## **A. Historical Inquiry**

A1.2 select and organize relevant evidence and information on aspects of world history from a variety of primary and secondary sources ..., ensuring that their sources reflect different perspectives *Sample questions:* "If you want to investigate the role the environment played in religion/ spirituality in some societies, what are some visual sources that you might consult? What art and architecture would you want to examine? What other sources might you use?" ...

## B. Origins to the Fifteenth Century

#### **B1.** Society and Community

- B1.2 analyse some of the causes and consequences of migration during this period (*e.g.*, causes: *natural disasters*, ... *famine* ...)
  Sample questions: "Which natural disasters had the greatest impact on migration during this period?" "Why did changes in land use cause some people to migrate?" ...
- **B1.4** explain some ways in which environmental factors affected people in selected societies during this period (e.g., the importance of bodies of water in settlement and transportation; natural defences such as deserts or mountains; the impact on agriculture of annual flooding

in the Fertile Crescent; deforestation in Sumer; the role of natural resources in economic development; famine caused by drought or pests; disease spread by insects; the use of local materials in artistic/artisanal production)

*Sample questions:* "What role did competition for natural resources play in the history of some societies during this period?" "How did the bubonic plague spread from Asia to Europe? What impact did the plague have at the global level?" "How does the rock art found in the Tassili n'Ajjer region of the southeastern Sahara help us understand how people adapted to a region that was slowly turning into a desert?"

## **B4.** Culture and Heritage

**B4.2** compare some key beliefs and practices associated with two or more religious/spiritual traditions ...

*Sample questions:* ... "How important was the environment to the religious/spiritual beliefs of the Maya and some Aboriginal people in what would become Canada? What evidence do you have to support your ideas?" ...

## D. Since the Early Nineteenth Century

## **D1. Society and Community**

D1.1 identify some key social developments during this period, and analyse some of their causes and consequences (e.g., changes in the roles of women, particularly in Western societies; developments in public education; increasing urbanization; demographic changes related to birth rates or life expectancy; changes in recreational activities)
 Sample auestions: "Why has life expectancy increased in much of the world during this

*Sample questions:* ... "Why has life expectancy increased in much of the world during this period? What impact has this change had on society and the environment?"

D1.3 describe some social movements that developed during this period, and analyse their impact (*e.g., with reference to ... environmental ... movements*)
Sample questions: ... "How effective has the environmental movement been in changing society's attitude and behaviours during the past fifty years? Has its impact been global?"

## **D3.** Work and Economics

**D3.1** explain some of the main causes and consequences of the Industrial Revolution (e.g., causes: ... environmental degradation, demand for raw materials, ...)

# LAW, GRADES 11 AND 12

# Understanding Canadian Law, Grade 11, University/College Preparation (CLU3M)

## **B. Legal Foundations**

## **B1. Legal Principles**

**B1.1** explain categories of law ..., areas of law (*e.g.*, ... *environmental*), and the role of law in Canadian society (*e.g.*, ... *to protect the environment*)

#### **B4.** Development of Law

**B4.1** explain how evolving societal attitudes and values have promoted or prevented changes to Canadian law *(e.g., in laws relating to ... environmental protection, ...)* 

# Understanding Canadian Law in Everyday Life, Grade 11, Workplace Preparation (CLU3E)

## **B. Legal Foundations**

#### **B2.** Development of Law

- **B2.3** describe ways in which changes in societal attitudes and values have influenced the development of Canadian law (*e.g.*, *with reference to ... environmental protection*, ...)
- **B2.4** describe ways in which advances in science *(e.g., in reproductive medicine)* and technology ... have influenced the development of Canadian law or may influence it in future ... *Sample questions:* ... "What are some legal issues regarding genetically modified seeds?"

# Canadian and International Law, Grade 12, University Preparation (CLN4U)

## A. The Inquiry Process and Skill Development in Legal Studies

#### A1. The Inquiry Process in Legal Studies

A1.5 use the concepts of legal thinking (i.e., legal significance, continuity and change, interrelationships, and legal perspective) when analysing, evaluating evidence about, and formulating conclusions and/or judgements regarding legal issues in Canada and around the world, and issues relating to international law ...

*Sample questions:* ... "Why would it be appropriate to apply the concept of legal perspective when investigating how environmental laws balance various competing interests in matters related to resource extraction and/or use?"

A1.7 communicate their ideas, arguments, and conclusions using various formats and styles, as appropriate for the audience and purpose (e.g., ... a debate that addresses competing interests and issues relating to laws regulating the transportation of hazardous materials; ...)

## **B. Legal Foundations**

#### **B3.** Development of Law

- **B3.1** identify some key issues and developments that have influenced legal change (*e.g.*, ... *natural and human disasters*, ...) and explain how they promoted and/or prevented change
- **B3.2** explain how evolving social attitudes, values, and circumstances have promoted or prevented changes in various areas of Canadian and international law over time, and might do so in the future (*e.g., laws relating to: ... environmental protection, ...*)

## C. Rights and Freedoms

#### **C4.** Contemporary Issues

- **C4.1** analyse from a legal perspective contemporary circumstances in which individual or group rights and freedoms are threatened ... or limited (*e.g.*, *by imposition of* ... *environmental protection laws*)
- **C4.3** assess the strengths and weaknesses of current laws for protecting the rights of individuals and various groups (*e.g., indigenous peoples*) from the impact of human activities that cause changes to the natural environment (*e.g., the construction of hydroelectric dams, pipelines, highways; resource extraction and processing*)

## D. Foundations of International Law and Dispute Resolution

## D1. Fundamentals of International Law

**D1.2** describe various challenges that face sovereign states in creating, ratifying, and implementing international treaties ...

*Sample question:* "How might the laws and policies of sovereign states hinder the ratification of international environmental ... agreements?"

**D1.3** identify and define various types of international crimes (*e.g.*, ... other types of international crimes: ... *illegal wildlife trade, illegal dumping of hazardous waste*) ...

## **D3.** Conflict and Cooperation

**D3.3** compare Canadian and international perspectives on global issues that are addressed in various international treaties and agreements (*e.g., issues related to ... environmental protection, ...*)

*Sample question:* "How does the Canadian perspective on issues relating to climate change differ from that of other countries?"

**D3.5** analyse Canada's record of supporting or not supporting various alliances, agreements, and treaties under international law (e.g., ... United Nations Framework Convention on Climate Change, ...)

## E. International Legal Issues

**E2.** Environmental Protection: analyse factors that influence the effectiveness of domestic and international environmental legislation ...

## **E2.** Environmental Protection

- E2.1 explain the purposes of environmental protection laws (e.g., to reduce and/or counter the negative effects of human activity on the natural environment) and some of the considerations influencing how such laws are framed (e.g., considerations related to national sovereignty, legal reciprocity, sustainable development, polluter pays, intergenerational equity)
  Sample questions: "Why was Ontario's Environmental Bill of Rights (1993) considered groundbreaking in terms of environmental law?" "Should Canada amend the Constitution to guarantee the right to clean air and water for its citizens? Why or why not?"
- **E2.2** describe from a legal perspective the role of various individuals and groups in developing and enforcing environmental protection laws (e.g., the role of: Maude Barlow and the Council of Canadians in achieving recognition of access to clean water as a human right by the United

Nations; Environmental Defence in securing the banning of bisphenol A [BPA] from baby bottles; the Sierra Club in the protection of wild places around the world; First Nations, Métis, and Inuit groups in strengthening requirements for environmental assessments)

- **E2.3** analyse from a legal perspective the strengths and weaknesses of international laws to protect key natural resources held in common around the world *(e.g., water, air, fish)*
- **E2.4** assess the validity of reasons put forward by various stakeholders for opposing various environmental protection agreements (e.g., claims that such laws are unnecessary, ineffective, unenforceable, not economically viable, unfair to certain groups or interests)
- E2.5 describe the purpose and actual or potential effects of various single-country and multilateral/ international environmental protection agreements (e.g., single-country agreements: Environmental Protection Act [Canada, 1990], Transportation of Dangerous Goods Act [Canada, 1992], granting of "personhood" status to the Whanganui River [New Zealand, 2012]; multilateral/international agreements: Convention on International Trade in Endangered Species of Wild Flora and Fauna, 1973; Montreal Protocol on Substances that Deplete the Ozone Layer, 1989; Canada-U.S. Air Quality Agreement, 1991; United Nations Framework Convention on Climate Change, 1992; Kyoto Protocol, 1997; European Union Emissions Trading System, 2005; Copenhagen Accord, 2009; Aichi Biodiversity Targets, 2011) Sample question: "To what degree have the following environmental protection agreements succeeded in their aims: the Montreal Protocol, the Canada-U.S. Air Quality Agreement, the Kyoto Protocol, the EU Emissions Trading System?"

## E4. Emerging Legal Issues

**E4.2** analyse from a legal perspective the advantages and/or disadvantages of participation in international economic organizations and agreements ...

*Sample questions:* "For countries seeking a free trade agreement, how might differing ... environmental regulations create challenges in negotiating the agreement? What impact might the final agreement have on those domestic laws/regulations?"

# Legal Studies, Grade 12, College Preparation (CLN4C)

## **B. Legal Foundations**

#### **B2.** Development of Law

**B2.1** explain how shifting societal attitudes, values, and customs have influenced the development of Canadian law (e.g., laws relating to: ... environmental conservation and stewardship, ...)

#### **B3.** Law and Diversity

B3.1 explain various provisions in Canadian law ... that may be used to accommodate the interests and needs of diverse groups (*e.g.*, ... *environmental groups*; ...)*Sample questions:* ... "How do people use the law to protect animals or plants?" ...

## C. Rights and Responsibilities

#### C2. Rights and Responsibilities

**C2.2** analyse from a legal perspective issues related to the right of individuals, groups, and governments to use natural resources, and the corresponding responsibilities/regulations

related to environmental protection (e.g., rights: access to water; Aboriginal hunting/ trapping, fishing, and harvesting treaty rights; other hunting/ trapping, fishing, and harvesting rights; mining rights; responsibilities/regulations: antipollution laws, licensing requirements, duty to consult environmental assessment requirements, reforestation laws, ecological restoration requirements)

*Sample questions:* "What are the responsibilities of governments and/or industries when planning a development that has an environmental impact?" "What legal options are available to communities that might object to the potential negative environmental impact of a development?" "How do the regulations for a dry-cleaning business relate to the protection of natural resources?" "What kinds of actions should be taken when the safety of the water supply is threatened? What officials and/or institutions have the legal responsibility to ensure that these actions are taken?" "When you examine some landmark cases (e.g., *Delgamuukw v. British Columbia*, 1997; *R. v. Marshall*, 1999; *R. v. Powley*, 2003; *Haida Nation v. British Columbia*, 2014), what do you notice about how the Supreme Court of Canada's interpretation of Aboriginal rights to land use has changed?"

## C3. Influences on Human Rights Issues

**C3.1** analyse from a legal perspective some positive and negative effects of globalization on human rights protection in Canada and abroad (*e.g.*, ... *transnational corporations can evade employment and environmental protection laws by establishing operations in a country with weaker laws; ...)* 

## D. Contemporary Legal Issues

## D1. Law and Society

D1.2 analyse the role of law in protecting the natural environment (e.g., in creating and enforcing legislation related to: the use of natural resources by corporations, air and water quality, recycling, the banning of harmful substances such as bisphenol A [BPA] or pesticides)
Sample questions: "Which levels of government and which ministries are responsible for making laws to protect the environment? How are these laws enforced? What kinds of penalties are imposed for breaking these laws? Are the penalties adequate to prevent violations? Why, or why not?" "How do Ontario's Environmental Bill of Rights and Environmental Registry provide for public access and government transparency and accountability in relation to environmental initiatives?"

## **D2.** Legal Structures and Processes

- **D2.1** describe various types of illegal activities in Canada and the legislation that governs them *(e.g., ... polluting the Environmental Protection Act; ...)*
- **D2.3** analyse situations in which legal judgements balance the competing rights and interests of individuals, groups, and governments (e.g., ... environmental protection interests versus resource-extraction interests; ...) ...

## D3. Emerging Legal Issues

**D3.4** describe the legal implications of various recent international political events, humanitarian crises, and environmental issues (*e.g.*, ... *climate change – international agreements versus national priorities*) ...

## E. Law in the Workplace

#### E2. Roles and Responsibilities in the Workplace

**E2.4** analyse the legal roles and responsibilities of employers, companies, and corporations *(e.g., with reference to: ... the Environmental Protection Act, ...)* 

## E3. Legal Issues in the Workplace

- **E3.2** explain the impact on the workplace of legal issues related to environmental practices (*e.g.*, *health and safety issues related to the handling of hazardous and other industrial waste or to second-hand smoke or other airborne toxins; security, privacy, and health issues related to the disposal of electronic devices*)
- **E3.3** analyse the effects of various types of national and international laws on business and employment in Canada (e.g., ... the impact [actual or potential] on Canadian industries of international boycotts targeting Canadian goods for ethical or environmental reasons [seal products, fur, "dirty oil"]; ...)

# POLITICS, GRADES 11 AND 12

# Politics in Action: Making Change, Grade 11, Open (CPC3O)

## A. Political Inquiry and Skill Development

#### **A1. Political Inquiry**

A1.5 use the concepts of political thinking (i.e., political significance, objectives and results, stability and change, and political perspective) when analysing and evaluating evidence, data, and information and formulating conclusions and/or judgements about issues of political importance in various communities and ways to address them (e.g., ... use the concept of stability and change to help them evaluate arguments for and against a proposal to establish a green belt around an urban area; ... )

## B. Foundations of Political Engagement

#### **B1. Factors Affecting Political Engagement**

**B1.5** explain, with reference to the perspectives of bystanders and upstanders, why people choose to take action on, or not get involved in, political issues ..., and analyse possible consequences of both stands

*Sample questions:* ... "Why do Canadians respond quickly to sudden disasters such as earthquakes and tsunamis but less reliably to long-term disasters such as famine and drought or long-term challenges such as climate change? What are some of the consequences of these patterns?" ...

## **B2.** Issues of Political Importance

**B2.1** explain the political importance of some current local, national, and/or global issues (e.g., *issues related to ... public transit, food security, ... water and/or energy conservation, disaster relief and/or development aid, ... climate change, ...)* 

**B2.2** identify criteria that could be used to rank issues in order of their political priority (*e.g.*, ... *the* ... *environmental impact of an issue*)

#### **B3.** Causes, Impact, and Solutions

- B3.2 analyse the impact of some issues of political importance, with a particular emphasis on issues related to equity, human rights, and/or the environment (e.g., ... carbon emissions, climate change, protection of water)
  Sample questions: ... "What is the economic impact of the development of the Alberta oil sands? What is its environmental impact?"
- B3.3 identify actions that have been taken to address some issues of political importance, and assess the effectiveness of these actions in achieving the intended objective *Sample questions:* ... "What is the purpose of the Kyoto Protocol? How effective has it been in achieving its objective?" ...

## C. Policy, Politics, and Democratic Change

#### C3. Political Change in Democratic Societies

**C3.2** identify various skills and strategies that can be used when seeking political change in democratic societies, and assess their effectiveness ...

*Sample questions:* ... "Why was the Green Party created? How effective do you think it has been in securing political change with respect to environmental issues?" ...

# Canadian and International Politics, Grade 12, University Preparation (CPW4U)

## A. Political Inquiry and Skill Development

#### **A1. Political Inquiry**

A1.5 use the concepts of political thinking (i.e., political significance, objectives and results, stability and change, political perspective) when analysing and evaluating evidence, data, and information and formulating conclusions and/or judgements about issues, events, and/or developments of national and international political importance ...

*Sample questions:* "Why might it be appropriate to analyse this issue from human rights, economic, and environmental perspectives? Are there other perspectives you might also consider?" ...

## **B.** Political Foundations

#### **B1.** Political Thought

**B1.1** describe some key similarities and differences between various political ideologies ..., and explain where these ideologies fall on a political spectrum (i.e., a political compass model or other type of spectrum)

Sample questions: ... "Where do 'green' political ideologies fit on political spectrum models?"

#### **B3.** Influences on Canadian and International Politics

**B3.6** analyse how geographic and environmental factors influence politics in and relations between various countries, including Canada (e.g., with reference to geographic location, natural resources, water scarcity, climate change, environmental degradation, natural disasters, invasive species)

*Sample questions:* "How does the relationship of First Nations, Métis, and/or Inuit people with the environment influence their position on some political issues?" "What are the objectives of the Kyoto Protocol? What are its limitations? Why has Canada withdrawn from the protocol? What impact do you think this will have?" "What are some ways in which countries' need for oil and gas affects international relations?"

#### C. Governments and Canadian and International Politics

#### **C2.** Intergovernmental Cooperation

- **C2.2** assess the effect on Canadians and the international community of various international agreements signed by Canada (*e.g.*, ... United Nations Framework Convention on Climate Change, ... Convention on International Trade in Endangered Species)
- **C2.3** analyse how globalization and technological advances have created the need for new types of intergovernmental cooperation *(e.g., ... environmental and labour regulation in industrializing countries; ...)*, and explain what types of international organizations/ agreements are being developed to address these changes

## D. Non-governmental Action on Canadian and International Political Issues

#### **D2.** Challenges and Strategies

**D2.1** explain key challenges relating to some specific issues of national and global political importance (e.g., ... climate change, protection of endangered species, loss of rainforest, food and water scarcity ...)

*Sample questions:* ... "Why do people respond differently to sudden, large-scale disasters than they do to ongoing global issues such as famine and climate change?"

**D2.4** analyse how the perspectives of individuals and non-governmental stakeholder groups *(e.g., ... environmental, ...)* may influence their response to issues of national and/or international political importance

#### D3. Contributions to the Global Community

- **D3.1** assess the importance of the contributions to Canada and the global community of various individuals (*e.g.*, ... *David Suzuki*, ...)
- **D3.2** describe the objectives of a variety of NGOs and social enterprise groups (*e.g.*, ... World Wildlife Fund), and assess the importance of their contribution to the national and global community

## E. Rights and Power in the International Community

#### E2. Technology and Globalization

**E2.3** analyse the impact of the power of multinational enterprises (MNEs) (*e.g. petrochemical, biotechnology, agribusiness ... companies*) on political policy in and relations between various countries

*Sample questions:* ... "Why and how might a MNE seek to influence ... environmental policies and regulations within a country?" ...

#### E3. Human Rights at Home and Abroad

E3.3 explain reasons for the success and failure of various Canadian and international agreements, institutions, and/or processes that were intended to protect human rights ...Sample questions: ... "Do all countries recognize the right to a healthy environment as a human right? If not, what impact might this have on the success of international environmental agreements?"

# **CLASSICAL STUDIES AND INTERNATIONAL LANGUAGES**, GRADES 9 TO 12 (2016)

From "Environmental Education and Classical Studies and International Languages" in the curriculum policy document:

There are many opportunities to integrate environmental education into the teaching of classical studies and international languages. For example, in international language courses, students might explore how the natural environment has influenced the celebrations, forms of artistic expression, and cuisine of various cultural groups that speak the target language. Or students might listen to a news broadcast or read an article in the target language regarding a concern related to the environment, such as air and water quality or a natural disaster linked to development or climate change. Doing so encourages students to consider different perspectives and make connections between Canada and the rest of the world.

Courses in classical studies and international languages can also be powerful vehicles for students to explore and identify the social, historical, and political impacts of issues related to the environment. For example, in the Grade 12 Classical Civilization course, students might explore how the urbanization methods of classical societies affected the environment and vice versa, as well as how the natural world influenced mythology and religion in the classical era.

# CLASSICAL STUDIES

# Classical Languages (Ancient Greek/Latin), Level 1, Academic (LVGBD/LVLBD)

## C. Writing

## C2. Writing in English

C2.1 Writing in a Variety of Forms: write a variety of English texts in response to passages in the classical language and to related cultural concepts ... *Teacher prompt:* "What points would you make in a letter to Emperor Vespasian asking for

assistance in dealing with a water shortage in the town where you live?"

## D. Intercultural Understanding

## **D2. Making Cultural Connections**

**D2.1 Understanding the Classical World:** demonstrate knowledge and understanding of some aspects of life in the classical world, using different strategies (*e.g.*, ... *explain the connection between ecology and urban planning in Campania in the first century CE;* ... *assess the environmental impact of hunting in North Africa to supply animals for the gladiatorial games; describe the connection between the need for natural resources and the expansion* 

of the Roman Empire; make a topographical map of the ancient Mediterranean; ... use geographical modelling software to show how topography influenced the construction of roads and other infrastructure in the classical world)

**D2.2 Making Cultural Connections:** relate aspects of classical culture (*e.g., religious practices, social customs, technology*) to comparable aspects of other societies and cultures (*e.g., ... compare the impact that the water and waste-water system had on the lives of Romans with the impact that access to clean water has in modern societies*)

# Classical Languages (Ancient Greek/Latin), Level 2, University Preparation (LVGCU/LVLCU)

## B. Reading

## **B2.** Awareness of Cultural Context

B2.1 Interpreting Information: make accurate inferences about the classical world, using information from a variety of sources and media ...
 *Teacher prompts:* "What does the topography in this map of ancient Greece tell you about the Greeks' ability to travel within their own country?" ...

## D. Intercultural Understanding

## **D2.** Making Cultural Connections

- **D2.1 Understanding the Classical World:** demonstrate knowledge and understanding of diverse aspects of life in the classical world, using several different strategies (e.g., ... outline mining techniques and/or agricultural practices used in the ancient Mediterranean world and describe their environmental impact; ... describe the role of warfare in destroying arable land and polluting water supplies; ... assess the impact of the Peloponnesian War on the natural resources of ancient Greece; ...describe, using maps, the need for wood in daily life, the resulting deforestation, and its influence on the expansion of the Roman Empire)
- **D2.2 Making Cultural Connections:** relate aspects of classical culture ... to comparable aspects of other societies and cultures (*e.g.*, ... *compare waste and waste-management issues in the classical world to similar issues in the modern world*)

# Classical Languages (Ancient Greek/Latin), Level 3, University Preparation (LVGDU/LVLDU)

## B. Reading

## **B2.** Awareness of Cultural Context

**B2.1 Interpreting Information:** make accurate inferences about the classical world, using information from a variety of sources and media (*e.g.*, ... *resources about garden archaeology and the sacred grove*)

*Teacher prompts:* ... "What does this reconstruction of a garden in Pompeii tell us about the importance of the garden in the life of ancient Romans?" "What does this fresco from Herculaneum say about the relationship of ancient Romans to nature?"

## D. Intercultural Understanding

#### **D2.** Making Cultural Connections

- **D2.1 Understanding the Classical World:** demonstrate knowledge and understanding of diverse aspects of life in the classical world, using a variety of strategies (*e.g.*, ...outline classical ecological practices associated with aqueducts and other water systems, using drawings or a model; evaluate the consequences of warfare for the ecology of the ancient Mediterranean; ...)
- **D2.2 Making Cultural Connections:** relate aspects of classical culture ... to comparable aspects of other societies and cultures (e.g., ... lead a seminar analysing Roman urban planning policies during the Empire and evaluating their effectiveness in light of modern environmental standards; ...)

## Classical Civilization, Grade 12, University Preparation (LVV4U)

## A. Critical Thinking and Literacy Skills

#### A1. Research

A1.1 Formulating Questions: formulate different types of questions to guide research and facilitate making predictions and inferences about aspects of classical civilizations (e.g., ... causal questions: ... "How did Roman demand for timber and other resources affect the local environment and create a need to expand territory?")

*Teacher prompts:* ... "What questions would you ask to guide an inquiry into the environmental effects of the expansion of the Roman Empire?"

#### A3. Communication

**A3.3 Developing and Producing Texts:** plan and produce a variety of literary, informational, and graphic texts about the classical world for a wide range of purposes and audiences, using effective words, images, and language structures, correct grammar, and a range of editing and revising strategies (*e.g.*, ... *produce a graphic text, such as a series of labelled diagrams, comparing the waste management systems in Rome and Athens*)

## C. History and Geography

**C2.** Geography: demonstrate knowledge and understanding of the geography of the classical world and its influence on the development of classical culture

#### C2. Geography

**C2.1 Topography and Settlement:** identify key topographical features in the ancient Mediterranean world (e.g., accurately trace Odysseus's route home through the Mediterranean, and describe how his journey was affected by the landscape of the islands and other territories he visited; map the route travelled by Aeneas from Troy to Italy as described in Vergil's Aeneid, identifying significant topographical features he encountered in such places as Carthage, Sicily, and the Bay of Naples), and explain the relationship of topography to human settlement patterns in the region (e.g., analyse how proximity to the sea affected

the development of cities in ancient Greece; explain why the inhabitants of Campania chose to live on the slopes of Vesuvius; explain how the location of Rome was chosen) **Teacher prompts:** "How do the barriers to travel revealed on this topographical map of ancient Greece help explain xenophobia?" "How did the geographical position of the island of Sicily (between Carthage and Rome) affect the people of Sicily in the third century BCE, especially during the height of the Carthaginian conflicts?"

**C2.2 Human Responses to Geography:** describe ways in which humans interacted with physical geography to shape the environment to their needs and aspirations in classical times (e.g., explain the importance of aqueducts for the development of the city of Rome; analyse and describe the influence of frontier zones such as Hadrian's Wall on settlement patterns in ancient Britannia; describe the role of Roman roads in the expansion and governance of the Roman Empire; summarize the effect of Roman mining practices on the environment; describe the long-term impact of the canals built by Roman emperors or the creation of a harbour at Ostia Antica)

*Teacher prompts:* "What geographical challenges did the early inhabitants of Rome face? To what extent and in what ways did they adapt the original terrain to suit human needs?" "In what ways did the Romans ensure a constant and safe supply of water to urban residents across their empire?"

## INTERNATIONAL LANGUAGES

## International Languages, Level 1, Academic (LBABD–LDYBD)

## A. Listening

## A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in brief, structured interactions in the target language about themselves, family, friends, and their immediate environment, with contextual and visual support (*e.g.*, ... offer additional ideas in response to a peer's plan for a waste-free lunch; ...)

## B. Speaking

#### **B1. Speaking to Communicate**

**B1.2 Producing Oral Communications:** produce brief, rehearsed messages in the target language to communicate information about matters of personal interest and familiar topics, with contextual, auditory, and visual support *(e.g., ... deliver an oral report on an environmental issue such as the impact of climate change; ...)* 

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in brief, structured spoken interactions in the target language about matters of personal interest and familiar topics, with teacher modelling and support *(e.g., ... exchange information with a peer about what can go into a recycling bin in the classroom or at home; ...)* 

## C. Reading

### C1. Reading Comprehension

**C1.2 Reading for Meaning:** demonstrate an understanding of information and ideas in simple texts in the target language, with teacher support as appropriate (e.g., ... dramatize key elements of a report about a current event or a social or an environmental issue; ...)

### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... read about an environmentally significant area in a target-language community and explain its significance)

## D. Writing

#### D1. Purpose, Audience and Form

**D1.2 Writing in a Variety of Forms:** write a variety of level-appropriate texts in the target language, applying their knowledge of the basic structural and stylistic elements of each form (*e.g.*, ... *a survey or questionnaire on an environmental issue;* ...) ...

#### D3. Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work in the target language, communicate information about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... write a letter to an imaginary or a real friend in a country or region where the target language is spoken, asking questions about ... eco-tourism; ...)

# International Languages, Level 1, Open (LBABO–LDYBO)

## B. Speaking

#### **B1. Speaking to Communicate**

**B1.2 Producing Oral Communications:** produce brief, rehearsed messages in the target language to communicate information about matters of personal interest and familiar topics, with contextual, auditory, and visual support *(e.g., ... compose and deliver a school announcement about an environmental activity such as reducing waste; ...)* 

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally in the target language about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (e.g., ... describe a popular eco-tourism destination in a region where the target language is spoken, using images to illustrate their remarks)
#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of level-appropriate texts in the target language, applying their knowledge of the basic structural and stylistic elements of each form (e.g., ... a poster containing a list of items that can be recycled or listing ways to reduce waste and energy used in school or at home; ...)

# International Languages, Level 2, University Preparation (LBACU–LDYCU)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of the purpose and meaning of oral texts in the target language that contain information and ideas about academic and familiar topics, with contextual and visual support as appropriate (e.g., ... extract ideas from an oral text about an environmental issue such as biodiversity ..., and categorize them by importance using a graphic organizer; ...) ...

*Teacher prompts:* ... "What are the main threats to biodiversity identified in this oral text? What is one solution?"

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in structured and some open-ended interactions in the target language about academic and familiar topics, with contextual and visual support as appropriate (e.g., ... agree or disagree with various points of view in a small-group or class debate about an environmental issue such as water pollution ...)

#### A3. Intercultural Understanding

**A3.1 Intercultural Awareness:** using information from oral texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, *after listening to a travelogue about a country where the target language is spoken, identify and describe some significant landmarks or eco-tourism destinations; ...)* 

#### B. Speaking

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in structured and spontaneous spoken interactions in the target language about academic and familiar topics, with teacher modelling and support as appropriate *(e.g., ... defend a point of view in a debate about the protection of animal habitats; ...)* 

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of information and ideas in a variety of texts in the target language, including simple texts and some complex adapted and authentic texts, with teacher support as appropriate (*e.g.*, ... summarize key ideas in an article on *climate change*; ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine, with support from the teacher, their purpose for writing and the audience for texts in the target language they plan to create (*e.g.*, ... *to highlight the environmental impact of different kinds of transportation in a community campaign poster;* ...)

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work in the target language, communicate information about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... create a flyer about the effects of climate change in a country where the target language is spoken, describing efforts to mitigate or adapt to these effects; ...)

# International Languages, Level 2, Open (LBACO–LDYCO)

#### A. Listening

#### A3. Intercultural Understanding

**A3.1 Intercultural Awareness:** using information from oral texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... *after listening to a broadcast, identify the effects of climate change on a region where the target language is spoken and compare them to the effects on their own community*)

#### B. Speaking

#### **B2. Speaking to Interact**

**B2.2 Interacting:** engage in structured and spontaneous spoken interactions in the target language about familiar and new topics, with teacher modelling and support (*e.g.*, ... *dramatize a scripted dialogue between an interviewer and an environmentalist about the protection of animal habitats; ...)* 

*Teacher prompts:* ... "In your interview with an environmentalist, what questions can you ask to ensure that the issue is explored and explained?"

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of information and ideas in a variety of texts in the target language, including simple texts and teacher-selected complex adapted and authentic texts, with teacher support as appropriate (*e.g.*, ... *identify the key message on the home page of an environmental organization's website*)

#### C2. Purpose, Form, and Style

**C2.2 Text Features and Elements of Style:** identify some features and stylistic elements of a variety of text forms, including fictional, informational, graphic, and media forms, and explain how they help convey the meaning ...

*Teacher prompts:* ... "What features of this environmental organization's website help you to navigate the information presented?"

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (e.g., ... read an article about an environmental issue in a target-language community and make connections to a similar issue in their own community)

*Teacher prompts:* ... "What common concerns does this article describe about the issue of waste disposal? What methods do your community and the target-language community choose to address the issue?"

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine, with support from the teacher, their purpose for writing and the audience for texts in the target language they plan to create (*e.g.*, ... to compose a survey to find out about the environmental practices of peers at home...)
- **D1.2 Writing in a Variety of Forms:** write a variety of level-appropriate texts in the target language, applying their knowledge of some structural and stylistic elements of each form (*e.g.*, ... an announcement for the school website or parents' council about a school environmental initiative; a fundraising plan to defray the cost of a trip) ...

#### **D3.** Intercultural Understanding

D3.1 Intercultural Awareness: in their written work in the target language, communicate information about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (e.g., ... create a flyer promoting conservation efforts in a region where the target language is spoken)
Teacher prompts: ... "What are the most significant facts about this individual? Has he or she made an important contribution to ... the environment ...? How was it unique?"

# International Languages, Level 3, University Preparation (LBADU–LDYDU)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of the purpose and meaning of oral texts in the target language that contain information and ideas about a variety of topics, with support as appropriate (e.g., ... summarize key ideas and outline supporting details in a documentary about an issue related to the environment, ...; explain the pros and cons of ecotourism described in a radio documentary)

#### A2. Listening to Interact

A2.2 Interacting: respond with understanding to what others say while participating in structured and open-ended interactions in the target language about a variety of topics, with support as appropriate (e.g., ... after watching a video clip about an environmental issue, respond to the opinions of others in a small-group discussion about the causes and solutions; ...)

#### A3. Intercultural Understanding

**A3.1 Intercultural Awareness:** using information from oral texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... *listen to a documentary about environmental protection in Canada and in another country where the target language is spoken, and compare the approaches of the two countries*)

#### B. Speaking

#### **B1.** Speaking to Communicate

**B1.2 Producing Oral Communications:** produce planned, detailed, and spontaneous messages in the target language to communicate information and ideas about a variety of topics, with support as appropriate (*e.g., compose and deliver a public service announcement about an environmental issue such as energy conservation; ...)* 

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in structured and spontaneous spoken interactions in the target language about a variety of topics, with support as appropriate (*e.g.*, ... contribute to a round-table discussion about environmental and traditional practices in First Nations, Métis, and Inuit communities; ...)

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally in the target language about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (e.g., ... create a podcast about an environmental initiative or project in a region where the target language is spoken)

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of information and ideas in a variety of texts in the target language, including complex adapted and authentic texts (e.g., ... locate and record significant points in a newspaper article about ... an environmental issue, and compose a rap or poem to express a personal reaction to the issue; ... in a response to a blog, support or refute arguments presented in the blog about an environmental issue...)

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine, with minimal support from the teacher, their purpose for writing and the audience for texts in the target language they plan to create (*e.g.*, ... to express their viewpoint about an environmental ... issue, such as a project proposed on First Nations, Métis, or Inuit lands, in a letter to a politician; ...)
- **D1.2 Writing in a Variety of Forms:** write a variety of level-appropriate texts in the target language, applying their knowledge of various structural and stylistic elements of each form *(e.g., ...; an essay about ... an environmental issue)*

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work in the target language, communicate information about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... write an opinion piece about an environmental ... issue in a country or region where the target language is spoken; ...)

# International Languages, Level 3, Open (LBADO-LDYDO)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of the purpose and meaning of oral texts in the target language that contain information and ideas about a variety of topics, with contextual and visual support as appropriate (*e.g.*, ... *identify the main concerns and solutions presented in a webcast or podcast about an environmental issue*)

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in structured and some open-ended interactions in the target language about a variety of topics, with contextual and visual support as appropriate (*e.g.*, ... ask questions to elicit additional information in a round-table discussion about an environmental issue such as food security ...)

#### A3. Intercultural Understanding

A3.1 Intercultural Awareness: using information from oral texts in the target language, identify communities where the target language is spoken, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (e.g., ... after listening to an audio webcast, answer questions about an ... environmental issue related to a target-language community and make connections to an issue related to a First Nations, Métis, or Inuit community; ...)

*Teacher prompts:* ... "How are environmental issues in the target-language community similar to and different from environmental issues in your community?"

#### B. Speaking

#### **B1.** Speaking to Communicate

**B1.2 Producing Oral Communications:** produce rehearsed, some detailed, and spontaneous messages in the target language to communicate information and ideas about a variety of topics, with contextual, auditory, and visual support as appropriate (e.g., ... present a summary of a current or proposed environmental project, such as mining, forestry, wind turbine farms, or clean water access, in a country where the target language is spoken; ...)

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in structured and spontaneous spoken interactions in the target language about a variety of topics, with teacher modelling and support as appropriate (*e.g., share career ideas in a small group; survey classmates and community members about an environmental issue such as whether to build an oil pipeline; ...)* 

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine, with some support from the teacher, their purpose for writing and the audience for texts in the target language they plan to create (*e.g.*, ... to write a proposal requesting support from the school parent's council for a school environmental initiative)
- **D1.2 Writing in a Variety of Forms:** write a variety of level-appropriate texts in the target language, applying their knowledge of several structural and stylistic elements of each form *(e.g., a class word web identifying an environmental problem and possible solutions...)*

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work in the target language, communicate information about communities where the target language is spoken, including aspects of their cultures and their contributions to the world, and make connections to personal experiences and their own and other communities (e.g., ... write a film script or play about an important environmental ... issue in a country where the target language is spoken; ...)

# COMPUTER STUDIES, GRADES 10 TO 12 (2008)

#### From "Environmental Education and Computer Studies" in the curriculum policy document:

There are many opportunities to integrate environmental education into the teaching of computer studies. In each of the computer studies courses, the expectations relating to environmental stewardship and sustainability allow students to focus on learning related to critical thinking, citizenship, and personal responsibility. Students analyse the impact of computer use on the environment. Questions about the safe handling and disposal of materials and substances used in computer studies provide students with opportunities to explore how simple human interactions with the environment can have significant consequences. Students will be expected to actively engage in developing and implementing strategies to reduce, reuse, and recycle computers, their products, and associated technologies. As well, they will research government agencies and community partners who have developed relevant opportunities to support these activities. By identifying and implementing measures to reduce the negative effects of computers on the environment, students will contribute to responsible environmental stewardship.

Programming projects can be used to support these expectations. For example, students might program a survey to assess people's knowledge of environmentally responsible strategies related to the use of computers. The program could be designed to calculate the respondent's "environmental awareness" grade and suggest additional strategies, or it could be designed to provide feedback for each survey question. Students could also design surveys to assess the use of environmentally responsible practices in the classroom.

Environmental education can also be integrated into the design of other programming projects, such as simulations that model healthy ecosystems (showing the balance between plants and animals in an enclosed system); or the consequences of an environmental catastrophe such as an oil spill on a coastline (including the speed and depth of the oil spread and the impact of the oil on the area affected); or the social costs and benefits of designing energy-efficient buildings. The dynamic relationships resulting from human interaction with the environment provide a rich context for developing authentic learning activities within computer studies courses.

# Introduction to Computer Studies, Grade 10, Open (ICS2O)

#### C. Computers and Society

C2. describe computer use policies that promote environmental stewardship and sustainability

#### C2. Environmental Stewardship and Sustainability

**C2.1** describe the negative effects of computers and computer use on the environment *(e.g., chemicals from electronic waste dumped in landfills – domestic or overseas – leaching into soil and groundwater; unnecessary use of paper; heavy power consumption)* and on human health *(e.g., effects of exposure to radiation ...)* 

- **C2.2** identify measures that help reduce the negative effects of computers on the environment *(e.g., lab regulations, school policies, corporate policies, provincial policies, paperless workplaces)* and on human health ...
- **C2.3** describe ways in which computers are or could be used to reduce resource use and to support environmental protection measures (*e.g., computer modelling to reduce use of physical resources; interpretation of large amounts of environmental data; management of natural resources; programmable temperature control to reduce energy consumption)*
- **C2.4** describe, on the basis of research, how and where recycled electronic waste is processed, and identify local companies and institutions that offer such services

# Introduction to Computer Science, Grade 11, University Preparation (ICS3U)

#### D. Topics in Computer Science

D1. describe policies on computer use that promote environmental stewardship and sustainability

#### D1. Environmental Stewardship and Sustainability

- **D1.1** describe the negative effects of computer use on the environment (*e.g., creation of e-waste, excessive use of paper resulting from unnecessary printing of files and emails, heavy power consumption*) and on human health (*e.g., exposure to radiation ...*)
- **D1.2** identify measures that help reduce the impact of computers on the environment (e.g., lab regulations, school policies, corporate and government policies promoting paperless workplaces and computer recycling and reuse) and on human health ...
- **D1.3** describe ways in which computers are or could be used to reduce resource use and to support environmental protection measures (*e.g., computer modelling to reduce use of physical resources; management of natural resources*)
- **D1.4** identify government agencies and community partners that provide resources and guidance for environmental stewardship (e.g., local community recycling centres, private companies that refurbish computers, printer cartridge recycling programs)

#### **D2.** Exploring Computer Science

**D2.2** demonstrate an understanding of an area of collaborative research between computer science and another field *(e.g., ... geology, ... climatology, ...)* 

# Introduction to Computer Programming, Grade 11, College Preparation (ICS3C)

#### B. Software Development

#### **B3.** Designing Simple Algorithms

**B3.2** solve problems (e.g., ... fuel consumption on a car trip; ... temperature at a given altitude, using the environmental lapse rate) by applying mathematical equations or formulas in an algorithm

#### D. Computers and Society

D1. describe computer use policies that promote environmental stewardship and sustainability

#### D1. Environmental Stewardship and Sustainability

- **D1.1** describe negative effects of computer use on the environment (*e.g., creation of waste, unnecessary printing of emails, heavy power consumption*) and on human health (*e.g., exposure to radiation, ...*)
- **D1.2** identify measures that help reduce the impact of computers on the environment (*e.g., lab regulations, school policies, corporate policies, provincial policies, paperless workplaces, computer recycling and reuse)* and on human health ...
- **D1.3** describe ways in which computers are or could be used to reduce resource use and to support environmental protection measures (*e.g., computer modelling to reduce use of physical resources; interpretation of large amounts of environmental data; management of natural resources; programmable temperature control to reduce energy consumption)*
- **D1.4** identify government agencies and community partners that provide environmental stewardship opportunities (e.g., local community recycling centres, private companies that refurbish computers, printer cartridge recycling programs)

#### **D3.** Emerging Technologies

**D3.3** describe some of the solutions to complex problems affecting society that have been or are being developed through the use of advanced computer programming and emerging technologies (*e.g., monitoring and regulating electrical supply and demand; ... analysing large-scale meteorological data to predict catastrophic storms*)

# Computer Science, Grade 12, University Preparation (ICS4U)

#### D. Topics in Computer Science

**D1.** assess strategies and initiatives that promote environmental stewardship with respect to the use of computers and related technologies

#### D1. Environmental Stewardship and Sustainability

- **D1.1** outline strategies to reduce the impact of computers and related technologies on the environment (*e.g., reduce, reuse, and recycle; turn computers and monitors off at end of day; participate in printer cartridge recycling*) and on human health ...
- **D1.2** investigate and report on governmental and community initiatives that encourage environmental stewardship and promote programs and practices that support sustainability *(e.g., local community recycling centres, private companies that refurbish computers, printer cartridge recycling programs)*

#### **D4. Exploring Computer Science**

**D4.1** report on some areas of collaborative research between computer science and other fields *(e.g., ... geology, ... climatology, ...)*, on the basis of information found in industry publications *(e.g., from the ACM and IEEE)* 

# Computer Programming, Grade 12, College Preparation (ICS4C)

#### D. Computers and Society

**D1.** analyse and apply strategies that promote environmental stewardship with respect to the use of computers and related technologies

#### D1. Environmental Stewardship and Sustainability

- **D1.1** outline and apply strategies to reduce the impact of computers and related technologies on the environment (*e.g.*, *reduce*, *reuse*, *and recycle*; *turn computers and monitors off at end of day*; *participate in printer cartridge recycling*) and on human health ...
- **D1.2** investigate and describe governmental and community initiatives promoting environmental stewardship and sustainability (*e.g., local community recycling centres, private companies that refurbish computers, printer cartridge recycling programs*)

# ENGLISH, GRADES 9 AND 10 (2007) AND GRADES 11 AND 12 (2007)

Although the expectations in the English curriculum do not explicitly address environmental education, the development of environmental understanding can be fostered in all English courses through the learning context (e.g., a topic, thematic unit, or issue related to the environment) and the learning materials used (e.g., books, websites, media).

In all courses in the English curriculum, students are encouraged "to look beyond the literal meaning of texts and to think about fairness, equity, social justice, and citizenship in a global society" (see pp. 27–28, "Instructional Approaches", in the Grade 9–10 and 11–12 curriculum policy documents). Such perspectives often provide opportunities to explore environmental issues. Students also acquire research and inquiry skills in their English courses, which can support the development of environmental literacy (see p. 34, "Literacy, Mathematical Literacy, and Inquiry/ Research Skills", in the curriculum policy documents).

In many cases, when global, historical, political, social, and/or economic issues are referred to in the expectations (especially when they are connected to Indigenous perspectives), they can be linked to environmental topics, helping students appreciate the scope of the environment's impact on their world.

# English, Grade 9, Applied (ENG1P)

#### Media Studies

#### 3. Creating Media Texts

Purpose and Audience

**3.1** describe the topic, purpose, and audience for media texts they plan to create (*e.g.*, *a storyboard for a music video to raise money for an environmental cause; ...*) and identify challenges they may face in achieving their purpose

*Note:* The example illustrates how environmental connections can be made through the choice of the topic and purpose of the media texts students are expected to create. A similar approach can be adopted in expectations in the Writing strand, with respect to pieces of writing students are expected to produce.

# English, Grade 10, Applied (ENG2P)

#### Reading and Literature Studies

#### 1. Reading for Meaning

Variety of Texts

**1.1** read several different short, contemporary, student- and teacher-selected texts from diverse cultures, identifying specific purposes for reading (*e.g.*, *identify information from a recycling brochure or from the website of an environmental organization to use in an assignment about protecting the environment; ...)* 

*Note:* The example illustrates how an environmental connection can be made in the context of a reading assignment.

# English, Grade 11, University Preparation (ENG3U)

#### Media Studies

#### 1. Understanding Media Texts

Audience Responses

1.4 explain why the same media text might prompt different responses from different audiences ... *Teacher prompts:* ... "Why does this documentary on climate change prompt such conflicting responses among viewers?"

*Note:* The teacher prompt illustrates how environmental connections can be made in the context of exploring differing responses to media texts. In this instance, students would learn about different perspectives on an environmental issue.

# English, Grade 12, University Preparation (ENG4U)

#### **Oral Communication**

#### 1. Listening to Understand

Critical Literacy

**1.8** identify and analyse in detail the perspectives and/or biases evident in oral texts, including complex and challenging texts, commenting with understanding and increasing insight on any questions they may raise about beliefs, values, identity, and power (*e.g.*, ... analyse the perspectives of various participants on an expert panel about global warming)

*Note:* The example illustrates how an environmental connection can be made in the context of this expectation, enabling students to examine various perspectives on a global environmental issue.

# English, Grade 12, College Preparation (ENG4C)

#### Reading and Literature Studies

#### 1. Reading for Meaning

Extending Understanding of Texts

**1.5** extend understanding of texts, including increasingly complex or difficult texts, by making appropriate and increasingly rich connections between the ideas in them and personal knowledge, experience, and insights; other texts; and the world around them (e.g., ...verify the credibility of descriptions of the environment in a futuristic novel by reading current articles about the likely effects of global warming)

*Note:* The example illustrates how an environmental connection can be made in the context of this expectation, enabling students to examine the possible future impact of global warming.

# Business and Technological Communication, Grade 12, Open (EBT4O)

#### A. Investigating Business and Technological Communications and Culture

#### 1. Understanding Business and Technological Communications and Culture

Understanding the Impact of Technology

1.4 research and demonstrate an understanding of the ways in which communications technologies influence business practices (e.g., the role of rich web communications systems that combine presentation, training, and online video-conferencing technology in supplementing or replacing face-to-face meetings that require travel; ... the impact of new communications technologies on the ecological "footprints" of various businesses)
Teacher prompts: "How possible is it to have a paperless office?" "What are some examples of waste in the workplace?" ... "Give an example of a communications technology that has increased efficiency in the workplace or home. Do you know of any examples that have decreased rather than increased efficiency?" In what way?"

*Note:* The examples and teacher prompts illustrate how environmental connections can be made in the context of learning about communications technologies in business, enabling students to examine the environmental implications of different technologies.

# ENGLISH AS A SECOND LANGUAGE AND ENGLISH LITERACY DEVELOPMENT, GRADES 9 TO 12 (2007)

The expectations listed here either refer directly to the environment or include examples and/or prompts that offer opportunities for environmental education. Beyond these particular expectations, the English as a second language and English literacy development classroom also provides many other occasions for students to develop their awareness and understanding of environmental issues, and to communicate their ideas about them. Students can be encouraged to read, write, and speak about and/or listen to information about a range of environmental issues, and they can learn about environmental topics when developing their awareness of Canada's geography, history, and social and economic issues.

# English as a Second Language, ESL Level 1, Open (ESLAO)

#### Socio-Cultural Competence and Media Literacy

#### 4. Developing Media Knowledge and Skills

**4.1** view, read, and listen to simple media texts to obtain information and complete assigned tasks *(e.g., report the weather as forecast on television; ...)* 

# English as a Second Language, ESL Level 2, Open (ESLBO)

#### Writing

#### 2. Organizing Ideas in Writing

**2.1** organize information relating to a central idea in a short paragraph with a topic sentence, supporting details, and a concluding sentence (e.g., follow a teacher think-aloud to write a paragraph about the variety of natural resources found in Canada; ...)

#### Socio-Cultural Competence and Media Literacy

#### 2. Developing Awareness of Canada, Citizenship, and Diversity

**2.1** demonstrate knowledge of a variety of facts about Canada (*e.g., describe similarities and differences among the regions of Canada with respect to their major economic activities, immigration patterns, weather, geographical features, and industrial and agricultural production; ...)* 

# English as a Second Language, ESL Level 3, Open (ESLCO)

#### Socio-Cultural Competence and Media Literacy

#### 2. Developing Awareness of Canada, Citizenship, and Diversity

- **2.1** explain the relationship between some important aspects of geography and history and current Canadian issues (e.g., the effect of rivers on transportation routes and settlement patterns; ...)
- **2.2** demonstrate knowledge of a variety of key facts about Canadian citizenship, levels of government in Canada, and current Canadian issues (e.g., ... research issues such as the sustainable use of natural resources, provincial elections, or the legalization of same-sex unions, and participate in small- and large-group discussions about them)

# English as a Second Language, ESL Level 4, Open (ESLDO)

#### Writing

#### 2. Organizing Ideas in Writing

**2.1** organize information relating to a central idea in a structured composition of three or more paragraphs (e.g., ... a report showing cause-and-effect relationships concerning the decline of an endangered species)

#### Socio-Cultural Competence and Media Literacy

#### 2. Developing Awareness of Canada, Citizenship, and Diversity

**2.1** identify examples of the influence of Canada's history and geography on its literature and art *(e.g., images of nature in Aboriginal art and Group of Seven paintings; ...)* 

#### 4. Developing Media Knowledge and Skills

**4.3** create a variety of media texts for specific purposes and audiences (*e.g.*, ... *a public-service announcement on a current issue relevant to students such as poverty, AIDS, violence prevention, or global warming*)

# English as a Second Language, ESL Level 5, Open (ESLEO)

#### Writing

#### 1. Writing for Different Purposes

**1.1** write complex texts to convey information and ideas for academic purposes using a wide variety of forms (*e.g.*, write a report comparing the environments of two regions of Canada; ... write a detailed report clearly outlining causes and effects of greenhouse gas emissions; ...)

# English Literacy Development, ELD Level 2, Open (ELDBO)

#### Reading

#### 1. Reading for Meaning

**1.4** identify the characteristics of some simple text forms (*e.g., maps: labels, different colours for land and water; ...)* 

#### Socio-Cultural Competence and Media Literacy

#### 2. Developing Awareness of Canada, Citizenship, and Diversity

**2.1** demonstrate knowledge of some Canadian celebrations and sites of historical, social, or civic significance (*e.g.*, ... *provincial and national parks, tourist attractions*)

#### 4. Developing Media Knowledge and Skills

**4.1** view, read, and listen to different types of media texts to obtain and record key information *(e.g., compile a weather report based on television forecasts; ...)* 

# English Literacy Development, ELD Level 3, Open (ELDCO)

#### Listening and Speaking

#### 1. Developing Listening Comprehension

**1.1** demonstrate comprehension of specific information in more detailed directions, instructions, and classroom presentations, with moderate contextual and visual support *(e.g., identify major weather trends from weather broadcasts; ...)* 

#### Writing

#### 1. Writing for Different Purposes

**1.1** write short texts to convey information and ideas for academic purposes using a variety of scaffolded forms (*e.g.*, *use a model to write a short informational paragraph about a landform in a region of Canada; ...)* 

#### Socio-Cultural Competence and Media Literacy

## 2. Developing Awareness of Canada, Citizenship, and Diversity

**2.1** demonstrate knowledge of a variety of facts about Canadian geography (e.g., name and locate on maps the provinces and territories, major cities, and major rivers and lakes; complete charts showing the distribution of natural resources in some provinces/territories)

# English Literacy Development, ELD Level 4, Open (ELDDO)

#### Socio-Cultural Competence and Media Literacy

#### 2. Developing Awareness of Canada, Citizenship, and Diversity

**2.2** demonstrate knowledge of key facts about Canadian citizenship, levels of government in Canada, and current Canadian issues (e.g., ... research issues such as energy conservation, recycling, election platforms of different political parties, human rights)

#### 4. Developing Media Knowledge and Skills

4.1 view, read, and listen to coverage of the same subject or issue in different media sources and compare the type of information provided (e.g., compare television, newspaper, and Internet accounts of a natural disaster or a sports event)
Teacher prompt: "How did the map in the newspaper report help you understand the television coverage of the hurricane?"

# English Literacy Development, ELD Level 5, Open (ELDEO)

#### Reading

#### 1. Reading for Meaning

**1.2** demonstrate an understanding of complex texts in a wide variety of ways (*e.g.*, ... summarize a report about the impact of human activity on aquatic systems; ...)

#### Writing

#### 2. Organizing Ideas in Writing

2.1 organize information to develop a central idea in a structured composition of three or more paragraphs (e.g., use a graphic organizer to map cause-and-effect relationships for a report about an endangered species; ...)

# FRENCH AS A SECOND LANGUAGE – CORE FRENCH, EXTENDED FRENCH, FRENCH IMMERSION (2014)

From "Environmental Education and French as a Second Language" in the curriculum policy document:

There are many opportunities to integrate environmental education into the teaching of FSL. Some examples related to environmental education have been included in the examples and teacher prompts in the curriculum. Teachers are encouraged to select French texts about environmental topics, enabling students to learn about issues of concern to different communities around the world. Throughout the FSL curriculum, students can be encouraged to read about, discuss, listen to programs about, or make presentations on environmental issues that are of interest to them.

# THE CORE FRENCH PROGRAM, GRADES 9 TO 12

# Core French, Grade 9, Academic (FSF1D)

# A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of the purpose and meaning of oral French texts about new and familiar topics, with contextual and visual support (e.g., ... extract key points from an oral text about an environmental issue; ...)

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in a variety of structured and guided interactions about new and familiar topics, in formal and informal situations (*e.g.*, ... participate in paired and small-group conversations on familiar topics, such as ... environmental issues in their community; ...)

# B. Speaking

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities in Africa and Asia, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... prepare a presentation on various factors that affect a particular *French-speaking region in Africa or Asia, such as ... climate, geography, ...*)

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of student- and teacherselected French texts about academic and personally relevant topics (*e.g.*, ... *dramatize key events in a text about* ... *a social or environmental issue;* ... *summarize the opinions and evidence that a newspaper column offers to support its points about recycling electronic devices;* ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for the French texts they plan to create (*e.g.*, ... to compose a survey to find out about people's habits and routines related to environmental concerns such as recycling; ...)
- **D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about academic and personally relevant topics, applying their knowledge of the basic structural and stylistic elements of each form (*e.g.*, ... *a letter to the editor using persuasive language to convince adults to increase their environmental awareness; ...)*

# Core French, Grade 9, Applied (FSF1P)

#### A. Listening

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in a variety of structured and guided interactions about new and familiar topics, in formal and informal situations (*e.g.*, ... participate in paired and small-group conversations on familiar topics, such as recycling ...)

#### B. Speaking

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities in Africa and Asia, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *present an oral report summarizing some key factors [such as* ... *climate, geography, ...] affecting the francophone community in a particular region ...)* 

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about everyday matters and personally relevant topics, applying their knowledge of the basic structural and stylistic elements of each form (*e.g.*, ... testimonials or quotes for an advertising campaign raising awareness about a social or environmental issue)

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work, communicate information about Frenchspeaking communities in Africa and Asia, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *create a print advertising campaign for a French-speaking African country to increase awareness about ... plants, or animals; ...*)

# Core French, Grade 9, Open (FSF1O)

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.4 Applying Language Structures:** communicate their meaning clearly, using parts of speech and word order appropriately (*e.g.*, ... *describe a person or an object from their environment;* ...)

#### **B2. Speaking to Interact**

**B2.2 Interacting:** exchange information, ideas, and opinions with the teacher and their peers in structured and guided spoken interactions about matters of personal interest and familiar topics, with teacher modelling as appropriate *(e.g., ... ask and respond to questions about ... weather, ...)* 

#### C. Reading

#### **C1. Reading Comprehension**

**C1.4 Developing Vocabulary:** use a variety of vocabulary-acquisition strategies before, during, and after reading to determine or confirm the meaning of new, unfamiliar, or recently learned words and expressions ...

*Instructional tips:* (1) Teachers can have students scan a text on a specific subject (e.g., ... the environment) to find new words and then use the context and familiar vocabulary to help them determine the meaning of those words. ...

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of French texts, identify French-speaking communities in Canada, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g., conduct research to identify and describe significant landmarks in various French-speaking places in eastern, western, and northern Canada; ...)* 

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for the French texts they plan to create (*e.g.*, ... to conduct a survey about environmental habits in the home; ...)

# Core French, Grade 10, Academic (FSF2D)

#### A. Listening

#### A2. Listening to Interact

A2.2 Interacting: respond with understanding to what others say while participating in a variety of interactions about academic and familiar topics, in formal and informal situations ... *Instructional tips:* (1) Teachers can ask students to listen for the verbs "connaître" and "savoir" in present and past tenses and to distinguish the differences in the meaning and usage of the two verbs (e.g., ... "Connais-tu la géographie de l'Europe?", ...)

#### B. Speaking

#### **B1.** Speaking to Communicate

**B1.4 Applying Language Structures:** communicate their meaning clearly, using parts of speech and word order appropriately ...

*Instructional tips:* ... (2) Teachers can encourage students to create a dialogue using the verbs "connaître" and "savoir" in the *présent* and in past tenses and to distinguish the differences in the meaning and usage of the two verbs (e.g., ... "Connais-tu la géographie de l'Europe?", ...).

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities worldwide, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (e.g., ... research the ... geography of French overseas administrative territories such as French Guiana, St. Martin, or Saint Pierre and Miquelon and present the information orally, using visual aids such as a slideshow, a poster, a travel brochure; ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for the French texts they plan to create (*e.g.*, *to discuss an environmental disaster in a newspaper article; ...)* 

*Teacher prompts:* ... "Quels détails vas-tu inclure dans un article au sujet d'un désastre environnemental afin d'informer tes lecteurs?" ...

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about academic and personally relevant topics, applying their knowledge of some of the structural and stylistic elements of each form *(e.g., ... a letter to the editor on a social or environmental issue; ...)* 

# Core French, Grade 10, Applied (FSF2P)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for the French texts they plan to create ...

*Teacher prompts:* … "Dans quelle mesure une biographie est-elle un véhicule efficace des expériences vécues par une personne d'importance dans un mouvement … environnemental?" …

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about everyday matters and personally relevant topics, applying their knowledge of some of the structural and stylistic elements of each form *(e.g., an editorial to encourage adults to improve their energy conservation practices; ...)* 

# Core French, Grade 10, Open (FSF2O)

#### A. Listening

#### A2. Listening to Interact

A2.2 Interacting: respond with understanding to what others say while participating in a variety of structured and guided interactions about everyday matters and matters of personal interest *(e.g., in a small group, create guidelines for preparing a litter-less lunch; ...)* 

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.2 Producing Oral Communications:** using familiar words and expressions, produce prepared and spontaneous messages in French to communicate information, ideas, and opinions about familiar, everyday matters and topics of personal interest, with contextual, auditory, and visual support as appropriate (*e.g.*, ... *create and deliver a presentation about a familiar environmental or social issue;* ...)

*Teacher prompts:* "Quel langage peux-tu utiliser pour convaincre les autres à participer à une démarche pour protéger l'environnement?" …

*Instructional tips:* ... (2) Teachers can model the use of past tenses when discussing events that occurred at different points in the past and can encourage students to practise using these tenses when discussing past environmental issues and how they have been addressed.

# Core French, Grade 11, University Preparation (FSF3U)

#### A. Listening

#### A1. Listening to Understand

**A1.2 Demonstrating Understanding:** demonstrate an understanding of explicit and implicit messages about a variety of topics in oral French texts, with support as appropriate (*e.g.*, ... *list the main points in a podcast about an environmental issue; ... summarize the main ideas in a news report on climate change; ...)* 

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.2 Producing Oral Communications:** produce prepared and spontaneous messages in French to communicate information, ideas, and opinions about a variety of topics, with support as appropriate (e.g., prepare and deliver a speech on current environmental issues; explain reactions to a news report on a natural disaster; ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.3 Applying Language Structures:** communicate their meaning clearly, using parts of speech appropriately and following conventions for correct spelling, word order, and punctuation *(e.g., ... highlight an industrial practice that has harmful consequences for the environment using hypothetical sentences; ...)* 

# Core French, Grade 11, Open (FSF3O)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of explicit and implicit messages about a variety of topics in oral French texts, with contextual and visual support (e.g., ... after listening to a weather forecast for the weekend, describe the expected weather; ... predict the reaction of an environmentalist to an excerpt from a news report they have heard; ...)

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.2 Producing Oral Communications:** produce prepared and spontaneous messages in French to communicate information, ideas, and opinions about a variety of topics, with support as appropriate (*e.g.*, ... summarize and comment on an environmental issue; ...)

#### **B2.** Speaking to Interact

**B2.2 Interacting:** exchange information, ideas, and opinions with others in guided and spontaneous spoken interactions about a variety of topics, with teacher modelling as appropriate (e.g., ... express and defend an opinion about a social or environmental issue with a partner; ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.3 Applying Language Structures:** communicate their meaning clearly, using parts of speech appropriately and following conventions for correct spelling, word order, and punctuation *(e.g., ... highlight an industrial practice that has harmful consequences for the environment using hypothetical sentences; ...)* 

# Core French, Grade 12, University Preparation (FSF4U)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of explicit and implicit messages about a wide variety of topics in oral French texts, with support as appropriate (e.g., ... after viewing a documentary on the subject, identify how environmental changes can affect people's health; ...)

#### C. Reading

#### C1. Reading Comprehension

**C1.2 Reading for Meaning:** demonstrate an understanding of explicit and implicit messages in a variety of student- and teacher-selected French texts about academic and personally relevant topics (*e.g.*, ... summarize articles or short stories about an environmental issue, ensuring that they include all key information)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about academic and personally relevant topics, applying their knowledge of the structural and stylistic elements of each form (*e.g.*, ... *a report with data and evidence regarding people's perceptions of an environmental issue; ...)* 

*Teacher prompts:* ... "Comment organiseras-tu un rapport qui examine les perceptions des gens au sujet d'un problème d'environnement?" ...

# Core French, Grade 12, Open (FSF4O)

#### B. Speaking

#### **B2. Speaking to Interact**

**B2.2 Interacting:** exchange information, ideas, and opinions with others in prepared and spontaneous spoken interactions about a variety of topics, with teacher modelling as appropriate (*e.g., discuss current global issues such as the environment, ... responding to questions from the teacher and peers; ...)* 

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for the French texts they plan to create (*e.g.*, *to educate people in the community on biodiversity, climate change, or the waste of natural resources; ...*)

*Teacher prompts:* "Quelles relations les êtres humains ont-ils avec la nature?" "De quelle façon ton utilisation quotidienne de l'eau affecte-t-elle le reste de la planète?" …

## THE EXTENDED FRENCH PROGRAM, GRADES 9 TO 12

## Extended French, Grade 9, Academic (FEF1D)

#### A. Listening

#### A1. Listening to Understand

A1.3 Responding to and Evaluating Media Texts: evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about familiar and academic topics, with support as appropriate (e.g., ... explain reasons for the repetition of key points in a news report about an environmental topic)

*Teacher prompts:* ... "Comment un documentaire visionné en classe peut-il vous aider à trouver une solution de recyclage électronique dans votre communauté?" ...

#### B. Speaking

#### **B1.** Speaking to Communicate

**B1.4 Creating Media Texts:** create a variety of oral media texts in French about familiar and academic topics, using forms, conventions, and techniques appropriate to the purpose and audience (e.g., ... in a small group, record a radio commercial for their geography class about the use and/or protection of Canada's natural environment; ...)

#### C1. Reading Comprehension

**C1.5 Responding to and Evaluating Media Texts:** demonstrate an understanding of ideas and information in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g.*, ... *explain their reactions to a news article on an environmental* ... *issue;* ...)

#### C3. Intercultural Understanding

C3.1 Intercultural Awareness: using information from a variety of French texts, identify French-speaking communities in Europe, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... research a variety of recipes explain how geography has influenced the ingredients)
 Teacher prompts: ... "Comment est-ce que l'environnement influence la création de différentes recettes régionales?"

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of short French texts to convey information, ideas, and opinions about familiar and academic topics, including literary topics, applying their knowledge of some of the structural and stylistic elements of each form (*e.g.*, ... *a letter to the school's principal to suggest ways of* ... *naturalizing the school grounds;* ...)

#### D3. Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work, communicate information about Frenchspeaking communities in Europe, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... write a description of a "green community" in a *French-speaking region of Europe*)

# Extended French, Grade 10, Academic (FEF2D)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of oral French texts about academic and familiar topics, including literary texts, with support as appropriate (*e.g.*, ... *explain main ideas and supporting details heard in a live or recorded presentation about a social or environmental issue;* ...)

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in interactions about academic and familiar topics, including literary topics, in formal and informal situations (*e.g.*, ... *after listening to a media clip about an environmental non-governmental organization, discuss their own environmental goals with peers*)

#### C1. Reading Comprehension

**C1.5 Responding to and Evaluating Media Texts:** demonstrate an understanding of explicit and implicit messages in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages ...

*Teacher prompts:* ... "Comment pouvons-nous justifier la circulation de dépliants publicitaires vu l'impact de l'usage du papier sur l'environnement?" ...

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (*e.g., to encourage adults to change practices that have a negative impact on the environment in a series of persuasive paragraphs; ... to suggest to a government official what could be done to protect endangered species in their region; ...)* 

# Extended French, Grade 11, University Preparation (FEF3U)

#### A. Listening

#### A1. Using Listening Comprehension Strategies

**A1.2 Demonstrating Understanding:** demonstrate an understanding of oral French texts about a variety of topics, including literary texts and long texts (*e.g.*, ... following a multimedia presentation on an environmental issue, develop solutions that can be implemented to address the issue in their community; ...)

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in sustained interactions about a variety of topics, including literary topics, in formal and informal situations (*e.g.*, ... ask questions about a presentation on a new environmental technology)

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.4 Creating Media Texts:** create oral media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience *(e.g., ... narrate a documentary on an ... environmental topic)* 

#### **B3. Intercultural Understanding**

**B3.1 Intercultural Understanding:** communicate information orally about French-speaking communities worldwide, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g., ... present an oral report summarizing key ... geographic factors that have affected the people of a particular French-speaking region, including the influence of ... climate, and location)* 

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of literary, informational, and graphic French texts, including challenging texts and texts used in real-life situations *(e.g., ... analyse the information and solutions presented in multiple texts about reducing pollution; ...)* 

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of French texts, identify French-speaking communities worldwide, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... *describe the influence of an environmental movement in a French-speaking region after reading books and periodicals, including e-books and e-journals*)

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (*e.g.*, ... *to heighten awareness of an environmental issue in an editorial;* ...)
- **D1.3 Creating Media Texts:** create media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... write a letter to the editor of a periodical stating the pros and cons of using genetically modified organisms in agriculture or in medicine)

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work, communicate information about Frenchspeaking communities worldwide, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, *write a research report analysing how different Frenchspeaking regions deal with the same social or environmental issue; ...)* 

# Extended French, Grade 12, University Preparation (FEF4U)

#### A. Listening

#### A1. Listening to Understand

**A1.3 Responding to and Evaluating Media Texts:** evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French, including some challenging texts, about a wide variety of topics (*e.g.*, ... analyse the perspective of a documentary about economic development and the environment in Canada and evaluate its objectivity ...)

#### B. Speaking

#### **B2. Speaking to Interact**

**B2.2 Interacting:** engage in sustained spoken interactions in French (prepared and spontaneous), in academic and social contexts, about a wide variety of topics, including literary and other challenging topics (*e.g.*, ... *in a small group, discuss ways to reduce energy and waste in the school*) ...

#### C. Reading

#### **C1. Reading Comprehension**

- **C1.2 Reading for Meaning:** demonstrate an understanding of a variety of literary, informational, and graphic French texts, including long, challenging texts and texts used in real-life situations (*e.g.*, ... *explain the points of view expressed in different essays, books, and/or articles about the impact of humans on the environment; ...)*
- **C1.5 Responding to and Evaluating Media Texts:** analyse and explain explicit and implicit messages in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g.*, ... *evaluate the effectiveness of the website of a non-governmental organization in advocating and monitoring policies that affect the environment;* ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about a wide variety of topics, including literary and other challenging topics, applying their knowledge of the structural and stylistic elements of each form (*e.g.*, ... *a report synthesizing different opinions on a ... environmental issue; ...)* 

#### D3. Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work, communicate information about Frenchspeaking communities worldwide, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *locate and compare photos of environmental rehabilitation and environmental degradation in a French-speaking region and in their own region, and record in a journal the emotions the photos evoke*)

# THE FRENCH IMMERSION PROGRAM, GRADES 9 TO 12

# French Immersion, Grade 9, Academic (FIF1D)

#### A. Listening

#### A1. Listening to Understand

- A1.2 Demonstrating Understanding: demonstrate an understanding of oral French texts about academic and familiar topics, including literary texts, with support as appropriate (*e.g., summarize information heard in a webcast on ... an environmental issue; ...*)
- A1.3 Responding to and Evaluating Media Texts: evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about academic and familiar topics (*e.g.*, ... compare the ways in which an environmental issue is represented in various public service announcements; ...)

#### B. Speaking

#### **B1. Speaking to Communicate**

B1.2 Producing Oral Communications: produce prepared and spontaneous communications in French containing information, ideas, and opinions about academic and familiar topics, including literary topics, with support as appropriate (*e.g., ... describe a memorable experience in the natural world, such as a hike through the forest) Teacher prompts:* ... "Comment avez-vous exploré des parcelles de nature vierge en toute sécurité?" ...

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in spoken interactions in French (prepared and spontaneous), in academic and social contexts, about academic and familiar topics, including literary topics (*e.g.*, *in small groups, discuss solutions to international problems, such as those related to ... natural disasters, or the environment; ...)* 

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities in Europe, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g., in pairs, research the ... geography of a French-speaking country such as Monaco, Switzerland, or Belgium, and present their findings orally; ...)* 

## C. Reading

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of literary, informational, and graphic French texts, including short, challenging texts and texts used in real-life situations (e.g., ... consult a variety of texts when conducting research on Aboriginal perspectives on sustainable uses of ecosystems, and write a report for science class to communicate their findings; ...)

**C1.5 Responding to and Evaluating Media Texts:** demonstrate an understanding of explicit and implicit messages in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g.*, ... *explore how text and images work together in brochures and pamphlets about an environmental issue*)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.3 Creating Media Texts:** create media texts in French on academic and familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... write an objective news article summarizing the causes and potential consequences of a current ... environmental issue)

# French Immersion, Grade 9, Applied (FIF1P)

#### A. Listening

#### A1. Listening to Understand

A1.3 Responding to and Evaluating Media Texts: evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about everyday matters and familiar topics (e.g., ... evaluate the effectiveness of a public service announcement about an environmental issue; ...)

*Instructional tips:* (1) Teachers can encourage the use of the *passé récent* to discuss something heard on the news (e.g., "Il vient de pleuvoir", ...)

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in guided and structured interactions about familiar and new topics and everyday matters, in formal and informal situations (*e.g.*, ... *in a small group, listen to a national weather report and compare weather conditions across the country; ...)* 

Teacher prompts: ... "Que remarquez-vous sur les prévisions météorologiques au Canada?" ...

## B. Speaking

#### **B1. Speaking to Communicate**

- **B1.2 Producing Oral Communications:** produce prepared and spontaneous communications in French containing information, ideas, and opinions about everyday matters and familiar topics, with contextual and visual support (*e.g.*, *... describe a memorable experience in the natural world, such as a fishing or camping trip*)
- **B1.3 Speaking with Fluency:** speak with a smooth pace, appropriate intonation, and accuracy in communications in French (prepared and spontaneous) about everyday matters and familiar topics (*e.g.*, ... pronounce new words correctly when discussing a news article about the impact of climate change on the environment; ...)
- **B1.4 Creating Media Texts:** create a variety of oral media texts in French about familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... *record a public service announcement about environmental choices;* ...)

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in guided and structured spoken interactions in French (prepared and spontaneous), in a variety of contexts, about everyday matters and familiar topics (*e.g.*, ... *in small groups, discuss a local environmental* ... *issue affecting the community and propose some solutions;* ...)

*Teacher prompts:* ... "Proposez des solutions pour traiter efficacement les effets de la pollution atmosphérique sur la santé des personnes dans votre communauté." ... *Instructional tips:* ... (2) Teachers can review the use of the *passé récent* to express something that just happened and can encourage students to use it when discussing an environmental issue (e.g., "Pas possible! Je viens de m'apercevoir que les élèves ont jeté leurs déchets par terre et les professeurs ont pris leurs voitures pour faire 200 mètres." ... )

#### C. Reading

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of short fictional, informational, and graphic French texts, including texts used in real-life situations (*e.g.*, ... *describe an environmental issue featured in an advertisement or on a website; ... explain the pictorial signs in a recycling guide; ...)* 

#### C2. Purpose, Form, and Style

**C2.1 Purposes and Characteristics of Text Forms:** identify the purpose(s) and characteristics of a variety of text forms in French, including fictional, informational, graphic, and media forms, and explain how the characteristics help to communicate the meaning (e.g., ... pictures, graphs, and text on plaques in conservation authority sites explain the local ecosystems; ...)

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of French texts, identify French-speaking communities in Europe, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (e.g., ... investigate, using online sources such as UNESCO's French-language website, some ways in which French-speaking European communities are working to preserve biodiversity; ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (*e.g.*, ... to promote awareness of a community environmental issue on the cover of a class magazine; ...) ...

*Instructional tips:* ... (2) Teachers can encourage students to use the *imparfait* when describing an event in an article (e.g., "Pendant le match de football il pleuvait; ...").

**D1.3 Creating Media Texts:** create media texts in French on everyday matters and familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... *create a brochure for French-speaking tourists about a Canadian national park;* ...)

# French Immersion, Grade 10, Academic (FIF2D)

#### B. Speaking

#### **B1. Speaking to Communicate**

- **B1.2 Producing Oral Communications:** produce prepared and spontaneous communications in French containing information, ideas, and opinions about academic and familiar topics, including literary topics, with support as appropriate (*e.g.*, ... *deliver a monologue articulating the point of view of a stakeholder after an environmental disaster;* ...)
- **B1.4 Creating Media Texts:** create a variety of oral media texts in French about academic and familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... *in small groups, create a media clip about climate change for their science class;* ...)
- **B1.5 Applying Language Structures:** communicate their meaning clearly, using parts of speech and word order appropriately *(e.g., use correct tense sequences when formulating a hypothesis about what might have prevented a particular social or environmental problem; ...)*

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities in Africa and Asia, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *deliver a presentation on key factors that affect a particular French-speaking country in Africa or Asia, such as ... climate, geography,...; give a presentation on travelling to a country that protects the environment and respects local culture, such as Madagascar)* 

*Teacher prompts:* ... "Quelles sont les activités et services écotouristiques qu'on peut offrir au Parc National à Madagascar?" ...

#### C. Reading

#### **C1. Reading Comprehension**

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of literary, informational, and graphic French texts, including challenging texts and texts used in real-life situations *(e.g., ... extract information from websites to support an opinion on an environmental issue; ...)* 

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of French texts, identify Frenchspeaking communities in Africa and Asia, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g., after investigating the issue online, explain in their own words an environmental issue in a Frenchspeaking African or Asian country, such as poaching and loss of lowland gorilla habitat in Democratic Republic of the Congo; ... )* 

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (*e.g.*, ... to survey and report on community attitudes towards reducing waste and conserving natural resources; ...) ...

*Instructional tip:* Teachers can encourage students to construct respectful survey questions on saving energy at home, using inversion with the *conditionnel présent* (e.g., "Éteindriez-vous la lumière quand vous quittez une pièce?", … "Quels produits certifiés respectueux de l'environnement vos parents achèteraient-ils chaque semaine?").

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about academic and familiar topics, including literary topics, applying their knowledge of the structural and stylistic elements of each form (*e.g., ... a critical analysis of news reports on uranium mining in Canada, paying particular attention to word choice and sentence variety; ... a vivid description of a natural disaster in a form that will raise awareness of the tragedy; ...)* 

# French Immersion, Grade 10, Applied (FIF2P)

#### A. Listening

#### A1. Listening to Understand

**A1.3 Responding to and Evaluating Media Texts:** evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about everyday matters and familiar topics (*e.g.*, ... *view a documentary clip about the impact of climate change in a region outside Canada and compare it with the impact of climate change on a local ecosystem*)

#### B. Speaking

#### **B1. Speaking to Communicate**

- **B1.2 Producing Oral Communications:** produce prepared and spontaneous communications in French containing information, ideas, and opinions about everyday matters and familiar topics, with contextual and visual support *(e.g., present a personal point of view on an environmental topic; ...)*
- **B1.4 Creating Media Texts:** create a variety of oral media texts in French about familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... *in a small group, produce a song and a music video to raise money for an environmental cause;* ...)

#### **B2.** Speaking to Interact

**B2.2 Interacting:** engage in spoken interactions in French (prepared and spontaneous), in a variety of contexts, about everyday matters and familiar topics (*e.g.*, ... with a group, identify a solution to a problem in the community such as the disposal of electronic items; ...)

#### **B3.** Intercultural Understanding

**B3.1 Intercultural Awareness:** communicate information orally about French-speaking communities in Africa and Asia, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *deliver a presentation on some key factors that affect a French-speaking country such as Laos, Lebanon, Burkina Faso, or Mali, including climate, geography, ...)* 

#### C. Reading

#### **C1. Reading Comprehension**

- **C1.2 Reading for Meaning:** demonstrate an understanding of a variety of fictional, informational, and graphic French texts, including short, challenging texts and texts used in real-life situations (*e.g.*, ... *interpret survey results from several sources to draw conclusions about the impact of food scrap recycling programs*)
- **C1.5 Responding to and Evaluating Media Texts:** explain ideas and information in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g.*, ... *analyse a page on an environmental website about recycling cellphones;* ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (e.g., ... to write a script for a fashion show that promotes environmental awareness; ...)
- **D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about everyday matters and familiar topics, applying their knowledge of some of the structural and stylistic elements of each form (*e.g.*, ... *a newspaper editorial using vivid language to emphasize the negative effect of poor environmental habits, such as the failure to recycle; ...)*

*Teacher prompts:* ... "Comment identifiez-vous vos mauvaises habitudes et les remplacezvous par de bonnes habitudes pour protéger l'environnement?" ...

*Instructional tips:* (1) Teachers can remind students that dialogue often includes elliptical sentences (e.g., ... "Pas de neige là-bas, au moins", ...)

**D1.3 Creating Media Texts:** create media texts in French on everyday matters and familiar topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g., write a script for a public service announcement about an issue related to ... climate change; ...)* 

## French Immersion, Grade 11, University Preparation (FIF3U)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of oral French texts about a variety of topics, including literary and other challenging texts (e.g., identify ways in which environmental changes can affect human and/or ecosystem health after viewing a documentary on the subject; ...)

**A1.3 Responding to and Evaluating Media Texts:** evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about a variety of topics (*e.g.*, ... *explain how the audio elements enhance the message in a documentary on sustainable development; ...)* 

#### A2. Listening to Interact

**A2.2 Interacting:** respond with understanding to what others say while participating in sustained interactions about a variety of topics, including literary and other challenging topics, in formal and informal situations (*e.g.*, ... *interview a local politician about his or her environmental platform;* ...)

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.4 Creating Media Texts:** create oral media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... create a video about an environmental issue, such as indoor or outdoor air quality)

#### C. Reading

#### C1. Reading Comprehension

**C1.2 Reading for Meaning:** demonstrate an understanding of a variety of literary, informational, and graphic French texts, including long, challenging texts and texts used in real-life situations (*e.g.*, ... synthesize information from an article about an environmental issue in a French-speaking community outside of North America; ...)

#### **C3.** Intercultural Understanding

C3.1 Intercultural Awareness: using information from a variety of French texts, identify French-speaking communities worldwide, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (e.g., ... using sources such as the website of the Programme des Nations Unies pour l'environnement, explain the agenda of an environmental project in a French-speaking community; ...)
Teacher prompts: ..."Quel est le rôle du Programme des Nations Unies pour l'environnement sur notre planète?" ...

#### D. Writing

#### D1. Purpose, Audience, and Form

- **D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (e.g., ... to write a persuasive essay with supporting details about environmental threats)
- **D1.3 Creating Media Texts:** create media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... design a themed calendar that includes tips for environmentally responsible practices and photographs of local scenes in the natural world; ...)
#### **D2.** The Writing Process

**D2.3 Drafting and Revising:** make improvements to enhance the clarity and readability of their written work, and use various elements of effective presentation to produce a polished product for publication ...

*Instructional tips:* ... (2) Teachers can encourage students to use indefinite pronouns, such as "plusieurs", "quiconque", "certains", and "aucun", when the subject of a sentence is unspecified (e.g., ... "Quiconque jettera des papiers sales sur le trottoir aura une amende de cent dollars", ...).

#### **D3.** Intercultural Understanding

**D3.1 Intercultural Awareness:** in their written work, communicate information about Frenchspeaking communities worldwide, including aspects of their cultures and their contributions to *la francophonie* and the world, and make connections to personal experiences and their own and other communities (*e.g.*, ... *in a small group, research an environmental issue on websites from different French-speaking countries, and write a report analysing how cultural perspectives influence the presentation of the issue; ...)* 

## French Immersion, Grade 11, Open (FIF3O)

#### A. Listening

#### A1. Listening to Understand

- A1.2 Demonstrating Understanding: demonstrate an understanding of oral French texts about a variety of topics, including long texts, with contextual and visual support (e.g., ... view videos to identify and describe examples of Canadian music, visual art, drama, or dance that reflect the natural ... landscape; ...)
- **A1.3 Responding to and Evaluating Media Texts:** evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about a variety of topics (*e.g.*, ... evaluate the effectiveness of the presentation of arguments in a documentary about how technology affects the relationship between humans and the environment; ...)

#### B. Speaking

#### **B1.** Speaking to Communicate

**B1.2 Producing Oral Communications:** produce prepared and spontaneous communications in French containing information, ideas, and opinions about a variety of topics, with contextual and visual support (e.g., ... take turns retelling a story read or told in class that addresses environmental stewardship; ...) ...

*Instructional tips:* (1) When students present their conservation plans, teachers can ask them to make suggestions using "si" with the *présent* and the *futur simple* (e.g., "Si on achète des piles rechargeables plutôt que des jetables, on évitera des effets extrêmement polluants") and express hopes using "si" with the *imparfait* and the *conditionnel présent* (e.g., "Si on éteignait les lumières chaque fois qu'on change de pièce, on ne gaspillerait pas d'énergie"). ...

**B1.4 Creating Media Texts:** create oral media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience *(e.g., present a news report on a ... natural disaster, ...; in small groups, create a video to promote a designer's upcoming line of clothing that is made from sustainable fabrics; ...)* 

#### **B2. Speaking to Interact**

**B2.2 Interacting:** engage in sustained spoken interactions in French (prepared and spontaneous), in a variety of contexts, about a variety of topics (*e.g.*, ... *engage in a round-table discussion exploring a social or environmental issue;* ...)

#### C. Reading

#### **C1. Reading Comprehension**

- **C1.2 Reading for Meaning:** demonstrate an understanding of a variety of fictional, informational, and graphic French texts, including challenging texts and texts used in real-life situations (e.g., ... extract information from a data chart about paper waste and its impact on the environment; ...)
- **C1.5 Responding to and Evaluating Media Texts:** explain ideas and information in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g., evaluate a poster created by a peer to inform workers about the safe storage, handling and disposal of hazardous materials; ...)*

#### C3. Intercultural Understanding

**C3.1 Intercultural Awareness:** using information from a variety of French texts, identify French-speaking communities worldwide, find out about aspects of their cultures, and make connections to personal experiences and their own and other communities (*e.g.*, ... *read tourism brochures and websites to plan and budget for* ... *an eco-tour to a French-speaking region;* ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.3 Creating Media Texts:** create media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience (*e.g.*, ... write a script for a webinar on working together to build birdhouses or to plant trees in the community)

## French Immersion, Grade 12, University Preparation (FIF4U)

#### A. Listening

#### A1. Listening to Understand

A1.2 Demonstrating Understanding: demonstrate an understanding of oral French texts about a wide variety of topics, including literary texts and challenging or specialized texts (e.g., ... extract the key ideas from a documentary by a conservationist such as Philippe Cousteau; ...)

#### B. Speaking

#### **B1. Speaking to Communicate**

**B1.3 Speaking with Fluency:** speak with a smooth pace, appropriate intonation, and accuracy in communications in French (prepared and spontaneous) about a wide variety of topics, including literary topics ...

*Teacher prompts:* "Comment vous préparez-vous pour parler d'un sujet littéraire ou d'un problème environnemental avec confiance et aisance?" …

**B1.4 Creating Media Texts:** create oral media texts in French on a wide variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience *(e.g., ... interview an environmental youth activist about his or her accomplishments)* 

#### **B2. Speaking to Interact**

**B2.2 Interacting:** engage in sustained spoken interactions in French (prepared and spontaneous), in academic and social contexts, about a wide variety of topics, including literary topics and challenging or specialized topics (*e.g.*, ... *evaluate the effectiveness of arguments during a class debate on an environmental* ... *issue;* ...)

#### C. Reading

#### C1. Reading Comprehension

**C1.5 Responding to and Evaluating Media Texts:** analyse and explain explicit and implicit messages in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages (*e.g.*, ... *compare the discussion of an environmental issue on different websites;* ...)

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.1 Identifying Purpose and Audience:** determine their purpose in writing and the audience for French texts they plan to create (*e.g.*, ... to respond in a letter to the editor to news reports about an environmental initiative; ...)

## French Immersion, Grade 12, Open (FIF4O)

#### A. Listening

#### A1. Listening to Understand

**A1.3 Responding to and Evaluating Media Texts:** evaluate the effectiveness of the treatment and presentation of ideas and information in a variety of oral media texts in French about a variety of topics (*e.g.*, ... evaluate the use of persuasive techniques in a documentary on an environmental issue of concern to Aboriginal people in Canada; ...)

#### B. Speaking

#### **B1. Speaking to Communicate**

- **B1.2 Producing Oral Communications:** produce prepared and spontaneous communications in French containing information, ideas, and opinions about a variety of topics, including challenging topics, with contextual and visual support *(e.g., present an oral report proposing green initiatives in the school community; ...)*
- **B1.4 Creating Media Texts:** create oral media texts in French on a variety of topics, using forms, conventions, and techniques appropriate to the purpose and audience *(e.g., produce a commercial promoting a school environmental initiative; ...)*

#### **B2. Speaking to Interact**

**B2.2 Interacting:** engage in sustained spoken interactions in French (prepared and spontaneous), in a variety of contexts, about a variety of topics, including challenging topics (*e.g., debate a current global issue related to ... carbon footprints, ...*)

#### C. Reading

#### **C1. Reading Comprehension**

- **C1.2 Reading for Meaning:** demonstrate an understanding of a variety of fictional, informational, and graphic French texts, including some long, challenging texts and texts used in real-life situations (*e.g.*, ... using a variety of sources, make informed recommendations on reducing energy consumption or solid waste or on making environmentally responsible choices for purchases for the school; ...)
- **C1.5 Responding to and Evaluating Media Texts:** analyse and explain explicit and implicit messages in a variety of French media texts, and evaluate the effectiveness of the treatment and presentation of the messages ...

*Instructional tip:* Teachers can direct students' attention to the use of the *conditionnel présent* and *conditionnel passé* in a news report that provides information that is not certain (e.g., "Après la violente tempête d'hier, la situation est très difficile; trente mille foyers sont encore privés d'électricité. … On dit que les secours auraient réussi à atteindre les maisons qui avaient été isolées par les chutes d'arbres sur les routes").

#### D. Writing

#### D1. Purpose, Audience, and Form

**D1.2 Writing in a Variety of Forms:** write a variety of French texts to convey information, ideas, and opinions about a variety of topics, including challenging topics, applying their knowledge of the structural and stylistic elements of each form *(e.g., ... an article about a trend in environmental stewardship; ...)* 

# GUIDANCE AND CAREER EDUCATION, GRADES 9 AND 10 (2006) AND GRADES 11 AND 12 (2006)

Courses in guidance and career education provide opportunities for students to make environmental connections by exploring careers related to the environment, considering how current environmental concerns and developments may affect jobs and the labour market, and learning about workplace practices that have been adopted to protect the environment. Relevant expectations are listed below.

## Learning Strategies 1: Skills for Success in Secondary School, Grade 9, Open (GLS10/GLE10/GLE20)

#### Exploration of Opportunities

#### All expectations in the strand.

*Note:* The expectations in this strand allow students who are interested in the environment to identify and research related careers.

## Career Studies, Grade 10, Open (GLC2O)

#### **Exploration of Opportunities**

• identify current trends in society and the economy and describe their effect on work opportunities and work environments

*Note:* This overall expectation, along with its corresponding specific expectations, gives students the opportunity to make various environmental connections.

## Discovering the Workplace, Grade 10, Open (GLD2O)

#### **Exploration of Opportunities**

• demonstrate an understanding of the nature of work and of workplace expectations and issues

#### Understanding the Workplace

 identify various workplace issues (e.g., ethics, confidentiality, harassment, equity, responsible use of technology) and explain how policies and procedures dealing with these issues contribute to a positive and productive work environment

*Note:* "Workplace issues" would include whether procedures are in place to protect the environment, such as paper recycling and safe disposal of hazardous substances.

## Designing Your Future, Grade 11, Open (GWL3O)

#### **Exploration of Opportunities**

• analyse emerging social and economic trends and their impact on individuals, workplaces, and career opportunities

*Note:* Learning related to the expectations in this strand can address trends such as globalization and growing environmental concerns, as well as employment and entrepreneurial opportunities that may emerge in connection with those trends.

## Leadership and Peer Support, Grade 11, Open (GPP3O)

#### Interpersonal Knowledge and Skills

#### **Group Dynamics**

 demonstrate effective use of leadership skills in classroom groups and in planning school or community events

#### Exploration of Opportunities

• demonstrate the ability to design and implement a plan or program that addresses needs identified in the school or the community

*Note:* Environmental connections can be made by applying the requirements described in the expectations above to school or community needs related to the environment.

## Advanced Learning Strategies: Skills for Success After Secondary School, Grade 12, Open (GLS4O/GLE4O/GLE3O)

### Exploration of Opportunities

#### Trends

- assess the effects of information technology on selected fields of work, including its impact on educational and skill requirements, learning opportunities, how work is done, and employment opportunities
- compare emerging work-style alternatives (e.g., contract work, telecommuting, talent pooling) and other employment-related trends (e.g., changing composition of the labour market, impact of education level on earnings and employment), and explain how these trends may influence their education and career plans

*Note:* These two expectations allow for environmental connections related to conservation of energy and resources and the influence of growing environmental concerns on employment opportunities, respectively.

## Navigating the Workplace, Grade 12, Open (GLN4O)

#### **Exploration of Opportunities**

#### **Understanding the Workplace**

identify workplace issues (e.g., harassment, ethics, confidentiality and the right to privacy, responsible use of computers, gender equity) and explain how policies and procedures dealing with them contribute to a positive and productive work environment

#### **Demonstrating Health and Safety Awareness**

- identify potential health and safety hazards in a workplace setting

*Note:* "Workplace issues" would include whether procedures that protect the environment are in place, such as paper recycling and safe disposal of hazardous substances. Also, by identifying health and safety hazards, students can learn about environmental concerns associated with cleaning products and other substances used in workplace environments, building materials, air vents, and so on.

# HEALTH AND PHYSICAL EDUCATION, GRADES 9 TO 12 (2015)

From "Environmental Education and Health and Physical Education" in the curriculum policy document:

There are many opportunities to integrate environmental education into the teaching of the Healthy Active Living Education courses. The learning environments for health and physical education include the school grounds, fields and trails in the vicinity of the school, and various other outdoor venues. Teaching students to appreciate and respect the environment is an integral part of being active in these spaces. Appreciating the value of fresh air and outdoor spaces, understanding the environmental benefits of healthy practices such as active transportation and the environmental implications of various food choices, being aware of the impact of using trails, and understanding the health risks associated with environmental factors such as sun exposure and air pollution are all components of environmental education that are integrated with learning in health and physical education. To facilitate these connections, health and physical education teachers are encouraged to take students out of the classroom and into the world beyond the school to help students observe, explore, and appreciate nature as they discover the benefits of being active outdoors.

Living skills, which are integrated throughout the HALE program of the health and physical education curriculum, are also closely tied to environmental education. As students learn more about themselves through the development of personal skills, learn to work effectively and respectfully with others through the development of interpersonal skills, and acquire the capacity for systems thinking through the development of critical and creative thinking skills, they increase their capacity to make connections with the world around them and to become environmentally responsible citizens.

## Healthy Active Living Education, Grade 9, Open (PPL10)

### Living Skills

#### Personal Skills

1.2 use adaptive management, and coping skills to help them respond to the various challenges they encounter as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living ... *Teacher prompt:* "... What are some strategies that you use or know to cope with stress?" *Students:* "I do a variety of things, such as getting outside..." ...

#### Interpersonal Skills

**1.4** apply relationship and social skills as they participate in physical activities, develop movement competence, and acquire knowledge and skills related to healthy living to help them interact positively with others, built healthy relationships, and become effective group or team members (*e.g.*, ... *Movement Competence:* ... *work cooperatively with a partner to complete a series of tasks in activities such as orienteering; ...)* 

#### A. Active Living

#### **A1. Active Participation**

- A1.1 actively participate in all aspects of the program ..., choosing from a wide and varied range of activities (e.g., ... recreational and outdoor pursuits, such as orienteering, cycling or hiking)
- A1.2 demonstrate an understanding of factors that contribute to their personal enjoyment of being active and that can support their participation in physical activity throughout their lives ..., and identify challenges and barriers to regular physical activity and actions they can take to overcome there (e.g., transferring activities to an indoor location or changing outdoor clothing in response to changes in weather, ...)

#### **A2.** Physical Fitness

A2.1 participate regularly in sustained moderate to vigorous physical activity to the best of their ability for a minimum of twenty minutes ...

*Students:* ... "We should try to avoid sitting for extended periods of time. We can do that by limiting recreational screen time to no more than two hours per day, using sedentary transport less, and spending more time outdoors." ...

A2.2 describe the short-term and long-term benefits of developing both health-related fitness ...and skill-related fitness ...and explain how to use basic training principles to enhance both types of fitness ...

*Students:* ... "Skill-related fitness doesn't have direct health benefits, and you can still be quite active even if you don't have a high level of skill-related fitness. However, it does give you better reflexes, balance, and coordination, which can be helpful not only when playing sports but also in other physical activities, such as cycling, figure skating, hiking, ..." ...

#### A3. Safety

A3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others (*e.g.*, ... *hiking and snow trails* ...) ...

*Students:* ... "Before hiking on park trails, we should check for weather warnings and find out about any hazards in the area." ...

#### B. Movement Competence: Skills, Concepts, and Strategies

#### **B1. Movement Skills and Concepts**

- **B1.1** perform stability and locomotor skills in combination in a variety of physical activities while responding to external stimuli (e.g., ... run/wheel to complete an orienteering course while demonstrating awareness of objects on the trail ...) ...
- B1.2 perform locomotor and manipulation skills in combination in a variety of physical activities while responding to external stimuli ...*Teacher prompt:* "What factors do you need to consider when throwing an object?"

Student: "... If I am outside, I need to consider the impact of other factors like the wind ..."

#### **B2.** Movement Strategies

B2.1 demonstrate an understanding of the components of a range of physical activities ... and apply this understanding as they participate in a wide variety of physical activities in a range of indoor and outdoor environments (*e.g.*, ... *hiking and snow trails*...) ... *Teacher:* "If we want to modify an orienteering activity to make it more suitable for a

*Teacher:* "If we want to modify an orienteering activity to make it more suitable for particular group of students, what are some of the things we can do?" ...

**B2.2** apply analytical and problem-solving skills to identify and implement tactical solutions that will increase their chances of success as they participate in a variety of physical activities (*e.g.*, *individual activities:* ... *choose a hiking trail suited to their experience or fitness level;* ...)

#### C. Healthy Living

#### **C2. Making Healthy Choices**

Healthy Eating

**C2.1** apply their knowledge of basic nutrition principles and healthy eating practices ... to develop a healthy eating plan ...

*Students:* ... "I am concerned about the impact of food choices on the environment, so I will also consider how and where the food is produced and how it is packaged." ...

#### C3. Making Connections for Healthy Living

Healthy Eating

**C3.1** analyse the influence of social and environmental factors on food and beverage choices (*e.g.*, ... *environmental impact of food production methods*)

*Teacher prompt:* "What are some social and environmental factors that affect a person's food choices?"

*Students:* ... "Things like food production, transportation, and packaging can have a serious impact on the environment. To reduce my carbon footprint and other environmental impacts, I try to choose local fresh food." ... "Food choices may not be the same in every part of Ontario because of differences in the kinds of foods that can be produced in or easily shipped to different areas, like the Far North, rural areas or cities."

#### Personal Safety and Injury Prevention

**C3.2** identify warning signs and symptoms that could be related to mental health concerns ..., and describe a variety of strategies for coping with or responding to mental health concerns affecting oneself or others ...

Student: "... Schedule breaks and fun activities such as ... gardening, ..." ...

## Healthy Active Living Education, Grade 10, Open (PPL2O)

### A. Active Living

#### A1. Active Participation

A1.1 actively participate in all aspects of the program ..., choosing from a wide and varied range of activities (*e.g.*, ... *outdoor and recreational pursuits*) ...

#### A2. Physical Fitness

A2.1 participate regularly in sustained moderate to vigorous physical activity to the best of their ability for a minimum of twenty minutes ...

*Teacher prompt:* "... What can you do to ensure that you can get enough activity every day?" *Students:* ... "Instead of travelling by car, I can use active transportation – walking/wheeling, biking, skateboarding, or in-line skating." ...

#### B. Movement Competence: Skills, Concepts, and Strategies

#### **B2.** Movement Strategies

- **B2.1** demonstrate an understanding of the components of a range of physical activities ..., and apply this understanding as they participate in a wide variety of physical activities in a range of indoor and outdoor environments (*e.g.*, ... *hiking and snow trails*) ...
- **B2.2** apply analytical and problem-solving skills to identify and implement tactical solutions that will increase their chances of success as they participate in a variety of physical activities (*e.g.*, *individual activities:* ... *choose a course suited to their experience or fitness level when orienteering...*) ...

#### C. Healthy Living

#### **C1. Understanding Health Concepts**

Personal Safety and Injury Prevention

C1.1 demonstrate an understanding of factors that enhance mental health and emotional and spiritual well-being

*Teacher prompt:* "... Having a clean environment with access to green spaces can also be beneficial to our mental health and well-being. ..." ...

#### **C2. Making Healthy Choices**

Healthy Eating

**C2.2** assess the nutritional implications of a variety of dietary choices, including those reflecting current dietary trends, and explain how they can make personal choices that will provide the nutritional requirements for a healthy, active life

*Teacher prompt:* "People can make dietary choices for a variety of reasons, such as ... environmental concerns related to food production methods, a desire to eat local food, ..." ... *Students:* "Some people follow a vegetarian diet, which is meatless, or a vegan diet, which includes no animal products at all. ...

#### C3. Making Connections for Healthy Living

Healthy Eating

**C3.1** demonstrate an understanding of how they, as consumers, can have an impact on food and beverage choices at school and in the community (*e.g.*, ... *raising awareness of ethical and environmental considerations related to food choices*)

#### Personal Safety and Injury Prevention

**C3.2** demonstrate an understanding of health and safety risks in their physical and personal environment, and describe practices and behaviours that can be promoted to minimize the exposure of themselves and others to these risks (*e.g.*, ... observing road safety rules while biking and walking; avoiding distractions such as using headphones while cycling and walking; ...) ...

*Teacher prompt:* "What are the health risks of too much sun or UV exposure? What can you do to protect yourself?"

*Student:* "In short term, you run the risk of getting sunburn or sunstroke. In the longer term, you increase your chances of getting skin cancer, developing cataracts, or having your skin age faster. You run the same risks when you use tanning beds and sunlamps as when you go

outdoors, because they expose you to ultraviolet rays too. Because of these health risks, it's not legal for anyone under 18 to use tanning beds or sunlamps. You can protect yourself when you go outdoors by checking the UV index and limiting your exposure: wear a hat, put on sunscreen, and avoid staying in the sun for long periods of time." ...

## Healthy Active Living Education, Grade 11, Open (PPL3O)

### A. Active Living

#### A1. Active Participation

A1.2 describe the holistic benefits of lifelong participation in physical activity ..., and demonstrate an understanding of strategies they can use to continue to be physically active throughout their lives ...

*Teacher prompt:* "You know that being physically active promotes better fitness and better health, including greater resistance to disease. When we talk about the holistic benefits of lifelong healthy active living, what do we mean?"

*Student:* "In addition to the physical benefits, there are a number of social, emotional, spiritual, and mental health benefits. For example, activity and fitness can relieve stress and help to build confidence and a positive sense of self. Physical activity outdoors can also give us a sense of connection with the world around us, and being active with others can help to build good friendships. Holistic refers to all of these benefits together."

*Teacher prompt:* "Compare the holistic health benefits of snowmobiling and cross-country skiing."

*Student:* "Skiing, like other non-motorized activities, offers much greater benefits for physical health, because you need to expend energy to move your own body. However, both activities provide the psychological and spiritual rewards of being out in nature. Both require physical skills, and mastering these skills contribute to your confidence and self-esteem. Both contribute to a sense of well-being, but in different ways. Some people enjoy the opportunity that cross-country skiing gives them to experience and appreciate the natural environment. Others enjoy the easy access that snowmobiling gives them to remote areas."

#### A2. Physical Fitness

A2.1 participate regularly in sustained moderate to vigorous physical activity to the best of their ability for a minimum of twenty minutes ... (e.g., ... snowshoeing, ...) ...

*Teacher prompt:* "... According to the Canadian Physical Activity Guidelines for Youth, how much physical activity do you need altogether and what kind of activity do you need to achieve health benefits?"

*Students:* "You can reduce the amount of time you spend sitting or not moving by limiting recreational screen time to no more than two hours per day, using sedentary transport less and spending more time outdoors." ...

#### A3. Safety

A3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others (e.g., wearing appropriate clothing and/or required safety equipment where necessary, such as when hiking, skating, skiing, or cycling; ... checking environmental and facility conditions before an activity; ...) in a variety of physical settings (e.g., ... ice rink, ..., lake, ski hill, hiking and snow trails, ...)

*Teacher prompt:* "When using community facilities such as trails for running, skiing, snowboarding, snowmobiling, cycling, wheeling, or walking, what can you do to ensure your safety and that of others?"

*Students:* "It is important to be aware of the terrain and watch for obstacles and uneven ground. You should make sure you wear appropriate clothing for the activity and proper protective equipment, including helmets for activities such as skiing and cycling. It's also important to follow trail etiquette: watch for others using the trail and warn them of your approach. Working with community groups on trail maintenance and cleaning will help you keep the trail accessible and safe for everyone." ...

A3.2 demonstrate an understanding of basic procedures for ensuring safety at physical activity sites and events (e.g., ... ensuring that everyone involved is familiar with relevant school board protocols for dealing with events such as ... lightning strikes ...)

#### B. Movement Competence: Skills, Concepts, and Strategies

#### **B2.** Movement Strategies

**B2.1** demonstrate an understanding of the components of a range of physical activities ..., and apply this understanding as they participate in a number of diverse physical activities, suited to their individual interests and abilities, in a variety of indoor and outdoor environments ...

#### C. Healthy Living

#### C1. Understanding Health Concepts

Personal Safety and Injury Prevention

**C1.2** identify behaviours and actions that can lead to adolescent injuries or death, and explain the factors that can influence adolescents to engage in or refrain from potentially harmful or dangerous behaviour...

*Teacher prompt:* "What are some examples of things you can do to stay safe in a variety of situations?"

Students: "... Don't drive a snowmobile on thin ice." ...

#### **C2. Making Healthy Choices**

Human Development and Sexual Health

**C2.3** describe how their understanding of factors that affect reproductive and sexual health *(e.g., environmental factors...)* and their knowledge of proactive health measures and supports ... can be applied to avoid or minimize illness ...

#### C3. Making Connections for Healthy Living

#### Healthy Eating

**C3.1** identify current issues that involve food either directly or indirectly (*e.g., issues involving food safety or quality, such as pesticide use, genetic modification of crops, the sale of non-pasteurized milk products; issues involving food marketing and advertising; environmental issues, such as climate change, packaging and waste reduction, water pollution, biodiversity, long-range transportation of food; ...), and explain how healthy eating choices are related to these issues.* 

*Teacher prompt:* "Issues related to food are often in the news. Let's think about two of them. One involves the influence of the media and advertising on our values and behaviour; the

other concerns the genetic modification of food crops. How might these issues be related to food choices? Do people's choices have an effect on these issues? How might these issues affect someone's choices?"

*Students:* ... "Some foods in Canada now come from genetically modified crops. Some people worry that genetic modification could be harmful to biodiversity or human health, while others believe that it is essential to maintain the current food supply. Current regulations do not require genetically modified ingredients in food to be identified on the product label. Some people feel this information should be included so that people can make an informed decision about whether to buy that product."

## Healthy Active Living Education, Grade 12, Open (PPL4O)

### A. Active Living

#### A1. Active Participation

A1.1 actively participate in physical activities ... in a variety of settings, choosing from a wide and varied range of activities (*e.g.*, ... outdoor pursuits, ...) ...

#### A3. Safety

- A3.1 demonstrate behaviours and apply procedures that maximize their safety and that of others ... in a variety of physical activity settings (e.g., ...hiking and snow trails, ski hill, ... lake, ... bicycle lanes) ...
- A3.2 assess the suitability and availability within and outside the local community of resources, agencies, and services that can be used to provide assistance in emergency situations associated with physical activity (e.g., ... hiking and canoe trips in remote areas; ...) ...

### B. Movement Competence: Skills, Concepts, and Strategies

#### **B2.** Movement Strategies

- **B2.1** demonstrate an understanding of the components of a range of physical activities ... and apply this understanding as they participate in a number of diverse physical activities, suited to their individual interests and abilities, in a variety of ... outdoor environments (*e.g.*, ... *ice rink, park, hiking and snow trails, bicycle lanes*) ...
- B2.3 explain how developing personal competence in physical activities can increase confidence and encourage lifelong participation in physical activities ...
  Students: ... "I liked the activities that got us outside. I now know I can be active by doing simple things I enjoy walking, hiking, cycling, and just exploring the community around me."

## C. Healthy Living

#### **C2. Making Healthy Choices**

#### Healthy Eating

C2.1 demonstrate the ability to make healthy eating decisions that take into account their personal requirements and resources (*e.g.*, ... *ethical and environmental values*, ...) in a variety of situations that they may encounter now and in the future (*e.g.*, *camping*, ...) ... *Teacher prompt:* "What should you consider when buying food for a camping trip?"

*Student:* "For camping, I would need to consider such things as how much food I would need, how much I could carry, the type of food I would need to meet my energy requirements, the kind of cooking facilities I would have access too, the utensils I would need, how long I could safely keep perishable foods without refrigeration, and whether I could get more food if I'm on a longer trip."

## Health for Life, Grade 11, College Preparation (PPZ3C)

#### A. Determinants of Health

A3. demonstrate an understanding of various environmental factors that influence personal health

#### A3. Environmental Factors

A3.1 describe current environmental issues and their implications for personal health (e.g., poor air quality increases the risk of developing respiratory diseases and can worsen existing respiratory conditions such as asthma and allergies; climate change increases the potential for water- and food-borne diseases to spread to temperate regions; ozone layer depletion increases exposure to UVB rays that can cause skin cancers and cataracts), and identify solutions that can contribute to better environmental quality and better personal health *Teacher prompt:* "The built environment includes things people have made, such as our homes, roads, parks, public recreation facilities, trails, and schools. Give an example of modifications to the built environment that can have a positive impact on both our health and the environment."

*Student:* "Having things in the community that support active transportation, such as walking paths, bike lanes, crosswalks, and bike racks, can benefit our health and the environment because they help to reduce air pollution and provide more opportunities for physical activity."

A3.2 describe a variety of personal practices and local programs that are environmentally responsible (*e.g., using active transportation; programs promoting green alternatives and green living, tobacco-free living, eating locally*), and explain how they can also benefit personal health

*Teacher prompt:* "Many initiatives by individuals and local groups are helping to make our society more environmentally responsible. Provide some examples of these initiatives that also have important health benefits."

*Students:* "Initiatives that promote eating local produce help to reduce greenhouse gas emissions, because local produce requires much less transportation. Because vegetables and fruit from local sources can be allowed to ripen before they are picked and can be consumed shortly after being harvested, they are usually more nutritious." "Community initiatives that increase the amount of green space can also increase the opportunity for physical activity. Exposure to the natural environment gives most people a greater sense of well-being."

A3.3 identify school and workplace conditions (*e.g., poor air quality ...*) that could have harmful effects on personal health and safety ..., and describe ways to make school and workplace environments healthier and safer ...

*Teacher prompt:* "A school's physical environment includes the school building and grounds, routes to and from the school, and materials and equipment used in school programs. What steps could you take at your school to make the physical environment safer and healthier?"

*Students:* ... "Our school is applying for EcoSchools certification. One of our projects involved planting new trees around the schoolyard. The trees will remove carbon dioxide from the air. They will also provide shady places where students can relax without being directly exposed to strong ultraviolet rays." ...

#### C. Healthy Communities

#### C1. Consumer Health

**C1.3** describe factors that influence personal choices of health products and services (*e.g.*, ... *environmental impact*), and assess the impact of these factors on their own choices of health products and services ...

#### **C2.** Components of Healthy Communities

**C2.1** identify the components of a healthy community (*e.g.*, safe and healthy social and physical environments; ...), and describe the factors that help to sustain it (*e.g.*, adequate access for all to food, clean water; adequate water and sanitation infrastructure; effective environmental regulation and pollution controls; ... availability and accessibility of recreational facilities, such as safe and properly lit walking trails and bike paths and lanes) ...

*Teacher prompt:* "… What do we mean by safe and healthy social and physical environments? Why are they important?"

*Student:* "A safe and healthy social environment is one in which a person feels safe emotionally. A safe and healthy physical environment is one in which you are not exposed to the danger of physical injury or threats to your health. A healthy physical environment also provides the conditions that help you maintain a high level of health and personal wellness. Safe and healthy social and physical environments are important because they are more inclusive, help you work and learn more efficiently, reduce time lost to illness, and increase productivity."

#### **C2.** Components of Healthy Communities

**C2.3** explain how government policies and programs for protecting the environment can also provide community health benefits

**Teacher prompt:** "Governments try to protect the environment by using laws and regulations to control or ban things that harm the environment. They also support and encourage initiatives that reduce stress on the environment. Government regulations determine where landfills can go, how they should be built, and what can go in them. They control what can be discharged into lakes and rivers and what can be emitted into the air. Much of what governments do to protect our water, air, soil, and natural environments also protects our health. For example, greenhouse gases from fossil fuels are a major cause of climate change. But fossil fuels are also a major contributor to smog and a source of toxic air pollutants such as mercury. Government actions that reduce fossil fuel emissions (e.g., setting fuel-efficiency requirements for car and truck engines, improving mass transit to reduce the use of motor vehicles, requiring the use of energy-efficient lighting, decreasing our reliance on fossil fuels for generating electric power) not only help to slow down climate change but also help to keep harmful pollutants that affect our health out of the atmosphere. Think of some other examples of government actions to protect the environment, and explain how these also provide benefits for community health."

**C2.4** explain the role of government policies and programs in protecting school and community health (*e.g.*, ... *The Smoke-Free Ontario Act; Safe Drinking Water Act, 2002; The Local Food Act, 2013; Highway Traffic Act sections relating to bike safety*, ...) ...

## Introductory Kinesiology, Grade 12, University Preparation (PSK4U)

#### A. Physical Activity and Sport in Society

#### A1. Social Change and Current Issues

A1.3 describe the scope of physical activity and sport in today's economy ..., and identify a wide range of career opportunities in related fields (*e.g.*, ... *outdoor recreation instructors*, *wilderness guide*, ...)

#### A2. Participation – Influences and Benefits

A2.1 describe factors that influence participation in physical activity and sport (e.g., built environment... environmental conditions, ...)

*Teacher prompt:* "The built environment is that part of our surroundings that has been constructed by humans. It is where most of our activities take place. A city is a built environment. So is a cabin in the woods or a farm. A growing body of evidence suggests there is a relationship between the built environment and physical activity, rates of obesity, and heart disease and stroke. How can the characteristics of a built environment affect physical activity rates and the health of a community? What can be done to make a community's built environment healthier?"

*Student:* "A built environment that offers lots of opportunities for physical activity and makes active transportation safe, practical, and attractive is likely to encourage people to be more active and will help to improve their health. Ensuring that neighbourhoods have adequate, well-lit sidewalks and accessible bike paths and parks, for example, will help to make the community more active and healthier."

#### B. The Basis of Movement

#### **B2. Human Performance**

B2.2 describe intrinsic and extrinsic factors that can affect performance during physical activity

(e.g., ... extrinsic: environmental conditions such as altitude and weather) Teacher prompt: "Environmental factors can have a significant effect on performance. Higher altitudes, for example, can both inhibit and improve performance. In 1968, when the Olympics were held in Mexico City, records fell at unprecedented rates, mainly because the city's average elevation is more than 2200 metres, and the thin air provided much less resistance to runners' bodies or to thrown objects like javelins. Performance declined, however, in the long-distance running events, because the lower concentration of oxygen limited the aerobic capacity of the athletes. Consider some other examples of environmental factors, and explain what effects they can have on performance and why." Students: "The weather can affect your performance either positively or negatively. For example, a tailwind will improve a cyclist's performance, but a headwind will impair it." "Extreme heat makes it more difficult for the body to cool itself and maintain a constant temperature, so prolonged exertion becomes more stressful, performance diminishes, and the danger of heat exhaustion or heat stroke increases. High humidity, which limits evaporation, reduces the cooling effect of sweating and adds to heat stress. Heavy sweating may result in a reduction of cardiovascular capacity as a result of fluid loss."

#### C. Biomechanics and Motor Development

#### **C2.** Growth and Motor Development

**C2.1** identify the stages of human growth and development from infancy to adulthood and describe the factors (*e.g.*, ... *physical and social environment*) that affect physical growth and motor development

*Teacher prompt:* "... Consider also factors in your physical and social environment, such as clean air and water, ... that might affect your overall development. ..."

## Recreation and Healthy Active Living Leadership, Grade 12, University/College Preparation (PLF4M)

#### A. Leadership

#### A1. Leadership Styles

A1.1 demonstrate an understanding of the concept of leadership, and compare various leadership styles and their use in a variety of situations ...

*Teacher prompt:* ... "Think of some of the different kinds of leadership positions that exist in our society and community today – for example, ... a leader of an environmental group. Within these different roles, which style or styles do these leaders tend to use, and why?"

#### A2. Leadership Skills

A2.3 demonstrate the ability to make decisions, set goals, and solve problems when in a leadership role, taking into consideration the viewpoints of oneself and others and the availability of resources ...

*Teacher prompt:* "You are planning an outdoor event that will take place next month. What will you do if you are unable to hold the event outside because of the weather?" ...

#### B. Facilitation of Recreation and Leisure

#### **B1.** Promotion of Lifelong Participation

**B1.1** explain the terms *active recreation* and *healthy leisure*, and describe the potential ... environmental benefits that active recreation and healthy leisure can provide for a community (*e.g.*, ... *environmental: reduction of carbon emissions and emissions of other air pollutants through use of active transportation*) ...

*Teacher:* "Active recreation and healthy leisure contribute to healthy communities. What can communities do to encourage active recreation and healthy leisure?"

*Student:* "Communities can provide facilities, such as parks, libraries, playgrounds, and pools, that encourage active recreation and healthy leisure. By considering active recreation initiatives, such as extending the amount of green space, for example, communities can increase opportunities for outdoor recreation and leisure and also benefit the environment."

**B1.3** describe motivational factors ... and potential challenges (*e.g.*, ... *poor environmental conditions*) that affect lifelong participation in active recreation and healthy leisure and identify strategies for overcoming these challenges ...

#### **B2.** Event Planning and Coordination

- **B2.3** develop an action plan, using the result gathered from the assessment process, to run an event that promotes healthy, active living (*e.g.*, ... *consider strategies to minimize environmental impact;* ...)
- **B2.4** identify and apply strategies for effectively communicating information about an event to a target group ...

*Teacher prompt:* "The school is thinking of organizing a leave-your-car-at-home day to raise awareness of pollution from motor vehicles and to promote the benefits of the various forms of active transportation, like walking, biking, rollerblading, or skateboarding. What strategies will you use to promote the event and the benefits of active transportation?"

*Students:* ... "What we say to each target audience will depend on the media we use and on the particular interests and concerns of the different audiences. In all cases, however, the basic message will be the same: Use your car less and use active transportation more. It's easier than you think, it's good for the environment, and it's good for your health."

# **INTERDISCIPLINARY STUDIES**, GRADES 11 AND 12 (2002)

The depth of knowledge relating to the environment that students may acquire in single-credit interdisciplinary studies courses or multiple-credit packages will depend on the courses selected for interdisciplinary study. The Theory and Foundation strand in each interdisciplinary studies course emphasizes examining each discipline from the perspective of the other component discipline(s), and focuses on the use of higher-level thinking skills to integrate knowledge and skills associated with the different disciplines. This approach supports systems thinking, a form of analysis that is essential for understanding environmental issues and concerns. The other two strands in the interdisciplinary studies courses – Processes and Methods of Research, and Implementation, Evaluation, Impacts, and Consequences – will equip student with other important inquiry and critical-thinking skills that will help them become environmentally literate citizens.

## Interdisciplinary Studies, Grade 11, Open (IDC3O/IDP3O)

#### Implementation, Evaluation, Impacts, and Consequences

• analyse and describe the impact on society of interdisciplinary approaches and solutions to real-life situations

#### **Impacts and Innovations**

 describe and critically analyse contemporary examples of interdisciplinary products and activities that provide innovative approaches and solutions to a variety of real-life situations in the local community (e.g., the coordination of local transportation systems, the delivery of services through e-commerce and e-government, the development of community health and recreation facilities)

*Note:* Students can choose an environmental issue or project as one of the real-life situations that would be the object of their study of interdisciplinary approaches.

## Interdisciplinary Studies, Grade 12, University Preparation (IDC4U/IDP4U)

#### Implementation, Evaluation, Impacts, and Consequences

• analyse and describe the impact on society of interdisciplinary approaches and solutions to real-life situations

#### Impacts

 describe and critically analyse the contributions to society of leading practitioners who have engaged in interdisciplinary endeavours related to the subjects or disciplines studied and describe the potential impact of their work on future society (e.g., David Suzuki, biologist; Buckminster Fuller, futurist; Margaret Mead, anthropologist; Douglas Cardinal, architect)

*Note:* The example of David Suzuki illustrates how an environmental connection can be made in the context of this expectation.

#### **Personal and Career Development**

 identify postsecondary training requirements for and potential employment opportunities in interdisciplinary fields related to the subjects or disciplines under study (e.g., by searching trade and professional publications, consulting university calendars, or inviting guest speakers to class) and describe possible future trends and opportunities (e.g., by researching economic forecasts and futurist speculations)

*Note:* Students could explore educational opportunities in the field of environmental studies or careers in related fields.

## Interdisciplinary Studies, Grade 12, Open (IDC4O/IDP4O)

#### Theory and Foundation

#### **Perspectives and Approaches**

 analyse and describe the different perspectives of various disciplines on the same topic as exemplified in key interdisciplinary texts, and explain how these texts have influenced human endeavour (e.g., the influence on urban development of *The Death and Life of Great American Cities* by Jane Jacobs, the influence on health care of *On Death and Dying* by Elisabeth Kübler-Ross)

#### **Skills and Strategies**

- demonstrate an understanding of the collaborative attitudes and skills that contribute to the research and creation of interdisciplinary products and activities (e.g., the ability to manage conflict and delegate tasks in planning a public exhibition of school art, to test and extend ideas by role-playing diverse perspectives on environmental issues in biotechnology developments, or to identify decision points in designing a municipal facility)
- identify and describe the strategies that community organizations use to address interdisciplinary issues, problems, and decisions (e.g., a municipality responding to changing environmental concerns, an arts organization funding diverse cultural activities)

*Note:* The examples illustrate how environmental connections can be made in the context of these expectations.

#### Implementation, Evaluation, Impacts, and Consequences

• analyse and describe the impact on society of interdisciplinary approaches and solutions to real-life situations

#### Impacts

 describe and critically analyse the potential cultural, economic, political, environmental, and technological impacts on present and future societies of interdisciplinary endeavours related to the subjects or disciplines studied (e.g., the impact of the Bauhaus movement on modern architecture, design, and the arts; of cybernetics on effective organizations; of alternative medicine on health-care systems)

## MATHEMATICS, GRADES 9 AND 10 (2005) AND GRADES 11 AND 12 (2007)

Although expectations in the mathematics curriculum do not explicitly address environmental education, the development of environmental understanding can be fostered through the learning context (e.g., problems and examples related to environmental issues such as climate change, habitat destruction, population growth, energy conservation, and waste management). Skills related to data management and measurement can readily be applied to environmental education (e.g., environmental monitoring could involve using trigonometry to determine the height of trees). In addition, becoming practised in the use of mathematical processes such as problem solving and connecting, and developing the literacy and inquiry skills described in the introduction to the mathematics policy documents, will equip students with the qualities and skills they need to become environmentally literate, responsible citizens.

## Principles of Mathematics, Grade 9, Academic (MPM1D)

#### Measurement and Geometry

#### **Explaining the Optimal Values of Measurements**

 explain the significance of optimal area, surface area, or volume in various applications (e.g., the minimum amount of packaging material; the relationship between surface area and heat loss)

#### Solving Problems Involving Perimeter, Area, Surface Area, and Volume

- solve problems involving the surface areas and volumes of prisms, pyramids, cylinders, cones, and spheres, including composite figures (Sample problem: Break-bit Cereal is sold in a single-serving size, in a box in the shape of a rectangular prism of dimensions 5 cm by 4 cm by 10 cm. The manufacturer also sells the cereal in a larger size, in a box with dimensions double those of the smaller box. Compare the surface areas and the volumes of the two boxes, and explain the implications of your answers.)

*Note:* The examples and the sample problem in these expectations illustrate how connections can be made to environmental issues such as waste (e.g., excess packaging) and energy conservation (e.g., heat loss).

## Foundations for College Mathematics, Grade 11, College Preparation (MBF3C)

#### Geometry and Trigonometry

#### 1. Representing Two-Dimensional Shapes and Three-Dimensional Figures

**1.4** solve design problems that satisfy given constraints (e.g., design a rectangular berm that would contain all the oil that could leak from a cylindrical storage tank of a given height

and radius), using physical models (e.g., built from popsicle sticks, cardboard, duct tape) or drawings (e.g., made using design or drawing software), and state any assumptions made

*Note:* The example illustrates how the context of environmental protection (i.e., containing an oil spill) can be introduced in connection with the expectation.

## Mathematics for Work and Everyday Life, Grade 11, Workplace Preparation (MEL3E)

#### Transportation and Travel

#### 3. Comparing Modes of Transportation

3.1 gather, interpret, and describe information about the impact (e.g., monetary, health, environmental) of daily travel (e.g., to work and/or school), using available means (e.g., car, taxi, motorcycle, public transportation, bicycle, walking)
 *Sample problem:* Discuss the impact if 100 students decided to walk the 3-km distance to school instead of taking a school bus.

*Note:* This expectation gives students the opportunity to calculate the environmental impact of various means of transportation.

## Advanced Functions, Grade 12, University Preparation (MHF4U)

#### **Characteristics of Functions**

#### **2.** Combining Functions

2.2 recognize real-world applications of combinations of functions (e.g., the motion of a damped pendulum can be represented by a function that is the product of a trigonometric function and an exponential function; the frequencies of tones associated with the numbers on a telephone involve the addition of two trigonometric functions), and solve related problems graphically *Sample problem:* The rate at which a contaminant leaves a storm sewer and enters a lake depends on two factors: the concentration of the contaminant in the water from the sewer and the rate at which the water leaves the sewer. Both of these factors vary with time. The concentration of the contaminant, in kilograms per cubic metre of water, is given by  $c(t) = t^2$ , where *t* is in seconds. The rate at which water leaves the sewer, in cubic metres per second, is given by  $w(t) = 1/t^4 + 10$ . Determine the time at which the contaminant leaves the sewer and enters the lake at the maximum rate.

*Note:* The sample problem above illustrates how the learning context can be related to the environment – in this case, to water pollution.

## Foundations for College Mathematics, Grade 12, College Preparation (MAP4C)

#### Mathematical Models

#### 2. Modelling Graphically

2.2 describe trends based on given graphs, and use the trends to make predictions or justify decisions (e.g., given a graph of the men's 100-m world record versus the year, predict the world record in the year 2050 and state your assumptions; given a graph showing the rising trend in graduation rates among Aboriginal youth, make predictions about future rates) *Sample problem:* Given the following graph [*see page 138 of the curriculum document*], describe the trend in Canadian greenhouse gas emissions over the time period shown. Describe some factors that may have influenced these emissions over time. Predict the emissions today, explain your prediction using the graph and possible factors, and verify using current data.

*Note:* The sample problem illustrates how an environmental connection can be made in the context of this expectation – in this case, through a detailed examination of greenhouse gas emissions.

## NATIVE LANGUAGES, GRADES 9 AND 10 (1999) AND GRADES 11 AND 12 (2000)

In the Oral Communication, Reading, and Writing strands of the Native language courses, the development of environmental education can be fostered through the learning context (e.g., a topic, thematic unit, or issue related to the environment) and through materials used in the classroom (e.g., books, websites, media). Stories and legends play an important role in First Nation, Métis, and Inuit cultures, often telling of the relationship between humans and their environment. The retelling of such stories and legends in Native language courses thus offers a natural opportunity for environmental education. In addition, teachers of Native language courses can draw upon the understanding and involvement of the local community with respect to environmental concerns to help their students make environmental connections through language study.

## Native Languages, Level 1, Open (NL1) (LNAAO-LNOAO)

#### **Oral Communication**

• demonstrate an awareness of Native oral traditions (e.g., Native legends, stories, songs)

## Native Languages, Level 2, Open (NL2) (LNABO-LNOBO)

#### **Oral Communication**

- compare the creation stories of various Native communities
- retell Native legends and stories

## Native Languages, Level 3, Open (NL3) (LNACO-LNOCO)

#### **Oral Communication**

- use various forms of communication to express Native philosophy
  - retell Native legends, stories, and community histories with accuracy

*Note:* The particular philosophy will determine the extent of the environmental connections that can be made.

## Native Languages, Level 4, Open (NL4) (LNADO-LNODO)

#### **Oral Communication**

- demonstrate an understanding of the concept of citizenship in Native North American culture
  - demonstrate an understanding of and respect for Native cultural traditions and arts
  - demonstrate an understanding of citizenship as it applies to the local community

- describe the concept of citizenship in Native North American culture
- describe the concept of relationships in Native North American culture (Aboriginal world view)

*Note:* All of these expectations provide opportunities for making environmental connections, by virtue of their content.

## Native Languages, Level 5, Open (NL5) (LNAEO-LNOEO)

#### **Oral Communication**

- demonstrate an understanding of the concepts of citizenship and relationships (Aboriginal world view) in the context of an indigenous culture outside North America
  - express a point of view on contemporary issues (e.g., environmental issues, political issues) from a Native perspective
  - demonstrate an understanding of the concept of citizenship in an indigenous culture outside North America
  - demonstrate an understanding of the concept of relationships (Aboriginal world view) in an indigenous culture outside North America

*Note:* All of these expectations provide opportunities for making environmental connections, by virtue of their content.

## **NATIVE STUDIES**, GRADES 9 AND 10 (1999) *AND* GRADES 11 AND 12 (2000)

First Nation, Métis, and Inuit cultures in Canada, along with Indigenous cultures around the world, are characterized by a profound relationship with the natural environment, which informs various aspects of the lives of contemporary Aboriginal peoples. The Native studies curriculum explores this relationship and its implications from social, economic, political, and artistic perspectives. The expectations that address environmental topics and issues directly, along with those that provide opportunities for making environmental connections, are identified below.

## Expressing Aboriginal Cultures, Grade 9, Open (NAC1O)

#### Relationships

- demonstrate understanding of the relationships among Aboriginal peoples, their environments, and art forms
  - describe aspects of traditional and contemporary Aboriginal relationships, including the relationships of Aboriginal peoples among themselves, to their communities and nations, to Canada, and to the natural environment
  - describe how their art forms demonstrate the relationships of Aboriginal peoples to themselves, their families, their communities (including gender roles), their nations, Canada, and the natural environment
  - explain how natural environments affect the development of Aboriginal art forms (e.g., Inuit soapstone carving)
  - describe the role of art forms in relation to the environment in specific Aboriginal cultures
- identify how specific Aboriginal art forms reflect aspects of the society that produced them
  - identify materials (e.g., tobacco, sage, deer hide) that demonstrate specific relationships among Aboriginal peoples and their environments, including people
  - use appropriate natural materials to reproduce art forms that convey some aspect of Aboriginal peoples' beliefs or values related to good relationships
  - produce art forms, using multimedia approaches, to illustrate various relationships to the natural environment

#### Challenges

 produce Aboriginal-style art forms that reflect solutions to contemporary issues of Aboriginal peoples

Note: Environmental issues are important among the contemporary issues of Aboriginal peoples.

## Aboriginal Peoples in Canada, Grade 10, Open (NAC2O)

#### Identity

- identify issues currently affecting Aboriginal peoples and the responses of local and national leadership to these issues

*Note:* Environmental issues are important among the issues currently affecting Aboriginal peoples.

#### Relationships

 describe the different economic relationships that Aboriginal peoples in Canada have cultivated with the public and private sectors (e.g., ecotourism, co-management of Crown lands, banking)

#### Challenges

- describe the impact of twentieth-century innovations in technology on Aboriginal communities
  - describe the impact that technological developments have had on Aboriginal society during the latter half of the twentieth century

*Note:* A variety of twentieth-century innovations in technology (e.g., snowmobiles, pesticides) have had an impact on Aboriginal communities and their environment.

## English: Contemporary Aboriginal Voices, Grade 11, University Preparation (NBE3U)

### Identity

 analyse the changing quality of life of Aboriginal communities (e.g., Alkali Lake, Davis Inlet), as depicted in media works

*Note:* Students could study media depictions of Aboriginal communities in which quality of life has been affected by environmental factors (e.g., Grassy Narrows, Kashechewan).

### Challenges

- identify challenges faced by Aboriginal peoples (e.g., challenges related to identity, urbanization, the need for improved educational and employment opportunities, the loss of extended family), as presented in the works of Aboriginal writers
- analyse Aboriginal writers' depictions of challenges faced by Aboriginal peoples that have resulted directly from societal influences (e.g., racism, ethnocentricity, marginalization)

*Note:* The challenges described in the works of Aboriginal writers would include challenges related to the environment.

 create media works (e.g., a radio documentary on the social changes occurring within an Aboriginal community, a photo essay on a day in the life of a community leader, a brochure on a local entrepreneur, a short video clip promoting an Aboriginal activity) that demonstrate an understanding of the issues associated with challenges faced by Aboriginal peoples

Note: The media works created by students could focus on environmental issues.

## Current Aboriginal Issues in Canada, Grade 11, University/College Preparation (NDA3M)

#### Identity

- demonstrate an understanding of how Aboriginal identity is linked to the physical environment
  - identify ways in which Aboriginal elders, healers, leaders, artists, and writers promote cultural perspectives and identities

*Note:* The specific expectation above provides an opportunity to examine Aboriginal art and writing that conveys Aboriginal peoples' strong links to the land and their relationship with the environment.

#### Relationships

- demonstrate an understanding of Aboriginal peoples' strong relationship to the land
  - describe how an Aboriginal world view defines and promotes close relationships (e.g., to the land, family, community, and culture)
  - explain how Aboriginal peoples' relationship with the land affects their perspectives on environmental issues (e.g., resource management), and compare the perspectives of non-Aboriginal society on these issues
  - identify current land-use issues that involve Aboriginal peoples, non-Aboriginal society, and Canadian governments (e.g., issues relating to mining and logging)
  - identify ways in which Aboriginal peoples and non-Aboriginal peoples could cooperate to achieve a common economic, political, or social objective (e.g., through World Earth Day; by jointly providing ecotourism tours)
  - predict how global trends (e.g., increasing scarcity of water, changes in economic opportunity) will impact on the relationship between Aboriginal peoples and Canadian society
  - describe sustainable land-use plans appropriate to local environments (e.g., the Porcupine Caribou Management Board) and resource megaprojects (e.g., the Mackenzie Valley pipeline)
  - describe community service projects (e.g., sports camps, habitat restoration projects) that would promote a positive relationship between Aboriginal peoples and other Canadians

#### Challenges

- demonstrate an understanding of contemporary Aboriginal education and health issues
  - describe how health and education issues relevant to the quality of life of Aboriginal peoples on and off reserves (e.g., the prevalence of diabetes, alcohol and substance abuse, teen pregnancy) are a mutual responsibility of Aboriginal peoples and Canadian society

*Note:* Many of the health problems that affect Aboriginal peoples are related to environmental issues (e.g., water quality, pollution).

- explain Aboriginal and non-Aboriginal perspectives on a specific treaty right (e.g., fishing rights, hunting rights, logging rights)

## Aboriginal Beliefs, Values, and Aspirations in Contemporary Society, Grade 11, College Preparation (NBV3C)

#### Identity

- explain specific environmental influences (e.g., salmon migration on the Northwest Coast; caribou migration for the Dene people, utilization of forests and lakes by the Ojibway and Cree communities) on the social and cultural identity of Aboriginal peoples
- demonstrate an understanding of how Aboriginal peoples' identity as custodians and protectors of the land entrusted to them by the Creator (e.g., as expressed in the thanksgiving address) inspires their historical and contemporary commitment to remaining on their lands (e.g., as reflected in their negotiation of treaties such as the Maritimes Treaty of 1752 and Treaty No. 11)
- describe how Aboriginal practices, behaviours, beliefs, and symbols (e.g., hunting and fishing traditions; ceremonies and feasts; the use of drums, music, and dance) strengthen Aboriginal cultural identities

### Relationships

- explain how Aboriginal peoples' relationship to the land traditionally sustained them in various environments across Canada
- explain how Aboriginal peoples' links to the land and to a sustainable environment are part of their cultural identity
  - identify customs, ceremonies, and spiritual beliefs that connect Aboriginal peoples to nature and to one another (e.g., hunters' respect for animal bones, drumming, dream interpretations, traditional roles of family members in different Aboriginal cultures)
  - identify examples of art, architecture, and artifacts that depict a spiritual and emotional link between Aboriginal peoples and their traditional lands (e.g., totem pole carvings; masks; designs of cultural centres; artwork of Daphne Odjig, Maxine Noel, and Joane Cardinal Schubert)
  - demonstrate an understanding of traditional Aboriginal activities associated with the seasonal cycle

- describe how the spiritual relationship that Aboriginal peoples have with the land is integrated with their beliefs and values (e.g., the Aboriginal belief that many parts of nature have spirits)
- compare harvesting behaviours and beliefs of Aboriginal and non-Aboriginal peoples (e.g., wild rice harvesting, fishing practices on the east and west coasts of Canada)

## English: Contemporary Aboriginal Voices, Grade 11, College Preparation (NBE3C)

#### Relationships

- demonstrate an understanding of relationships (e.g., within the family or community; within the plant, animal, or spirit world) portrayed in the works of Aboriginal writers

#### Challenges

- demonstrate an understanding of Aboriginal writers' descriptions of the challenges faced by Aboriginal peoples
  - analyse Aboriginal writers' depictions of challenges faced by Aboriginal peoples that have resulted directly from societal influences (e.g., racism, ethnocentricity, marginalization)

*Note:* The challenges described in the works of Aboriginal writers would include challenges related to the environment.

 create media works (e.g., a radio documentary on the social changes occurring within an Aboriginal community, a photo essay on a day in the life of a community leader, a brochure on a local entrepreneur, a short video clip promoting an Aboriginal activity) that demonstrate an understanding of the issues associated with challenges faced by Aboriginal peoples

Note: The media works created by students could focus on environmental issues.

## Aboriginal Beliefs, Values, and Aspirations in Contemporary Society, Grade 11, Workplace Preparation (NBV3E)

#### Identity

- describe how traditional and contemporary beliefs and values of Aboriginal cultures influence present-day activities and behaviours
  - identify specific environmental influences (e.g., salmon migration on the Northwest Coast; caribou migration for the Dene people; utilization of forests and lakes by the Ojibway and Cree communities) on the social and cultural identity of Aboriginal peoples
  - describe the importance of aspects of the environment (e.g., animals, fish, plants) to the identity of Aboriginal cultures

- identify characteristics of language, artistic symbols, and the spiritual beliefs of Aboriginal nations that relate to the natural environment (e.g., the language of the Iroquoian thanksgiving address, West Coast totem poles, Inuit stone carvings)
- describe the importance of Aboriginal customs inside and outside of Aboriginal communities (e.g., smudging, ceremonial uses of tobacco, naming ceremonies, walking out ceremonies, marriage ceremonies, burial ceremonies)
- identify Aboriginal businesses that incorporate traditional beliefs, values, and aspirations (e.g., ecotourism projects, wild rice marketing, Air Creebec)

#### Relationships

- explain how Aboriginal peoples' relationship to the land traditionally sustained Aboriginal life in various environments across Canada and continues to be evident in the cultural practices of Aboriginal peoples today
  - describe the physical, intellectual, emotional, and spiritual beliefs of Aboriginal peoples related to the land
  - identify customs, ceremonies, and spiritual beliefs (e.g., respect for animal bones and spirits, uses of songs and drums, creation stories) that connect Aboriginal peoples to the natural environment and to one another
  - identify how provincial laws and developments such as hydro-electric dams may restrict Aboriginal harvesting, hunting, and fishing practices (e.g., Northern Manitoba Flood Agreement)

#### Sovereignty

- identify how the beliefs and teachings of contemporary elders support political, social, and economic growth (e.g., environmental protection to ensure survival of future generations) as a framework for Aboriginal self-determination
- describe Aboriginal beliefs and values (e.g., relationship to the land) that may affect future directions of treaties and agreements

#### Challenges

- identify the obstacles that Aboriginal peoples must overcome to protect and maintain their cultures and languages
  - describe the challenges of accommodating both Aboriginal and business corporation values concerning ecological sustainability in such areas as logging, mining, and the production of hydro-electric power

## English: Contemporary Aboriginal Voices, Grade 11, Workplace Preparation (NBE3E)

#### Challenges

- identify challenges to Aboriginal communities (e.g., urbanization, economic pressures) that are presented in media works
- examine the challenges facing Aboriginal peoples depicted in documentaries, news reports, journalistic accounts, and photographs (e.g., by examining bias in both the images and the scripts)

*Note:* The challenges depicted in media works would include challenges related to environmental issues.

## Aboriginal Governance: Emerging Directions, Grade 12, University/College Preparation (NDG4M)

#### Identity

- identify traditional beliefs and values that are part of Aboriginal identity and that affect Aboriginal decision making and leadership

#### Challenges

- describe the difference in how land is perceived by Aboriginal society and by Canadian society (e.g., in terms of respect for the land and all living things, compatible resource development, and sustainable small-scale economies) and explain the crucial importance of this difference to governance among Aboriginal peoples
- describe how the ways in which Aboriginal peoples perceive land (e.g., the Aboriginal belief that human beings were given special responsibilities to serve as stewards of the natural environment) may affect the future of Aboriginal and Canadian relations

## Issues of Indigenous Peoples in a Global Context, Grade 12, University/ College Preparation (NDW4M)

### Identity

- describe emerging global economic and environmental practices and their impact on indigenous cultural identity
  - describe the legal and political perspectives of the world views of indigenous peoples concerning their own social, economic, or cultural development (e.g., regarding governance, resource development, or the preservation of indigenous languages);
  - describe how indigenous peoples throughout the world have maintained the core principles of an indigenous world view (e.g., land stewardship; cooperation; reciprocal relationships, such as "people with the Creator", "people with people", and "people with the environment") or have lost their traditional ways (e.g., destruction of the rain forest)

- define the factors that indigenous peoples believe are critical for ensuring healthy, sustainable communities (e.g., a secure land base, political autonomy, a viable communitybased economy)
- demonstrate an understanding of the different political, economic, and environmental issues that unite indigenous peoples throughout the world (e.g., decolonization, economic exploitation, preservation of biodiversity)

#### Relationships

- demonstrate an understanding that the North American Aboriginal cultural perspective on land is shared by indigenous peoples in various parts of the world

#### Challenges

- demonstrate an understanding of the global roles that indigenous peoples see for themselves (e.g., stewardship of the environment, co-management of resources with national governments)
- describe the strategies that indigenous peoples are using to sustain their cultures and languages, and to protect the environment
- describe how indigenous peoples are using their cultural practices and traditional teachings when developing new strategies to cope with change
- demonstrate an understanding of the issues that are of common interest to the world's indigenous population (e.g., resource development, self-determination, the preservation of culture)
- describe the steps (e.g., resolving land claims, granting indigenous peoples rights to natural resources) that members of the international community have taken to ensure that indigenous peoples will have a sustainable land base for generations to come
- identify the successes that indigenous peoples have had in influencing the policies of national governments and multinational corporations (e.g., land-use policies, partnerships, co-management strategies)

## SCIENCE, GRADES 9 AND 10 (2008) AND GRADES 11 AND 12 (2008)

#### From "Environmental Education" in the curriculum policy documents:

The increased emphasis on relating science to technology, society, and the environment (STSE) within this curriculum document provides numerous opportunities for teachers to integrate environmental education effectively into the curriculum. The STSE expectations provide meaningful contexts for applying what has been learned about the environment, for thinking critically about issues related to the environment, and for considering personal action that can be taken to protect the environment. Throughout the courses and strands, teachers have opportunities to take students out of the classroom and into the world beyond the school, to observe, explore, and investigate. One effective way to approach environmental literacy is through examining critical inquiry questions related to students' sense of place, to the impact of human activity on the environment, and/or to systems thinking. This can be done at numerous points within the science curriculum.

The following are some examples:

- A sense of place can be developed as students investigate the geological history of their region.
- An understanding of the effects of human activity on the environment can be developed as students consider the impact of their actions (e.g., the use of household chemicals, the consumption of electricity, the acquisition of new electronic devices and the disposal of used ones) on the local and global environment.
- Systems thinking can be developed as students extend their understanding of various kinds of systems (e.g., bodily systems; our solar system; Earth systems; mechanical systems) and the interdependence of their components.

### GRADES 9 AND 10

### Science, Grade 9, Academic (SNC1D)

#### A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

- A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., astrophysicist, geophysicist, conservation officer, park warden, fire protection engineer, hydrologist, electrician) and the education and training necessary for these careers
- A2.2 identify scientists, including Canadians (e.g., David Suzuki, Howard Alper, Roberta Bondar, Kenneth Hill), who have made a contribution to the fields of science under study

#### B. Biology: Sustainable Ecosystems

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** assess the impact of human activities on the sustainability of terrestrial and/or aquatic ecosystems, and evaluate the effectiveness of courses of action intended to remedy or mitigate negative impacts
- B1.1 assess, on the basis of research, the impact of a factor related to human activity (e.g., urban sprawl, introduction of invasive species, overhunting/overfishing) that threatens the sustainability of a terrestrial or aquatic ecosystem [IP, PR, AI, C] *Sample issue:* The Great Lakes constitute an important shipping route. Foreign ships often empty their ballast water, which can contain invasive species, directly into the lakes. The goby, which was likely imported in ballast water, is an aggressive fish that has taken over the spawning grounds of some native species, threatening the balance of the ecosystem. *Sample questions:* How has suburban development on the Niagara Escarpment or the Oak Ridges Moraine affected local ecosystems? How has the zebra mussel population in Lake Erie affected aquatic species and water quality? How has commercial logging affected the sustainability of forests in Northern Ontario?
- **B1.2** evaluate the effectiveness of government initiatives in Canada (federal, provincial, municipal), and/or the efforts of societal groups or non-governmental organizations, such as Aboriginal communities, environmental groups, or student organizations, with respect to an environmental issue that affects the sustainability of terrestrial or aquatic ecosystems (e.g., wetland restoration, recycling programs, Canada–Ontario Environmental Farm Plans, stewardship of national and provincial parks) [AI, C]

*Sample issue:* Landfill sites can have negative effects on adjacent ecosystems, attracting pests, leaching toxic chemicals, and producing greenhouse gases. Municipal recycling and composting programs divert garbage, reducing the need for new landfill sites. However, many people, particularly rural residents and those in apartment buildings, may not be included in these programs.

*Sample questions:* What provincial or federal legislation attempts to protect special features or sensitive elements of terrestrial or freshwater ecosystems? How could such legislation be more effective? How have the actions of local wetland-reclamation, municipal tree-planting, Aboriginal fisheries-management, Great Lakes–rehabilitation, organic farming, or other groups helped to ensure ecological sustainability? What further action could such groups take?

#### **B2.** Developing Skills of Investigation and Communication

- **B2.** investigate factors related to human activity that affect terrestrial and aquatic ecosystems, and explain how they affect the sustainability of these ecosystems
- **B2.1** use appropriate terminology related to sustainable ecosystems, including, but not limited to: *bioaccumulation, biosphere, diversity, ecosystem, equilibrium, sustainability, sustainable use, protection,* and *watershed* [C]
- **B2.2** interpret qualitative and quantitative data from undisturbed and disturbed ecosystems (terrestrial and/or aquatic), communicate the results graphically, and, extrapolating from the data, explain the importance of biodiversity for all sustainable ecosystems [PR, AI, C]
- **B2.3** plan and conduct an investigation, involving both inquiry and research, into how a human activity affects soil composition or soil fertility (e.g., changes to soil composition resulting from the use of different compostable materials, organic or inorganic fertilizers, or pesticides), and, extrapolating from the data and information gathered, explain the impact of this activity on the sustainability of terrestrial ecosystems [IP, PR, AI, C]
- **B2.4** plan and conduct an investigation, involving both inquiry and research, into how a human activity affects water quality (e.g., leaching of organic or inorganic fertilizers or pesticides into water systems, changes to watersheds resulting from deforestation or land development, diversion of ground water for industrial uses), and, extrapolating from the data and information gathered, explain the impact of this activity on the sustainability of aquatic ecosystems [IP, PR, AI, C]
- **B2.5** analyse the effect of human activity on the populations of terrestrial and aquatic ecosystems by interpreting data and generating graphs (e.g., data from Statistics Canada, Parks Canada, and other websites on: the concentration in water of chemicals from fertilizer run-off and their effect on the growth of algae; stressors associated with human use of natural areas, such as trampled vegetation, wildlife mortality from motor vehicles, and the removal of plants, animals, and/or natural objects; suburban developments and their impact on the food supply for animals such as foxes and racoons) [PR, AI, C]

#### **B3.** Understanding Basic Concepts

- **B3.** demonstrate an understanding of the dynamic nature of ecosystems, particularly in terms of ecological balance and the impact of human activity on the sustainability of terrestrial and aquatic ecosystems
- **B3.1** compare and contrast biotic and abiotic characteristics of sustainable and unsustainable terrestrial and aquatic ecosystems
- **B3.2** describe the complementary processes of cellular respiration and photosynthesis with respect to the flow of energy and the cycling of matter within ecosystems (i.e., carbon dioxide is a by-product of cellular respiration and is used for photosynthesis, which produces oxygen needed for cellular respiration), and explain how human activities can disrupt the balance achieved by these processes (e.g., automobile use increases the amount of carbon dioxide in the atmosphere; planting more trees decreases the amount of carbon dioxide in the atmosphere)
- **B3.3** describe the limiting factors of ecosystems (e.g., nutrients, space, water, energy, predators), and explain how these factors affect the carrying capacity of an ecosystem (e.g., the effect of an increase in the moose population on the wolf population in the same ecosystem)
- **B3.4** identify the earth's four spheres (biosphere, hydrosphere, lithosphere, atmosphere), and describe the relationship that must exist between these spheres if diversity and sustainability are to be maintained
- **B3.5** identify various factors related to human activity that have an impact on ecosystems (e.g., the introduction of invasive species; shoreline development; industrial emissions that result in acid rain), and explain how these factors affect the equilibrium and survival of ecosystems (e.g., invasive species push out native species and upset the equilibrium in an ecosystem; shoreline development affects the types of terrestrial and aquatic life that can live near lake shores or river banks; acid rain changes the pH of water, which affects the type of aquatic life that can survive in a lake)

## C. Chemistry: Atoms, Elements, and Compounds

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** assess social, environmental, and economic impacts of the use of common elements and compounds, with reference to their physical and chemical properties
- **C1.1** assess the usefulness of and/or the hazards associated with common elements or compounds in terms of their physical and chemical properties [AI, C]

*Sample issue:* Polyethylene is a versatile, flexible, and durable compound that is used in a range of products, including toys, plastic bottles, bulletproof vests, and plastic bags. However, its durability poses problems for the environment because products made from polyethylene are not biodegradable.

*Sample questions:* ... What property of DDT allows it to continue to accumulate in the fatty tissue of mammals despite its ban by the Canadian government in the 1980s? How do the chemical properties of peroxide make it suitable for use in hair dye? What are the hazards associated with this use?

**C1.2** assess social, environmental, and economic impacts of the use of common elements or compounds [AI, C]

*Sample issue:* By reducing the accumulation of ice on roads, road salt makes winter driving safer, decreasing medical and insurance costs associated with motor vehicle accidents. But the compounds in road salt damage roads and vehicles, pollute water systems, and harm animals and vegetation.

*Sample questions:* How has the presence of mercury in water bodies in Northern Ontario affected the environment and the lives of Aboriginal people? How does the widespread use of agricultural chemicals in Canada or elsewhere affect the economy, society, and the environment? What are the economic benefits and environmental costs of diamond mining for Northern Canadian communities?

## D. Earth and Space Science: The Study of the Universe

#### D1. Relating Science to Technology, Society, and the Environment

D1.2 assess some of the costs, hazards, and benefits of space exploration (e.g., the expense of developing new technologies, accidents resulting in loss of life, contributions to our knowledge of the universe), taking into account the benefits of technologies that were developed for the space program but that can be used to address environmental and other practical challenges on Earth (e.g., radiation monitors and barriers, sensors to monitor air and water quality, remote sensing technology, fire-resistant materials) [AI, C]
Sample issue: Technologies that were originally developed for space exploration now have a range of environmental, medical, business, and domestic uses. However, these technologies were developed at great cost, using funds that might have been directed to other types of research and development.

*Sample questions:* What hazards do humans face when they are in space? What technologies have been developed in response to these hazards? How have these technologies been adapted for use on Earth? How much money was spent to develop the Canadarm? How is Canadarm technology now used in other sectors such as medicine and the environment?

#### **D3.** Understanding Basic Concepts

**D3.4** describe the sun's composition and energy source, and explain how its energy warms Earth and supports life on the planet (e.g., with reference to the types of radiation the sun emits and the interaction of the sun's energy with Earth's atmosphere)

## E. Physics: The Characteristics of Electricity

#### E1. Relating Science to Technology, Society, and the Environment

- **E1.** assess some of the costs and benefits associated with the production of electrical energy from renewable and non-renewable sources, and analyse how electrical efficiencies and savings can be achieved, through both the design of technological devices and practices in the home
- **E1.2** assess some of the social, economic, and environmental implications of the production of electrical energy in Canada from renewable and non-renewable sources (e.g., wind, solar, hydro, coal, oil, natural gas, nuclear) [AI, C]

*Sample issue:* The operation of wind farms along Lake Huron produces electricity from a renewable source, reducing dependence on non-renewable sources of electricity. However, the wind farms produce noise and visual pollution, affect local animal life, and reduce the amount of land available for agriculture.

*Sample questions:* What is the price difference between electricity produced from solar power and by coal-burning plants? What effects do coal mining, oil production, wind farms, and hydroelectric dams have on surrounding ecosystems? What types of hazardous substances are used or created in the production of solar power and nuclear power? What types of emissions are produced by coal-burning and hydroelectric power plants? What are the effects of these emissions on human health and the environment?

E1.3 produce a plan of action to reduce electrical energy consumption at home (e.g., using EnerGuide information when purchasing appliances), and outline the roles and responsibilities of various groups (e.g., government, business, family members) in this endeavour [IP, AI, C] *Sample issue:* Replacing incandescent light bulbs with compact fluorescent bulbs can reduce the energy needed to light a home by 75%. Although the bulbs are more expensive than incandescent bulbs, electrical companies sometimes provide coupons to reduce the price. Also, the Ontario government is phasing out incandescent bulbs, which will further reduce energy consumption. *Sample questions:* What are EnerGuide and ENERGY STAR, and how can they be used when purchasing appliances or electronics? What is the difference in energy consumption between a conventional and a front-loading washing machine? What appliances consume electrical energy even when they are not in use?

# Science, Grade 9, Applied (SNC1P)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

- A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., radar satellite technician, fish and wildlife technologist, ceramicist, electrician) and the education and training necessary for these careers
- A2.2 identify scientists, including Canadians (e.g., Kim Fernie, Robert Ackman, Helen Hogg, Kenneth Hill), who have made a contribution to the fields of science under study

## B. Biology: Sustainable Ecosystems and Human Activity

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse the impact of human activity on terrestrial or aquatic ecosystems, and assess the effectiveness of selected initiatives related to environmental sustainability
- B1.1 analyse, on the basis of research, how a human activity (e.g., urban sprawl, use of pesticides and fertilizers, creation of pollution, human interaction with wildlife) threatens the sustainability of a terrestrial or aquatic ecosystem [IP, PR, AI, C] *Sample issue:* Pesticides and fertilizers are used to increase the productivity of land. However, run-off flows into water bodies and leaches into groundwater, poisoning the water or altering its chemical balance and affecting aquatic ecosystems. *Sample questions:* How does the draining of wetlands for new subdivisions affect local waterbirds and plants that thrive in marshes? How does untreated waste released into rivers or lakes affect fish and animals that eat the fish? How does the introduction of Atlantic salmon or other sport fish affect indigenous lake trout and brook trout?
- **B1.2** assess the effectiveness of a local initiative of personal interest that seeks to ensure the sustainability of a terrestrial or aquatic ecosystem (e.g., greening their school grounds; conservation efforts of local Aboriginal communities; naturalizing banks of local rivers or ponds with native vegetation; adoption of an integrated pest management strategy to combat pests in a local garden), and explain why the initiative is important to the sustainability of the ecosystem [AI, C]

*Sample issue:* Municipal composting initiatives divert garbage from landfill sites and make compost available to gardeners. The use of compost reduces the need for chemical fertilizers, helping to ensure the sustainability of aquatic ecosystems by reducing fertilizer run-off. However, many people, such as those living in apartment buildings, are not included in composting programs.

*Sample questions:* What action has been taken to green the grounds of your school? What effect has such action had on the local ecosystem? What additional action could be taken? What local initiatives have been developed to reduce the amount of pollution released into nearby rivers or lakes? What additional initiatives could be taken to enhance the sustainability of these ecosystems? How has the implementation of an Environmental Farm Plan (EFP) changed practices at a local farm? What are the benefits of the plan with regard to the sustainability of the ecosystem?

#### **B2.** Developing Skills of Investigation and Communication

- **B2.** investigate some factors related to human activity that affect terrestrial or aquatic ecosystems, and describe the consequences that these factors have for the sustainability of these ecosystems;
- **B2.1** use appropriate terminology related to sustainable ecosystems and human activity, including, but not limited to: *biodiversity*, *biotic*, *ecosystem*, *equilibrium*, *species diversity*, *sustainability*, and *watershed* [C]
- **B2.2** investigate the characteristics and interactions of biotic and abiotic components of a terrestrial or aquatic ecosystem, and describe the importance of these components in a sustainable ecosystem [PR, AI, C]
- **B2.3** compile and graph qualitative and quantitative data on organisms within an undisturbed or disturbed ecosystem (terrestrial or aquatic) (e.g., nematode and earthworm populations in soil or compost; bird populations during migration or winter feeding; tadpole and mosquito larvae populations in a local pond) [PR, AI, C]

- **B2.4** plan and conduct an inquiry into how a factor related to human activity affects a terrestrial or aquatic ecosystem (e.g., how changes to soil composition from the use of different compostable materials or organic or inorganic fertilizers affect the types of plants that can be grown; how lower water levels resulting from water diversion affect waterfowl nesting areas and fish reproduction), and describe the consequences that this factor has for the sustainability of the ecosystem [IP, PR, AI, C]
- **B2.5** analyse the effect of factors related to human activity on terrestrial or aquatic ecosystems by interpreting data and generating graphs (e.g., data on the concentration in water of chemicals from fertilizer run-off and their effect on the growth of algae) [AI, C]

#### **B3.** Understanding Basic Concepts

- **B3.** demonstrate an understanding of characteristics of terrestrial and aquatic ecosystems, the interdependence within and between ecosystems, and the impact humans have on the sustainability of these ecosystems
- **B3.1** identify similarities and differences between terrestrial and aquatic ecosystems, and describe these similarities and differences using diagrams
- **B3.2** describe the interdependence of the components within a terrestrial and an aquatic ecosystem, and explain how the components of both systems work together to ensure the sustainability of a larger ecosystem
- **B3.3** describe the complementary processes of cellular respiration and photosynthesis with respect to the flow of energy and the cycling of matter within ecosystems (e.g., carbon dioxide is a by-product of cellular respiration and is used for photosynthesis, which produces oxygen needed for cellular respiration), and explain how human activities can disrupt the balance achieved by these processes (e.g., automobile use increases the amount of carbon dioxide in the atmosphere; planting trees reduces the amount of carbon dioxide in the atmosphere)
- **B3.4** identify the major limiting factors of ecosystems (e.g., nutrients, space, water, predators), and explain how these factors are related to the carrying capacity of an ecosystem (e.g., how an increase in the moose population in an ecosystem affects the wolf population in the same ecosystem)
- **B3.5** identify some factors related to human activity that have an impact on ecosystems (e.g., the use of fertilizers and pesticides; altered shorelines; organic and conventional farming; urban sprawl), and explain how these factors affect the equilibrium and survival of populations in terrestrial and aquatic ecosystems (e.g., fertilizers change the fertility of soil, affecting what types of plants can grow in it; pesticides leach into water systems, affecting water quality and aquatic life; shoreline development affects the types of aquatic life and terrestrial vegetation that can live by lake shores or river banks; urban sprawl wipes out fields and woods, destroying wildlife habitats)

#### C. Chemistry: Exploring Matter

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse how properties of common elements and/or simple compounds affect their use, and assess the social and environmental impact associated with their production or use
- C1.1 analyse how the chemical and physical properties of common elements and/or simple compounds affect the use of everyday materials that contain those elements and/or compounds [AI, C] *Sample issue:* Chlorine compounds have strong disinfectant properties and are used in bleach and to purify water. However, these compounds can be highly toxic and must be used with care.

**C1.2** assess the social and environmental impact of the production or use of a common element or simple compound [AI, C]

*Sample issue:* The use of road salt makes winter driving safer, reducing the social costs of motor vehicle accidents, including loss of human life. But the compounds in road salt damage roads and vehicles, pollute water systems, and harm animals and vegetation.

*Sample questions:* What are the social benefits and environmental costs of mining or refining metals such as nickel, iron, or gold? What is the environmental impact of using fertilizers rich in nitrogen on lawns and gardens? What is the environmental impact of the widespread use of plastics?

## D. Earth and Space Science: Space Exploration

#### D1. Relating Science to Technology, Society, and the Environment

**D1.1** research the challenges associated with space exploration, and explain the purpose of materials and technologies that were developed to address these challenges and how these materials and technologies are now used in other fields of endeavour (e.g., robotic arm technology developed for the space program is used in industry to handle hazardous chemicals; synthetic materials developed to protect astronauts are used in fire-fighting equipment) [IP, PR, AI, C]

*Sample questions:* Why is radiation a particular hazard for astronauts? What sorts of instruments are used to monitor radiation levels? What sorts of materials have been developed to protect astronauts from radiation? What uses would such instruments and materials have on Earth?

#### **D3.** Understanding Basic Concepts

**D3.4** describe the characteristics of the sun and the effects of its energy on Earth and Earth's atmosphere

## E. Physics: Electrical Applications

#### E1. Relating Science to Technology, Society, and the Environment

- E1. assess the major social, economic, and environmental costs and benefits of using electrical energy, distinguishing between renewable and non-renewable sources, and propose a plan of action to reduce energy costs
- **E1.1** assess social, economic, and environmental costs and benefits of using a renewable and a non-renewable source of electrical energy (e.g., solar, wind, hydro, nuclear, coal, oil, natural gas), taking the issue of sustainability into account [AI, C]

*Sample issue:* The production of electricity at nuclear power plants generates very low levels of greenhouse gases. However, the construction and maintenance of nuclear power plants is expensive and the long-term storage of nuclear waste may have an impact on the environment.

*Sample questions:* Which method of production of electrical energy generates the greatest amount of greenhouse gases? Which generates the smallest amount? What are the economic and long-term environmental costs of producing nuclear energy? Of using solar energy? What are some of the social and environmental effects of oil production?

**E1.2** propose a plan of action to decrease household energy costs by applying their knowledge of the energy consumption of different types of appliances (e.g., front-load and top-load washing machines; cathode ray tube [CRT] and liquid crystal display [LCD] computer monitors) [PR, AI, C]

*Sample questions:* Which appliances in the home consume the greatest amount of energy? What are some options for reducing the amount of energy they consume? How cost-efficient is it to purchase a new energy-efficient appliance when a less efficient appliance is still in good working condition?

# Science, Grade 10, Academic (SNC2D)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

- A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., meteorologist, medical illustrator, geochemist, optical physicist) and the education and training necessary for these careers
- A2.2 identify scientists, including Canadians (e.g., Sheela Basrur, William Richard Peltier, Alice Wilson, Willard Doyle), who have made a contribution to the fields of science under study

## C. Chemistry: Chemical Reactions

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse a variety of safety and environmental issues associated with chemical reactions, including the ways in which chemical reactions can be applied to address environmental challenges
- **C1.1** analyse, on the basis of research, various safety and environmental issues associated with chemical reactions and their reactants and/or product(s) (e.g., chemical reactions related to the use of cyanide in gold mining, the corrosion of metal supports on bridges, the use of different antibacterial agents such as chlorine and bromine in recreational pools) [IP, PR, AI, C] *Sample questions:* Why is it important to understand the chemical composition of chlorinating agents used in swimming pools before using them? What chemical reactions result in acid precipitation? What impact does it have on the environment? What sources of information are available on the safety or environmental implications of chemicals and chemical reactions? Why is it important to ensure that these sources are up to date? Why is it important to understand WHMIS information, including Material Safety Data Sheets, before using any chemicals?
- **C1.2** analyse how an understanding of the properties of chemical substances and their reactions can be applied to solve environmental challenges (e.g., renewing the Great Lakes, neutralizing acid spills, scrubbing smokestack emissions) [AI, C]

*Sample issue:* Spills from oil tankers damage the environment by contaminating water and shorelines, killing birds and aquatic life. Biological oil agents help break down the oil so it degrades faster and does less damage to the environment.

*Sample questions:* How does the addition of lime reduce the acidification of water? How can this reaction be applied to renew lakes that have been affected by acid precipitation? Why is acid leaching used in soil contaminated with heavy metals?

## D. Earth and Space Science: Climate Change

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse some of the effects of climate change around the world, and assess the effectiveness of initiatives that attempt to address the issue of climate change
- D1.1 analyse current and/or potential effects, both positive and negative, of climate change on human activity and natural systems (e.g., loss of habitat for Arctic mammals such as polar bears and loss of traditional lifestyles for Inuit as Arctic ice shrinks; famine as arable land is lost to desertification; an increase in water-borne disease and human resettlement as coastal lands are flooded; expansion of the growing season in some regions) [AI, C] *Sample issue:* Scientists are researching changes in climate patterns as possible contributing factors to an increase in the number of smog days in Ontario and elsewhere in Canada. As the air quality worsens, people may curtail their outdoor activities, and those with respiratory problems may require medical attention, increasing health care costs. *Sample questions:* How have recent extreme weather events such as heat waves in Europe or drought in southern Africa affected habitats in these regions? How might predicted changes to global temperature and precipitation affect agriculture in Ontario, Canada, or different areas around the world? How might the continuing reduction of the polar ice cap influence domestic and international transportation and shipping?
- D1.2 assess, on the basis of research, the effectiveness of some current individual, regional, national, or international initiatives that address the issue of climate change (e.g., Drive Clean, ENERGY STAR, federal and provincial government rebates for retrofitting older buildings to be more energy efficient, carbon offset programs, community tree-planting programs, municipal recycling programs, Intergovernmental Panel on Climate Change [IPCC]), and propose a further course of action related to one of these initiatives [PR, AI, C] *Sample issue:* Governments and industry have created rebates or tax cuts to encourage consumers to replace their old appliances with efficient ENERGY STAR appliances. However, such initiatives do not take into account the resources used to create the new products or the problems associated with the disposal of old appliances. *Sample questions:* What type of recycling and composting programs are in place in your community? What proportion of locally generated garbage do they divert from landfill sites? How could they be improved? What is the purpose of carbon offset credits? Do they achieve

that purpose? Why or why not?

#### D2. Developing Skills of Investigation and Communication

- **D2.** investigate various natural and human factors that influence Earth's climate and climate change
- **D2.1** use appropriate terminology related to climate change, including, but not limited to: *albedo*, *anthropogenic*, *atmosphere*, *cycles*, *heat sinks*, and *hydrosphere* [C]
- **D2.2** design and build a model to illustrate the natural greenhouse effect, and use the model to explain the anthropogenic greenhouse effect [IP, PR, C]
- **D2.3** analyse different sources of scientific data (e.g., lake cores, tree rings, fossils and preserved organisms, ice cores) for evidence of natural climate change and climate change influenced by human activity [PR, AI, C]

- **D2.4** investigate a popular hypothesis on a cause-and-effect relationship having to do with climate change (e.g., the combustion of fossil fuels is responsible for rising global temperatures; the concentration of atmospheric CO2 is responsible for rising global temperatures; global temperatures have been on the increase since the industrial revolution; the severity of cyclones, hurricanes, and tornadoes increases as atmospheric temperatures increase), using simulations and/or time-trend data that model climate profiles (e.g., data from Statistics Canada and Environment Canada) [PR, AI, C]
- **D2.5** investigate, through laboratory inquiry or simulations, the effects of heat transfer within the hydrosphere and atmosphere [PR, AI]
- **D2.6** investigate, through laboratory inquiry or simulations, how water in its various states influences climate patterns (e.g., water bodies moderate climate, water vapour is a greenhouse gas, ice increases the albedo of Earth's surface) [PR, AI]
- **D2.7** investigate, through research or simulations, the influence of ocean currents on local and global heat transfer and precipitation patterns [PR, AI]
- **D2.8** classify the climate of their local region using various tools or systems (e.g., Ecoregions of Canada, bioclimate profiles), and compare their region to other regions in Ontario, Canada, and the world [AI, C]
- D2.9 compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and values) [AI, C]

#### **D3.** Understanding Basic Concepts

- **D3.** demonstrate an understanding of natural and human factors, including the greenhouse effect, that influence Earth's climate and contribute to climate change
- **D3.1** describe the principal components of Earth's climate system (e.g., the sun, oceans, and atmosphere; the topography and configuration of land masses) and how the system works
- **D3.2** describe and explain heat transfer in the hydrosphere and atmosphere and its effects on air and water currents
- **D3.3** describe the natural greenhouse effect, explain its importance for life, and distinguish it from the anthropogenic greenhouse effect
- **D3.4** identify natural phenomena (e.g., plate tectonics, uplift and weathering, solar radiance, cosmic ray cycles) and human activities (e.g., forest fires, deforestation, the burning of fossil fuels, industrial emissions) known to affect climate, and describe the role of both in Canada's contribution to climate change
- **D3.5** describe the principal sources and sinks, both natural and/or anthropogenic, of greenhouse gases (e.g., carbon dioxide, methane, nitrous oxide, halocarbons, water vapour)
- **D3.6** describe how different carbon and nitrogen compounds (e.g., carbon dioxide, methane, nitrous oxide) influence the trapping of heat in the atmosphere and hydrosphere
- **D3.7** describe, in general terms, the causes and effects of the anthropogenic greenhouse effect, the depletion of stratospheric and tropospheric ozone, and the formation of ground-level ozone and smog
- **D3.8** identify and describe indicators of global climate change (e.g., changes in: glacial and polar ice, sea levels, wind patterns, global carbon budget assessments)

## E. Physics: Light and Geometric Optics

#### E1. Relating Science to Technology, Society, and the Environment

E1.2 analyse a technological device that uses the properties of light (e.g., microscope, retroreflector, solar oven, camera), and explain how it has enhanced society [AI, C] *Sample issue:* Cameras can produce a range of optical effects, from highly detailed and realistic to manipulated and abstract. Photographic images are used for a wide range of purposes that benefit society, including in the areas of culture, education, security, policing, entertainment, and the environment. However, the widespread use of cameras raises privacy concerns. *Sample questions:* ... How are outdoor lights such as street or stadium lights designed to limit light pollution in surrounding areas?

# Science, Grade 10, Applied (SNC2P)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., veterinarian assistant, quality control technician, conservation officer, sound and light technician) and the education and training necessary for these careers

## B. Biology: Tissues, Organs, and Systems

#### B1. Relating Science to Technology, Society, and the Environment

**B1.2** evaluate the effects that use of or exposure to a technology, substance, or environmental factor (e.g., cellphones, X-rays, UV radiation, personal audio players, cigarette smoke, pesticides, food additives/preservatives, vitamins, gene therapy) may have on the function of human tissues, organs, or systems [AI, C]

*Sample questions:* What impact does the ingestion of food additives have on the cells of the digestive system? What impact does smoking have on lung tissue? What effects does exposure to UV radiation have on skin? How can using a personal audio player affect a person's auditory system?

## C. Chemistry: Chemical Reactions and Their Practical Applications

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse how chemical reactions are employed in common products and processes, and assess the safety and environmental hazards associated with them
- C1.1 analyse, on the basis of research, the function of chemical reactions in the production of selected products and/or in processes commonly encountered at home or in the workplace (e.g., carbonation of soft drinks; rust proofing), and communicate their findings [IP, PR, AI, C]

*Sample questions:* How does the addition of ethanol to gasoline result in cleaner engine emissions? What chemical reactions are used in the rust-proofing process? How can chemical reactions affect the decomposition of important nutrients in food?

**C1.2** identify practical applications of chemical reactions in a particular profession (e.g., ceramics, cosmetology, firefighting, heating and cooling system technology, food preparation, plumbing, custodial services), and assess the associated hazards, including hazards associated with the handling and disposal of chemicals [PR, AI, C]

*Sample issue:* Class B fire extinguishers containing ammonium phosphate, sodium bicarbonate, or potassium bicarbonate are effective in smothering fires involving flammable liquids. However, some of these chemicals are corrosive and can cause damage if introduced to an ecosystem.

## D. Earth and Space Science: Earth's Dynamic Climate

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse effects of human activity on climate change, and effects of climate change on living things and natural systems
- D1.1 analyse, on the basis of research, various ways in which living things and natural systems have been affected by climate change (e.g., the effect of loss of permafrost on northern roads and housing; the effect of longer growing seasons in some regions on farmers; the effect of warming oceans on coral reefs), and communicate their findings [IP, PR, AI, C] *Sample issue:* Some areas of Canada have been experiencing hotter and drier summers, resulting in poor harvests, loss of wetland habitat, and increased incidence of forest fires. However, in other areas, an increase in the number of frost-free days has extended the agricultural growing season.

*Sample questions:* What effect does climate change have on air quality and extreme weather phenomena? How does global warming increase the vulnerability of Canadian forests to fire and pests? How does the destruction of forests affect animals and humans?

D1.2 analyse ways in which human actions (e.g., burning fossil fuels, implementing tree-planting programs) have increased or decreased the production of greenhouse gases [AI, C] *Sample issue:* Motor vehicle emissions are a major contributor to greenhouse gases. People can reduce such emissions by walking, biking, or using public transportation instead of driving; by keeping their vehicle in good operating condition; or by driving a hybrid vehicle. *Sample questions:* Why do government and/or industry offer rebates to consumers buying programmable thermostats and compact fluorescent light bulbs? How does the production of oil from the Alberta oil sands contribute to greenhouse gas emissions? What is the difference in greenhouse gas emissions between a traditional SUV and a hybrid vehicle? What is "clean coal", and what is its impact on greenhouse gases? What actions have you and/or your community taken to help reduce levels of greenhouse gases?

#### **D2.** Developing Skills of Investigation and Communication

- **D2.** investigate various natural and human factors that have an impact on climate change and global warming
- **D2.1** use appropriate terminology related to Earth's dynamic climate, including, but not limited to: *anthropogenic*, *atmosphere*, *carbon footprint*, *carbon sink*, *climate*, *greenhouse gases*, *hydrosphere*, and *weather* [C]
- **D2.2** investigate the principles of the natural greenhouse effect, using simulations, diagrams, and/ or models, and compare these principles to those of an actual greenhouse [PR, AI]
- **D2.3** use a research process to investigate a source of greenhouse gases (e.g., decaying garbage, animal digestive processes, burning biomass) and its effect on a region of Canada (e.g., melting of the polar ice cap in the Arctic, shrinking of glaciers in the Rockies) [IP, PR, AI]

- **D2.4** conduct an inquiry to determine how different factors (e.g., an increase in surface temperature, an increase in water temperature) affect global warming and climate change [PR]
- **D2.5** investigate their personal carbon footprint, using a computer simulation or numerical data (e.g., determine carbon emissions that result from their travelling to school, work, and recreation venues; from vacation travelling; from buying products imported from distant countries), and plan a course of action to reduce their footprint (e.g., a plan to increase their use of bicycles or public transit; to eat more local foods) [PR, AI, C]
- **D2.6** compare different tools or systems used by scientists to make informed decisions on global climate change (e.g., Ecoregions of Canada, bioclimate profiles) [PR, AI]
- D2.7 compare different perspectives and/or biases evident in discussions of climate change in scientific and non-scientific media (e.g., with reference to knowledge, beliefs, and/or values) [PR, AI]

#### **D3.** Understanding Basic Concepts

- **D3.** demonstrate an understanding of various natural and human factors that contribute to climate change and global warming
- **D3.1** describe the principal components of Earth's climate system (e.g., the sun, oceans, and the atmosphere; the topography and configuration of land masses)
- **D3.2** describe the natural greenhouse effect, its importance for life, and the difference between it and the anthropogenic greenhouse effect
- D3.3 describe how heat is transferred and stored in both hydrospheric and atmospheric heat sinks
- **D3.4** identify different greenhouse gases (e.g., carbon dioxide, methane, water vapour, nitrous oxide), and explain how they are produced naturally in the environment
- **D3.5** describe methods by which greenhouse gases are produced by humans (e.g., burning of biomass, chemical reactions involving pollutants)
- **D3.6** identify the natural and human causes of climate change in the world and, in particular, how Canada contributes to climate change
- **D3.7** identify indicators of global climate change (e.g., changes in: the mass of glacial and polar ice, sea levels, wind patterns, global carbon budget assessments, migratory patterns of birds)

# BIOLOGY, GRADES 11 AND 12

# **Biology, Grade 11, University Preparation (SBI3U)**

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

- A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., zoologist, botanist, geneticist, ecologist, pharmacologist, farmer, forester, horticulturalist) and the education and training necessary for these careers
- A2.2 describe the contributions of scientists, including Canadians (e.g., ... Louis Bernatchez, ... Helen Battle, Memory Elvin-Lewis), to the fields under study

## B. Diversity of Living Things

#### B1. Relating Science to Technology, Society, and the Environment

**B1.1** analyse some of the risks and benefits of human intervention (e.g., tree plantations; monoculture of livestock or agricultural crops; overharvesting of wild plants for medicinal purposes; using pesticides to control pests; suppression of wild fires) to the biodiversity of aquatic or terrestrial ecosystems [AI, C]

*Sample issue:* Stocking lakes with fish provides recreation for fishing enthusiasts and increases the amount of food available for humans and other animals. However, this practice also increases the competition for food, which could threaten native species and affect the natural biodiversity of the aquatic ecosystem.

*Sample questions:* What types of conservation efforts have been made to help protect local wetlands from urban developments? In what ways does the planting of native species in a disturbed area help to improve the ecosystem? How and why might some species benefit from human intervention?

**B1.2** analyse the impact that climate change might have on the diversity of living things (e.g., rising temperatures can result in habitat loss or expansion; changing rainfall levels can cause drought or flooding of habitats) [AI, C]

*Sample issue:* Some scientists believe that we are in the early stages of a human-made mass extinction partly caused by rapid climate change. Many species that cannot tolerate the change will become extinct. However, Earth's history has shown that extinction of some species creates opportunities for surviving species to adapt, evolve, and flourish. *Sample questions:* Why do higher temperatures affect the survival of some species in freshwater environments? Why would an increase in ocean temperatures endanger many species that depend on coral as a home and food supply? In what ways have longer growing seasons, which may include a second harvest, affected the biodiversity of agricultural lands? How might species such as the Eastern Massasauga rattlesnake be affected by increased water levels in their habitats?

#### **B3. Understanding Basic Concepts**

**B3.5** explain why biodiversity is important to maintaining viable ecosystems (e.g., biodiversity helps increase resilience to stress and resistance to diseases or invading species)

## C. Evolution

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse the economic and environmental advantages and disadvantages of an artificial selection technology, and evaluate the impact of environmental changes on natural selection and endangered species
- C1.1 analyse, on the basis of research, the economic and environmental advantages and disadvantages of an artificial selection technology (e.g., livestock and horticultural breeding) [IP, PR, AI, C]

*Sample issue:* Selective breeding of agricultural crops can benefit populations in lessdeveloped countries by producing hardier crops, increasing food supplies, and improving the nutritional content of food. However, opponents of artificial selection technology believe that it affects the natural ability of a species to reproduce, which negatively affects biodiversity. *Sample questions:* How has selective breeding of specific crops helped to increase the yield of the crop and decrease the need for chemicals in the fields? How has the introduction of genetically engineered species in the horticultural industry affected other species planted in the same areas? ...

**C1.2** evaluate the possible impact of an environmental change on natural selection and on the vulnerability of species (e.g., adaptation to environmental changes can affect reproductive success of an organism) [AI, C]

*Sample issue:* An increase in forest fires in some areas of North America has affected the reproductive success of some species as their food supplies decrease and they are forced to adapt to adverse habitat conditions. Yet, forest fires also naturally promote changes in plant and animal species over time as the environment becomes more suitable for other species. *Sample questions:* Why has a decline in the milkweed population, as a result of urbanization and pesticides, affected the migration of monarch butterflies? How has the introduction of bacteria and viruses in inland lakes affected the life cycle of carp? What impact has the loss of bamboo forests to urbanization had on the giant panda's ability to breed and live?

#### C2. Developing Skills of Investigation and Communication

**C2.2** use a research process to investigate some of the key factors that affect the evolutionary process (e.g., genetic mutations, selective pressures, environmental stresses) [IP, PR]

## F. Plants: Anatomy, Growth, and Function

#### F1. Relating Science to Technology, Society, and the Environment

F1.1 evaluate, on the basis of research, the importance of plants to the growth and development of Canadian society (e.g., as a source of food, pharmaceuticals, Aboriginal medicines, building materials, flood and erosion control; as a resource for recreation and ecotourism) [IP, PR, AI, C] *Sample issue:* The agricultural sector holds great economic potential as demand increases for products such as biofuels, biochemicals, and biopharmaceuticals. Bioresources could also support our efforts to produce renewable energy, improve health, and minimize environmental impact. However, critics are concerned about the impact of bioresources on the availability of food crops and the price of food.

*Sample questions:* In what ways does the local-food movement contribute to community development? How does the re-introduction of native plant species along river banks help to prevent land erosion? What plant species are considered important in sustaining Canada's growth in the agricultural sector? How might the increasing demand for straw-bale housing materials support Canada's agricultural sector and increase the sustainability of other natural resources?

F1.2 evaluate, on the basis of research, ways in which different societies or cultures have used plants to sustain human populations while supporting environmental sustainability (e.g., sustainable agricultural practices in developing countries such as crop rotation and seed saving; traditional Aboriginal corn production practices) [IP, PR, AI, C]
Sample issue: Aboriginal peoples living near Canada's boreal forest rely on forest plants for food and medicine. Plants are harvested by traditional methods to maintain natural habitats and local biodiversity. However, these traditional practices are threatened as more areas are subject to development and commercial resource exploitation.

*Sample questions:* How are strategies for the conservation and sustainable use of medicinal plants being used by small communities and traditional healers in some developing countries? What effect does the re-establishment of wetland plants in agricultural settings have on the natural balance of the ecosystem? How are plants being used to clean wastewater from fish farms so that the water can go back into local streams?

#### F3. Understanding Basic Concepts

**F3.5** explain the process of ecological succession, including the role of plants in maintaining biodiversity and the survival of organisms after a disturbance to an ecosystem

# Biology, Grade 11, College Preparation (SBI3C)

#### A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., food science technologist, medical laboratory technologist, dental hygienist, outpost clinic/primary care nurse, respiratory therapist, veterinary technician, water or wastewater technician) and the education and training necessary for these careers

## B. Cellular Biology

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** evaluate the impact of environmental factors and medical technologies on certain cellular processes that occur in the human body
- **B1.2** analyse the effects of environmental factors on cellular processes that occur in the human body (e.g., the effect of lead on nerve cells; the effect of electromagnetic radiation on brain cells) [AI, C]

*Sample issue:* Vitamin D, essential to cellular processes that ensure the health of the bones and teeth, is not well absorbed by the human digestive system. It is manufactured by the body after exposure to the ultraviolet radiation of the sun. However, long-term exposure to the sun without proper UVA and UVB sunscreen protection can eventually lead to skin cancers, such as melanoma.

*Sample questions:* How might ingesting a high level of mercury by eating contaminated fish affect the nerve cells in our bodies? Which chemicals that are sometimes found in drinking water can affect the cells of the reproductive system? What are their possible effects? How can ultraviolet light from the sun affect the cells of the human eye? What types of toxins accumulate in human cells? What is their long-term effect on the body?

## C. Microbiology

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** assess the effects of microorganisms in the environment, and analyse ethical issues related to their use in biotechnology
- C1.1 assess some of the effects, both beneficial and harmful, of microorganisms in the environment (e.g., decomposers break down waste, E. coli in water systems poses a severe risk to human health) [AI, C]

*Sample issue:* Adding beneficial microorganisms to compost at large-scale composting facilities aids in the decomposition of organic waste, and produces high-quality compost in a reduced amount of time. However, the microorganisms can leach into groundwater and run off into nearby water systems, where they can harm other organisms.

## D. Genetics

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** evaluate some social, ethical, and environmental implications of genetic research and related technologies
- **D1.2** evaluate, on the basis of research, some of the effects of genetic research and biotechnology (e.g., genetically modified organisms [GMOs]) on the environment [IP, PR, AI, C] *Sample issue:* Farmed salmon can be genetically modified to reach market size in half the time of normal fish, and cost half as much to feed. However, entire populations of wild fish could be endangered by mating with bioengineered fish that are released into the wild, with disastrous consequences for the ecosystem.

*Sample questions:* What are the risks of growing genetically modified crops near fields where traditional crops are growing? Why have some countries banned genetically modified food crops? What impact has the introduction of herbicide-tolerant plants had on local environments? In what ways can insect-resistant plants both improve agriculture and hurt biodiversity? What are some of the possible effects on the environment of releasing bioengineered insects into the wild?

## F. Plants in the Natural Environment

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse the roles of plants in ecosystems, and assess the impact of human activities on the balance of plants within those ecosystems
- **F1.1** analyse, on the basis of research, and report on ways in which plants can be used to sustain ecosystems [IP, PR, AI, C]

*Sample issue:* Urban areas place intense pressure on ecosystems. Some of the negative impact can be reduced by cultivating urban forests. These green spaces filter air, water, and sunlight; reduce the "urban heat island" effect; provide habitat for wildlife; and increase biodiversity. However, many cities do not set aside enough land for green spaces because of pressures for urban development.

*Sample questions:* What are some of the environmental and economic benefits of building urban green spaces on large commercial buildings? What role do native plant species in marshes play in filtering organic waste? How have traditional Aboriginal seed maintenance and distribution practices helped sustain ecosystems in Aboriginal communities?

**F1.2** assess the positive and negative impact of human activities on the natural balance of plants (e.g., crop rotation, the use of fertilizers and herbicides, the introduction of new species) [AI, C] *Sample issue:* The greening of cities with a variety of native plant species helps to maintain biodiversity, restore natural landscapes, and provide food and habitat for local wildlife. However, many urban gardeners introduce non-native plants, which can compete with the native species and may not be hospitable to the local wildlife.

*Sample questions:* How has increased knowledge about plant growth been applied to improve the resistance of some plants to pests, and allowed those plants to be used in non-native areas? What are the positive and negative effects of such applications? In what ways does monoculture affect the natural balance of plants and the ecosystems they help sustain?

#### F2. Developing Skills of Investigation and Communication

- F2. investigate some of the factors that affect plant growth
- **F2.1** use appropriate terminology related to plants in the environment, including, but not limited to: *xylem, phloem, chloroplast, pistil, stamen, nitrogen fixation,* and *tropism* [C]
- **F2.3** investigate how chemical compounds (e.g., fertilizers, herbicides, pesticides) and physical factors (e.g., amount of sun and water, quality of soil, pH of soil) affect plant growth [PR, AI]
- **F2.4** investigate plant tropism by growing and observing plants in a variety of natural and humanmade environments [PR]

#### F3. Understanding Basic Concepts

- **F3.** demonstrate an understanding of the structure and physiology of plants and their role in the natural environment
- **F3.4** explain the various roles of plants in the sustainability of the natural environment (e.g., in nutrient cycles, in the water cycle, in erosion control, in wildlife habitats)

## **Biology, Grade 12, University Preparation (SBI4U)**

#### A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., scientific journalist, fisheries and wildlife officer, physician, infectious disease researcher, geneticist) and the education and training necessary for these careers

#### B. Biochemistry

#### B1. Relating Science to Technology, Society, and the Environment

**B1.1** analyse technological applications related to enzyme activity in the food and pharmaceutical industries (e.g., the production of dairy products; breadmaking; the use of enzymes to control reaction rates in pharmaceuticals) [AI, C]

*Sample issue:* Natural enzymes are used in many food production processes to speed up chemical reactions, which reduces water usage and energy consumption. Scientists are now designing and producing synthetic enzymes that will be more efficient catalysts and allow new technological applications in medicine and industry.

## C. Metabolic Processes

#### C1. Relating Science to Technology, Society, and the Environment

C1.1 analyse the role of metabolic processes in the functioning of and interactions between biotic and abiotic systems (e.g., specialized microbes and enzymes in biotechnological applications to treat wastewater in the pulp and paper industry; microbes and enzymes in bioremediation, such as in the cleanup of oil spills; energy transfer from producers to consumers) [AI, C] *Sample issue:* Most restaurants dispose of cooking oil and grease in an environmentally sound way to avoid contaminating municipal sewer systems. One method they can use is bioaugmentation, which uses microorganisms to metabolize oils into bacterial biomass, carbon dioxide, and water. However, this process can create unpleasant odours, which are undesirable in a food service setting.

*Sample questions:* How do symbiotic bacteria use metabolic processes to produce biohydrogen from food waste? How are microbes used in the bioremediation of contaminated groundwater sites? What is the relationship between the position of a particular species in the food chain and the energy required to maintain that species?

#### D. Molecular Genetics

#### D1. Relating Science to Technology, Society, and the Environment

D1.2 analyse, on the basis of research, some key aspects of Canadian regulations pertaining to biotechnology (e.g., current or potential legislation for mandatory DNA fingerprinting, human cloning, ownership of a genome, patenting of genetically modified organisms), and compare them to regulations from another jurisdiction [IP, PR, AI, C]
Sample issue: Modern biotechnologies, such as selective breeding, are regulated under Health Canada's Food and Drugs Act and the Canadian Environmental Protection Act. It is an ongoing challenge to ensure that our regulations keep up with advances in scientific knowledge and technologies, as well as with developments in other countries.
Sample questions: What is the role of the Canadian Food Inspection Act play in regulating biotechnology? Why was bovine growth hormone approved for use in dairy cattle in the United States but not in Canada? Why does Mexico have laws to limit the cultivation of genetically modified corn? ...

#### E. Homeostasis

#### E1. Relating Science to Technology, Society, and the Environment

- **E1.** evaluate the impact on the human body of selected chemical substances and of environmental factors related to human activity
- **E1.2** evaluate, on the basis of research, some of the human health issues that arise from the impact of human activities on the environment (e.g., the effects of synthetic estrogen compounds released into our water systems; the effects of leaching of compounds from plastic products into soil and water) [IP, PR, AI, C]

*Sample issue:* Human-produced biosolids are a low-cost source of nutrient-rich organic matter that is often spread on agricultural land rather than being sent for incineration or landfill disposal. Opponents of land application of biosolids are concerned about the potential health impact of heavy metals, bacteria, and drugs that may remain in the biosolids.

*Sample questions:* In what ways have mining, forestry, and hydroelectric developments affected the health of Aboriginal people in Northern Ontario? What are the links between air pollution and respiratory diseases such as asthma? What types of human activity have led to the thinning of the ozone? What human health conditions are related to this phenomenon? How can the dumping of chemicals down sinks and into storm sewers affect the incidence of skin conditions among swimmers at local beaches?

## F. Population Dynamics

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse the relationships between population growth, personal consumption, technological development, and our ecological footprint, and assess the effectiveness of some Canadian initiatives intended to assist expanding populations
- **F1.1** analyse the effects of human population growth, personal consumption, and technological development on our ecological footprint (e.g., the deforestation resulting from expanding development and demand for wood products causes the destruction of habitats that support biological diversity; the acidification of lakes associated with some industrial processes causes a decrease in fish populations) [AI, C]

*Sample issue:* Every day, millions of Canadians drive their vehicles to work, school, or entertainment venues, which creates greenhouse gases and consumes non-renewable resources. These behaviours, and many other consumption habits, all contribute to our ecological footprint. Many experts believe that we are consuming more resources each year than Earth can produce.

*Sample questions:* How does the Living Planet Index (LPI) help a nation to assess its ecological footprint and sustain its population? How does the planned obsolescence of electronic devices and appliances contribute to our ecological footprint? What impact has rapid population growth into the suburbs had on the local environment? What is the environmental impact of using packaged infant formula instead of breastfeeding a baby for the first six months of life?

**F1.2** assess, on the basis of research, the effectiveness of some Canadian technologies and projects intended to nourish expanding populations (e.g., the risks and benefits of growing genetically modified canola; some of the sustainable development projects funded by the Canadian International Development Agency [CIDA]) [IP, PR, AI, C]

*Sample questions:* How are Canadian programs helping to reverse the effects of land degradation and promote sustainable farming in semi-arid and dry sub-humid areas? What is Canada's role in the Flour Fortification Initiative, and how effectively does this initiative meet its goal of nourishing expanding populations?

#### F2. Developing Skills of Investigation and Communication

- **F2.** investigate the characteristics of population growth, and use models to calculate the growth of populations within an ecosystem;
- F2.3 determine, through laboratory inquiry or using computer simulations, the characteristics of population growth of two different populations (e.g., the different population cycles of a predator and its prey; the population cycles of two populations that compete for food; ...) [PR, AI, C]

#### F3. Understanding Basic Concepts

**F3.5** explain how a change in one population in an aquatic or terrestrial ecosystem can affect the entire hierarchy of living things in that system (e.g., how the disappearance of crayfish from a lake causes a decrease in the bass population of the lake; how the disappearance of beaver from an ecosystem causes a decrease in the wolf population in that ecosystem)

# CHEMISTRY, GRADES 11 AND 12

# Chemistry, Grade 11, University Preparation (SCH3U)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., pharmacist, forensic scientist, chemical engineer, food scientist, environmental chemist, occupational health and safety officer, water quality analyst, atmospheric scientist) and the education and training necessary for these careers

## B. Matter, Chemical Trends, and Chemical Bonding

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse the properties of commonly used chemical substances and their effects on human health and the environment, and propose ways to lessen their impact
- **B1.1** analyse, on the basis of research, the properties of a commonly used but potentially harmful chemical substance (e.g., fertilizer, pesticide, a household cleaning product, materials used in electronics and batteries) and how that substance affects the environment, and propose ways to lessen the harmfulness of the substance (e.g., by reducing the amount used, by modifying one of its chemical components) or identify alternative substances that could be used for the same purpose [IP, PR, AI, C]

*Sample issue:* Many commercial household cleaning products contain corrosive substances that can accumulate in the environment. There are now many "green" cleaners that do not contain these substances, although some of these products may not be as environmentally friendly as claimed.

*Sample questions:* Why is it more environmentally friendly to use latex rather than oilbased paint? Why should paint never be poured down a drain? What properties of some common pharmaceuticals allow them to stay in water systems and influence the growth and development of organisms? What are some ways in which this impact can be reduced?

**B1.2** evaluate the risks and benefits to human health of some commonly used chemical substances (e.g., chemical additives in foods; pharmaceuticals; cosmetics and perfumes; household cleaning products) [AI, C]

*Sample questions:* How can the use of non-stick cookware help reduce the amount of fat in our diet? What risks are associated with the use of such cookware? What are the risks and benefits of using sunscreens that contain PABA? What are the risks and benefits of using insect repellents that contain DEET?

## C. Chemical Reactions

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse chemical reactions used in a variety of applications, and assess their impact on society and the environment
- **C1.1** analyse, on the basis of research, chemical reactions used in various industrial processes (e.g., pulp and paper production, mining, chemical manufacturing) that can have an impact on the health and safety of local populations [IP, PR, AI, C]

*Sample issue:* Base metal smelting produces useful metals such as zinc, lead, copper, and nickel directly from their ores. However, during smelting, harmful compounds can be released into the environment, including cadmium, arsenic, sulphur dioxide, and mercury, all of which can endanger the health and safety of local populations.

*Sample questions:* What are some chemical reactions used in the manufacture of paper? How might the reactants or products of the pulp and paper production process affect the health of people living near the plant? In what ways might the leaching of chemicals from tailing ponds affect the water quality in a local community? In what ways do toxic chemical fires affect local communities?

**C1.2** assess the effectiveness of some applications of chemical reactions that are used to address social and environmental needs and problems [AI, C]

*Sample issue:* Scrubber systems are a group of air pollution control devices used by industry to remove or neutralize acid exhaust gases before they reach the atmosphere. Scrubber technologies help to reduce acid precipitation, but there are many different scrubbing techniques with varying levels of effectiveness in controlling acid gas emissions. *Sample questions:* How are chemical reactions used to remediate environments affected by chemical spills? How can tailing ponds be rehabilitated to lessen the effects of hazardous chemicals on plant populations? What types of chemical reactions can change a toxic chemical into one that is less toxic or non-toxic?

## D. Quantities in Chemical Reactions

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse processes in the home, the workplace, and the environmental sector that use chemical quantities and calculations, and assess the importance of quantitative accuracy in industrial chemical processes
- D1.1 analyse processes in the home, the workplace, and the environmental sector that involve the use of chemical quantities and calculations (e.g., mixing household cleaning solutions, calculating chemotherapy doses, monitoring pollen counts) [AI, C] *Sample questions:* ... How are carbon dioxide emissions calculated and why are they monitored?
- **D1.2** assess, on the basis of research, the importance of quantitative accuracy in industrial chemical processes and the potential impact on the environment if quantitative accuracy is not observed [IP, PR, AI, C]

*Sample issue:* Errors in quantitative accuracy have played a role in many industrial chemical disasters worldwide. Failing to adjust the quantities of chemicals needed to produce different batch sizes of a product have created runaway reactions, resulting in huge explosions. Such industrial accidents can have devastating short- and long-term effects on the environment.

*Sample questions:* Why is it important to use the correct salt-sand mix on highways during winter storms? Why is it important to correctly measure the chemicals used in water treatment plants? How might incorrect measurements affect the environment? How and why are environmental contaminants monitored in soil, water, and air around a chemical manufacturing plant?

## E. Solutions and Solubility

#### E1. Relating Science to Technology, Society, and the Environment

- **E1.** analyse the origins and effects of water pollution, and a variety of economic, social, and environmental issues related to drinking water
- **E1.1** analyse the origins and cumulative effects of pollutants that enter our water systems (e.g., landfill leachates, agricultural run-off, industrial effluents, chemical spills), and explain how these pollutants affect water quality [AI, C]

*Sample issue:* Golf courses use fertilizer and irrigation systems to sustain the vegetation. However, chemical substances, when combined with water, may run off and pollute local water systems.

*Sample questions:* What pollutants might be found in untreated wastewater from a chicken farm or a poultry-processing plant? How do leachates from old landfill sites enter our water system? How might they affect the water quality of local streams? What are some of the sources and effects of mercury in water systems? What impact might this contaminant have on Aboriginal communities that depend on fishing as a source of food?

E1.2 analyse economic, social, and environmental issues related to the distribution, purification, or use of drinking water (e.g., the impact on the environment of the use of bottled water) [AI, C] *Sample issue:* In developing countries, thousands of people, many of them children, die every year from drinking contaminated water. Many of these countries cannot afford to build water treatment plants. In North America, where safe water is generally available, we spend millions of dollars on bottled water, draining sources of fresh water and challenging waste-disposal systems.

*Sample questions:* What are the economic costs of building, maintaining, and monitoring waterpurification plants? What are the social and environmental costs if these plants are not properly maintained and monitored? How effective are municipal wastewater treatment processes at removing pharmaceuticals such as hormones and antibiotics from our drinking water? What public health concerns are associated with the consumption of water bottled in plastic containers?

#### E3. Understanding Basic Concepts

**E3.4** identify, using a solubility table, the formation of precipitates in aqueous solutions (e.g., the use of iron or aluminum compounds to precipitate and remove phosphorus from wastewater)

## F. Gases and Atmospheric Chemistry

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse the cumulative effects of human activities and technologies on air quality, and describe some Canadian initiatives to reduce air pollution, including ways to reduce their own carbon footprint
- **F1.1** analyse the effects on air quality of some technologies and human activities (e.g., smelting; driving gas-powered vehicles), including their own activities, and propose actions to reduce their personal carbon footprint [AI, C]

*Sample issue:* Gas-powered lawnmowers cut grass quickly and efficiently, but they emit greenhouse gases. However, there are several alternatives, including electric or push mowers or replacing lawn with a naturalized garden.

*Sample questions:* In what ways does our consumption of products imported from distant countries affect our carbon footprint? How might "eat local–buy local" initiatives help to reduce our carbon footprint? How effectively does the use of digital communications for business reduce our carbon footprint?

F1.2 assess air quality conditions for a given Canadian location, using Environment Canada's Air Quality Health Index, and report on some Canadian initiatives to improve air quality and reduce greenhouse gases (e.g., Ontario's Drive Clean program to control vehicle emissions) [AI, C]

*Sample issue:* Historically, mining and smelting polluted the air, land, and water around Sudbury, Ontario. More recently, as a result of government regulations, industry has significantly reduced emissions, leading to an improvement in air quality and reversal in the acidification of local waterways.

*Sample questions:* How effective has Ontario's Drive Clean program been in reducing greenhouse gas emissions in the province? What are some industrial and geographic factors that might make air quality in some communities very different from that in others? What are some municipal governments doing to improve local air quality? How can public transit initiatives help improve air quality? What are the limitations of such initiatives?

#### F3. Understanding Basic Concepts

F3.1 identify the major and minor chemical components of Earth's atmosphere

# Chemistry, Grade 12, University Preparation (SCH4U)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., food and drug analyst, chemical safety officer, nurse practitioner, consumer protection specialist, metallurgy technologist, environmental and waste management technician, geochemist) and the education and training necessary for these careers

## B. Organic Chemistry

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** assess the social and environmental impact of organic compounds used in everyday life, and propose a course of action to reduce the use of compounds that are harmful to human health and the environment
- **B1.1** assess the impact on human health, society, and the environment of organic compounds used in everyday life (e.g., polymers, nutritional supplements, food additives, pharmaceuticals, pesticides) [AI, C]

*Sample issue:* Organic solvents can dissolve many substances such as paint, oil, and grease. They are used to produce plastics, dyes, detergents, textiles, and pharmaceuticals. However, workers exposed to organic solvents may experience long-term effects on their health. Also,

solvents from industrial spills and leaks can leach into soil and groundwater, posing serious health and environmental risks.

**B1.2** propose a personal course of action to reduce the use of compounds that are harmful to human health and the environment (e.g., weed lawns by hand rather than using herbicides, use cloth bags for shopping to reduce the number of plastic bags in landfill sites, choose fuel-efficient or hybrid vehicles to reduce fossil fuel emissions) [AI, C]

*Sample issue:* Many Ontario communities have banned the use of pesticides. As a consequence of these by-laws, many homeowners are seeking alternative ways of controlling weeds in their lawns.

*Sample questions:* How long does it take for plastic garbage bags to decompose in a landfill site? What biodegradable materials can be used to replace polystyrene as a packaging material? What are some technologies and features that are making new cars more fuel-efficient?

## C. Structure and Properties of Matter

## C1. Relating Science to Technology, Society, and the Environment

- **C1.** assess the benefits to society and evaluate the environmental impact of products and technologies that apply principles related to the structure and properties of matter
- **C1.2** evaluate the benefits to society, and the impact on the environment, of specialized materials that have been created on the basis of scientific research into the structure of matter and chemical bonding (e.g., bulletproof fabric, nanotechnologies, superconductors, instant adhesives) [AI, C]

*Sample issue:* Nanoparticles have many potential applications in medicine, including the improvement of drug delivery systems, the enhancement of diagnostic images, and use in surgical robotics, all of which could improve the effectiveness of our health care system. However, nanoparticle contamination can have a negative effect on the environment. *Sample questions:* ... What properties of disposable diapers enable them to hold so much liquid? What impact has the widespread use of such diapers had on the environment? ...

## D. Energy Changes and Rates of Reaction

## D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse technologies and chemical processes that are based on energy changes, and evaluate them in terms of their efficiency and their effects on the environment
- **D1.1** analyse some conventional and alternative energy technologies (e.g., fossil fuel-burning power plants, hydro-powered generators, solar panels, wind turbines, fuel cells), and evaluate them in terms of their efficiency and impact on the environment [AI, C] *Sample issue:* The cooling of homes and commercial buildings in summer requires more energy than heating in the winter at peak times. Brownouts are more likely in summer than in winter. However, new technologies use deep lake water cooling as an alternative to conventional air conditioning systems in office towers. This significantly reduces energy use and its environmental impact.

*Sample questions:* What proportion of Ontario's energy needs is served by solar and wind technologies? What are the pros and cons of expanding the availability of these technologies? What types of chemical reactions occur in different types of fuel cells? What are the advantages and disadvantages, in terms of efficiency and environmental impact, of using corn to produce ethanol fuel?

**D1.2** analyse the conditions (e.g., temperature, pressure, presence of a catalyst) required to maximize the efficiency of some common natural or industrial chemical reactions (e.g., decomposition, combustion, neutralization), and explain how the improved efficiency of the reaction contributes to environmental sustainability [AI, C]

*Sample issue:* Bleaches such as hydrogen peroxide and chlorine are used when fibres are processed into paper or textiles. Concentrations of these substances can harm the environment, but if enzymes are added to these processes as biocatalysts, fewer chemicals are needed, less energy is consumed, and there is less environmental impact.

*Sample questions:* How can you increase the rate of decomposition in a home composter? What can be done to improve the efficiency of an automobile that runs entirely on fossil fuels? Why is just a very small quantity of catalyst required in industrial processes? Why is the ozone layer still deteriorating despite the banning of chlorofluorocarbons (CFCs)?

## E. Chemical Systems and Equilibrium

#### E1. Relating Science to Technology, Society, and the Environment

- E1.1 analyse the optimal conditions for a specific chemical process related to the principles of equilibrium that takes place in nature or is used in industry (e.g., the production of sulphuric acid, electrolyte balance in the human body, sedimentation in water systems) [AI, C] *Sample issue:* The principle of dynamic equilibrium is used in industrial processes to maximize the concentration of products and minimize leftover reactants. Industrial chemists determine ideal pressure and temperature conditions, and proper catalysts, so that fewer materials and less energy are used.
- **E1.2** assess the impact of chemical equilibrium processes on various biological, biochemical, and technological systems (e.g., remediation in areas of heavy metal contamination, ...) [AI, C]

## F. Electrochemistry

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse technologies and processes relating to electrochemistry, and their implications for society, health and safety, and the environment
- **F1.1** assess, on the basis of research, the viability of using electrochemical technologies as alternative sources of energy (e.g., fuel cells for emergency power generation or as power sources in remote locations), and explain their potential impact on society and the environment [IP, PR, AI, C]

*Sample issue:* Hydrogen fuel cells use hydrogen as the fuel and oxygen as the oxidant, and produce water, rather than environmentally harmful greenhouse gases, as waste. Although some cars run on such cells, practical problems must be resolved before this source of energy is commonly used in the transportation sector.

*Sample questions:* What is the capacity of a standard rechargeable battery before it has to be recharged? What methods should be used to dispose of depleted batteries? ...

**F1.2** analyse health and safety issues involving electrochemistry (e.g., corrosion of metal pipes in drinking water systems) [AI, C]

*Sample questions:* What health and safety hazards are associated with waste generated by electroplating companies? ... What are some of the toxic substances that can escape from electronic waste into the environment? What are the potential effects of these poisons on our health?

# Chemistry, Grade 12, College Preparation (SCH4C)

## A. Scientific Investigation Skills and Career Exploration

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., environmental technologist, pharmacy technician, electroplating technician, green building or renewable energy technician, veterinary technician, biochemical technologist) and the education and training necessary for these careers

## B. Matter and Qualitative Analysis

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** evaluate the effects of chemical substances on the environment, and analyse practical applications of qualitative analysis of matter
- B1.1 evaluate the risks and benefits to the environment of some commonly used chemical substances (e.g., substances used in fireworks, fire extinguishers, "green" cleaning products) [AI, C]

*Sample issue:* Numerous synthetic fertilizers are available for residential lawns and gardens, all of which claim good results based on their chemical composition. Although these fertilizers provide nutrients that are essential for healthy plants and soil, they may also contain harmful chemicals that can pose risks to the environment.

*Sample questions:* What chemical substances can be removed from drinking water by household water purification systems? What impact do chemical substances used in drive-through car washes have on the local environment? Why are packing chips that are made from cornstarch better for the environment than those made from polystyrene?

B1.2 analyse, on the basis of research, applications of qualitative analysis of matter in various fields of endeavour (e.g., ... in the manufacture of food products) [IP, PR, AI, C]Sample questions: What substances do environmental chemists test for in the soil of industrial sites that have been rezoned for residential use? What different chemical compounds are used to create some of the desired effects in fireworks? What types of particulate matter do air quality testers measure when there is the potential for a smog alert?

## C. Organic Chemistry

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** evaluate the impact on society, human health, and the environment of products made using organic compounds
- **C1.1** identify various materials and products used in everyday life that are made from organic compounds (e.g., synthetic fabrics, drugs, pesticides, cosmetics, organic solvents, car parts, artificial hearts), and assess the benefits of those products for society, as well as the health hazards they pose [AI, C]

*Sample questions:* ... What are the benefits, and potential health risks, to farmers of spraying pesticides on their crops? ...

**C1.2** research a useful product made from one or more organic substances (e.g., CDs, made from crude oil), and assess the environmental impact of the production, use, and disposal of the product [IP, PR, AI, C]

*Sample issue:* We depend on plastics in every area of our lives, from food packaging to construction materials to DVDs. However, the manufacture of plastics involves the release of chemical pollutants and greenhouse gases into the environment, and huge quantities of plastic trash are now being found in our oceans.

*Sample questions:* What is the environmental impact of the production, use, and disposal of plastic water bottles? What impact does the vulcanization of rubber have on the environment? What are the risks and benefits to the environment of the production of synthetic fibres for the textile industry?

## D. Electrochemistry

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse technological applications or processes relating to oxidation-reduction reactions, and assess their impact on the environment
- **D1.1** analyse, on the basis of research, a technological application that is based on the oxidationreduction (redox) reaction that occurs in galvanic cells (e.g., in cardiac pacemakers, batteries, electroplating) [IP, PR, AI, C]

*Sample issue:* Hydrogen fuel cells use a redox reaction that produces water, rather than environmentally harmful greenhouse gases, as waste. Although some cars could run on fuel cells, practical problems, such as the storage and cost of producing hydrogen, currently limit the usefulness of this technology in the transportation sector.

**D1.2** analyse, on the basis of research, the causes of metal corrosion, and assess the environmental impact of some techniques used to protect metals from corrosion (e.g., rustproofing, painting, cathodic protection, galvanization) [IP, PR, AI, C]

*Sample issue:* The maintenance of large spanbridges over salt water has always been challenging, because the salt water spray causes corrosion. Newer bridges use support structures that have been protected from corrosion, but long-term studies have not been done on the impact of these methods on the environment.

*Sample questions:* What are some of the techniques used to protect metals from corrosion? What are the benefits and risks to the environment of the electroplating of metals? ...

## E. Chemical Calculations

#### E1. Relating Science to Technology, Society, and the Environment

- E1. analyse processes in the home, the workplace, or the environmental sector that use chemical quantities and calculations, and assess the importance of accuracy in chemical calculations
- **E1.1** analyse processes in the home, the workplace, or the environmental sector that require an understanding of accurate chemical calculations (e.g., ... testing water quality in a public pool) [AI, C]

*Sample issue:* Farmers use fertilizers that contain nitrogen and phosphorus to fertilize their crops. Although these nutrients are needed by the crops for growth, too much fertilizer can harm crops and potentially run off into water systems and contribute to the eutrophication of ponds and lakes.

*Sample questions:* What are the potential effects of adding too much or too little chlorine to drinking water at a water purification plant or private well? ...

## F. Chemistry in the Environment

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** evaluate the importance of government regulations, scientific analyses, and individual actions in improving air and water quality, and propose a personal plan of action to support these efforts
- **F1.1** evaluate, on the basis of research, the effectiveness of government initiatives or regulations (e.g., the Great Lakes Action Plan), and the actions of individuals (e.g., use of public transportation), intended to improve air and water quality, and propose a personal action plan to support these efforts [IP, PR, AI, C]

*Sample issue:* The Yellow Fish Road is a nationwide program in which volunteers paint yellow fish symbols by storm drains to remind people that material poured into the drains flows directly into our local waterways, and that they should not pour hazardous substances down the drains. However, not everyone is aware of the symbolism of the fish, so the program may not be as effective as it could be.

*Sample questions:* How can your personal actions influence the air or water quality in your local area? Why have government initiatives, such as mass transit in urban areas, not been readily accepted by everyone? What can be done to encourage more people to use mass transit? What plans do local conservation authorities have to improve water quality in lakes, rivers, and streams in your local area? How effective are these plans?

**F1.2** evaluate the importance of quantitative chemical analysis in assessing air and water quality (e.g., the use of Environment Canada's Air Quality Index to determine when smog advisories need to be issued; systems to monitor the quality of drinking water), and explain how these analyses contribute to environmental awareness and responsibility [AI, C]

*Sample issue:* Traditional stationary monitoring stations may not be able to supply sufficient data to reflect the differences in air quality from one location to another. However, researchers in Ontario now use mobile air quality monitors to measure vehicle emissions in high traffic areas and "hot spots" where vehicles idle for long periods of time. These data can be used to develop more precise air quality indices.

*Sample questions:* How can increased monitoring and reporting of air and water pollution influence the actions of individuals? Why are present chemical analyses not sufficient to detect and quantify all organic and inorganic contaminants in the water supply? How does WHMIS aid in minimizing damage to the environment and ensuring the safety of individuals in a case of an industrial accident?

#### F2. Developing Skills of Investigation and Communication

**F2.1** use appropriate terminology related to chemical analysis and chemistry in the environment, including, but not limited to: *ozone, hard water, titration, pH, ppm*, and *ppb* [C]

#### F3. Understanding Basic Concepts

- **F3.** demonstrate an understanding of chemical reactions that occur in the environment as a result of both natural processes and human activities
- F3.1 identify major and minor chemical components of Earth's atmosphere
- **F3.2** identify gases and particulates that are commonly found in the atmosphere, and explain how they affect air quality (e.g., greenhouse gases, tropospheric and stratospheric ozone, carbon monoxide, chlorofluorocarbons, soot)
- **F3.5** identify the gas emissions that are the major contributors to acid precipitation, and explain the steps in the formation of acid rain

# EARTH AND SPACE SCIENCE, GRADES 11 AND 12

# Earth and Space Science, Grade 12, University Preparation (SES4U)

## C. Planetary Science (Science of the Solar System)

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse political, economic, and environmental issues related to the exploration and study of the solar system, and how technology used in space exploration can be used in other areas of endeavour
- **C1.1** analyse political considerations related to, and economic and environmental consequences (actual and/or potential) of, exploration of the solar system (e.g., ... the ability to monitor environmental conditions from space) [AI, C]

*Sample issue:* As we deplete Earth's natural resources, researchers are studying the feasibility of supplementing those resources through space mining. Asteroids and other bodies in the solar system are potentially rich sources of minerals and other valuable substances, but their exploitation raises a range of legal, economic, environmental, and technological questions.

**C1.2** analyse, on the basis of research, a specific technology that is used in space exploration and that has applications in other areas of research or in the environmental sector (e.g., Canadian satellites and robotics, spacecraft technologies, ground base and orbital telescopes, devices to mitigate the effects of the space environment on living organisms), and communicate their findings [IP, PR, AI, C]

*Sample issue:* The Canadarms were developed for space shuttle missions and the International Space Station. However, the robotic arms have other applications, including inspecting and cleaning up hazardous substances, servicing nuclear power plants, repairing pipelines on the ocean floor, mining in areas too inhospitable for humans, and conducting remote or microsurgery.

*Sample questions:* How are Landsat and radar from space shuttles used in archaeological research, costal studies, and the monitoring of natural disasters? How can technologies developed for space travel be used in water purification and waste treatment on Earth? How is remote sensing used to monitor atmospheric changes, such as changes in the ozone layer? How is remote sensing used to monitor changes to ecosystems?

#### D. Recording Earth's Geological History

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse, with reference to geological records, the relationship between climate, geology, and life on Earth, and evaluate contributions to our understanding of changes in Earth systems over geological time
- **D1.1** analyse the relationship between climate and geology, and, using geological records, assess the impact of long-term climate change on life on Earth [AI, C]

*Sample issue:* Geological records provide scientists with important evidence about climate change and changes in life on Earth. Not all scientists agree about the significance and meaning of geological evidence, however, and there is disagreement about the accuracy of some dating techniques.

*Sample questions:* What do changes in atmospheric conditions recorded throughout the geological record tell us about past and present environmental conditions? How have the patterns of ocean currents changed as a result of continental drift, and how has this affected Earth's climate? What environmental and evolutionary changes are seen from the Devonian period to the Carboniferous period?

**D1.2** evaluate the significance of contributions, including Canadian contributions, to our understanding of geological time and of changes in Earth systems over time (e.g., the contributions of Raymond A. Price; the Canadian contribution to the development of Landsat) [AI, C]

*Sample questions:* What contributions have Canadian scientists made to the study of sediment and glacial records, and how have these contributions increased our understanding of long-term changes in Earth systems? What role have Canadians played in the development or use of technological applications such as Radarsat, and how have these applications contributed to our knowledge of Earth systems?

#### D2. Developing Skills of Investigation and Communication

**D2.7** investigate interactions over time between physical, chemical, and biological processes, and explain how they have affected environmental conditions throughout Earth's geological history (e.g., the impact of increasing amounts of atmospheric oxygen on stromatolites; the impact of increasing amounts of atmospheric carbon dioxide on global warming; the influence of plants on the water cycle, other life forms, the atmosphere, weathering, and erosion) [PR, AI, C]

#### **D3.** Understanding Basic Concepts

**D3.2** describe various kinds of evidence that life forms, climate, continental positions, and Earth's crust have changed over time (e.g., evidence of mass extinction, of past glaciations, of the existence of Pangaea and Gondwanaland)

## E. Earth Materials

#### E1. Relating Science to Technology, Society, and the Environment

- **E1.** analyse technologies used to explore for and extract Earth materials, and assess the economic and environmental impact of the exploitation of such materials
- E1.2 analyse technologies and techniques used to explore for and extract natural resources, and assess their actual or potential environmental repercussions [AI, C] *Sample issue:* Mountaintop removal is a coal-mining technique proposed for use near the headwaters of the Flathead River in British Columbia. Mining companies favour the technique because the coal can be removed more cheaply than in conventional mining. However, the process devastates the local environment, causing erosion, loss of terrestrial and aquatic habitat, and air and water pollution.

*Sample questions:* Why has there been so much protest against the proposed Mackenzie Valley pipeline in the Canadian North? What mining techniques have the greatest and the least impact on local water systems? ... What impact has the extraction of oil from the Alberta oil sands had on the local environment?

#### E2. Developing Skills of Investigation and Communication

**E2.7** investigate a geological setting in their local area (e.g., a river/stream bed or lakeshore; a rock outcrop), and identify and classify rock samples collected from that area [PR, AI]

#### E3. Understanding Basic Concepts

**E3.5** describe the role of Earth materials in the safe disposal of industrial and urban waste and toxic materials (e.g., the low permeability of clays makes them suitable material for barriers in waste disposal sites)

#### F. Geological Processes

#### F1. Relating Science to Technology, Society, and the Environment

**F1.3** analyse the relationship between human activities and various geological structures and processes (e.g., the relationship between the location of deposits and the extraction/use of resources; the relationship between urban development and/or building codes and the probability of earthquakes or volcanic activity), and propose ways in which the relationships can be effectively or sustainably managed [AI, C]

*Sample questions:* What impact do stream erosion and alluvial deposits have on agriculture along a river? What are some ways in which humans can exploit mineral resources without depleting them or harming the environment? What negative effects can construction projects have on surface water or groundwater systems? How can these effects be reduced?

# ENVIRONMENTAL SCIENCE, GRADES 11 AND 12

# Environmental Science, Grade 11, University/College Preparation (SVN3M)

#### A. Scientific Investigation Skills and Career Exploration

#### A1. Scientific Investigation Skills

A1.2 select appropriate instruments (e.g., probes, moisture meters, rain gauges), and materials (e.g., water-sampling kits, soil-testing kits), and identify appropriate methods, techniques, and procedures, for each inquiry

#### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., organic chemist, landscaper, conservationist, air quality technician, personal support worker, environmental lawyer) and the education and training necessary for these careers

## B. Scientific Solutions to Contemporary Environmental Challenges

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse social and economic issues related to an environmental challenge, and how societal needs influence scientific endeavours related to the environment
- **B1.1** analyse, on the basis of research, social and economic issues related to a particular environmental challenge (e.g., overfishing, deforestation, acid rain, melting of the polar ice cap) and to efforts to address it [IP, PR, AI, C]

*Sample issue:* Greenhouse gas emissions from motor vehicles are a major contributor to global warming. The use of ethanol and other biofuels in motor vehicles reduces these emissions. However, diverting crops from food production to fuel production can increase prices and decrease the supply of food.

*Sample questions:* What are some of the social and economic challenges associated with cleaning up and conserving fresh water supplies? What are some alternative energy sources? What social and economic challenges are associated with their development? In what ways can consuming locally grown foods help the local economy, society, and the environment?

B1.2 analyse ways in which societal needs or demands have influenced scientific endeavours related to the environment (e.g., the development of drought- and pest-resistant crops to address the rising global need for food; research into alternative energy sources in response to demands to address the impact on climate change of burning fossil fuels) [AI, C] *Sample issue:* Because of unstable oil prices and the environmental damage caused by motor vehicle emissions, many consumers have been demanding more environmentally friendly vehicles. As a result, car companies are devoting greater resources towards the development of more fuel-efficient engines, hybrid vehicles, and cars powered by electricity or other types of energy.

*Sample questions:* How and why do demands by environmentally conscious consumers affect the types of products developed by corporations? What impact have the energy needs of remote communities had on innovations in the development of off-grid energy sources? What types of products have been developed in response to the health threats resulting from ozone depletion?

#### **B2.** Developing Skills of Investigation and Communication

- **B2.** investigate a range of perspectives that have contributed to scientific knowledge about the environment, and how scientific knowledge and procedures are applied to address contemporary environmental problems
- **B2.1** use appropriate terminology related to the application of scientific knowledge and procedures to environmental issues, including, but not limited to: *fact*, *inference*, *paradigm*, *objectivity*, and *causality* [C]
- **B2.2** plan and conduct a laboratory inquiry to test a scientific procedure used to address a contemporary environmental problem (e.g., an oil spill, acid precipitation) [IP, PR, AI]
- **B2.3** investigate, through research or using case studies or computer simulation, how scientific knowledge and procedures are applied to address a particular contemporary environmental issue (e.g., scientific data on the needs and habits of endangered species are used to develop plans to protect threatened species; life-cycle assessments are conducted to determine the total environmental impact of a consumer product) [PR, AI]

- **B2.4** use a research process to investigate how evidence, theories, and paradigms reflecting a range of perspectives have contributed to our scientific knowledge about the environment (e.g., with respect to debates about climate change; regarding the relationship between the cod moratorium and seal populations in Atlantic Canada), and communicate their findings [IP, PR, AI, C]
- **B2.5** use a research process to locate a media report on a contemporary environmental issue (e.g., climate change, melting of the polar ice cap, deforestation), summarize its arguments, and assess their validity from a scientific perspective [IP, PR, AI, C]

#### **B3.** Understanding Basic Concepts

- **B3.** demonstrate an understanding of major contemporary environmental challenges and how we acquire knowledge about them
- **B3.1** identify some major contemporary environmental challenges (e.g., global warming, acid precipitation), and explain their causes (e.g., deforestation, carbon and sulfur emissions) and effects (e.g., desertification, the creation of environmental refugees, the destruction of aquatic and terrestrial habitats)
- **B3.2** describe how scientists use a variety of processes (e.g., environmental impact assessments, environmental scans) to solve problems and answer questions related to the environment
- **B3.3** explain how new evidence affects scientific knowledge about the environment and leads to modifications of theory and/or shifts in paradigms (e.g., the impact of evidence of the effects of carbon dioxide emissions on theories of global warming)
- **B3.4** explain how an environmental challenge has led to advances in science or technology (e.g., scrubbers on smokestacks to decrease sulphur dioxide emissions, hybrid cars)
- **B3.5** describe a variety of human activities that have led to environmental problems (e.g., burning fossil fuels for transportation or power generation; waste disposal) and/or contributed to their solution (e.g., the development of renewable sources of energy; programs to reduce, reuse, and recycle)

## C. Human Health and the Environment

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse initiatives, both governmental and non-governmental, that are intended to reduce the impact of environmental factors on human health
- **C1.1** analyse grassroots initiatives that are intended to reduce the impact of environmental factors on human health (e.g., community cleanup of local aquatic or terrestrial environments; class action lawsuits against major polluters) [AI, C]

*Sample issue:* People from the Grassy Narrows Reserve in Northern Ontario were experiencing chronic health problems. They commissioned a study, which found that many animals and fish that were part of a traditional diet were contaminated with mercury and heavy metals. Guidelines were proposed to limit consumption of the affected animals, and thereby improve people's health.

*Sample questions:* Are there any grassroots groups in your community concerned with the state of the environment and its impact on human health? What types of actions do they take? What action has been taken by the Bulkley Valley and Lakes District Airshed Management Society to help reduce the impact of particulate matter in air on the health of local people? What is the Yellow Fish Road program, and how does it try to reduce the number of contaminants in local water sources?

C1.2 evaluate the effectiveness of government initiatives that are intended to reduce the impact of environmental factors on human health (e.g., Ontario Ministry of the Environment smog advisories; provincial laws regulating drinking water; WHMIS regulations on hazardous material) [AI, C]

*Sample questions:* Why does the Ontario Ministry of the Environment issue smog advisories? Why are there concerns about the water quality in many First Nations communities in Canada? Why did the water treatment plant in Kashechewan, in Northern Ontario, fail to protect the community from contaminated water?

#### **C2.** Developing Skills of Investigation and Communication

- C2. investigate environmental factors that can affect human health, and analyse related data
- **C2.1** use appropriate terminology related to human health and the environment, including, but not limited to: *contaminants, heavy metals, air pollution,* and *pesticide* [C]
- **C2.2** analyse longitudinal data to determine the impact of various environmental factors that affect human health (e.g., air temperature, atmospheric greenhouse gases, contaminants in drinking water) [AI]
- **C2.3** investigate, through laboratory inquiry or field study, water samples from natural and disturbed environments (e.g., tap water; pond, river, or lake water from disturbed and undisturbed areas; water from an outdoor pool), and analyse the resulting data [PR, AI]
- C2.4 analyse, on the basis of a laboratory inquiry, computer simulation, or field study, particulate matter in air (e.g., an air sample from an exhaust pipe or air vent, particles in a filter that cigarette smoke has passed through, particles caught on sticky paper set up in an open area) [PR, AI]
- **C2.5** investigate health standards for buildings and methods to retrofit or otherwise improve structures to reduce their negative impact on human health (e.g., the use of materials that do not contain volatile organic compounds, the use of biological air and water filters), and communicate their findings [PR, C]

#### **C3.** Understanding Basic Concepts

- **C3.** demonstrate an understanding of various environmental factors that can affect human health, and explain how the impact of these factors can be reduced
- **C3.1** identify the main pollutants and environmental contaminants that can affect human health (e.g., air pollutants such as sulfur dioxide, nitrous oxide, and particulates; noise pollution; heavy metals such as lead and mercury; DDT; PCBs; mould; volatile organic compounds such as acetone and chlorinated solvents)
- **C3.2** describe the effects of a variety of environmental factors on human health (e.g., air pollutants are associated with disorders such as asthma; consumption of fish products from contaminated water may lead to increased levels of heavy metals in the human body; the thinning of the ozone layer may lead to increased incidence of skin cancer; noise pollution may impair hearing)
- **C3.3** describe ways in which a variety of environmental contaminants (e.g., volatile organic compounds in paints, carpets, and cleaning products; mercury in fish; E. coli in the water at public beaches) can enter the human body (e.g., inhalation, ingestion, absorption)
- **C3.4** describe measures that can reduce exposure to environmental contaminants (e.g., wearing protective clothing or sunscreen, or remaining indoors during peak UV hours, to prevent exposure to ultraviolet rays; avoiding the use of paints, solvents, and cleaning agents that contain volatile organic compounds)

**C3.5** identify a variety of populations who are particularly vulnerable to the effects of environmental factors, and explain why these populations are vulnerable (e.g., seniors are vulnerable to extreme temperatures because the ability to regulate body temperature diminishes as people age; Inuit who follow a traditional diet are vulnerable to contaminants that accumulate in the fatty tissue of sea mammals because these animals are their main food source)

## D. Sustainable Agriculture and Forestry

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** evaluate the impact of agricultural and forestry practices on human health, the economy, and the environment
- **D1.1** evaluate, on the basis of research, a variety of agricultural and forestry practices (e.g., companion planting, biological pest control, the use of genetically modified seed, forest fire control) with respect to their impact on the economy and the environment (e.g., the use of nematodes eliminates crop damage from grubs, thus contributing to better harvests, while reducing the use of toxic chemical pesticides; under some circumstances, forest thinning can help prevent or reduce the seriousness of forest fire, and its economic and environmental consequences) [IP, PR, AI, C]

*Sample issue:* The recycling of animal waste as fertilizer is economical and is generally considered an environmentally sustainable practice. However, care must be taken that the manure does not run off into water sources, as it can contaminate them with E. coli and other bacteria.

*Sample questions:* What are the economic and environmental pros and cons of growing crops that are genetically modified to be herbicide resistant? Why is organic produce more expensive than conventionally grown produce? What are the economic advantages of monoculture, both on farms and in forestry operations? How can monocultural practices lead to environmental degradation? What types of forestry practices can be implemented to maintain features of old-growth ecosystems while harvesting trees?

**D1.2** evaluate, on the basis of research, the impact, including the long-term impact, of agricultural and forestry practices on human health (e.g., the use of chemical fertilizers and pesticides; the use of growth hormones and antibiotics in livestock; the use of feed containing animal by-products; the clear-cutting of forests) [IP, PR, AI, C]

*Sample issue:* The toxins in pesticides can accumulate in the human body over the years. Although the immediate effects of exposure to pesticide may be unnoticeable, the chemicals build up in body fat and organs and can lead to a variety of cancers.

*Sample questions:* What was the source of contamination of well water in Walkerton, Ontario, in 2000? What are the immediate and long-term health effects of exposure to E. coli? What is known about the long-term effects of consuming genetically modified food? What impact could the spraying of forest canopies to prevent gypsy moth infestations have on human health?

#### D2. Developing Skills of Investigation and Communication

- **D2.** investigate conditions necessary for plant growth, including the soil components most suitable for various species, and various environmentally sustainable methods that can be used to promote growth
- **D2.1** use appropriate terminology related to sustainable agriculture and forestry, including, but not limited to: *bioremediation*, *crop rotation*, *companion planting*, *organic product*, *humus*, *compost*, *mulch*, *silviculture*, and *naturalization* [C]

- **D2.2** test samples of a variety of types of soil (e.g., clay, loam, commercial potting soil) to determine their nutrients and composition (e.g., pH; the percentage of nitrogen, phosphorus, and potassium; porosity; moisture) [PR, AI]
- **D2.3** use an inquiry process to investigate the nutrients in and composition of a variety of compost samples (e.g., nutrients such as nitrogen, phosphorous, potassium; composition with respect to pH, porosity), and analyse the findings to determine appropriate uses for each sample [IP, PR, AI]
- **D2.4** prepare a soil mixture (e.g., using compost, manure, vermiculite, black earth, top soil, peat moss, loam, and/or sand) for a selected plant species, based on analysis of the criteria for optimal growth for that species (e.g., cactus, tomato plants, wheat, jack pine) [PR, AI]
- **D2.5** use a research process to investigate environmentally sustainable methods of managing and maintaining healthy and productive agricultural zones and forests (e.g., companion planting, crop rotation, selective tree-harvesting, planting a diverse canopy) [IP, PR]
- **D2.6** design a landscaping project for their local area (e.g., a rooftop garden, a plot in a community garden, a riparian restoration), taking into account local conditions (e.g., zone hardiness, soil composition, amount of sunlight and rainfall), and propose a course of action to ensure the sustainability of the project and its healthy interaction with the surrounding environment (e.g., companion gardening, the use of compost to fertilize the soil, the use of native plants, the inclusion of plants that attract birds or butterflies) [IP, PR, AI]

#### **D3.** Understanding Basic Concepts

- **D3.** demonstrate an understanding of conditions required for plant growth and of a variety of environmentally sustainable practices that can be used to promote growth
- **D3.4** explain different ecologically sound practices for improving and maintaining soil structure and fertility (e.g., crop rotation, fallowing, adding compost or manure, inter-seeding grains and legumes, mulching, tree harvesting using a shelterwood system)
- **D3.5** explain agricultural techniques and forestry practices that aim to maintain both biodiversity and long-term productivity (e.g., growing a variety of species, inter-planting crops, planting native and heritage varietals instead of hybrids or transgenic species, saving seeds, maintaining some older trees and snags for animal habitat)
- **D3.6** describe sustainable water-management practices in agricultural and forestry settings (e.g., regulating the frequency of watering, planting species suited to local precipitation levels, limiting run-off and erosion)

## E. Reducing and Managing Waste

#### E1. Relating Science to Technology, Society, and the Environment

- E1. analyse economic, political, and environmental considerations affecting waste management strategies
- E1.1 analyse, on the basis of research, the impact of economic and political considerations on the development of waste management practices or strategies (e.g., incineration of hazardous waste; biological filtration and reuse of greywater; user fees for garbage disposal; vermicomposting) [IP, PR, AI, C]

*Sample issue:* The use of landfill sites has been a long-time strategy for disposal of garbage. As local sites fill up, some municipalities are shipping their garbage to distant sites. This strategy is often politically unpopular and, with high fuel prices, is increasingly expensive, so local politicians are under pressure to implement new strategies.
*Sample questions:* What are the costs of recycling compared to the costs of using landfill sites or incinerating garbage? Why is garbage incineration a controversial political issue? Why do municipal recycling programs recycle only a limited number of items?

E1.2 evaluate the short- and long-term impact on the environment of a specific type of waste (e.g., waste products from animal farming; plastic shopping bags; tailings from mines) [AI, C] *Sample issue:* Non-rechargeable batteries can be convenient, but their disposal presents problems. Batteries contain heavy metals and corrosive substances that can contaminate landfill sites and leach into surrounding soil or water. Ontario municipalities designate batteries as hazardous waste, yet some people continue to throw them in the garbage. *Sample questions:* What impact do disposable diapers have on the environment? What effects does the dumping of solid waste into lakes, rivers, or oceans have on aquatic life? How long does it take polystyrene, widely used to make food and drink containers, to break down? What environmental challenges are associated with nuclear waste?

#### E2. Developing Skills of Investigation and Communication

- E2. investigate the effectiveness of various waste management practices
- **E2.1** use appropriate terminology related to waste management, including, but not limited to: *solid, liquid, and gaseous waste; toxic waste; heavy metal; chlorinated hydrocarbons;* and *polychlorinated biphenyls* (PCBs) [C]
- **E2.2** plan and conduct an inquiry in a microenvironment to treat a solid, liquid, or gaseous waste (e.g., reduce the acidity in a closed bog system in an aquarium; use a vermicomposter to recycle solid organic matter) [IP, PR]
- **E2.3** use a research process to investigate the waste generated throughout the life cycle of a product (e.g., the waste associated with all the materials and energy that go into the development and disposal of a computer or a running shoe) [IP, PR]
- **E2.4** plan and conduct a waste audit within their school, and propose a plan of action for waste reduction based on their findings (e.g., review the school's policy regarding paper and plastic recycling, monitor actual practices, and propose strategies to improve them) [IP, PR, AI, C]
- **E2.5** investigate a local, regional, national, or global waste management practice (e.g., local practices such as recycling or charging for residential and/or commercial garbage bags; shipping garbage to landfill sites in another region; disposal of nuclear waste; dumping raw sewage into rivers, lakes, oceans), and communicate their findings [PR, C]

#### E3. Understanding Basic Concepts

- E3. demonstrate an understanding of the nature and types of waste and strategies for its management
- E3.1 describe different categories of waste (e.g., biodegradable, recyclable, toxic, organic, inorganic)
- **E3.2** explain some current waste remediation practices used with substances or products that are not environmentally friendly (e.g., "Toxic Taxi" for pick-up of household hazardous waste; the recycling of plastic to make furniture and "lumber")
- **E3.3** describe the scientific principles involved in processing solid, liquid, and gaseous waste (e.g., combustion, decomposition, pyrolysis)
- **E3.4** explain common strategies and technologies used in the collection and storage of waste (e.g., strategies such as recycling, composting, dumping in landfill sites; technologies such as compacters, enzyme digesters, flocculation tanks)
- E3.5 explain how scientific knowledge and technological processes have been applied in the development of environmentally sound waste management strategies (e.g., accelerated waste aeration, bioremediation)

## F. Conservation of Energy

## F1. Relating Science to Technology, Society, and the Environment

**F1.** assess the impact on society and the environment of the use of various renewable and non-renewable energy sources, and propose a plan to reduce energy consumption

F1.1 evaluate the impact on the environment of renewable and non-renewable energy sources, and propose an environmentally friendly solution to reduce non-renewable energy consumption (e.g., a plan for broader use of hybrid cars or solar panels) [AI, C] *Sample issue:* In some remote areas that are off the electrical grid, generators that run on fossil fuels are used to generate electricity. However, these devices are inefficient, and they produce carbon dioxide, which contributes to global warming, and noise pollution. *Sample questions:* What impact can hydroelectric dams and generating stations have on the local environment? What effects do coal mining and the use of coal-burning power plants have on the local, regional, and global environment? How can the use of ethanol reduce the amount of petroleum needed to run cars?

**F1.2** assess the costs and benefits to society of the use of renewable and non-renewable energy sources, using a variety of criteria (e.g., associated health concerns, reliability, ability to meet demand, start-up and production costs) [AI, C]

*Sample issue:* The extraction, processing, and burning of fossil fuels damage the environment. However, some fossil fuels, such as coal, are plentiful and therefore a reliable source of energy. Some alternative energy sources, such as wind and solar power, are less reliable, and their unit costs are much higher.

*Sample questions:* How do the costs of coal and geothermal power compare? Do these costs change when environmental costs and benefits of the two sources are factored in? What are the health concerns associated with nuclear power? Why are wind and solar power less reliable than fossil fuel sources? How could that change?

## F2. Developing Skills of Investigation and Communication

- **F2.** investigate various methods of conserving energy and improving energy efficiency
- **F2.1** use appropriate terminology related to energy conservation, including, but not limited to: *renewable resource, non-renewable resource,* and *R-value*
- **F2.2** investigate energy consumption and costs in their household over a given period of time, and suggest ways in which their household could conserve energy [PR, AI, C]
- F2.3 plan and conduct an energy audit of a home or business, and propose ways to improve its energy efficiency [IP, PR, AI, C]
- **F2.4** design and construct a working model of a device that uses an alternative energy source (e.g., a wind generator, a solar-powered car, a "fan boat") [IP, PR]
- **F2.5** plan and conduct an inquiry to evaluate the effectiveness of various insulation materials and/or techniques (e.g., straw, foam, fibreglass, blown cellulose) [IP, PR, AI]

## F3. Understanding Basic Concepts

- **F3.** demonstrate an understanding of energy production, consumption, and conservation with respect to a variety of renewable and non-renewable sources
- **F3.1** explain the historical significance of a variety of energy sources (e.g., whale oil, coal), and describe their long-term impact on the environment
- **F3.2** describe the characteristics of a sustainable energy system (e.g., equitable access to the source, long-term availability, limited environmental impact)

- **F3.3** explain the basic principles and characteristics of various types of renewable (e.g., tidal, geothermal, solar, wind) and non-renewable (e.g., coal, oil, gas) energy production and their impact on the environment
- **F3.4** describe methods of energy production and conservation intended to reduce greenhouse gas emissions (e.g., energy production methods at the Prince Edward Island Wind-Hydrogen Village; charging higher prices for energy used during peak hours)
- **F3.5** describe technological advances aimed at reducing energy consumption (e.g., programmable thermostats, improved R-value in insulation, compact fluorescent light bulbs, rechargeable batteries, "smart meters")

## Environmental Science, Grade 11, Workplace Preparation (SVN3E)

## A. Scientific Investigation Skills and Career Exploration

## A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., hydro meter reader, hospitality employee, waste management operator, custodian) and the education and training necessary for these careers

## B. Human Impact on the Environment

## B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse selected current environmental problems in terms of the role human activities have played in creating or perpetuating them, and propose possible solutions to one such problem
- B1.1 propose possible solutions, on the basis of research, to a current practical environmental problem that is caused, directly or indirectly, by human activities [IP, PR, AI, C] *Sample issue:* Car emissions contribute to smog as well as global warming. Road tolls and increased use of public transit to cut down on the number of cars on the road, and the implementation and enforcement of idling by-laws, could significantly cut these emissions. *Sample questions:* How can various kinds of chemical spills in local ecosystems (e.g., fields, rivers, streams) be cleaned up? In what ways does improper sewage treatment or agricultural run-off threaten local water supplies, and how can these dangers be addressed or averted? What can be done to minimize the effect of an invasive species (e.g., purple loosestrife) on a native species (e.g., milkweed)?
- **B1.2** analyse the risks and benefits to the environment of human recreational activities and the leisure industry [AI, C]

*Sample issue:* Ecotourism attempts to reduce the waste and environmental damage associated with mass tourism. Although responsible ecotourism seeks to conserve local ecosystems through sustainable practices, and can, for example, help reduce deforestation and animal poaching rates, any human intrusion can damage fragile ecosystems.

*Sample questions:* What are the risks to the environment of herbicide use and water consumption on golf courses? What are some of the risks and benefits to the environment of landscaping? In what ways can hunters and fishers damage the environment? In what ways can they contribute to its sustainability? What rules are needed to ensure that visitors to a protected area do not harm that ecosystem?

#### **B2.** Developing Skills of Investigation and Communication

- **B2.** investigate air, soil, and water quality in natural and disturbed environments, using appropriate technology
- **B2.1** use appropriate terminology relating to the environmental impact of human activity, including, but not limited to: *carbon footprint, carbon neutral, biodegradable, biodiversity, carrying capacity, sustainability,* and *invasive and native species* [C]
- **B2.2** plan and conduct an inquiry, using appropriate technology, to compare soil quality in natural and disturbed environments (e.g., compare the phosphorous content, pH, organic matter content, water content, water-holding capacity, nutrient content, porosity, and/or bulk density of soil from a forest or meadow and soil from a garden or farmer's field that has been treated with chemical fertilizer) [IP, PR, AI]
- **B2.3** plan and conduct an inquiry, using appropriate technology, to compare water quality in natural and disturbed environments (e.g., compare the pH, ion content, temperature, dissolved oxygen content, hardness, turbidity, biological oxygen demand [BOD], and/or fecal coliform of tap water, water from a pond or stream, and water from a drainage ditch) [IP, PR, AI]
- **B2.4** analyse and interpret data on particulate matter in air samples from several different regions of Canada, using prepared data from a variety of sources (e.g., the Ontario Ministry of the Environment Air Quality Ontario, Environment Canada) [AI]
- B2.5 plan and conduct a waste audit of their home or school [IP, PR]

#### **B3.** Understanding Basic Concepts

- **B3.** demonstrate an understanding of some of the ways in which human activities affect the environment and how the impact of those activities is measured and monitored
- **B3.1** identify the basic components of soil, water, and air, and describe some of the effects of human activity on soil, water, and air quality (e.g., the effects of industrial or vehicle emissions on air quality; of chemical spills on soil quality; of chlorination on water quality)
- **B3.2** explain the concept of the cycling of substances in ecosystems (e.g., fertilizers made from biosolids leach into ground water or run off into rivers and streams, where the chemicals are absorbed by aquatic life, which is in turn consumed by humans)
- **B3.3** explain common methods of sampling soil, water, and air for analysis (e.g., soil core sampling, depth integrated sampling, stack sampling systems) and of monitoring soil, water, and air quality over time
- **B3.4** explain the concept of a "carbon footprint" and how it is used to measure the impact on the environment of a range of human activities
- **B3.5** explain the effects of human activity on an aquatic or terrestrial ecosystem (e.g., the impact of fertilizer run-off, acid precipitation, or an oil spill on an aquatic ecosystem)
- **B3.6** explain how human activities (e.g., agriculture, travel, the purchase of exotic pets, importing and exporting, releasing domesticated fish into fresh water environments, the use of live bait) have led to the introduction of invasive species, and why it is important to measure and monitor the impact of invasive species on native species

## C. Human Health and the Environment

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse the effects on human health of environmental contaminants and a significant environmental phenomenon
- **C1.1** assess, on the basis of research, the effects on human health of a significant environmental phenomenon (e.g., the ice storm of 1998 in central Canada, the European heatwave of 2003), and communicate their findings [IP, PR, AI, C]

*Sample issue:* In August 2005, Hurricane Katrina destroyed the levees surrounding New Orleans. Hundreds of people were drowned in the resulting floods. Many survivors contracted skin and gastro-intestinal diseases from contaminated water.

*Sample questions:* What impact did the 2003 drought in the Okanagan Valley have on the health and well-being of local populations? How did the 2003 tsunami in the Indian Ocean affect the health of people in that region?

**C1.2** analyse how environmental contaminants can affect the health of different populations in Canada (e.g., mercury contamination in streams and rivers in Northern Ontario where Aboriginal people fish, toxins in Arctic sea mammals hunted by Inuit, smog in large cities) [AI, C]

*Sample issue:* When the U.S. government abandoned its Cold War military bases in the Canadian North, it left behind a variety of contaminants, including large amounts of polychlorinated biphenyls (PCBs). Exposure to these chemicals can affect the nervous system and the immune system and can cause cancer.

*Sample questions:* How does the use of biosolids as fertilizer on Canadian farms affect the health of local populations? What short- and long-term health problems can be traced to the chemicals in the tar ponds in Sydney, Nova Scotia?

#### C2. Developing Skills of Investigation and Communication

- **C2.** investigate how different environmental factors can affect people's health and their lifestyle choices
- **C2.1** use appropriate vocabulary related to human health and the environment, including, but not limited to: *smog*, *environmental contaminants*, *pathogens*, *inhalation*, *ingestion*, and *absorption* [C]
- **C2.2** investigate, using a research process, and report on an environmental factor that can have an impact on human health (e.g., smog, ultraviolet [UV] rays, bacteria, pesticide residue), and explain how their personal lifestyle choices can affect its impact (e.g., avoiding strenuous physical activity on days when there is a smog alert can reduce the severity of respiratory ailments; lying on the beach without sunscreen or sun protective clothing during peak UV hours can increase the risk of skin cancer) [IP, PR, AI, C]
- **C2.3** investigate the characteristics of a personal protective device or substance (e.g., sunscreen, mosquito repellent, respiratory mask, sun protective clothing) and whether the device or substance is effective in protecting a person from an environmental factor that can affect human health [PR, AI]

## **C3.** Understanding Basic Concepts

- **C3.** demonstrate an understanding of the ways in which environmental factors can affect human health and how their impact can be reduced
- **C3.1** describe common environmental factors, including pollution and environmental contaminants (e.g., air, noise, soil, and water pollution; UV rays; heat; heavy metals; workplace chemicals; pathogens), and explain how they can affect human health
- **C3.2** describe various ways in which environmental contaminants can enter the human body (e.g., inhalation, ingestion, absorption)
- **C3.3** explain how the human body can react to exposure to a variety of environmental factors (e.g., rashes, asthma, mercury poisoning, hearing loss, diseases such as malaria and cancer)
- **C3.4** describe medical and non-medical ways to protect oneself from the effects of harmful environmental factors (e.g., vaccination or medication, washing of fruits and vegetables, use of sunscreen or insect repellent, use of personal protective devices)
- C3.5 describe good personal hygiene and household cleanliness practices that reduce health risks resulting from environmental contaminants (e.g., thorough hand washing, use of air filters, reduced use of household chemicals)

## D. Energy Conservation

## D1. Relating Science to Technology, Society, and the Environment

- **D1.** evaluate initiatives and technological innovations related to energy consumption and conservation, and assess their impact on personal lifestyles, social attitudes, and the environment
- **D1.1** assess, on the basis of research, the impact that initiatives for reducing energy consumption and waste have on personal lifestyles, societal attitudes, and the environment (e.g., local, provincial, or national initiatives by government, business, or non-governmental organizations) [IP, PR, AI, C]

*Sample issue:* Home energy audit and retrofit rebate programs have been established by many provincial governments to help homeowners reduce their energy bills. Although these programs raise awareness of the environmental impact of wasting energy and provide practical ways of reducing waste, not all homeowners take advantage of them. *Sample questions:* What types of incentives exist to encourage consumers to purchase energy-efficient products and services? How effective are such incentives? What methods do energy companies use to encourage consumers to conserve energy? What are some of the non-governmental organizations in Canada that raise awareness of the environmental costs of energy consumption? Are there any groups in your local community that focus on energy conservation? How effective are they?

D1.2 evaluate, on the basis of research, some of the advantages or disadvantages of technological innovations that contribute to the production of renewable energy and/or aid in conservation (e.g., bio-oil, biodiesel, wind turbines, improved insulation, programmable thermostats) [IP, PR, AI, C]

*Sample issue:* Tankless water heaters heat water only when it is needed. They save energy over traditional water heaters, which keep a large tank of water hot at all times. However, tankless water heaters may not be able to supply enough hot water for multiple uses. *Sample questions:* What technologies are used to produce biofuels? How do these fuels help to reduce use of non-renewable energy? What problems might be associated with the use of agricultural crops for fuel rather than food? In what ways has the design of wind farm

technology improved over the years? What are the advantages and disadvantages of replacing old appliances with more energy-efficient ones?

## D2. Developing Skills of Investigation and Communication

- D2. investigate various methods of conserving energy and improving energy efficiency
- **D2.1** use appropriate terminology related to energy conservation and consumption, including, but not limited to: *conventional source*, *alternative source*, *efficiency*, *watt*, *kilowatt-hour* [kWh], *joule*, *BTU*, *gas meter*, *electric meter*, *thermostat*, and *EnerGuide* [C]
- **D2.2** determine the energy consumption of their household over a given time period by reading and interpreting gas and/or electric meters, calculate the cost of consumption (e.g., the number of kWh × cost per kWh, cubic metres of gas × cost per cubic metre), and suggest ways in which the household could conserve energy [PR, AI, C]
- **D2.3** use a research or inquiry process to compare the efficiency of different types or brands of a common household appliance (e.g., different brands of kettles, fans, or refrigerators; natural gas and electric water heaters) or of audio-visual equipment (e.g., different types of computer monitors), and report their findings [IP, PR, AI, C]
- **D2.4** conduct a risk-benefit analysis of different types of electricity generation (e.g., fossil fuel, hydro, nuclear, wind, and/or solar power) [PR, AI]

## **D3.** Understanding Basic Concepts

- **D3.** demonstrate an understanding of the basic principles of energy production, with reference to both renewable and non-renewable sources, and of various methods of energy conservation
- **D3.1** explain the basic principles and characteristics of various types of power generation from non-renewable sources (e.g., coal, oil, natural gas, nuclear) and renewable sources (e.g., hydroelectric, tidal, geothermal, solar, wind, hydrogen fuel cells)
- **D3.2** compare and contrast renewable and non-renewable energy sources, using criteria such as availability, cost, and environmental impact (e.g., compare a fossil fuel and geothermal energy, using a graphic organizer)
- **D3.3** describe methods of energy conservation (e.g., the replacement of incandescent bulbs with compact fluorescent bulbs, the replacement of a manual thermostat with a programmable one, the installation of more energy-efficient windows) and some policies that are intended to manage energy demand in the home and the workplace (e.g., variable pricing, which increases the price of electricity during peak hours)
- D3.4 describe several criteria used in the construction of energy-efficient buildings (e.g., "smart homes", in which the use of light, heat, and power for equipment can be programmed; R-2000 homes; straw-bale houses)

## E. Natural Resource Science and Management

## E1. Relating Science to Technology, Society, and the Environment

- **E1.** assess the environmental impact of the harvesting and/or extraction of resources, including ways of reducing this impact, and analyse threats to the sustainability of natural resources
- E1.1 assess the environmental impact of industrial practices related to the extracting or harvesting of natural resources, and describe ways in which that impact can be monitored and minimized [AI, C]

*Sample issue:* As a result of overfishing, several marine species are endangered. Bottom-trawling drag nets drown sea life, including mammals and turtles, who become entangled

in them, and destroy seafloor habitat. In an effort to allow endangered species to recover, governments monitor populations, sometimes limiting catches or declaring moratoriums, and some countries have banned bottom trawling.

*Sample questions:* What impact can mine tailings have on local water? What practices can be used to reduce this impact? What impact does clear-cutting have on local ecosystems? What impact does large-scale deforestation have on the environment? What harvesting practices can the forestry industry use to minimize the effects of clear-cutting and deforestation?

E1.2 analyse, on the basis of research, the impact that an environmental contaminant, parasite, or bacteria has on the sustainability of a natural resource in Canada (e.g., the effects of PCBs on Arctic sea mammals, of sea lice on farmed and wild salmon, of E. coli on water resources) [IP, PR, AI, C]

*Sample issue:* As a result of warmer winters and a policy of fire suppression, the mountain pine beetle has decimated coniferous forests in British Columbia, killing millions of lodgepole pines, the most widely harvested tree in the province. There are fears that the beetle will expand into Alberta and could eventually harm pine forests across the country. *Sample questions:* How have mercury levels in fish affected the local fishing industry in Northern Ontario? How has mange affected the fox population and people who depend on trapping? What impact has increased bacteria levels in inland waterways had on duck populations?

## E2. Developing Skills of Investigation and Communication

- **E2.** investigate methods scientists use to classify and monitor natural resources, and conduct investigations using those methods
- **E2.1** use appropriate terminology related to natural resources and resource management, including, but not limited to: *population*, *bioamplification*, *sampling size*, *sustainability*, *ore*, *mineral*, *tailings*, and *succession* [C]
- **E2.2** identify and classify a variety of natural resources found in Canada, using appropriate classification systems (e.g., dichotomous keys, botanical keys, tree identification guides, wildlife guides, mineral tests) [PR, AI]
- **E2.3** investigate, through laboratory inquiry, field study, or simulations, some of the methods and procedures used by scientists to monitor biodiversity in different environments (e.g., making plant tallies in forests; tagging or marking ground vegetation species in fields; tagging and tracking wildlife with the global positioning system in remote areas; using aquatic dip nets for sampling organisms in shallow ponds or streams) [PR]
- **E2.4** conduct an inventory of a local environment (e.g., a field, a pond), using appropriate techniques and methods (e.g., plant tallies, tags, keys), and display the results graphically [PR, C]

## E3. Understanding Basic Concepts

- **E3.** demonstrate an understanding of the sustainable use of resources and its relationship to the biodiversity and sustainability of ecosystems
- **E3.1** describe the main types of natural resources found in Canada (e.g., forests, minerals, fisheries, wildlife, water, fossil fuels)
- **E3.2** describe the characteristics and properties that make a natural resource viable for use (e.g., the size, type, and location of trees; the value, location, and extraction and processing costs of minerals), and explain the importance of managing natural resources to ensure sustainability and biodiversity

- **E3.3** describe a variety of methods used to extract or harvest natural resources (e.g., drag nets, strip mining, selective cutting of forests)
- **E3.4** explain how a variety of sampling techniques (e.g., quadrant sampling, catch-and-release, core sampling to measure tree rings, counting annuli in scales to measure the age of fish) are used to gather information about natural resources
- **E3.5** explain the importance of biodiversity to the sustainability of life within an ecosystem (e.g., variability among biotic and abiotic factors within an ecosystem decreases the chance that any organism within that ecosystem will become extinct)
- **E3.6** describe some methods that scientists use to monitor biodiversity in aquatic and terrestrial environments (e.g., field data collection, aerial and satellite imagery)

## F. The Safe and Environmentally Responsible Workplace

## F1. Relating Science to Technology, Society, and the Environment

- **F1.** assess workplace situations with respect to safety and environmental issues, and propose a course of action to address unsafe working conditions
- **F1.2** analyse, on the basis of research, and report on the environmental impact of unsafe handling, storage, and disposal of hazardous and non-hazardous workplace materials associated with a particular job [IP, PR, AI, C]

*Sample issue:* Home construction workers use a range of materials that can harm the environment. Spills of stains and solvents, improper disposal of paint and other chemical substances, the particulate matter created when wall board is cut or insulation is blown, and improper storage of combustible or corrosive materials can contaminate the air, water, and soil.

*Sample questions:* What impact does the improper storage and disposal of cooking oils in fast-food restaurants have on the environment? In what ways can improper handling or disposal of medical materials (e.g., pharmaceuticals, medical isotopes, disinfectants) in a hospital affect the environment? What is the environmental impact if fast-food restaurants do not separate their waste into compostable, recyclable, and non-recyclable materials?

## F2. Developing Skills of Investigation and Communication

- F2. investigate a variety of safe and environmentally responsible workplace practices
- **F2.1** use appropriate terminology related to safety and environmental responsibility in the workplace, including, but not limited to: *Möbius loop*, *Material Safety Data Sheet (MSDS)*, *Hazardous Household Product Symbols (HHPS)*, *hazardous material*, and *personal protective equipment (PPE)* [C]
- **F2.4** use appropriate techniques for handling, storing, and disposing of teacher-selected materials, drawing on Material Safety Data Sheets and Canadian Environmental Protection Act regulations (e.g., use appropriate personal protective equipment), and outline proper procedures for handling those materials in the workplace [PR, C]
- **F2.5** design and report on a plan for reusing, recycling, reducing the volume of, or disposing of a hazardous material found in the workplace (e.g., disposing of batteries, reusing motor or cooking oils for a different purpose) [IP, C]
- **F2.6** investigate the effectiveness of a personal protective device or environmental protection device for use in the workplace (e.g., compare two different spill kits for absorbing spills; test the key features of a mask for protection from airborne particulate matter; identify the appropriate types of eye protection for different situations) [PR, AI]

#### F3. Understanding Basic Concepts

- **F3.** demonstrate an understanding of general workplace safety procedures and environmentally responsible practices
- **F3.1** describe some of the ways in which implementation of the 4Rs (reduce, reuse, recycle, and recover) in the workplace protects the environment (e.g., by reducing the production of garbage and recycling materials for daily use), and explain the meaning of different symbols used to promote these strategies (e.g., different representations of the Möbius loop [the international recycling symbol])
- **F3.2** compare some of the features, uses, and environmental implications of Hazardous Household Product Symbols and WHMIS hazard symbols
- **F3.3** identify and describe common types of biological, physical, and chemical hazards in the workplace (e.g., hazards posed by bacteria, noise, work at dangerous heights, use of chemicals and other hazardous materials) and associated accident-prevention methods (e.g., sterilization, soundproofing, use of five-point safety harnesses, use of safe storage cabinets, safe disposal of chemicals)
- **F3.4** explain how the use of personal protective equipment (e.g., aluminized gloves, a welding shield, ear plugs, a self-contained breathing apparatus, an air-purifying mask) minimizes exposure to hazardous materials that can enter the body through ingestion, inhalation, absorption, and injection
- **F3.5** identify some current workplace procedures, practices, and protocols that help to protect the environment (e.g., garbage separation, paper recycling, use of recycled products, "telecommuting" to workplaces, practices that conserve water and energy)

## PHYSICS, GRADES 11 AND 12

## Physics, Grade 11, University Preparation (SPH3U)

## B. Kinematics

## B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse technologies that apply concepts related to kinematics, and assess the technologies' social and environmental impact
- **B1.2** assess the impact on society and the environment of a technology that applies concepts related to kinematics (e.g., photo radar helps prevent vehicular accidents and reduces fuel consumption associated with excessive speeding) [AI, C]

*Sample issue:* The use of the global positioning system (GPS) increases accuracy in mapping, surveying, navigation, monitoring earthquakes, and tracking the movement of oil spills and forest fires, among other benefits. However, its extensive use raises concerns about privacy and human rights.

*Sample questions:* How are satellites used to track animal species in remote areas? How can scientists and environmentalists use this information to help protect vulnerable species? What is the impact of the use of speed limiters and tracking devices in the trucking industry? What effect do lower truck speeds have on highway safety and vehicle emissions?

## C. Forces

### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse and propose improvements to technologies that apply concepts related to dynamics and Newton's laws, and assess the technologies' social and environmental impact
- **C1.2** evaluate the impact on society and the environment of technologies that use the principles of force ... [AI, C]

*Sample questions:* ... What are the advantages and disadvantages for the environment of various methods of using the natural forces from tidal currents to generate energy?

## D. Energy and Society

## D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse technologies that apply principles of and concepts related to energy transformations, and assess the technologies' social and environmental impact
- **D1.1** analyse, using the principles of energy transformations, a technology that involves the transfer and transformation of thermal energy (e.g., a power station, an air conditioner, a fuel cell, a laser printer) [AI, C]

*Sample questions:* How do vertical or rooftop gardens help insulate structures? In what ways have refrigeration technologies changed since their initial development? When they are designed efficiently, how do homes with solar-powered cells use the energy from the sun? How do ground-source heat pumps reduce the need for traditional heating and cooling systems?

D1.2 assess, on the basis of research, how technologies related to nuclear, thermal, or geothermal energy affect society and the environment (e.g., thermal regulating units, radiopharmaceuticals, dry-steam power plants, ground-source heat pumps) [IP, PR, AI, C] *Sample issue:* With the rising economic and environmental costs of heating homes using conventional methods, geothermal technologies are an increasingly popular alternative. However, tapping geothermal heat sources involves placing kilometres of tubing containing antifreeze in the ground, which constitutes a potential environmental hazard. *Sample questions:* How is the nuclear technology known as receptor binding assay used to monitor the toxicity of shellfish? How does this technology benefit consumers? How can nuclear technology be used to sterilize insects? If used widely, what impact would such a pest-control technique have on society and the environment? ...

## E. Waves and Sound

## E1. Relating Science to Technology, Society, and the Environment

- E1. analyse how mechanical waves and sound affect technology, structures, society, and the environment, and assess ways of reducing their negative effects
- E1.2 analyse the negative impact that mechanical waves and/or sound can have on society and the environment, and assess the effectiveness of a technology intended to reduce this impact [AI, C] *Sample issue:* Noise pollution from industrial, transportation, entertainment, and other sources can increase stress, lead to hearing loss, disrupt ecosystems, and alter animal behaviour. Noise pollution can be reduced by using mufflers, sound barriers, baffles, and earplugs, and by turning down the volume on devices such as cellphones and headsets.

*Sample questions:* What impact can tsunamis have on coastal regions? How effective is tsunami-monitoring equipment in reducing death tolls and property destruction? How do the noise levels produced by different types of jet engines compare with each other? How effective are the sound baffles erected on the sides of highways that run through residential areas?

## F. Electricity and Magnetism

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse the social, economic, and environmental impact of electrical energy production and technologies related to electromagnetism, and propose ways to improve the sustainability of electrical energy production
- F1.1 analyse the social and economic impact of technologies related to electromagnetism (e.g., particle accelerators, mass spectrometers, magnetic levitation [maglev] trains, magnetic resonance imaging [MRI], electromagnetic pulses after nuclear explosions) [AI, C]*Sample questions:* What are the benefits of electromagnetic medical technologies? What impact does the cost of acquiring these technologies, and the need for specialized technicians to operate them, have on equitable access to health care in all regions of Canada? What harmful effects do solar flares have on our atmosphere, satellites orbiting the earth, and electrical systems?
- **F1.2** analyse the efficiency and the environmental impact of one type of electrical energy production (e.g., from hydroelectric, fossil fuel-burning, wind, solar, geothermal, or nuclear sources), and propose ways to improve the sustainability of electrical energy production [AI, C] *Sample issue:* Compared to oil, coal is relatively inexpensive and plentiful, and, globally, the number of coal-burning electrical plants is expanding. Yet, coal power is inefficient, and the mining and burning of coal produce a great deal of pollution. Although technology is available to make coal cleaner, it is costly and has been implemented to only a limited extent. *Sample questions:* How efficient are the small and large-scale solar-power systems used in individual homes and industrial settings? What is the environmental impact of the generation of solar power? What technologies are being used to improve the efficiency of energy sources such as coal and biofuel? What impact does the increasing use of biofuels have on air quality, land use, and agricultural practices?

## Physics, Grade 12, University Preparation (SPH4U)

## B. Dynamics

#### B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse technological devices that apply the principles of the dynamics of motion, and assess the technologies' social and environmental impact
- B1.2 assess the impact on society and the environment of technological devices that use linear or circular motion (e.g., projectile weapons, centrifuges, elevators) [AI, C]
  Sample issue: Satellites, which use principles of circular motion to revolve around Earth, support communications technologies and are used by governments to gather intelligence. They also provide information on the movement of animal populations and forest fires, and on changes in weather systems or the atmosphere. But satellites use huge amounts of fuel, and old satellites often become space junk.

*Sample questions:* How are large-scale centrifuges used in wastewater treatment? How do windmills use the principles of dynamics to generate power? What is the environmental impact of wind power and wind farms? How are linear actuators used to make the workplace more ergonomic, reducing work days lost to strain and injury?

## C. Energy and Momentum

## C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse, and propose ways to improve, technologies or procedures that apply principles related to energy and momentum, and assess the social and environmental impact of these technologies or procedures
- **C1.2** assess the impact on society and the environment of technologies or procedures that apply the principles of energy and momentum (e.g., crumple zones, safety restraints, strategic building implosion) [AI, C]

*Sample issue:* Hydroelectricity is produced by using the potential energy of dammed water to drive turbines and generators. Although hydroelectricity is renewable and generates no greenhouse gases, the damming of waterways can create massive flooding upstream and reduce flows downstream, affecting aquatic and terrestrial ecosystems and people living near the water source.

*Sample questions:* ... What is the environmental impact of the chemicals whose combustion produces the effects in fireworks displays?

## D. Gravitational, Electric, and Magnetic Fields

## D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse the operation of technologies that use gravitational, electric, or magnetic fields, and assess the technologies' social and environmental impact
- D1.2 assess the impact on society and the environment of technologies that use gravitational, electric, or magnetic fields (e.g., satellites used in surveillance or storm tracking, particle accelerators that provide high-energy particles for medical imaging) [AI, C] *Sample issue:* The radiation produced by the magnetic and electric fields of electron accelerators is used to treat tumours. In conjunction with other therapies, radiation increases the survival rate of cancer patients, but safeguards are needed to ensure that patients receive safe doses of radiation and that medical personnel and the immediate environment are not contaminated. *Sample questions:* ... What is the effect on human health of long-term exposure to the electrical fields created by high-voltage lines? How could zero-gravity experiments on agricultural products benefit society and the environment? What are the environmental benefits of using technology involving gravitational fields to search for mineral deposits?

## E. The Wave Nature of Light

## E1. Relating Science to Technology, Society, and the Environment

- E1. analyse technologies that use the wave nature of light, and assess their impact on society and the environment
- E1.2 assess the impact on society and the environment of technologies that use the wave nature of light (e.g., DVDs, polarized lenses, night vision goggles, wireless networks) [AI, C]Sample questions: ... In what ways can posting magazines or newsletters on the Internet, rather than printing and distributing them, benefit the environment?

## Physics, Grade 12, College Preparation (SPH4C)

## A. Scientific Investigation Skills and Career Exploration

### A2. Career Exploration

A2.1 identify and describe a variety of careers related to the fields of science under study (e.g., alternative energy advocate, sustainable energy technician, electrician, mechanic) and the education and training necessary for these careers

## B. Motion and Its Applications

## B1. Relating Science to Technology, Society, and the Environment

- **B1.** analyse selected technologies that are used to move objects or track their motion, and evaluate their impact on society and the environment, including their contribution to scientific knowledge
- **B1.1** analyse the design and uses of a transportation technology (e.g., snowmobiles, automobiles, motorized personal water craft), and evaluate its social and environmental impact, including the impact on risk behaviour and accident rates [AI, C]

*Sample issue:* All-terrain vehicles (ATVs), designed to be driven off-road, are used in occupations requiring access to remote areas and for recreational purposes. However, ATVs can lack stability on uneven surfaces, which can result in serious accidents, particularly for inexperienced drivers. The vehicles can also cause damage when they are driven in environmentally sensitive areas.

**B1.2** analyse how technologies are used to track the motion of objects, and outline various kinds of scientific knowledge gained through the use of such technologies (e.g., data on animal populations and migrations, on changes in ocean currents related to global warming, on the behaviour of celestial objects) [AI, C]

*Sample questions:* How are motion-related technologies used to monitor wildlife populations? What type of information do these technologies provide, and how is it used? How are satellites used to track weather systems? What are the uses of the information gathered?

## C. Mechanical Systems

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse common mechanical systems that use friction and applied forces, and evaluate their effectiveness in meeting social or environmental challenges
- **C1.2** evaluate, on the basis of research, the effectiveness of a common mechanical system in addressing a social or environmental challenge (e.g., ... high-efficiency heating and cooling systems) [IP, PR, AI, C]

*Sample questions:* ... How have integrated mechanical systems such as programmable thermostats improved energy efficiency in homes?

## D. Electricity and Magnetism

#### D1. Relating Science to Technology, Society, and the Environment

- **D1.** analyse the development of selected electrical and electromagnetic technologies, and evaluate their impact on society and the environment
- D1.1 evaluate, on the basis of research, the impact on society and the environment of the evolution of an electrical technology (e.g., electric cars or buses, electric appliances) [IP, PR, AI, C] *Sample questions:* What impact has the development and evolution of refrigeration technologies had on society and the environment? Are trains powered by electricity an improvement over trains powered by steam or diesel engines? Why or why not? What impact does the use of electric buses, streetcars, and subway trains by the Toronto Transit Commission have on local residents and the environment?
- **D1.2** assess the impact of an electromagnetic technology that is used for the benefit of society or the environment (e.g., devices for diagnosing and treating diseases, technologies for treating seeds to increase the rate of germination) [AI, C]

*Sample questions:* ... What are some of the uses of electromagnetic technologies in health care? What are the benefits of using electromagnetic sensors to detect metal concentrations in brown-field developments? What are the advantages of maglev trains over conventional transportation technologies?

## E. Energy Transformations

#### E1. Relating Science to Technology, Society, and the Environment

- E1. evaluate the impact on society and the environment of energy-transformation technologies, and propose ways to improve the sustainability of one such technology
- **E1.1** analyse an energy-transformation technology (e.g., wind turbines, refrigerators, telephones, steam engines, coal-fired electrical plants), and evaluate its impact on society and the environment [AI, C]

*Sample issue:* Fax machines allow documents to be transmitted quickly and securely. Most fax machines use ink cartridges, which can end up in landfill sites. By contrast, thermal fax machines use heat resistors to convert electricity into usable heat. They then apply this heat through a print head onto chemically treated paper to print a document.

*Sample questions:* What types of energy transformations take place in an air conditioner? What impact does the widespread use of air conditioners have on society and the environment? What types of energy transformations occur in incandescent and fluorescent light bulbs? What impact does the difference in energy transformations in these two types of bulbs have on the environment?

E1.2 propose a course of practical action to improve the sustainability of an energy-transformation technology (e.g., solar panels, internal combustion engines, fuel cells, air conditioners) [PR, AI, C] *Sample issue:* Although wind is a renewable source of energy, many windmills are needed to generate a useful amount of energy, and large wind farms can have a negative impact on wildlife and local residents. Researchers are experimenting with modifications to the blades to increase the efficiency of each windmill.

*Sample questions:* Why are ice-cooling systems more energy efficient than traditional air conditioners? How could solar panels be modified to enable them to capture solar energy on a cloudy day? How could a speaker system be improved to maximize its energy use? What modifications could be made to an internal combustion engine so that it used less gasoline?

## E3. Understanding Basic Concepts

- **E3.4** compare the efficiency of various systems that produce electricity (e.g., wind farms, hydroelectric generators, solar panels), using the law of conservation of energy, and outlining the transformations, transmissions, and energy losses involved
- **E3.5** describe a variety of renewable and non-renewable sources of energy (e.g., solar energy, fossil fuels, hydroelectric energy, energy generated from biomass), and identify the strengths and weaknesses of each

## F. Hydraulic and Pneumatic Systems

#### F1. Relating Science to Technology, Society, and the Environment

**F1.** analyse the development of technological applications related to hydraulic and pneumatic systems, and assess some of the social and environmental effects of these systems

## SCIENCE, GRADES 11 AND 12

## Science, Grade 12, University/College Preparation (SNC4M)

## C. Pathogens and Disease

### **C3.** Understanding Basic Concepts

**C3.6** describe some of the means used by international non-governmental organizations (e.g., Médecins sans Frontières, Oxfam, Ryan's Well Foundation, UN agencies, the Stephen Lewis Foundation) to control the spread of disease (e.g., distribution of vaccines, medication, malaria nets; installing wells so people have access to clean water; public education on strategies for transmission prevention)

## E. Science and Public Health Issues

## E3. Understanding Basic Concepts

- **E3.3** explain the impact of various threats to public health, including infectious diseases (e.g., hepatitis, HIV/AIDS, tuberculosis, malaria, sexually transmitted diseases), chronic diseases (e.g., cardiovascular disease, diabetes, asthma), and environmental factors (e.g., climate change, air pollution, chemical pollutants, radiation)
- **E3.4** explain a variety of social factors that can promote the rapid spread of infectious diseases (e.g., global population growth, international travel, poor sanitation, lack of clean drinking water)

## F. Biotechnology

## F1. Relating Science to Technology, Society, and the Environment

- **F1.** analyse a variety of social, ethical, and legal issues related to applications of biotechnology in the health, agricultural, or environmental sector
- F1.1 analyse social issues related to an application of biotechnology in the health, agricultural, or environmental sector (e.g., issues related to the uses of genetically modified organisms ...)[AI, C]

*Sample issue:* The promise of genetically modified (GM) crops was that they would be resistant to pests and would produce more abundant harvests. However, GM crops can crossbreed with crops in adjoining fields, thus contaminating traditional food sources, reducing biodiversity, changing farming practices, and limiting the choices available to consumers.

F1.2 analyse, on the basis of research, ethical and legal issues related to an application of biotechnology in the health, agricultural, or environmental sector ... [IP, PR, AI, C] *Sample questions:* ... Who determines whether genetically modified foods are safe? How might the testing/regulation process be open to abuse? What are the legal and ethical implications of introducing into an ecosystem a species engineered through biotechnology?

#### F3. Understanding Basic Concepts

- **F3.** demonstrate an understanding of biological processes related to biotechnology and of applications of biotechnology in the health, agricultural, and environmental sectors
- **F3.3** describe applications of biotechnology in the health (e.g., genomics, gene therapy, xenotransplantation, in vitro fertilization), agricultural (e.g., genetically modified crops, biopesticides, cloning), and environmental sectors (e.g., bioremediation, phytoremediation)

## Science, Grade 12, Workplace Preparation (SNC4E)

## B. Hazards in the Workplace

## B1. Relating Science to Technology, Society, and the Environment

- **B1.** assess common workplace settings with respect to hazards, and analyse selected legislation that is in place to protect workers and the environment from these hazards
- **B1.1** assess a workplace setting, either real or simulated, with respect to hazards that could affect workers or the environment, using appropriate criteria (e.g., a checklist for a health and safety audit) [AI, C]

*Sample questions:* What hazardous substances are used in the workplace being assessed? Are warnings posted as to the dangers they pose? How are the substances handled, stored, and disposed of? ...

B1.2 analyse and summarize the requirements of selected sections of workplace safety and/or environmental protection legislation related to a career of personal interest (e.g., regulations applying to mining in the Occupational Health and Safety Act; regulations applying to waste management in the Ontario Environmental Protection Act) [AI, C]
Sample issue: Section 91.1 of the Ontario Environmental Protection Act requires employers to prevent or reduce the risk of spills of pollutants and, if such a spill does occur, to provide the appropriate equipment, personnel, and material to clean it up. This section covers a range

of workplaces where spills of environmental contaminants may occur.

*Sample questions:* What types of jobs are affected by regulations under the Ontario Environmental Protection Act? ...

## C. Chemicals in Consumer Products

#### C1. Relating Science to Technology, Society, and the Environment

- **C1.** analyse chemical products used in the home and workplace, and issues related to their safe and environmentally responsible use and disposal
- **C1.2** assess the environmental consequences of improper disposal of chemical products commonly used in the home (e.g., pouring paint down the drain; dumping batteries in garbage destined for landfill sites) [AI, C]

*Sample issue:* Some batteries contain lithium or cadmium, which are toxic heavy metals. If such batteries are tossed into the regular garbage, these metals can leach into the soil or run off into water systems. Batteries can also overheat and cause a fire or other kind of chemical reaction.

*Sample questions:* What happens when pharmaceuticals are poured down the drain? Why should containers of flammable substances such as turpentine or corrosive substances such as drain cleaner not be thrown in the regular garbage?

C1.3 evaluate the appropriateness of current disposal practices in their home, at school, or in the community, with particular reference to the disposal of chemical waste [AI, C] *Sample issue:* Many commonly used chemicals can damage the environment if they are not properly disposed of. Some chemicals are combustible, produce toxic vapours, or are corrosive. Some otherwise safe chemicals can become toxic if combined with another chemical. Safe disposal methods must take the properties of each chemical into account. *Sample questions:* What is the proper method for disposing of solvent-soaked rags? What sorts of items are considered to be household hazardous waste (HHW)? Are there HHW depots in your community? What happens to the waste once it arrives at such a depot?

## C2. Developing Skills of Investigation and Communication

**C2.6** investigate a variety of consumer products within a given category (e.g., shampoo, window cleaner, disinfectant), focusing on products claiming to be environmentally friendly, and analyse them with respect to selected factors (e.g., cost, effectiveness, impact on the environment) [PR, AI, C]

## E. Electricity at Home and Work

## E1. Relating Science to Technology, Society, and the Environment

- E1. assess electrical hazards in the home and workplace, and the social and environmental impact of electrical technologies
- E1.1 assess the social and environmental impact of electrical technologies, including the impact associated with the manufacture and disposal of electronic devices (e.g., the impact of electrical devices used in the health care field, such as pacemakers or respirators; the impact of energy generation needed to power electrical devices and appliances) [AI, C] *Sample issue:* Electronics play an important part in our everyday lives. However, disposal of used electronic equipment is a huge problem. Globally, we generate 30 to 50 million tonnes of electronic waste each year. Much of this waste is shipped to developing countries, where it is incinerated or dumped in landfill sites, practices that release toxic chemicals into the air or soil. *Sample questions:* How often do you replace an electronic device because something newer, faster, or more powerful has been developed? What do you do with the older devices? ...

## F. Nutritional Science

#### F1. Relating Science to Technology, Society, and the Environment

- **F1.** assess the environmental implications of a variety of food choices, and evaluate and propose ways to improve the nutritional content of a menu
- **F1.1** assess the environmental implications of food choices available in a variety of situations (e.g., in the school cafeteria, a fast-food restaurant, a supermarket, a local farmers' market, an organic meat shop), and propose ways to minimize the environmental impact of their food choices [AI, C]

*Sample issue:* Supermarkets commonly sell imported produce, distributed through large warehouses, even when the same types of food are in season locally and are available from local farmers. Importing foods generates greater carbon emissions but may be seen as more efficient if local farmers lack a reliable distribution system.

*Sample questions:* What is the environmental impact of organic farming compared to traditional farming methods? What are the advantages and disadvantages of buying certified organic foods from a local farmer? What are the environmental costs of purchasing a pizza? Why is the environmental footprint associated with consuming a hamburger different from that associated with eating a veggie burger?

# SOCIAL SCIENCES AND HUMANITIES, GRADES 9 TO 12 (2013)

From "Environmental Education and Social Sciences and Humanities" in the curriculum policy document:

There are many opportunities to integrate environmental education into the teaching of social sciences and humanities. Family studies courses provide opportunities for students to explore ways in which varying notions of "need" affect how various individuals, families, communities, and societies use – or overuse – resources. Students come to understand the environmental impact of their choices – and those of the broader society – with respect to food, clothing, housing, and other aspects of life. In general social sciences and equity studies courses, students examine the impact of climate change on individuals and diverse groups and communities, including the disproportionate impact on the poor and marginalized. In world religions courses, students explore the ways in which environmental stewardship and responsible environmental practices are woven into the tenets of a number of religions and belief traditions. Philosophy courses provide opportunities for students to reflect on the ethics associated with differing attitudes and actions with respect to the environment.

## EQUITY STUDIES

## Gender Studies, Grade 11, University/College Preparation (HSG3M)

## C. Gender Issues and Gender-Related Policy in Context

**C2.** Local and Global Challenges: analyse a range of social, political, economic, and environmental issues relating to gender in Canadian and global contexts

## C2. Local and Global Challenges

C2.3 analyse the relationship between gender and environmental issues in both Canadian and global contexts (e.g., ... the impact of desertification on arable land, family farms, and the roles of women and men; differences in the impact of climate change on men and women) Teacher prompts: "What is meant by the term ecofeminism?" "Where would you find data to determine the relationship between the use of pesticides and fertility rates?" "What effects has oil sands development in Alberta had on women in the Lubicon First Nation?" "What evidence exists of the impact on boys and men of increased levels of estrogen in drinking water?"

## Equity, Diversity, and Social Justice, Grade 11, Workplace Preparation (HSE3E)

## **B.** Foundations

**B3.** Social Awareness and Individual Action: demonstrate an understanding of the impact individual action can have on equity, social justice, and environmental issues, and of how the media can create awareness of these issues

#### **B3.** Social Awareness and Individual Action

**B3.2** demonstrate an understanding of the effects of individual actions that are grounded in environmental awareness (*e.g., taking public transportation helps reduce air pollution, shopping at thrift stores helps reduce the depletion of resources used to create products, recycling lessens the amount of garbage going into landfill sites)* 

*Teacher prompts:* "What are some ways in which you can act in an environmentally responsible manner on a day-to-day basis? What impact can these actions have?" "What is your responsibility to people in other countries and to future generations with respect to the environment?"

**B3.3** explain how the media and popular culture can help create awareness of equity, social justice, and environmental issues ...

*Teacher prompt:* "Who are some musicians who use their music to convey messages about social justice or the environment? What impact do you think they have had?"

## C. Equity, Social Justice, and Change

#### C2. Equity and Social Justice in Canada

**C2.1** describe a variety of historical and contemporary examples of inequity and social injustice in Canada (*e.g.*, ... *environmental degradation related to resource exploitation*)

#### C3. Social Activism

**C3.1** describe the impact of historically important social movements (e.g., ... environmental ... movements)

## Equity and Social Justice: From Theory to Practice, Grade 12, University/College Preparation (HSE4M)

#### **B. Understanding Social Construction**

#### **B1.** Approaches and Perspectives

**B1.5** analyse how legislation, the courts, and public policy approach equity and social justice issues (*e.g.*, ... Ontario's Environmental Bill of Rights, ...), and how they can affect people's perceptions of these issues

*Teacher prompts:* ... "What arguments can be made for and against the idea that access to adequate food, housing, and health care, as well as clean air and water, is a basic human right?" ...

## C. Addressing Equity and Social Justice Issues

**C1. Historical and Contemporary Issues:** analyse a range of historical and contemporary equity and social justice issues and the impact of economic and environmental factors on these issues

#### C1. Historical and Contemporary Issues

**C1.3** analyse the role of economics and globalization in promoting or impeding equity or social justice (e.g., ... the lack of labour and environmental industrial standards in the Canada–U.S. *Free Trade Agreement, ...*)

*Teacher prompts:* ... "What effect has the marketing of fair-trade products had on farm economies in developing countries?"

**C1.4** assess the equity and social justice implications of major environmental issues (*e.g.*, *the privatization of water; the shipment of electronic waste to developing countries; the unsustainable exploitation of natural resources; issues relating to genetically modified crops and the seed-saving movement; the impact of global warming, and policies to reduce global warming, on developing countries; urban/industrial development of protected land or land whose ownership is disputed*)

*Teacher prompts:* "How do discrepancies between countries' environmental standards benefit some countries or groups of people and harm others?" "What developments need to occur in international law to address global environmental issues?" "What impact has the demand for corn for biofuel had on farmers in developing countries?" "How are farming practices affected when a large corporation owns and controls the use of seeds?"

#### C2. Leadership

C2.1 evaluate the achievements of a range of individual Canadians (e.g., ... environmentalists...) in the areas of equity and social justice
Teacher promotes "How effective has Devid Surply been in reising enveroness of

*Teacher prompts:* "How effective has David Suzuki been in raising awareness of environmental issues?" ...

**C2.4** describe the issues leading to the establishment of a range of secular social justice movements or organizations *(e.g., ... Greenpeace, ...)*, and assess the impact of these movements on individuals and groups

## D. Personal and Social Action

#### **D1.** Promoting Equity and Social Justice

**D1.3** analyse ways in which personal actions (*e.g.*, ... *reducing energy consumption*) can empower individuals and reduce the impact of inequity or social injustice in local, national, and international contexts

*Teacher prompts:* "What are the costs and benefits of purchasing organic and fair-trade products?" ...

## World Cultures, Grade 12, University/College Preparation (HSC4M)

## B. The Concept of Culture

#### **B1. Understanding Culture**

**B1.3** describe multiple ways in which culture can influence individual's perceptions, attitudes, and behaviours, (*e.g.*, ... *the human relationship to nature*, ...) and can shape social institutions and practices

#### **B2.** Cultural Dynamics

B2.4 compare the rates at which cultural change is taking place within a variety of cultures and analyse the factors contributing to this change (*e.g., ... climate change*) *Teacher prompts:* ... "What are the current effects of rising sea levels on people living in island and coastal communities? What are the future effects likely to be?"

## C. Cultural Expressions

#### C1. Art, Philosophy, and Religion

**C1.4** analyse the ways in which a culture's relationship to the environment is reflected in its art, philosophy, and religious/spiritual beliefs (*e.g.*, *with reference to depictions of nature in visual arts; creation stories of various cultures, including that of the Garden of Eden; the Aboriginal medicine wheel; philosophical approaches that view nature as separate from humanity*)

*Teacher prompts:* "How is the Cree conception of Mother Earth reflected in that nation's relationship to the environment?" "What does the concept of instrumental reason in Western philosophy suggest about humanity's relationship to the environment?"

#### **C3.** Contributions and Influences

**C3.4** demonstrate an understanding of the ways in which Canadian individuals from various ethnocultural minority groups have contributed to and influenced Canadian culture and society (*e.g.*, ... *David Suzuki*)

*Teacher prompts:* ... "What impact has David Suzuki had on environmental awareness in Canada?"

C3.5 assess the broad significance of historic cultural developments associated with a diverse range of ethnocultural groups (e.g., ...the Three Sisters of Haudenosaunee agriculture; tobacco; ... foods/beverages such as pasta, rice, ketchup, corn, potatoes, tea, coffee, wine)
 Teacher prompts: ... "What was the role of East Africa and the Arab world in the popularization of coffee? How important is the coffee trade to today's global economy? What have been the effects of the trade on local farmers who cultivate this crop?"

## FAMILY STUDIES

## Exploring Family Studies, Grade 9 or 10, Open (HIF10/20)

## B. Self and Others

#### **B1.** Adolescent Development

**B1.2** distinguish between needs and wants, and identify needs, wants, values, and goals that may develop during adolescence

*Teacher prompts:* ... "Do adolescents around the world have access to clean water? Is clean water a need or a want? Why?"

#### **B3.** Family Lifestyles

**B3.1** describe the impact of change, including social, economic, technological, and environmental change, on the lifestyles of past and present families (*e.g.*, ... *the impact of resource depletion on families who live on the land;* ...)

*Teacher prompts:* ... "What impact have economic and technological changes had on people's recreational time? How have these changes affected the extent to which people spend time outside, in nature?"

## C. Daily Living Skills

#### **C2. Managing Resources**

**C2.4** identify resources within their community that are available to support the needs of individuals and families *(e.g., parks and playgrounds ...)* 

#### **C3.** Practical Skills

**C3.4** describe factors that can affect the design of living spaces, and demonstrate the practical knowledge and skills required to help create and sustain a healthy and functional living space *(e.g., the ability to choose environmentally friendly technology and materials, ... to construct a home accessory from new or recycled components)* 

## D. Exercising Responsibility

#### **D1.** Personal Responsibilities

**D1.1** identify strategies and resources that individuals can use to improve and/or maintain their personal health and well-being *(e.g., ... spending time in nature, ...)* 

#### **D2.** Family Responsibilities

**D2.4** explain how families can fulfil their functions and meet their needs while reducing their impact on the environment (*e.g., by recycling and reusing goods, composting, shopping for second-hand clothing or household items, reducing consumption, using forms of transportation other than a car whenever possible)* 

#### **D3.** Consumer Awareness

D3.1 describe strategies for making informed and responsible consumer decisions *Teacher prompts:* ... "Why is it important to consider where our food is grown and where products are made? How can buying locally grown foods decrease our environmental footprint?"

## Clothing, Grade 10, Open (HNL2O)

## **B.** Influences on Clothing Choices

#### **B1.** The Functions and Social Impact of Clothing

**B1.1** describe the functions of clothing and accessories and the messages they convey (*e.g.*, to protect against the weather ...)

#### **B2.** Wardrobe Planning and Clothing Selection

**B2.2** describe various criteria used in wardrobe planning and explain how these criteria affect their personal clothing and accessory selections

*Teacher prompts:* ... "To what extent do you take environmental factors into consideration when buying clothing and accessories?"

## C. Making Knowledgeable Decisions

#### C3. Fibres and Fabric Care

**C3.2** explain how knowledge of natural and synthetic fibres and fabrics, including how they are produced, can affect clothing choices (*e.g.*, *the selection of* ... *organic cotton or hemp to limit environmental damage arising from the production of traditionally farmed cotton or petroleum-based polyester* ...)

*Teacher prompts:* ... "How do the production, use, and disposal of silk, wool, and polyester affect the environment?"

**C3.3** describe ways, including environmentally responsible ways, to care for garments to maintain their appearance and extend their life (*e.g.*, ... *using environmentally responsible detergents and stain-removal practices*)

*Teacher prompt:* "What clothing care procedures or products have the least impact on the environment?"

## D. Design and Clothing Construction Skills

#### D3. Procedures, Skills, and Techniques

D3.4 demonstrate the ability to create new clothing or accessories from recycled materials or garments (e.g., turn drink boxes into a bag; candy wrappers into a necklace; neckties into a skirt; a necktie into a handle for a bag; jeans into a skirt or a bag; tea towels into a dress; fabric samples into a tote, cosmetic bag, laptop case, or music player pouch)
Teacher prompts: "What are some ways you can repurpose an old wool sweater?" "How can old saris be repurposed into yarn? What could you make with this yarn?" "What are some current examples of 'upcycled' products that are being sold in your community or online?"

## Understanding Fashion, Grade 11, College Preparation (HNC3C)

## B. Influences on Fashion

#### **B3.** Fashion Cycles and Trends

**B3.3** analyse how social factors, including current events, influence fashion trends and cycles *(e.g., factors such as ... environmental issues)* 

*Teacher prompts:* ... "How has concern for the environment affected current fashion trends?" ...

## C. Marketing, Environmental Responsibility, and Consumer Behaviour

#### C1. Consumer Behaviour and Fashion Marketing

**C1.5** analyse fashion promotions and products that raise awareness of social issues (*e.g.*, ... *reusable shopping bags*)

*Teacher prompts:* "What are some fashion products that promote awareness of environmental issues? How effective do you think they are?" ...

**C2.** Fibres, Fabrics, and the Environment: demonstrate an understanding of fibres, fabrics, and finishes, and of the environmental impact associated with their production and use

#### C2. Fibres, Fabrics, and the Environment

**C2.3** describe characteristics of various types of dyes and fabric finishes and describe the effects they have on fabrics

*Teacher prompts:* "Why might some natural dyes have a more negative impact on the environment than some synthetic dyes?" ...

- C2.4 describe the environmental impact of the production, use, and care of various fibres and fabrics (e.g., the impact of farming cotton, hemp, bamboo, sheep, silkworms; of the production process for various synthetic fabrics and dyes; of dry cleaning)
  Teacher prompts: "Which is more damaging to the environment washing garments at home or having them dry cleaned? Why?" "What is the environmental impact of the chemicals used in stain-resistant finishes?" "What is the environmental impact of using dyes in the production of fibres?"
- **C2.5** describe strategies to reduce the environmental impact of the production of various fibres, fabrics, and finishes (e.g., purchasing garments made from organic cotton or hemp, using plant-based dyes, buying second-hand clothes, limiting the use of stain-resistant fabric)
- **C2.6** apply their knowledge of the basic characteristics of various fibres and fabrics and their environmental impact when choosing appropriate fabrics for various fashion products

## Housing and Home Design, Grade 11, Open (HLS3O)

## A. Research and Inquiry Skills

#### A1. Exploring

A1.1 explore a variety of topics related to housing and home design (*e.g.*, ... *eco-housing*; *eco-textiles* ...) to identify topics for research and inquiry

## **B. Housing Needs**

#### **B1. Housing and Human Needs**

- **B1.2** explain, on the basis of comparison of historical and modern living spaces, how housing has evolved to meet human needs (*e.g., insulation, windows, central heating, air conditioning to protect inhabitants from heat/cold; chimneys, fans and vents to circulate air and remove harmful fumes and dampness; ... bans on harmful building substances)*
- **B1.4** describe how and why housing needs and preferences vary in different regions of Canada and throughout the world (*e.g., the impact of factors such as climate, proximity to earthquake or flood zones, ...)*

Teacher prompts: "What impact does climate have on people's housing needs?"

#### **B2.** Homelessness and Inadequate Housing

B2.2 explain the effects of living in inadequate housing (e.g., housing that is ... not adequate to withstand natural disasters common in the region)Teacher prompts: "What diseases are associated with lack of access to clean drinking water?"

## C. Social, Economic, and Legal Considerations

#### C1. The Impact of Social Factors

- C1.1 analyse the impact of current social and demographic factors on housing (e.g., ... environmental issues, green space regulations)
  Teacher prompts: ... "What is the Ontario Greenbelt and what impact does it have on housing developments?"
- **C1.2** describe how the increased recognition of the need for resource conservation can affect decisions related to living spaces, and identify ways in which householders can conserve energy, water, and other resources (*e.g., by using alternative sources of energy such as solar or geothermal power; by installing low-flow toilets and shower heads; by using recycled building materials; by retrofitting a building with more energy-efficient windows and doors and improving insulation; by using energy-saving appliances, programmable thermostats, dimmer switches, and LED lights; by recycling and composting)*

*Teacher prompts:* "What are some ways to retrofit a house to be more energy efficient?" "What can apartment or condominium dwellers do to conserve energy?"

**C1.4** describe how social factors and housing-related technologies may affect housing in the future, and provide reasons to support their predictions (*e.g.*, *the increasing development of high-rise buildings as available land decreases in urban spaces; the availability of more recycled building materials and/or stricter building regulations to conserve natural resources and protect the environment; the development of decentralized communities with single-family housing as more people telecommute to work or school*)

*Teacher prompts:* "What do you think an environmentally friendly dwelling will look like in the future? Why?" ...

#### C3. Economic and Legal Considerations

**C3.6** summarize housing-related services and regulations available in Canadian communities (*e.g.*, *garbage collection; water and sanitation; energy services; tree-planting and maintenance services; ... environmental assessment ...)* 

## D. Creating and Maintaining Living Spaces

#### **D1. Functional Floor Plans**

**D1.2** using floor plans, evaluate the effectiveness of interior design decisions (*e.g.*, ... *orientation of windows for solar gain* ...)

## D2. Design and Furnishing Considerations

- **D2.3** analyse the interrelationship between the elements and principles of design, practical considerations, and the range of available products with respect to home-decorating decisions (*e.g.*, ... how the availability of environmentally friendly and energy-efficient products may influence design decisions; how the size and purpose of a yard and the amount of sun and shade affect landscaping decisions)
- **D2.4** describe the criteria involved in selecting home furnishings, equipment, and appliances (*e.g.*, ... *energy efficiency* ...)

## D3. Home Maintenance

**D3.2** describe strategies for maintaining a healthy home environment (e.g., limiting use of household chemicals or choosing environmentally responsible products; using proper waste disposal and recycling procedures; using safe and appropriate pest control ...)

## The World of Fashion, Grade 12, University/College Preparation (HNB4M)

## B. History and Influences

#### **B1.** Fashion History

**B1.1** analyse the impact on the fashion industry of historical developments and social issues (*e.g.*, ... *environmental issues*, ... *natural disasters*, ...)

*Teacher prompts:* ... "What impact can natural disasters such as drought or pest infestation affecting cotton crops or silk worms have on the fashion industry?" "What impact have current environmental issues had on the fashion industry?" ...

## C. Textile Production, Society, and the Globalized Marketplace

**C2. Global Textile Production:** demonstrate an understanding of global textile production and its social and environmental impact

#### **C2.** Global Textile Production

C2.3 analyse the social and environmental impact of textile production and disposal (e.g., ... the environmental impact of the irrigation of and use of pesticides on cotton, the production process for petroleum-based textiles, the use of various dyes and finishes, the disposal of non-biodegradable textiles, the leaching of finishes from fabric disposed of in landfill)
Teacher prompts: ... "What environmental issues are associated with different stages in the life cycle of a synthetic fabric such as polyester? In what ways are these different from the issues associated with a natural fabric such as cotton or silk?"

## C3. Globalization and Social Responsibility

- **C3.4** describe strategies that consumers can adopt to make socially responsible fashion choices *(e.g., buying less, ... buying fabrics that are sustainable, engaging in letter-writing campaigns or boycotts against unethical practices or companies, creating fashion items from recycled materials, buying second-hand clothing, washing clothing less frequently)*
- C3.5 explain strategies used by the fashion industry to reduce its environmental impact (e.g., reducing waste during the manufacturing process; reducing and/or eliminating pesticide use on cotton and other crops; using natural dyes such as indigo, cutch, and weld whenever possible; reducing water use and water pollution during production)
  Teacher prompts: "How is the fashion industry using sustainable and recycled materials?" "How can 'upcycling' reduce the environmental impact of the fashion industry? How successful are garment manufacturers who specialize in upcycling?" "What are the environmental benefits of blending hemp with cotton or silk in fabric manufacturing?"

## Food and Nutrition, Grade 9 or 10, Open (HFN1O/2O)

## C. Food Choices

#### **C2.** Influences on Food Choices

C2.1 identify different factors that influence people's food choices (e.g., ... environmental ...) Teacher prompts: "Why do some people choose to be vegetarian?" "How can you modify your food choices to reduce your impact on the environment?" "Why might some people choose to eat organic foods while others choose to eat local foods as a way of reducing their impact on the environment?" ...

## D. Local and Global Foods

#### **D1.** Availability of Food

- D1.2 explain how various factors affect the availability of local foods (*e.g., proximity to agricultural land, length of growing season, ... weather, soil conditions) Teacher prompts:* ... "What makes the Niagara region so well suited to growing peaches and other soft fruits?"
- **D2.** Food and Environmental Responsibility: demonstrate an understanding of how various food-purchasing choices and food-preparation practices affect the environment

#### **D2.** Food and Environmental Responsibility

**D2.1** assess their personal and family food purchasing and food-preparation practices to determine their effect on the environment (*e.g., local foods require less fossil fuel for transportation; homemade foods require less packaging*)

*Teacher prompts:* "Which would reduce your carbon footprint more – organic produce or local produce?" "How can individuals and families ensure that the fish and seafood they consume are grown and harvested in environmentally responsible ways?"

**D2.2** assess programs and practices that reduce the impact of food production and consumption on the environment (*e.g., recycling programs, organic farming, food co-ops, community gardens*)

*Teacher prompt:* "What food-related programs could your school and community support to help the environment?"

**D2.3** outline environmentally responsible food-related strategies that can be used in the home *(e.g., using cooking techniques that require less energy, cultivating home vegetable gardens, packing lunches in reusable containers, using reusable shopping bags, buying in bulk, <i>recycling, vermi-composting)* 

## **D3.** Food Security

- **D3.1** identify the components of food security (e.g., ... sustainability)
- **D3.2** explain why some people in Canada cannot achieve food security (*e.g.*, ... poor growing conditions or low crop yields as a result of soil depletion or natural disasters)

## Food and Culture, Grade 11, University/College Preparation (HFC3M)

## B. Culture, Foods, and Food Practices

## **B1. Food Choices**

**B1.1** explain how various factors (*e.g.*, ... *environment*, ...) influence personal and societal food choices

## **B3.** Culture and Food Habits

**B3.4** compare some food-production and food-acquisition practices in Canada to those in a variety of other countries/cultures (e.g., with reference to: cultivation on small family farms versus large monoculture farms; the role of hunting and fishing; organic farming practices versus the use of chemicals and genetically modified seeds/plants; buying packaged goods and butchered meat in grocery stores versus fresh produce and live animals in markets ...)

## C. Foods and Flavours

**C1.** Food Availability: demonstrate an understanding of the relationship between geography and the foods naturally found and/or produced in Canada and various other countries

## C1. Food Availability

- C1.1 explain the relationship between geography and the foods naturally found or produced in different regions of Canada (e.g., salmon on the west coast, beef and bison on the prairies, Saskatoon berries on the prairies, cranberries in Ontario, grapes in southern Ontario, fish/seafood in the Atlantic provinces, seal and whale in the far north)
- **C1.2** explain how overhunting and overfishing, as well as the reduction or elimination of natural habitats, have affected the availability of foods found in different regions of Canada
- **C1.3** explain the relationship between geography and the foods naturally found or produced in various countries of the world (*e.g., tropical and citrus fruits in countries with consistently warm climates, fish/seafood in coastal areas, food products from grazing animals in grassland areas)*

Teacher prompt: "Why can we not grow coffee and tea in Ontario?"

## Food and Culture, Grade 11, Workplace Preparation (HFC3E)

## B. Culture, Foods, and Food Practices

#### **B1.** Food Choices

**B1.1** describe how various factors (*e.g.*, ..., *environment*, ...) influence personal food choices *Teacher prompt:* "How would your food choices be affected if you consumed only food that was grown and/or produced within a 100-kilometre radius of your home?"

#### **B3.** Culture and Food Habits

**B3.3** describe some food-production and food-acquisition practices in Canada and in a variety of other countries/cultures (*e.g.*, *cultivation on small family farms*, *organic farming practices*, *large monoculture farms*, *the use of chemicals and genetically modified seeds/plants*, *the role of hunting and fishing ...*)

## C. Foods and Flavours

**C1.** Food Availability: demonstrate an understanding of the relationship between geography and the foods naturally found and/or produced in Canada and in various other countries

#### C1. Food Availability

- **C1.1** identify foods naturally found or produced in the different regions of Canada (*e.g., salmon on the west coast, beef and bison on the prairies, Saskatoon berries on the prairies, cranberries in Ontario, grapes in southern Ontario, fish/seafood in the Atlantic provinces, seal and whale in the far north)*
- **C1.2** explain the relationship between geography and the foods naturally found or produced in Canada (e.g., the influence on food production of land formations, rainfall, the location of fertile farmland or temperate climates)

**Teacher prompt:** "What factors explain the fact that cranberries grow so well in Ontario?"

- **C1.3** explain how overhunting and overfishing, as well as the reduction or elimination of natural habitats, have affected the availability of foods found in different regions of Canada
- **C1.4** explain the relationship between geography and the foods naturally found or produced in various countries or regions (*e.g., tropical and citrus fruits in countries with consistently warm climates, fish/seafood in coastal areas, food products from grazing animals in grassland areas)*

## Nutrition and Health, Grade 12, University Preparation (HFA4U)

#### **B.** Nutrients

#### **B4.** Nutritional Status

**B4.3** explain how various factors (*e.g.*, ... *environmental governance*, ... *natural disasters*) affect the nutritional status of specific population groups in Canada and around the world

## D. Local and Global Issues

### **D1. Food Security**

**D1.1** explain the importance of each of the key components of food security (*e.g.*, ... *sustainability*) *Teacher prompts:* "Why would access to potable water be considered a food security issue?"

## **D2.** Food Production and Supply

**D2.1** explain how geographical factors, physical conditions, and natural disasters *(e.g., climate, weather, soil conditions, proximity to water, mudslides, floods, earthquakes)* affect food supply and production and water potability

*Teacher prompts:* "In what ways have food supply and production and water potability been affected after a recent natural disaster?" "Which countries' or regions' food supplies are most at risk because of climate change?" "How does climate change affect the food supply of indigenous people, in particular?" "How might climate change affect the different agricultural regions of Canada?"

**D2.4** analyse the effect of various trends in agriculture and aquaculture *(e.g., organic farming, ...)* on local and global food supply and production

*Teacher prompt:* "In what ways do different interest groups and communities differ in their opinions about the risks and benefits of organic farming? What are some reasons for the differing opinions?"

**D3.** Food Production and the Environment: demonstrate an understanding of the impact of food production on the environment.

#### **D3.** Food Production and the Environment

**D3.1** explain how consumer food choices affect the environment, locally and globally (e.g., demand for imported food increases the amount of energy used in transportation; choice of overpackaged products increases the volume of waste going to landfills; demand for fair-trade products supports sustainable farming practices and small-scale farmers but may cause farmers to grow cash crops, such as cocoa and coffee, rather than food; demand for local produce supports farmers' markets, reduces the use of preservatives, and lowers transportation costs)

*Teacher prompts:* "How can one person's decision to purchase fair-trade chocolate have an impact on environmental conditions in a different part of the world?" "What is the environmental impact of purchasing bottled water?"

D3.2 analyse the effect on the environment of various agricultural trends (e.g., growing crops for biofuels) and food production technologies (e.g., types of farm equipment, types of energy sources, climate-control techniques, genetic engineering of foods)
 Teacher prompt: "What are some positive and negative environmental effects of using land

for biofuel production rather than food production?"

**D3.3** analyse the effects of various environmental protection laws and regulations on food supply and production (*e.g.*, *policies related to forest preservation, fuel emission standards, pesticide use*)

*Teacher prompt:* "How might regulations to limit pesticide use affect food production and consumption?"

**D3.4** demonstrate an understanding of health, safety, and environmental issues related to food supply and production *(e.g., risks associated with the bioaccumulation of pesticides and hormones, risks of contamination during food production)*, and describe key aspects of legislation that is designed to protect Canadian consumers *(e.g., Canadian Agricultural Products Act, Food and Drugs Act)* 

*Teacher prompts:* "How can consumer awareness of the food-production process benefit food producers, consumers, and the environment?" "What evidence was used to support the Government of Canada's decision to reduce the use of bisphenol A in some food packaging?"

## Nutrition and Health, Grade 12, College Preparation (HFA4C)

## B. Nutrition and Health

## **B4.** Nutritional Status

**B4.3** identify factors that can contribute to the poor nutritional status of people in Canada and around the world (*e.g.*, ... *natural disasters*)

*Teacher prompts:* ... "Why do some First Nation communities in Canada have such limited access to safe drinking water? ..."

## C. Eating Patterns and Trends

## C3. Trends and Patterns in Food and Nutrition

**C3.1** analyse new and emerging food- and nutrition-related products and services in terms of their real or perceived benefits to Canadian consumers *(e.g., environmental benefits)* 

## D. Local and Global Issues

## **D1. Food Security**

**D1.1** explain the importance of each of the key components of food security (*e.g., ... sustainability*) *Teacher prompt:* "Why would access to potable water be considered a food security issue?"

## **D2.** Food Production and Supply

**D2.1** outline how geographical factors, physical condition, and natural disasters (*e.g., climate, weather, soil conditions, proximity to water, mudslides, floods, earthquakes)* affect food supply and production

*Teacher prompt:* "Why are the soil conditions in the Holland Marsh so favourable to crop growth?"

**D2.2** explain the effects of various agricultural methods (*e.g., crop rotation, integrated pest management, fallow fields, intercropping, no tillage*) on local or global food production and yields

*Teacher prompts:* "Why might regular tillage of soil decrease crop yields?" "How can leaving a field fallow for a season lead to increases in crop yields in future years?"

**D3.** Food Production and the Environment: demonstrate an understanding of the effects of food production on the environment.

### **D3.** Food Production and the Environment

**D3.1** describe how consumer food choices affect the environment, locally and globally (e.g., demand for imported food increases the amount of energy used in transportation; choice of overpackaged products increases the volume of waste going to landfills; choice of fair-trade products supports sustainable farming and small-scale farmers; demand for local produce supports farmers' markets and reduces use of fossil fuels)

*Teacher prompt:* "What is the environmental impact of purchasing overpackaged foods? Of purchasing bottled water?"

D3.2 explain the effect on the environment of various agricultural trends (e.g., growing crops for biofuels) and food-production technologies (e.g., types of farm equipment, types of energy sources, climate-control techniques, genetic engineering of foods)
 Teacher prompt: "What are some positive and negative environmental effects associated

*Teacher prompt:* "What are some positive and negative environmental effects associated with the production and consumption of genetically modified foods?"

**D3.3** explain the effect of various environmental protection laws and regulations on food supply and production (e.g., policies related to forest preservation, fuel emission standards, pesticide use)

*Teacher prompts:* "What impact have codfishing bans on the east coast of Canada had on the fishing and fish-processing industries?" "How do current fishing and hunting bans affect relationships between Aboriginal and non-Aboriginal people in Canada?"

**D3.4** demonstrate an understanding of health, safety, and environmental issues related to food supply and production *(e.g., risks associated with bioaccumulation of pesticides and hormones, risks of contamination during food production)*, and identify legislation that is designed to protect Canadian consumers *(e.g., Canada Agricultural Products Act, Food and Drugs Act)* 

*Teacher prompts:* "How can consumer awareness of the food-production process benefit food producers, consumers, and the environment?" "What are the health risks associated with the use of bisphenol A?"

## Food and Healthy Living, Grade 12, Workplace Preparation (HFL4E)

## A. Research and Inquiry Skills

#### A1. Exploring

A1.3 formulate effective questions to guide their research and inquiry

*Teacher prompts:* "If you were researching sources of omega-3 fatty acids, why might you want to compare vegetarian to non-vegetarian sources? Which aspects would be important to compare (e.g., ... environmental considerations ...)?"

## D. The Food Consumer

**D2. Responsible Consumerism:** demonstrate an understanding of practices related to responsible consumerism;

#### **D2.** Responsible Consumerism

**D2.1** describe environmentally responsible ways of acquiring food *(e.g., buying locally, bartering or exchanging, growing their own vegetables)* 

Teacher prompt: "How does buying locally grown produce help the environment?"

- **D2.2** describe some environmentally responsible food-preparation practices (*e.g.*, *using energy efficient appliances; filling the freezer to the recommended level; using fewer pots in cooking; using a microwave oven rather than a conventional oven to cook a small amount of food; using as many parts of an item of food as possible; planning meals to avoid overshopping, eating out, or food waste)*
- **D2.3** describe strategies they can use at home to reduce food waste and excess packaging (e.g., separating out recyclable materials, vermicomposting, using reusable fabric shopping bags, buying in bulk, refusing excess packaging)

*Teacher prompt:* "What are some environmentally responsible ways of dealing with food waste and packaging?"

## Dynamics of Human Relationships, Grade 11, Open (HHD3O)

## B. Personal Growth and Development

#### **B1.** Personal Well-Being

B1.2 explain how various factors (e.g., good nutrition, physical activity, a strong support network, awareness of one's experiences and surroundings, lifelong learning, sharing and volunteering) contribute to the development of personal well-being *Teacher prompts:* ... "What have researchers found about the connection between personal well-being and time spent outdoors?"

#### **B3.** Self-concept and Healthy Relationships

**B3.2** explain how self-concept influences a person's relationships (*e.g.*, ...*with the environment*) *Teacher prompt:* "How does your sense of self affect your actions towards ... the environment?"

## C. Healthy Relationships

#### C3. Dynamics and Challenges That Affect Relationships

**C3.8** describe the impact on human interactions of various changes that are taking place in society (*e.g.*, ... *increased sense of environmental responsibility*)

## D. Rights and Responsibilities

## D1. Individual Rights and Responsibilities

D1.1 identify the rights of the individual in human interactions as outlined in a variety of laws and policies (e.g., ... the Ontario Environmental Bill of Rights ...)
Teacher prompts: ... "What protections does the Ontario Environmental Bill of Rights give to individuals?"

### D2. Rights and Responsibilities in Community Context

**D2.1** explain how various societal factors (*e.g.*, ... *environmental conditions*, ...) extend or limit individual rights and responsibilities

## E. Interpersonal Skills

## E4. Enhancing Relationships through Community Involvement

**E4.4** design and implement a social-action initiative to promote healthy relationships (*e.g.*, ... *a campaign to address community environmental concerns* ...)

## Families in Canada, Grade 12, University Preparation (HHS4U)

## C. The Impact of Norms, Roles, and Institutions

### C3. The Effects of Family and Parent-Child Relationships

**C3.1** explain a range of factors that can influence decisions about having children (*e.g.*, ... *concerns about overconsumption of resources*)

## D. Trends, Issues, and Challenges

## D1. Trends and Challenges for Individuals

D1.2 assess the impact of current social trends, issues, and challenges on individual development (*e.g., with reference to ... climate change, ...*)
 *Teacher prompts:* ... "How is childhood development affected by increased urbanization and the corresponding decrease in time spent in nature?"

#### D3. Trends and Challenges in the Family and in Parent-Child Relationships

D3.3 assess the impact of current social trends, issues, and challenges relating to the functioning of families (e.g., with reference to ... climate change ...)
 Teacher prompts: ... "How has climate change affected Inuit families?"

## Families in Canada, Grade 12, College Preparation (HHS4C)

## C. The Impact of Norms, Roles, and Institutions

## C3. The Effects on Family and Parent-Child Relationships

**C3.1** describe a range of factors that can influence decisions about having children (*e.g.*, ... *concerns about over-consumption of resources*)
#### D. Trends, Issues, and Challenges

#### D1. Trends and Challenges for Individuals

**D1.2** explain the impact of current social trends, issues, and challenges on individual development *(e.g., with reference to ... climate change ...)* 

#### D3. Trends and Challenges in the Family and in Parent-Child Relationships

**D3.3** explain the impact of current social trends, issues, and challenges relating to the functioning of families (*e.g.*, ... *climate change* ...)

# Human Development throughout the Lifespan, Grade 12, University/ College Preparation (HG4M)

#### B. Developmental Theories, and Risk and Resilience

#### **B2.** Risk and Resilience

- **B2.1** describe threats to healthy development and their impacts at various stages of life (*e.g.*, ... *environmental degradation* ...)
- **B2.3** describe ways in which government policies and initiatives by non-governmental organizations (NGOs) at the local and global level can function as protective factors that reduce the impact of threats to human development at different stages of the lifespan *(e.g., ... establishing green space, combating global climate change ...)*

# C. Understanding Physical Development

#### **C3.** Factors Affecting Physical Development

- **C3.3** identify factors that can affect brain development during the prenatal period *(e.g., ... environmental pollutants ...)*, and analyse their impact
- **C3.4** describe brain plasticity with reference to the brain's response to ... environmental factors *(e.g., ... environmental toxins ...)*

# E. Social-Emotional Development and Personality

#### E3. Factors Affecting Social-Emotional Development

**E3.1** analyse the role that family plays in socializing its members (*e.g., with reference to the transmission of ... values such as respect for ... the environment*)

# Personal Life Management, Grade 12, Open (HIP4O)

# C. Daily Living Skills

#### **C1. Making Decisions**

**C1.3** explain how a variety of factors can influence an individual's decision-making process *Teacher prompt:* "What factors might influence a consumer's decision to buy or not buy environmentally friendly products?"

#### C3. Managing a Household

**C3.2** describe the basic responsibilities involved in maintaining a safe and functional home environment (*e.g., conserving water and energy, recycling, reducing waste, making informed decisions about the use of toxic household products ...)* 

## D. Personal and Social Responsibilities

#### D3. Consumer Rights and Responsibilities

- **D3.1** describe strategies for making responsible consumer decisions when living independently *(e.g. ... considering the environmental impact of purchases ...)*
- **D3.2** identify internal and external factors that influence spending decisions (*e.g.*, ... *environmental impact* ...)

# Working with Infants and Young Children, Grade 11, College Preparation (HPW3C)

## B. Growth and Development

#### **B3.** Positive Environments for Development

**B3.4** explain how and why outdoor play contributes to children's physical and emotional health (*e.g., by providing opportunities for vigorous exercise and connection with the natural environment, ...*)

# C. Employment Opportunities and Requirements

#### **C2.** Workplace Expectations

**C2.4** identify the responsibilities of early childhood educators in promoting the socialization and healthy development of children *(e.g., fostering environmental awareness ...)* 

# E. Addressing Social Challenges

#### E1. Issues and Challenges

E1.5 describe strategies that could be used in early learning programs to reduce their environmental impact (e.g., using cloth diapers, recycling craft materials, planting a vegetable garden, using reusable cutlery and dishes)

# Raising Healthy Children, Grade 11, Open (HPC3O)

# B. Child Growth and Development

#### B1. Pregnancy, Birth, and Postnatal Care

**B1.5** describe the effects of teratogens and environmental hazards on prenatal and long- term development (*e.g., fetal alcohol spectrum disorder, low birth weight, brain damage, premature birth*), and identify strategies for avoiding exposure to teratogens and environmental

hazards (e.g., avoiding cat feces; checking with a physician before taking any medications; avoiding recreational drugs and alcohol; avoiding exposure to toxic cleaning products, household and garden chemicals, paints and solvents, and insecticides on fruits and vegetables) **Teacher prompt:** "What resources are available to inform people about toxic chemicals in everyday products?"

### C. Personal and Social Responsibilities of Parents

#### **C1. Preparing for Parenting**

**C1.8** describe ways in which parents can reduce the environmental impact of raising children (*e.g.*, *using cloth diapers, breastfeeding, using homemade baby food, using public transit, choosing a fuel-efficient vehicle*)

## D. Child Rearing around the World

#### **D2.** Parenting Styles and Practices

D2.4 describe ways in which a parent can act as a positive role model for children (e.g., by modelling environmental responsibility ...)
Teacher prompt: "When a parent refuses excess packaging at a grocery store, what messages does that communicate to a child?"

# Working with School-Age Children and Adolescents, Grade 12, College Preparation (HPD4C)

#### B. Growth and Development

#### **B3.** Positive Environments for Development

**B3.3** explain how and why physical activity, including physical activity out of doors, promotes the physical and emotional health of school-age children and adolescents (*e.g., by providing opportunities for vigorous exercise and connection with the natural environment ...*)

# C. Employment Opportunities and Requirements

#### **C2. Workplace Expectations**

**C2.4** identify ways in which people who work with school-age children and adolescents carry out their responsibility to promote children's socialization and healthy development (*e.g.*, ... *fostering environmental awareness* ...)

# GENERAL SOCIAL SCIENCES

# Introduction to Anthropology, Psychology, and Sociology, Grade 11, University Preparation (HSP3U)

### B. Anthropology

#### **B2.** Explaining Human Behaviour and Culture

B2.1 explain, from an anthropological perspective, how various factors (e.g., physical environment ...) influence and shape human behaviour and culture ... *Teacher prompts:* "What features of Bedouin culture reflect the people's response to environmental conditions such as geographic location and climate?" "What are some ways in which geographic location has influenced the development of Inuit culture?"

## D. Sociology

#### **D2.** Explaining Social Behaviour

**D2.3** explain, from a sociological perspective, how diverse influences ... shape social behaviour ... *Teacher prompts:* ... "What factors might contribute to changes in social attitudes regarding, for example, ... environmentally responsible behaviour?"

# Introduction to Anthropology, Psychology, and Sociology, Grade 11, College Preparation (HSP3C)

# B. Anthropology

#### **B2.** Explaining Human Behaviour and Culture

B2.1 describe, from an anthropological perspective, how various factors (*e.g., physical environment ...*) influence and shape human behaviour and culture ... *Teacher prompts:* ... "How has environmental consciousness changed behaviour and culture?"

#### D. Sociology

#### **D3.** Socialization

D3.1 describe how structural changes take place in social institutions) in response to diverse influences (e.g., ... the growth of environmentalism ...)
Teacher prompts: "How have environmental initiatives affected your school and local

*Teacher prompts:* "How have environmental initiatives affected your school and local institutions?" ...

**D3.2** describe ways in which social structures ... affect individual and group behaviour *Teacher prompts:* ... "How can social structures work to convince individuals to behave in a more environmentally responsible manner?"

# Challenge and Change in Society, Grade 12, University Preparation (HSB4U)

## B. Social Change

#### **B2.** Causes and Effects of Social Change

- **B2.1** describe ways in which influential Canadian leaders have contributed to social change *(e.g., ... David Suzuki, ...)*
- **B2.2** explain how various ... environmental ... factors (*e.g., global warming/climate change, environmental activism, ...*) can lead to social change, and how other factors can create resistance to change

*Teacher prompt:* "What are some changes in our society that have resulted or that may result from attempts to deal with the challenge of climate change? What are some factors that make it difficult to respond to this challenge?"

**B2.6** explain the impact of social change on individuals in Canada and on Canadian society (e.g., ... increased recognition of climate change has brought environmental issues to the forefront of political and economic debates ...)

#### **B3.** Technological Change

**B3.3** explain how technological advances (*e.g., in ... agriculture, recycling*) lead to cultural adaptations

### D. Global Social Challenges

#### **D1.** Global Inequalities

**D1.1** describe the key provisions of various provincial, national, and international agreements for addressing human rights issues (*e.g.* ... the Ontario Environmental Bill of Rights)

#### **D2.** Globalization

- **D2.1** explain various types of arrangements between governments and transnational corporations, including the reasons for such arrangements, and describe their impact on developing nations *(e.g., ... lax environmental standards, the privatization of water)*
- **D2.3** summarize the impact *(e.g., ... environmental)* of globalization on Canadian society *Teacher prompts:* "How does the size of the carbon footprint of a material item affect the calculation of its economic and social value or usefulness?"

#### **D3.** Exploitation

**D3.3** identify environmental changes that have resulted from the unchecked exploitation of fossilfuel resources *(e.g., environmental degradation, climate change)*, and assess the impact of these changes on the well-being of Canadians

*Teacher prompts:* "In what ways are the negative effects of climate change experienced more by disenfranchised groups than by those in positions of power?" "Why have some activists argued that climate change is a human rights issue?"

# PHILOSOPHY

# Philosophy: The Big Questions, Grade 11, University/College Preparation (HZB3M)

#### D. The Relevance of Philosophy

#### D1. The Relevance to Everyday Life and Society

**D1.2** explain the relevance of some of the big questions of philosophy to their community and the broader society (*e.g.*, ... about ethics in debates about issues such as ... genetically modified organisms; questions about the relationship between nature and human beings in debates about environmental policy ...)

*Teacher prompts:* "What philosophical questions arise in relation to research into and the manufacturing of genetically modified organisms? ... "What ethical and metaphysical questions underlie the issue of human responsibility to protect the environment or endangered species?" ...

# Philosophy: Questions and Theories, Grade 12, University Preparation (HZT4U)

#### A. Research and Inquiry Skills

#### A1. Exploring

A1.1 explore a variety of topics related to philosophy (e.g., ... the relationship of humankind to other animals and the environment ...) to identify topics for research and inquiry

#### C. Core Topics: Metaphysics

#### **C3.** Making Connections to Metaphysics

**C3.4** demonstrate an understanding of the influence of metaphysical ideas on other subject areas (*e.g.*, ... how views of the self influence discussions of the relationship of people to nature in environmental studies)

#### D. Core Topics: Ethics

#### **D3.** Making Connections to Ethics

**D3.1** demonstrate an understanding of the influence that ideas related to ethics have on their everyday life

*Teacher prompts:* ... "Do you think that you have a moral obligation to protect the environment? Why or why not?" ...

# WORLD RELIGIONS

# World Religions and Belief Traditions: Perspectives, Issues, and Challenges, Grade 11, University/College Preparation (HRT3M)

#### B. Approaches to the Study of the Sacred

#### B2. Terms and Concepts in the Study of the Sacred

**B2.2** define and appropriately use terms that relate to the study of world religions and belief traditions (*e.g.*, ... *pantheism* ...)

#### C. Religious and Spiritual Impulse

#### **C1. Functions of Human Belief Traditions**

**C1.1** explain the connection between religions/belief traditions and human efforts to understand existence and the nature of reality (*e.g., belief as a way of understanding ... the natural world ...*)

#### C2. The Search for Meaning

**C2.2** identify and explain concepts associated with the journey of life and the quest for meaning in various religions and belief traditions

*Teacher prompts:* ... "How does the First Nation concept of walking the sacred path incorporate ideas about ... environmental, ...healing?" ...

#### D. Sacred Teachings and Principles

#### **D1.** Tenets, Practices, and Teachings

**D1.1** explain the concept of the supernatural and the role of entities associated with it in various religions and belief traditions

*Teacher prompts:* ... "How did beliefs about the supernatural influence the decision of the Adivasi, the Aboriginal people of the Narmada River, to protest the construction of a dam?"

D1.3 describe actions people perform to fulfil the expectations of their particular belief tradition (e.g., Aboriginal respect for and protection of the environment ...)
Teacher prompts: ... "How have First Nation beliefs about the natural world inspired the spawn-on-kelp sustainable fishing industry?"

D1.4 explain how concepts of time, creation, and the afterlife are reflected in the teachings and practices of various religions and belief traditions
*Teacher prompts:* "How do the cultural practices and spiritual beliefs of various First Nations

reflect their knowledge and understanding of cyclical processes in nature?"

#### **D3.** Prescribed Roles and Influential Figures

**D3.4** analyse the impact of leaders and activists associated with various religions and belief traditions (*e.g.*, ... *the women of Chipko*)

*Teacher prompts:* ... "How are the experiences and lessons of the women of Chipko relevant to current global and environmental issues?"

## E. Rites and Observances

#### E1. Daily Living as Sacred Reality

E1.3 explain the origins of the daily practices of various religions or belief traditions (e.g., ... Prayer to the Four Directions)

*Teacher prompts:* ... "How might geography or environment affect the rituals of Prayer to the Four Directions?"

# F. Social and Cultural Contexts

#### F1. Cultural Contexts

**F1.1** identify and explain the significance of signs and symbols associated with various religions and belief traditions

*Teacher prompts:* ... "How do the colours in a medicine wheel embody the First Nation concept of the importance of the physical, spiritual, and natural worlds?"

F1.3 analyse the ways in which various religions and belief traditions are reflected in specific works of art, architecture, music, literature, and dance; in styles of dress; and in cuisines *Teacher prompts:* ... "How are Aboriginal attitudes towards the environment and geography reflected in the architecture of Douglas Cardinal?"

#### F3. Social Challenges

**F3.1** explain why tensions and debates have arisen between various faith communities and society *Teacher prompts:* "How did the beliefs of the women of Narmada influence their decision to stage a non-violent protest against the construction of the Narmada Valley dam?" ...

# World Religions and Belief Traditions in Daily Life, Grade 11, Open (HRF3O)

# B. Commonalities, Concepts, and Contexts

#### **B2.** Terms and Concepts

**B2.1** define and appropriately use terms and concepts related to the study of world religions and belief traditions (*e.g.*, ... *pantheism* ...)

# D. Actions

#### D1. Festivals, Celebrations, and Commemorations

**D1.3** describe the role and significance of fasts and feasts in various belief traditions *Teacher prompts:* ... "How does the nalukataq – the spring whaling festival – express the significance of the whale to the Inuit community?"

#### **D3.** Daily Observances

**D3.2** describe the role and significance of daily observances in different world religions and belief traditions (*e.g.*, ... *sunrise ceremony*, ...)

*Teacher prompts:* ... "How might the observation of the sunrise ceremony affect and reflect an individual's attitude towards the natural world?"

**D3.3** explain how daily practices and rituals associated with various religions and belief traditions connect to and/or affect the lives of their adherents

*Teacher prompts:* ... "How might the life of someone be affected if he or she spent time in meditation or prayer or in the natural world each day?" ...

#### F. Dimensions of the Sacred

#### F1. Sacred Time

F1.1 describe ways in which common celebrations and commemorations associated with various religions and/or belief traditions are linked to concepts of time *Teacher prompts:* "What is the connection between respect for ancestors and the arrival of

**Teacher prompts:** "What is the connection between respect for ancestors and the arrival of spring through the Qingming festival for Confucians?" "Based on what you know about the potlatch celebration, why would it make more sense to celebrate a potlatch during the winter months rather than the summer months?"

**F1.2** identify and explain the significance of historical events and natural cycles that are commemorated in various religions and belief traditions (*e.g.*, *planting and harvest time; the migrations of monarch butterflies, salmon, and birds; cycles of the moon and sun; the births and/or deaths of religious leaders*)

*Teacher prompts:* "How does the lunar cycle affect the timing of events in the religious year of various belief traditions? How does its influence compare with the effect of the solar cycle in various belief traditions?" "Why do some communities gather to celebrate cycles of nature?"

#### F2. Sacred Place

- **F2.1** describe the main features of the places of worship of various religions or belief traditions *Teacher prompts:* ... "How does the construction of a sweat lodge reflect the understandings and beliefs of First Nation people about the natural world?" ...
- **F2.2** explain ways in which attitudes and actions of believers are shaped by convictions about the significance of place (e.g., places such as Turtle Island for the Haudenosaunee people ... the Ganges River for Hindus)

*Teacher prompts:* ... "How are Aboriginal people's attitudes towards the environment and the earth a reflection of their larger belief tradition?"

# TECHNOLOGICAL EDUCATION, GRADES 9 AND 10 (2009) AND GRADES 11 AND 12 (2009)

#### From "Environment Education in Technological Education" in the curriculum policy documents:

There are many opportunities to integrate environmental education into the teaching of technological education. In each of the technological education courses, the expectations in the Technology/Industry Practices, the Environment, and Society strand allow students to develop critical thinking skills and an understanding of responsible practice with respect to the environmental implications of the technology they are studying. Students analyse the impact of technology on the environment and learn about the safe handling and disposal of materials and substances used in the development of products and the provision of services. In this way, students are able to explore how simple human interactions with the environment can have significant consequences. Students will be expected to actively engage in developing and implementing strategies to reduce, reuse, and recycle materials and products, and will learn about government agencies and community partners that have developed relevant opportunities to support such practices. By identifying and implementing measures to reduce the negative effects of technology on the environment, students will be contributing to responsible environmental stewardship.

The dynamic relationships resulting from human interaction with the environment provide a rich context for developing authentic learning activities in technological education courses. Technological education projects can readily be designed to integrate content and principles relevant to environmental education. For example, students can be engaged in constructing solar-powered devices, designing recycling centres, or creating media projects that focus on environmental awareness.

# GRADES 9 AND 10

# Exploring Technologies, Grade 9, Open (TIJ1O)

# A. Technology Fundamentals

#### A1. Planning and Development

A1.4 incorporate appropriate technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication/building/creation, function, innovation, material, mechanism, power and energy, safety, structure, systems) in the design, fabrication or delivery, and evaluation of a product or service ...

#### A3. Product or Service Evaluation

A3.1 evaluate a product or service, and processes associated with its development, on the basis of a set of criteria relevant to that product or service (e.g., adherence to specifications, ease of use, attractive appearance, ruggedness, clean joints, acceptable weld bead, uniform colour, adherence to forest management plan, nutritional value)

A3.2 suggest improvements to a product or service on the basis of a set of criteria relevant to that product or service (e.g., durability, reliability, ease of use, eco-friendliness, appearance, safety, customer satisfaction)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- C1. demonstrate an awareness of the effects of various technologies on the environment
- **C1.1** describe how various technologies (e.g., integrated pest management, water purification, mass transit, agricultural technologies, resource extraction) affect the environment, and identify important environmental considerations associated with different areas of technology (e.g., how to deal with ozone-depleting chemicals or hazardous wastes; how to increase opportunities for recycling, conservation, use of sustainable methods or materials)
- **C1.2** identify technological solutions that have been designed in response to environmental concerns (*e.g., catalytic converter, wind turbines, solar-powered signs, biofuels, non-toxic and hypoallergenic products, recyclable and reusable packaging*)
- **C1.3** follow proper procedures for the safe storage and disposal of materials and waste products (*e.g.*, *keep flammable solvents, paints, and varnishes in non-combustible cabinets; recycle used motor oil*)

#### C2. Technology and Society

- **C2.2** describe how society is being affected today by various new and emerging technologies (e.g., electronic messaging, Global Positioning System [GPS], wireless access, hybrid vehicles, nanotechnology, biotechnology)
- **C2.3** describe economic, ecological, social, and safety considerations facing consumers when they make choices between particular products or services (*e.g., natural versus synthetic materials, renewable versus non-renewable resources; ...*)
- **C2.5** describe how social and economic factors influence the development and use of technology *(e.g., ... rotating blackouts speed the development of energy alternatives, ...)*

# Communications Technology, Grade 10, Open (TGJ2O)

# C. Technology, the Environment, and Society

- **C1.** describe the impact of communications media technologies and activities on the environment and identify ways of reducing their harmful effects
- **C1.1** describe the effects of current communications technologies on the environment *(e.g., effects related to paper consumption, energy use, light and sound pollution, disposal of obsolete equipment)*
- **C1.2** identify sustainable practices that are currently used or can be used to minimize the impact of communications technologies on the environment (*e.g., recycling of paper, recycling or reuse of electronic components, use of energy-efficient equipment, use of sleep mode when computers are temporarily unused)*

# Computer Technology, Grade 10, Open (TEJ2O)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** identify harmful effects of the widespread use of computers and associated technologies on the environment, as well as agencies that reduce these effects
- C1.1 identify harmful effects of computer use on the environment (e.g., resources used and wastes created during production; disposal of old computers in landfill)
- **C1.2** identify government agencies and community partners that provide resources and guidance for environmentally sound production, use, and recycling of computer equipment (*e.g., recycling centres that accept old computers and/or batteries, companies that recycle printer cartridges or refurbish computers for resale*)

# Construction Technology, Grade 10, Open (TCJ2O)

# B. Design, Layout, and Planning Skills

#### **B1. Design and Problem Solving**

**B1.3** apply appropriate technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) as they work through design and/or problem-solving processes ...

# D. Technology, the Environment, and Society

- **D1.** demonstrate an understanding of ways in which the construction industry affects the environment
- **D1.1** describe the major effects of the construction industry on the environment (*e.g., non-sustainable logging causing deforestation; water and air pollution released during the production of manufactured building materials; landfills required for the disposal of construction waste; energy required to produce and transport construction materials)*
- **D1.2** identify the environmental impact of producing and using natural and manufactured construction materials (*e.g.*, *deforestation and loss of animal habitat; release of arsenic from pressure-treated wood and formaldehyde from oriented-strand board [OSB] and medium-density fibreboard [MDF])*
- **D1.3** identify ways of reducing the environmental impact of a structure (e.g., ground-source heating and cooling, improved insulation, building-envelope systems, technologies to reduce light and noise pollution, energy-conserving lighting, non-toxic building materials, use of local materials)
- **D1.4** apply best practices for sustainable construction and building (e.g., use efficient cutting patterns to minimize waste; reduce, reuse, or recycle materials)

#### **D2.** Technology and Society

**D2.1** identify the economic and social effects of the construction industry on society (*e.g.*, ... *effects of logging on traditional hunting by Aboriginal communities*)

# Green Industries, Grade 10, Open (THJ2O)

### A. Green Industry Fundamentals

#### A1. Basic Biology

- A1. demonstrate an understanding of plant and/or animal biology and species classification as they relate to the green industries
- A1.1 describe the key distinguishing characteristics of different plant and/or animal groups (*e.g., shrubs, trees, annuals, flowers, animal breeds*)
- A1.2 identify the basic components of common plants and/or animals and describe their functions (*e.g., leaves, flowers, bark, internal organs*)
- A1.3 describe important physiological processes in plants and/or animals (*e.g., germination, photosynthesis, reproduction, digestion*)

#### A2. Factors Affecting Growth

- A2. describe the factors affecting the growth and care of plants and/or animals
- A2.1 describe environmental factors that affect growth and post-harvest quality (e.g., light, temperature, soils, nutrients, water, wind)
- A2.2 describe biological factors that affect growth and post-harvest quality (*e.g.*, *plant type*, *photosynthesis*, *genetics*)
- A2.3 identify a variety of pests and diseases (e.g., Asian long-horned beetle, thrips, grubs, moles, Dutch elm disease, mastitis, hoof-and-mouth disease) and describe their effects on plants and/or animals

#### A3. Designs, Processes, and Systems

A3.3 demonstrate an understanding of a variety of processes used in plant and/or animal care (e.g., plant growth experiments, propagation, pruning, sheep shearing)

# B. Green Industry Skills

#### **B1. Design and Production**

- **B1.2** demonstrate competence in applying techniques related to the propagation and growth of plants and/or the breeding and growth of animals *(e.g., seeding, hatching eggs, making cuttings)*
- **B1.4** apply techniques relating to the maintenance, care, and handling of plants and/or animals, using environmental best practices (*e.g.*, *mulching gardens, feeding and watering, product processing, visual inspection*)

# **B2.** Technical Skills

**B2.1** complete a variety of green industry projects and tasks using appropriate tools, equipment, and materials (*e.g.*, ... *prune a tree, scale a log, transplant a shrub, create a walkway, design a butterfly garden*)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** identify the impact of green industries on the environment and describe ways of minimizing harmful effects
- **C1.1** identify ways in which green industry activities affect the environment (*e.g., contamination of water by fertilizers, pesticides, and manure; emission of greenhouse gases from animals, tilled soils, and equipment; emission of air pollutants from gasoline- and diesel-powered machinery; noise pollution; high energy demand)*
- **C1.2** identify best management practices, environmentally sustainable practices, and technologies that can be used to reduce the harmful effects of green industry operations (*e.g., composting, recycling, use of renewable energy sources, land retirement, minimal use of fertilizers and pesticides)*

#### C2. Technology and Society

**C2.1** describe the societal and economic implications of recent innovations and trends in the green industries (e.g., mechanization and its effects on productivity and employment, expanded distribution systems and their consequences for consumer choice and local production, transgenic plants and their effects on food cost and availability)

#### C3. Local Industries

- **C3.2** describe the relationships between a variety of local green industries and their local outlets (*e.g.*, garden centre and nursery, vegetable production and farmers' market, maple syrup production and specialty food store, flower producer and florist)
- **C3.3** describe the effects of local green industries on the community (e.g., effects on employment, water and air quality, leisure opportunities, aesthetics; availability of locally produced specialty products)

# D. Professional Practice and Career Opportunities

#### D1. Health and Safety

**D1.3** identify potential hazards *(e.g., trip hazards, environmental conditions, danger zones)* related to the materials, site conditions, and equipment used in the work environment

# **D2.** Career Opportunities

**D2.1** describe career opportunities in a variety of sectors in the green industries (*e.g., landscape architect, arborist, forester, florist, horticulturalist, farmer, herder*) and the education, training, and certification required for employment in green industry occupations (*e.g., training in first aid, CPR, and WHMIS; driver's licence; cut skid certification*)

# Hairstyling and Aesthetics, Grade 10, Open (TXJ2O)

# C. Industry Practices, the Environment, and Society

#### C2. Industry Practices and the Environment

**C1.** describe ways in which hairstyling and aesthetics products and activities can affect the environment, and ways to reduce harmful effects

- **C1.1** identify some environmental effects of various products used in the hairstyling and aesthetics industry (e.g., toxic substances: peroxide, chemical relaxers, lighteners; nonbiodegradable substances: plastic; organic/natural substances: facial masks, olive oil)
- **C1.2** describe how salons and spas can help to protect the environment (*e.g.*, *purchase sustainable products*, *such as refillable containers*, *products with natural ingredients*, *non-toxic cleaning products*, *and energy-saving products; adopt environmentally friendly methods of managing waste, such as recycling and waste-reduction programs*)

#### **C2. Industry Practices and Society**

**C2.1** describe some key social issues that are of concern to the hairstyling and aesthetics industry (e.g., ... the use of natural versus synthetic ingredients in product development; demand for scent-free and hypoallergenic products; ...)

# Health Care, Grade 10, Open (TPJ2O)

## A. Health Care Fundamentals

#### A2. Personal Health

A2.1 identify factors that affect the personal health and well-being of children and adolescents (e.g., environmental conditions, diet, food safety, food security, adequate shelter, amount of daily exercise, amount of daily rest, recreation opportunities, work/life balance, stress)

#### A3. Conventional and Complementary Therapies

A3.1 compare conventional and complementary approaches to health care in terms of the therapeutic approaches used (e.g., pharmaceutical medications versus herbal/natural remedies) and the types of practitioners offering the services (e.g., physicians versus homeopaths or Aboriginal healers)

#### C. Health Care, the Environment, and Society

#### C1. Health Care and the Environment

- C1. demonstrate an understanding of environmental issues related to health care and personal well-being
- **C1.1** identify current environmental issues and describe their implications for human health and well-being (e.g., air quality and respiratory disease, water quality and gastrointestinal problems, toxic substances and cancer or birth defects)
- **C1.2** describe the impact of health-related choices on the environment, and create a plan for improving personal health and fitness that also benefits the environment *(e.g., walking or biking rather than driving; eating more locally produced fruits and vegetables and less meat and processed food)*

#### **C2.** Health Care and Society

- **C2.2** describe current issues related to the delivery of health care services in Canada (*e.g.*, ... lack of health care support, sanitation, and clean water in remote communities)
- **C2.3** identify current child and adolescent health issues in developing countries from recent media coverage (*e.g., malnutrition, lack of effective immunization programs, lack of clean water*)

# Hospitality and Tourism, Grade 10, Open (TFJ2O)

## A. Hospitality and Tourism Fundamentals

#### A1. Services and Products of the Tourism Industry

- A1.5 identify the types of tourist attractions associated with the various geographic regions of Ontario (e.g., wineries in the Niagara region, ecotourism in northern Ontario, museums and art galleries in Ottawa, sporting events and conventions in major urban areas)
- A1.6 identify province-wide tourist activities and attractions in Ontario (e.g., seasonal festivals, cultural events, areas of natural beauty, historical sites, fishing and hunting, Aboriginal powwows)

## B. Hospitality and Tourism Skills

#### **B4.** Planning an Event or Activity

**B4.2** design a tourism event or activity (e.g., reception, ski vacation, fishing trip, catered event) that meets a customer's specific needs

# C. Industry Practices, the Environment, and Society

#### **C1. Industry Practices and the Environment**

- **C1.** demonstrate an understanding of ways in which various aspects of the tourism industry affect the environment, and ways in which harmful effects can be reduced
- **C1.1** describe ways in which various aspects of the tourism industry affect the environment (*e.g.*, *use of pesticides and fertilizers on golf courses may cause water pollution; air travel causes increased greenhouse gas emissions through the burning of jet fuel; Aboriginal lands and traditions may be affected by ecotourism; high water consumption by hotels may put a strain on the local environment*)
- **C1.2** identify ways of reducing the harmful effects that various aspects of the tourism industry have on the environment (e.g., create wildlife sanctuaries; support conservation projects; ensure that tourist facilities do not exceed the carrying capacity of the area or region; invest in carbon offsets such as planting a diversity of native trees)
- C1.3 describe and apply appropriate conservation measures (e.g., reduce, reuse, recycle)
- **C1.4** describe, on the basis of research, codes of ethics and/or guidelines for sustainable tourism, and use them to assess a tourism product, facility, or service

#### **C2. Industry Practices and Society**

**C2.1** explain the economic and social impact of the tourism industry (*e.g., developing tourist facilities creates jobs; tourism can cause road congestion, pollution, and/or degradation of the environment; tourists bring money into the community*)

# Manufacturing Technology, Grade 10, Open (TMJ2O)

## A. Manufacturing Technology Fundamentals

#### A1. The Manufacturing Industry

- A1.1 describe major differences between primary manufacturing industries (e.g., iron and steel, *lumber*, *paper*, *petroleum*) and secondary manufacturing industries (e.g., automotive, aerospace, chemicals, plastics, textiles)
- A1.4 describe ways in which manufacturing technology affects people's daily lives (e.g., by providing improved consumer products, developing new diagnostic equipment in health care, creating more energy-efficient means of transport)

#### A2. Design Fundamentals

A2.2 identify technological concepts (e.g., aesthetics, control, environmental sustainability/ stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ... and particular environmental concerns (e.g., pollution, disposal of waste, packaging, recycling) that are important considerations in product design

#### C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which the manufacturing industry affects the environment
- **C1.1** identify ways in which manufacturing affects the environment today (*e.g., through the demand for raw materials, creation of greenhouse gases, disposal of waste materials)*, and predict how the effects will change in the future
- **C1.2** explain the importance of "reduce, reuse, and recycle" and life cycle assessment (LCA) when designing, manufacturing, and marketing a product
- **C1.3** use proper storage and disposal techniques of materials and waste products, ensuring that there is a minimal effect on the environment
- **C1.4** explain the need for environmental stewardship and describe how the manufacturing industry can act in an environmentally responsible way (*e.g., by harvesting raw materials in a sustainable manner, using energy from renewable sources, making products that can be recycled, ensuring ethical treatment of people affected by manufacturing activities)*

#### C2. Technology and Society

- C2.1 describe the past and present effects of manufacturing on society (e.g., changes in work environments and lifestyle brought about by the Industrial Revolution, rising standards of living, widespread availability of consumer goods, effect of resource extraction on Aboriginal communities, effect on developing countries that accept industrialized countries 'waste), and predict how manufacturing will affect society in the future
- **C2.3** evaluate from various perspectives *(e.g., safety, technical, financial, environmental, ethical)* the effects of new and emerging manufacturing technologies ... on culture and society

# Technological Design, Grade 10, Open (TDJ2O)

### A. Technological Design Fundamentals

#### A1. Design Process

A1.1 describe the purpose of design for a given project (e.g., cleaner energy, cost-efficient products, smaller living spaces) in terms of key technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ...

#### B. Technological Design Skills

#### B1. Research, Planning, and Organization

**B1.1** gather and use pertinent information (e.g., on existing products, available materials, and other resources) for a variety of design challenges (e.g., ... birchbark canoe, tikinagan, or other item made from local renewable resources)

#### **B3.** Making and Testing Models and Prototypes

**B3.3** assess models and/or prototypes on the basis of prescribed criteria (*e.g., aesthetics, ergonomics, safety, efficiency, environmental impact*)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmentally responsible practices, and apply them throughout the technological design process
- C1.1 identify environmental issues that affect technological design (e.g., global climate change, resource depletion, conservation, toxins)
- **C1.2** describe and apply best practices for conserving energy and other resources during the design process (*e.g.*, *use wood glue instead of hot glue*, *plan projects to make efficient use of materials and equipment, reuse and recycle prototype material*)

#### C2. Technology and Society

- C2. describe how society influences technological innovation and how technology affects society
- **C2.1** describe how society influences the development and use of technology (e.g., traffic congestion spurs development of compact vehicles; increasing population density leads to the construction of taller buildings; environmental awareness leads to increased use of alternative energy sources)
- **C2.2** describe how various technological innovations have affected quality of life (*e.g.*, *pesticides*, *internal combustion engines*, *plastics*, *on-demand water heaters*, *catalytic converters*, *nanotechnology*, *wireless communication*)

## D. Professional Practice and Career Opportunities

#### **D1. Health and Safety**

- D1. apply appropriate health, safety, and environmental practices throughout the design process
- **D1.2** demonstrate an understanding of and follow personal and environmental health and safety procedures with respect to processes, materials, tools, equipment, and facilities throughout the design process and related activities (*e.g., use protective equipment; set tool and equipment guards properly; ensure adequate ventilation and ergonomic seating and other workplace arrangements; follow safe operating procedures; keep work areas clean and organized; store materials and dispose of wastes properly)*

# Transportation Technology, Grade 10, Open (TTJ2O)

#### C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which various aspects of the transportation industry affect the environment and ways in which harmful effects can be remedied or reduced
- C1.1 research and report on ways in which the transportation industry affects the environment and on efforts being made to remedy or reduce harmful effects (*e.g., improved production methods, automotive parts recycling*), including ways of disposing of waste products (*e.g., used oil, used batteries, used paint/thinners*)
- **C1.2** describe the pros and cons of using environmentally friendly products (*e.g., biodegradable cleaners*) and procedures (*e.g., recycling of materials*) when servicing and/or maintaining vehicles and/or craft
- **C1.3** describe the environmental impact of various modes of transportation (*e.g., tail-pipe emissions, noise pollution, water contamination and habitat degradation, bird and animal strikes*)

#### C2. Technology and Society

**C2.2** describe recent technological innovations (*e.g., related to performance, comfort, driveability, fuel economy, recycling of parts*) in vehicles and/or craft

#### D. Professional Practice and Career Opportunities

#### **D1. Health and Safety**

**D1.2** demonstrate good housekeeping and safety practices in the work environment (*e.g., cleaning up spills and leaks, proper disposal of waste, keeping areas clean and clear of obstructions*)

# **COMMUNICATIONS TECHNOLOGY, GRADES 11 AND 12**

# Communications Technology, Grade 11, University/College Preparation (TGJ3M)

#### C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** describe the impact of current communications media technologies and activities on the environment and identify ways of reducing harmful effects
- **C1.1** describe the impact of current communications media technologies on the environment (e.g., increased energy consumption, disposal of electronic equipment and batteries, noise pollution, electromagnetic interference, RF pollution, chemical and other wastes associated with paper production)
- **C1.2** describe environmentally responsible practices that can be used to reduce the impact of communications technologies on the environment (*e.g., recycling or finding new uses for obsolete equipment, disposal of batteries as toxic waste, using energy-efficient equipment and turning off equipment that is not being used, recycling of toner cartridges, use of recycled paper)*

# Communications Technology: Broadcast and Print Production, Grade 11, Open (TGJ3O)

#### A. Communications Technology Fundamentals

#### A1. Core Concepts, Techniques, and Skills

A1.1 demonstrate an understanding of technological concepts (e.g., aesthetics, control, environmental sustainability, ergonomics, fabrication/building/creation, function, innovation, material, mechanism, power and energy, safety, structure, systems) and their relevance to the design and creation of media projects ...

#### C. Technology, the Environment, and Society

- **C1.** describe the impact of communications media technologies and activities on the environment, and identify ways of reducing their harmful effects
- **C1.1** describe the effects of current audio, video, broadcast journalism, graphic arts, and printing technologies on the environment (*e.g., increased energy consumption, waste and disposal problems created by rapid obsolescence, toxic wastes, noise pollution, electromagnetic interference, RF pollution)*
- **C1.2** describe ways in which environmental problems are being or can be addressed by the audio, video, broadcast journalism, graphic arts, and printing industries (e.g., using energy-efficient equipment, upgrading rather than replacing obsolete equipment, recycling equipment slated for disposal, using environmentally friendly inks and environmentally responsible press cleanup methods, using the persuasive power of the media to promote environmental stewardship, environmental certification of operations [EcoLogo, ISO 14001])

# Communications Technology, Grade 12, University/College Preparation (TGJ4M)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** analyse the environmental impact of recent advances in communications technology, and describe ways of reducing harmful effects
- **C1.1** analyse the environmental costs and benefits, local and global, of recent innovations in communications technology (e.g., costs and benefits related to resource usage, energy demand, waste disposal, toxic substances, radiation, air and water pollution)
- **C1.2** describe ways of minimizing or avoiding harmful environmental effects caused by communications technologies and media activities (*e.g., upgrade products rather than dispose of them; turn off equipment that is not being used; treat dead batteries as toxic waste; recycle used paper and printer cartridges)*

# Communications Technology: Digital Imagery and Web Design, Grade 12, Open (TGJ4O)

#### A. Communications Technology Fundamentals

#### A1. Core Concepts, Techniques, and Skills

A1.1 demonstrate an understanding of technological concepts (e.g., aesthetics, control, environmental sustainability, ergonomics, fabrication/building/creation, function, innovation, material, mechanism, power and energy, safety, structure, systems) and their relevance to the design and creation of media projects ...

#### C. Technology, the Environment, and Society

- **C1.** describe the environmental impact of communications media technologies, and identify ways of minimizing their harmful effects
- **C1.1** describe the effects of current photographic, digital imaging, animation, 3D modelling, and web design technologies on the environment (*e.g., paperless publication, increased energy consumption, battery disposal, waste and disposal problems created by rapid obsolescence of equipment)*
- **C1.2** describe ways in which environmental problems are being or can be addressed by the photographic, digital imaging, animation, 3D modelling, and web design industries (*e.g.*, *use of rechargeable batteries; reduction of packaging; recycling of paper, toner and ink cartridges; use of energy-efficient equipment; upgrading rather than replacing obsolete equipment; recycling equipment slated for disposal; environmental certification of operations [EcoLogo, ISO 14001]*)

# **COMPUTER ENGINEERING, GRADES 11 AND 12**

# Computer Engineering Technology, Grade 11, University/College Preparation (TEJ3M)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- C1. describe environmental issues related to the widespread use of computers and associated technologies
- **C1.1** describe the effects of computer and electronic technology on the environment (*e.g., accumulation* of electronic waste, including lead and other toxic materials used in computers; release of ozone-destroying chemicals used to wash soldering flux from circuit boards; energy consumed by computers left in standby mode; fuel consumption and air pollution reduced by computerized traffic-control systems)
- C1.2 outline how community partners and government agencies apply the reduce/reuse/recycle concept to computer technology

# Computer Technology, Grade 11, Workplace Preparation (TEJ3E)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- C1. describe environmental issues related to the widespread use of computer technology
- **C1.1** describe the effects of computer technology on the environment (*e.g., accumulation of electronic waste, use of lead and other toxic materials in computers, use of ozone-destroying chemicals to wash soldering flux from circuit boards, energy consumed by computers left in standby mode, energy saved by use of programmable thermostats)*
- **C1.2** outline how community partners and government agencies apply the reduce/reuse/recycle concept to computer technology

# Computer Engineering Technology, Grade 12, University/College Preparation (TEJ4M)

# C. Technology, the Environment, and Society

- **C1.** analyse environmental issues related to the widespread use of computers and associated technologies, and apply strategies to reduce environmental harm from computer use
- **C1.1** assess the effects of computer and electronics technology on the environment (*e.g., hazardous materials contained in computer components, use of energy and other resources, fuel consumption and air pollution reduced by computerized traffic-control systems)*
- C1.2 outline and apply strategies to recycle or reuse computers and computer components (*e.g.*, *develop a local recycle/reuse program, create an in-school public awareness campaign*)

#### C2. Technology and Society

**C2.1** assess the benefits of computer and electronic technology for society (*e.g.*, ... software that can help monitor or predict changes in wetland area, deforestation, and climate)

#### **D.** Professional Practice and Career Opportunities

#### **D2.** Ethics and Security

**D2.2** outline a purchasing policy for computers, taking ethical issues into account (*e.g., the environment, human rights, child labour*)

# Computer Technology, Grade 12, Workplace Preparation (TEJ4E)

#### C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** describe environmental issues related to the widespread use of computer technology, and apply strategies to reduce environmental harm from computer use
- **C1.1** assess the effects of computer technology on the environment (*e.g., leakage of hazardous substances from obsolete computers dumped in landfills or improperly recycled; increased energy use; benefits of computer-controlled heating and cooling systems)*
- **C1.2** outline and apply strategies to recycle and reuse computer components (*e.g.*, *build computers using used components and donate to a community partner, offer a service where computers can be upgraded using used components*)
- **C1.3** describe and apply strategies and devices that help reduce the energy used by computers at home and in the workplace (*e.g.*, *software that throttles drive speed and CPU speed, monitors that turn off automatically, more efficient processors, lower-speed hard drives, diskless computers, virtualization to eliminate extra computers)*

#### C2. Technology and Society

**C2.1** analyse the benefits of computer technology for society (e.g., ... use of computers to help monitor and predict long-term environmental changes)

# **CONSTRUCTION TECHNOLOGY, GRADES 11 AND 12**

# Construction Engineering Technology, Grade 11, College Preparation (TCJ3C)

#### A. Construction Technology Fundamentals

#### A2. Building Codes, Regulations, and Standards

A2.6 identify organizations that promote sustainable building practices, and related standards (e.g., Canada Green Building Council, Leadership in Energy and Environmental Design [LEED<sup>®</sup>] certification standards)

## A4. Design Considerations

A4.3 identify components of an environmentally friendly house (e.g., solar water heater, energyefficient heating and cooling systems, recycled building materials)

## D. Technology, the Environment, and Society

#### **D1.** Technology and the Environment

- **D1.** demonstrate an understanding of the environmental effects of construction projects, and ways of reducing harmful effects
- **D1.1** plan projects and processes to minimize waste (e.g., use efficient cutting patterns, reuse and recycle leftover materials)
- **D1.2** identify and describe environmentally friendly building practices (*e.g.*, *high-efficiency heating and cooling, renewable energy technologies, reuse of grey water, use of materials produced from sustainable resources*)
- **D1.3** describe the environmental effects of using natural and manufactured construction materials (*e.g.*, *energy use, release of toxic chemicals, disposal of manufacturing and construction waste, effects on water supply and quality*)
- **D1.4** describe ways of reducing and/or managing energy consumption in the home (e.g., smart meters, energy-efficient lighting, timers, heat-recovery ventilators)
- **D1.5** describe the life cycle of a construction product *(e.g., manufacture; installation; reuse, recycling, or disposal)*

#### **D2.** Technology and Society

**D2.2** describe factors affecting the quality of life of the occupants of residential buildings *(e.g., air quality; allergens; ...)* 

# E. Professional Practice and Career Opportunities

#### E2. Career Opportunities

**E2.1** identify careers in construction technology (e.g., civil or construction engineer, architectural draftsperson, renovation technician or technologist, indigenous environmental technician, project manager), and describe the education and training required for these careers

# Construction Technology, Grade 11, Workplace Preparation (TCJ3E)

#### D. Technology, the Environment, and Society

- **D1.** demonstrate an understanding of the environmental effects of construction projects, and ways of reducing harmful effects
- **D1.1** compare the efficiency and environmental effects of a variety of energy sources used in residential dwellings (*e.g., solar, ground source, pellets, propane, wood, oil, natural gas, wind*)
- **D1.2** plan projects and processes to minimize waste (e.g., use efficient cutting patterns, reuse and recycle leftover materials)

- **D1.3** identify ways of reducing energy consumption in the home (e.g., heat recovery ventilator, tankless water heater, timers, energy-efficient lighting)
- **D1.4** identify programs provided by community partners and government agencies to reduce construction waste and to reuse or recycle construction materials *(e.g., drywall, wood, refrigerants)*
- **D1.5** research and identify sources and certifications for construction materials that have been manufactured using sustainable practices

#### **D2.** Technology and Society

**D2.3** identify the economic and social effects of the construction industry on a community or region (e.g., direct and indirect effects on employment, waste disposal, land use, water supply, Aboriginal land claims and traditional hunting)

# Custom Woodworking, Grade 11, Workplace Preparation (TWJ3E)

#### D. Technology, the Environment, and Society

#### D1. Technology and the Environment

- **D1.** demonstrate an understanding of the environmental effects of the woodworking industry, and ways of reducing harmful effects
- **D1.1** describe the major effects of the woodworking industry on the environment (e.g., costs and benefits related to forest management; non-sustainable logging that causes deforestation, destruction of old-growth forests, and/or loss of wilderness habitat for endangered species; water and air pollutants released during the production of manufactured materials; energy required to produce and transport materials for woodworking)
- **D1.2** identify the environmental effects of using and disposing of specific natural and manufactured materials (e.g., landfill or incineration of woodworking waste; harmful emissions from some types of paints, adhesives, and manufactured materials, which contribute to "sick building syndrome")
- **D1.3** identify ways of reducing environmental harm through the choice of particular materials (e.g., sustainably produced products, products that have a minimal ecological footprint, non-toxic products)
- **D1.4** plan projects and use materials to minimize waste (e.g., use efficient cutting patterns, reuse or recycle leftover materials)
- **D1.5** identify various certifications and/or standards for sustainable practices (*e.g., Forest Stewardship Council Canada standards*)

#### **D2.** Technology and Society

**D2.3** describe how societal needs and client preferences (*e.g.*, *budget restraints; cultural, religious, and environmental choices; ease of use by persons with physical disabilities)* affect custom woodworking projects

# Construction Engineering Technology, Grade 12, College Preparation (TCJ4C)

# A. Construction Technology Fundamentals

#### A4. Design Considerations

- A4.3 describe factors affecting the design of a foundation (e.g., drainage, soil type, load, frost penetration)
- A4.4 describe the weather-related loads and stresses that a building must be designed to withstand (e.g., force of wind, snow load on roofs, expansion and contraction due to changes in temperature and humidity)

#### D. Technology, the Environment, and Society

#### D1. Technology and the Environment

- **D1.** identify and evaluate measures that can be taken to conserve resources on construction projects
- **D1.1** plan projects and construction processes to minimize waste (e.g., use efficient cutting *patterns*, reuse leftover material)
- **D1.2** describe the costs and benefits of environmentally friendly building practices (*e.g., high-efficiency heating and cooling, renewable energy technologies, reuse of grey water, use of materials produced from sustainable resources*)
- **D1.3** compare ways of reducing the environmental footprint of construction projects through the choice of energy sources (*e.g., solar, geothermal, wind*), building design (*e.g., extra insulation, high-efficiency heating systems, green roof*), and construction processes (*e.g., use of recycled material, fuel-efficient equipment*)
- **D1.4** outline strategies to reduce, reuse, and recycle construction materials, and identify methods for implementing sustainable building practices (*e.g.*, *work with a community partner or government agency, help develop local programs, create a public awareness campaign*)
- **D1.5** research and describe strategies for implementing sustainable building practices (*e.g.*, *Canada Green Building Council guidelines, Forest Stewardship Council Canada standards*)

#### **D2.** Technology and Society

- **D2.1** research and assess the economic and social effects of the construction industry (*e.g., creation of primary and secondary jobs, transport of materials, land use, resource management, encroachment on Aboriginal lands)*
- **D2.2** describe the factors affecting the quality of life of the occupants of residential and/or light commercial buildings (e.g., air quality, allergens, carcinogens, aesthetics, access to transit and other services)
- D2.4 identify factors to consider in community planning (e.g., population density, ecology, culture)

# Construction Technology, Grade 12, Workplace Preparation (TCJ4E)

## B. Design, Layout, and Planning Skills

#### **B4. Building Skills**

**B4.1** identify and describe the factors that affect the design and installation of foundations for construction projects (*e.g., drainage, soil conditions, frost penetration, ...*)

#### D. Technology, the Environment, and Society

#### D1. Technology and the Environment

- **D1.** demonstrate an understanding of the environmental effects of construction projects, and ways of reducing harmful effects
- **D1.1** assess environmentally friendly alternatives for building systems (*e.g.*, *heating with solar energy, heat pumps, or geothermal systems; reusing grey water; harvesting rainwater; chlorine-free treatment of storm water and sewage*)
- **D1.2** assess the environmental and health effects of using manufactured construction materials (*e.g.*, *pressure-treated wood*, *oriented-strand board*, *medium-density fibreboard*, *cultured stone*)
- **D1.3** compare ways of reducing and/or managing energy consumption in homes and businesses (e.g., smart meters, timers, skylights, heat recovery, energy-efficient lighting)
- **D1.4** research and describe strategies for implementing sustainable building practices (*e.g., Canada Green Building Council guidelines, Forest Stewardship Council Canada standards*)

#### **D2.** Technology and Society

- **D2.1** identify the economic and social effects of the construction industry (*e.g.*, *waste disposal*, *land use, labour supply and cost, water supply, local infrastructure*)
- **D2.2** identify factors to consider in community planning *(e.g., population density, culture, the environment)*

# Custom Woodworking, Grade 12, Workplace Preparation (TWJ4E)

#### D. Technology, the Environment, and Society

- **D1.** demonstrate an understanding of the environmental effects of the woodworking industry, and ways of reducing harmful effects
- **D1.1** describe ways to improve air quality in a living or working space through the choice of materials for woodworking projects (*e.g., lumber, plastics, medium-density fibreboard, paint, varnish*)
- **D1.2** assess the environmental effects of using scarce and/or exotic woods (*e.g., destruction of rainforest and old-growth boreal forests, displacement of Aboriginal peoples, loss of wildlife habitat*) and the extent to which sustainable forestry practices can reduce environmental degradation

- **D1.3** plan projects and apply strategies to minimize or mitigate degradation of the environment (*e.g.*, *use efficient cutting patterns, reuse and recycle leftover materials, select sustainably produced products, contribute to restoration plans, purchase carbon offsets*)
- **D1.4** assess various certifications and/or standards used to recognize sustainable practices (e.g., *Forest Stewardship Council Canada standards*)

#### **D2.** Technology and Society

- **D2.1** assess how consumer trends and technological innovations have affected employment in the custom woodworking industry (*e.g.*, *use of exotic or old-growth woods, sale of prefabricated furniture and cabinets in large retail outlets, use of computer assisted design [CAD] and CNC machines)*
- **D2.2** assess economic and societal issues related to the custom woodworking industry (*e.g., waste disposal, labour supply, logging near Aboriginal communities, imports and exports, use of renewable and non-renewable resources)*

# **GREEN INDUSTRIES, GRADES 11 AND 12**

# Green Industries, Grade 11, University/College Preparation (THJ3M)

# A. Green Industry Fundamentals

#### A1. Species Classification and Geographical Regions

- A1. demonstrate an understanding of species classification and identification and relationships between species and geographical regions
- A1.1 distinguish between different plant and/or animal groups on the basis of key identification characteristics, and identify species using both common names and scientific classifications (e.g., annuals and perennials; native and non-native plants; major types, species, and varieties of trees, shrubs, flowering plants, and crops; animal breeds)
- A1.2 identify geographical regions on the basis of classification criteria relevant to the green industries (e.g., forest type, hardiness, agricultural use, ease of cultivation, water features)
- A1.3 explain the relationships between the characteristics of different geographical regions and the key desirable characteristics of plant and/or animal groups within them (e.g., relationship of plant and animal characteristics to available heat, moisture, light, shelter, and food)

#### A2. Factors Affecting Growth and Product Quality

- A2. demonstrate an understanding of the effects of biotic and abiotic factors on growth and product quality
- A2.1 describe how abiotic factors *(e.g., air quality, temperature, nutrients, water, topography, handling procedures)* affect the growth of various plant and/or animal species and the quality of products derived from them
- A2.2 explain biological processes that are essential to the propagation, development, and health of plants and/or animals and the quality of products derived from them (*e.g., reproduction, respiration, photosynthesis, transpiration, post-harvest physiology*)

A2.3 identify a variety of pests and diseases (e.g., bacteria, viruses, moulds, fungi, insects, animals) and explain their effects on the health of plants and/or animals and the quality of products derived from them

#### A3. Designs and Processes

- A3.1 demonstrate an understanding of and apply the steps in a design process ... to a variety of requirements in the green industries (e.g., creation of forest management plans, environmental farm plans, urban landscape designs, hydroponic system designs)
- A3.2 explain fundamental operational processes that are commonly used in the green industries (*e.g.*, *single animal management, crop location and rotation, crop scheduling, event planning, nutrient and waste management, composting, select cutting, timber cruise*)
- A3.4 demonstrate an understanding of correct procedures for the care and handling of plants and/ or animals (e.g., propagating, pruning, transporting, watering, feeding, fertilizing, removing bark)

#### A4. Technological and Mathematical Literacy and Communication Skills

A4.1 demonstrate an understanding of terminology used in the green industries and use it correctly in oral and written communication (e.g., sustainability, coniferous, massing flower, flagstone, organic)

#### B. Green Industry Skills

#### **B1. Design and Production**

- **B1.1** implement a production process or procedures according to a design or plan *(e.g., timber cruise, stand inventory, landscape construction, crop rotation, mixed animal farming, selective breeding)*
- **B1.2** utilize a management plan for a specific application related to the green industries (e.g., forest management plan, nutrient management plan, site layout plan, crop rotation plan, annual work plan, business plan, five-year operational plan)
- **B1.3** demonstrate an understanding of and apply techniques related to the propagation and maintenance of a variety of plant and/or animal species and the post-harvest handling of plant products (*e.g., techniques related to crop, mammal, and poultry production, sexual and asexual plant production, shrub rejuvenation, rose processing, care of selected local tree species*)
- **B1.4** demonstrate an understanding of and apply techniques or processes that promote biodiversity, increase ecosystem function, and reduce maintenance requirements *(e.g., planting native species, mulching, establishing natural habitat)*

#### **B2.** Plant and Animal Management Strategies

- **B2.** apply management strategies for assessing and controlling biotic and abiotic factors that affect plant and/or animal quality
- **B2.1** apply a variety of methods to monitor and assess biotic factors that affect plant and/or animal quality (e.g., weed identification, regular animal health inspections, plant quality inspections, pest scouting, post-harvest tracking of product freshness and quality)
- **B2.2** apply a variety of methods to monitor and assess abiotic factors that affect plant and/or animal quality (*e.g., nutrient balance analysis, soil testing, plant tissue analysis, monitoring growing degree days [GDDs], form defect analysis, water testing)*

**B2.3** apply a variety of techniques to control pests and reduce plant and/or animal defects (*e.g., maintenance or enhancement of natural barriers to control pest migration, animal quarantine, log hydration, integrated pest management*)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** analyse the impact of the green industries on the environment and describe ways of minimizing harmful effects
- **C1.1** demonstrate an understanding of ecological relationships and processes (*e.g., food webs, symbiotic relationships, ecological succession, nutrient flows and cycles, habitat and species diversity*) that can affect or be affected by green industry operations
- **C1.2** analyse the effects of green industry activities on the environment in the past and in the present (*e.g., logging practices, irrigation, fertilization, pest control, nutrient and waste management*)
- **C1.3** assess the advantages and disadvantages of using natural rather than manufactured materials or products in green industry activities (*e.g., natural fertilizers and pest control methods rather than chemical fertilizers and pesticides, real flowers rather than artificial flowers, real grass rather than artificial turf, untreated rather than pressure-treated lumber)*
- **C1.4** identify sustainable practices and guidelines that are currently applied within the green industries or may be applied in the future (e.g., environmental farm planning, integrated pest management, xeriscaping, forest regeneration, low-till cultivation)
- C1.5 explain the environmental implications (e.g., effects on landfill lifespan and water and air quality) of using particular materials, products, processes, and disposal methods (e.g., recycling, reusing, composting, growing genetically modified crops, organic farming, various disposal methods for invasive plants)

#### C2. Technology and Society

**C2.2** analyse societal issues relating to the green industries, and identify ways of resolving them, taking a variety of perspectives into account (*e.g.*, *effects on Aboriginal hunting and harvesting territories, land use conflicts such as parkland versus commercial development, property rights and municipal landscape management, animal welfare, rights of migrant workers, fair trade concerns relating to imported agricultural or floral products, fuel ethanol versus food production*)

# D. Professional Practice and Career Opportunities

#### D1. Health and Safety

**D1.2** demonstrate an understanding of environmental and site-related hazards (*e.g., land conditions; weather conditions; crew competence and organization; presence of utility lines, glass structures, hanging limbs, chicots)* and apply appropriate safety measures for avoiding them (*e.g., roping off an area, setting up caution signs, removing hazards, implementing traffic control measures*)

#### **D3.** Career Opportunities

**D3.1** describe careers in the green industries (*e.g., landscape architect, forest manager, horticulturalist, farm manager, turf manager, botanist, veterinarian*) and the education, training, and certification required for entry into these occupations

# Green Industries, Grade 11, Workplace Preparation (THJ3E)

#### A. Green Industry Fundamentals

#### A1. Species Classification and Geographical Regions

- A1. demonstrate an understanding of species classification and identification and of relationships between species and geographical regions
- A1.1 distinguish between different plant and/or animal groups and identify them by key characteristics and desirable features (*e.g., annuals and perennials; native and non-native plants; major types, species, and varieties of trees, shrubs, flowering plants, and crops; animal breeds*)
- A1.2 identify geographical regions on the basis of classification criteria relevant to the green industries (e.g., forest type, hardiness, soil type)
- A1.3 explain the relationships between geographical regions and the key characteristics and desirable features of plant and/or animal groups within them (*e.g., relationship of plant and animal characteristics to available heat, moisture, light, shelter, and food*)

#### A2. Factors Affecting Growth and Product Quality

- **A2.** demonstrate an understanding of the effects of biotic and abiotic factors on growth and product quality
- A2.1 identify the main abiotic factors that affect growth and post-harvest quality (*e.g., temperature, sunlight, soil composition, rainfall and soil moisture*)
- A2.2 describe biological processes that are essential to the propagation, development, and health of plants and/or animals and the quality of products derived from them (e.g., photosynthesis, respiration, reproduction, transpiration, post-harvest physiology, digestion)
- A2.3 identify a variety of pests and diseases (e.g., bacteria, viruses, moulds, fungi, insects, animals) that may affect the health of plants and/or animals and the quality of products derived from them

#### **A3. Designs and Processes**

- A3.1 describe the steps in a design or planning process ... and demonstrate an understanding of their application to a variety of requirements in the green industries (*e.g., preparing environmental farm plans, urban forestry management plans, landscape designs; designing water gardens, mass arrangements*)
- **A3.2** describe common operational processes that are used in the green industries (*e.g., single animal management, crop location and rotation, crop scheduling, event planning, waste management, composting, select cutting*)

## B. Green Industry Skills

#### **B1. Design and Production**

- **B1.1** implement a production process or procedures according to a design or plan (*e.g., harvest a crop, construct a landscape, grow and cultivate plants, make floral arrangements*)
- **B1.2** demonstrate an understanding of and apply techniques for the propagation and care of plants and animals and for ensuring the quality of products derived from them (*e.g.*, *plant/tree regeneration, animal reproduction, cut flower processing, crop production, tree planting*)
- **B1.3** demonstrate an understanding of and apply techniques and processes that promote biodiversity, increase ecosystem function, and reduce maintenance requirements (*e.g.*, *planting of native species, mulching, naturalizing gardens, using local cut flowers*)

#### **B2.** Plant and Animal Management Strategies

- **B2.** apply management strategies for assessing and controlling biotic and abiotic factors that affect plant and/or animal quality
- **B2.1** apply a variety of methods to monitor biotic factors that affect plant and/or animal quality (*e.g.*, *pest scouting*, *regular health inspections of animals*, *weed identification*, *post-harvest tracking of product freshness and quality*)
- **B2.2** apply a variety of methods to monitor abiotic factors that affect plant and/or animal quality (*e.g.*, *nutrient balancing*, *soil testing*, *monitoring indoor and outdoor environmental conditions*)
- **B2.3** apply a variety of pest and disease control techniques (e.g., crop rotation, greenhouse sanitation, enhancement of natural barriers, disinfection of equipment)

# C. Technology, the Environment, and Society

- **C1.** identify the impact of the green industries on the environment and describe ways of minimizing harmful effects
- **C1.1** describe the effects of green industry activities on the environment in the past and in the present (e.g., destruction of habitat, increased energy use for long-distance shipping of floral products, pesticide and fertilizer contamination, greenhouse gas emissions from tillage and sheep and cattle, noise and air pollution from gasoline- and diesel-powered machinery)
- **C1.2** describe the advantages and disadvantages of using natural rather than manufactured materials or products in the green industries (*e.g., natural fertilizers and pest control methods rather than chemical fertilizers and pesticides, real flowers rather than artificial flowers, real grass rather than artificial turf, untreated rather than pressure-treated lumber)*
- **C1.3** identify sustainable practices and guidelines that are currently applied within the green industries or may be applied in the future (*e.g., environmental farm planning, sustainable forest management, integrated pest management, sustainable golf course maintenance, select spraying, energy-efficient greenhouse production)*
- **C1.4** describe the environmental implications (*e.g.*, *effects on landfill lifespan and water and air quality*) of using particular materials, products, processes, and disposal methods (*e.g.*, *chemically treated wood products; recycling, reusing, composting; using correct disposal methods for invasive plants*)

#### C2. Technology and Society

**C2.2** describe societal issues relating to the green industries and identify ways of resolving them (e.g., effects on Aboriginal hunting and harvesting territories, land use conflicts such as parkland versus commercial development, property rights and municipal landscape management, animal welfare, rights of migrant workers, fair trade concerns relating to imported agricultural or floral products)

## D. Professional Practice and Career Opportunities

#### D1. Health and Safety

**D1.2** demonstrate an understanding of environmental and site-related hazards (*e.g., land conditions, weather conditions, dangerous plants and animals, utility lines, glass structures, hanging limbs, chicots)* and apply appropriate safety measures for avoiding them (*e.g., roping off danger areas, removing hazards, setting up traffic controls*)

#### **D2.** Career Opportunities

**D2.1** describe careers *(e.g., arborist, florist, herder, greenhouse worker, forester)* in the sectors of the green industries and the education, training, and certification required for entry into these occupations

# Green Industries, Grade 12, University/College Preparation (THJ4M)

## A. Green Industry Fundamentals

#### A1. Species Classification and Geographical Regions

- A1. demonstrate an understanding of species classification and identification and explain relationships between species and geographical regions
- A1.1 distinguish between different plant and/or animal groups on the basis of key identification characteristics (e.g., native and non-native species, dairy and beef cattle, deciduous and coniferous shrubs, monocotyledonous and dicotyledonous plants), and identify species using both common and scientific names (e.g., white birch [also known as paper birch or canoe birch] [Betula papyrifera] and Mountain paper birch [Betula cordifolia], euonymus [gen. Euonymus] and Emerald Gaiety [Euonymus fortunei 'Emerald Gaiety'])
- A1.2 identify geographical regions in Canada on the basis of classification criteria relevant to the green industries (*e.g., plant hardiness, growing degree days, elevation, soil type, soil moisture*), and explain how geographical factors determine the distribution of species in these regions
- A1.3 compare different kinds of ecosystems in terms of their biodiversity (e.g., a climax forest versus a rejuvenated forest, natural versus managed land, a cultivated field versus a greenhouse), and explain how biodiversity affects the stability of ecosystems (e.g., monocultures versus diversified ecosystems)

#### A2. Factors Affecting Growth and Product Quality

- A2. analyse the effects of biotic and abiotic factors on growth and post-harvest quality
- A2.1 analyse the effects of abiotic factors on growth and post-harvest quality (e.g., effects of differences in soil composition, climate, water quality and quantity, topography)

- A2.2 analyse the effects of biotic factors on growth and post-harvest quality (e.g., physiological effects of pests and diseases, invasive species, genetic variations)
- A2.3 assess the effects of interactions between abiotic, biotic, and cultural factors on a variety of ecosystems (e.g., forests in various stages of natural succession, golf courses, fish farms, organic farms, riparian zones)
- A2.4 compare the effectiveness of different integrated pest management techniques for a variety of applications (e.g., cultural [tilling and mulching], physical [crop rotation], environmental [introduction of beneficial insects], biological [fungi, nutrients], chemical [pheromones, chemical pesticides])

## A3. Designs and Processes

- A3.1 explain the steps required to create designs or plans for a variety of applications in the green industries (*e.g., timber cruising, surveying, perennial gardens, farms, environmental assessments*)
- A3.2 explain advanced systems, processes, and techniques relating to the propagation, maintenance, and care of plants or animals (e.g., irrigation systems, tree support and protection systems, plantation tending, prescribed burning, regeneration)
- A3.3 evaluate the appropriateness and effectiveness of a management process (e.g., environmental impact assessment, tree or crop loss assessment, herd health evaluation, growth and yield monitoring)

#### A4. Technological and Mathematical Literacy and Communication Skills

A4.1 demonstrate an understanding of terminology used in the green industries and use it correctly in oral and written communication (*e.g., biodiversity, tendril, balance, pergola, tilth*)

# B. Green Industry Skills

#### **B1. Design and Production**

- **B1.1** develop a design and/or process that fulfills a specific functional or aesthetic requirement (*e.g.*, *a graphic design*, *a barn design*, *a specialty garden design*, *an urban forest regeneration schedule*, *an advertising brochure; specialty pruning techniques*)
- **B1.2** design and implement a management plan or site layout for a specific application (e.g., a natural disturbance response and restoration plan, a site survey and construction implementation plan for a landscape design, a growing system for plant production and distribution, plant selection and schedule for crop rotation, animal housing, an urban forest development plan)
- **B1.3** demonstrate competence in the use of biological techniques for propagating and maintaining a variety of species (*e.g., cone selection, transplanting large trees, reforestation, insect control, hybridization, grafting, artificial insemination*)
- **B1.4** create plans or designs for green industry projects that enhance biodiversity *(e.g., moisture conservation, xeriscaping, integrating diverse native plants, sustainable water gardening)*

#### **B2.** Plant and Animal Management Strategies

- **B2.** develop and apply management strategies for assessing and controlling biotic, abiotic, and cultural factors that affect plant and/or animal quality
- **B2.1** analyse biotic conditions affecting the health of plants and/or animals and the quality of products derived from them, using a variety of diagnostic procedures (*e.g., pest counts, pest determination, microscopic investigation, visual inspection, blood testing, cavity assessment*)

- **B2.2** analyse abiotic conditions affecting the health of plants and/or animals and the quality of products derived from them, using a variety of diagnostic procedures (*e.g., nutrient balance testing, soil and water testing, form defect analysis, air quality assessment*)
- **B2.3** apply a variety of pest and disease control techniques (*e.g., integrated pest management, crop rotation, animal inoculation, instituting invasive species controls*), and assess their effects on plant and/or animal stock and the environment
- **B2.4** develop and apply best management practices for enhancing environmental sustainability within the green industries (*e.g., herd management, native species selection and placement, forest certification, cut selection, local purchasing, composting, integrated pest management, water management, biogas production from wastes)*

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- C1. assess options for achieving environmental sustainability in green industry operations
- **C1.1** evaluate green industry operations and processes in terms of their impacts on environmental sustainability (*e.g.*, global floral sourcing and greenhouse gas emissions, by-product management and water quality, monocultures and biodiversity, genetically modified products and effects on pesticide use and biodiversity)
- **C1.2** analyse ways of reducing negative or enhancing positive environmental consequences through the use of particular materials, products, processes, and disposal methods *(e.g., nutrient recycling, spot spraying for insects and fungus, using organic fertilizer, composting, xeriscaping)*
- **C1.3** describe methods used in the green industries to balance economic sustainability with environmental responsibilities (e.g., selective breeding, selective cutting, organic production methods, restricted cattle crossings and buffer zones to prevent water contamination, environmental best management practices)
- **C1.4** describe the benefits of alternative practices that reduce the environmental impact of green industry operations (*e.g., living walls, naturalscaping, xeriscaping, forest certification, tree marking guidelines, fibre crops, armatures and grid work, alternative animal housing systems)*
- C1.5 describe legislation, regulations, standards, and guidelines relating to environmental protection that affect operations in the green industries (e.g., Greenbelt Act, Fisheries Act, Crown Forest Sustainability Act, Nutrient Management Act, Forest Fires Prevention Act, pest control regulations)

#### C2. Technology and Society

**C2.2** assess the economic importance of linkages between the green industries and related industries and technologies (e.g., *agriculture:* food processing industry, farm implement industry; *horticulture:* shipping industry, event-related businesses [funeral homes, wedding planners]; *landscaping:* recreational industries, small-engine industry; *forestry:* heavy equipment industry, paper-consuming industries such as newspapers)

# D. Professional Practice and Career Opportunities

#### D1. Health and Safety

**D1.3** demonstrate the ability to make appropriate safety decisions for personnel on the basis of environmental and site conditions (*e.g., weather conditions, presence of poisonous plants or dangerous gases, hazardous trees, reliability of communications in remote areas, access to emergency services) and level of crew training and experience* 

#### **D2.** Business and Regulatory Environment

**D2.1** identify industry associations, government departments, and non-governmental organizations that are involved with matters that affect the green industries (*e.g., local growers' associations; provincial and federal agriculture, health, environment, and resource departments; environmental NGOs)* 

#### **D3.** Career Opportunities

**D3.3** investigate areas of specialization within the green industries (e.g., lighting systems, water features, irrigation systems, GIS analysis, robotics, automation, entomology, pathology, tissue culture, agronomy, marketing, environmental management, farm management)

# Green Industries, Grade 12, Workplace Preparation (THJ4E)

## A. Green Industry Fundamentals

#### A1. Species Classification and Geographical Regions

- A1. demonstrate an understanding of species classification and identification and of relationships between species and geographical regions
- A1.1 use common classification schemes and key identification characteristics to distinguish between different plant and/or animal groups (e.g., annuals versus perennials, deciduous versus coniferous trees and shrubs, oaks versus birches, Holsteins versus Ayrshires)
- A1.2 identify geographical regions on the basis of classification criteria relevant to the green industries (*e.g., plant hardiness, growing degree days, elevation, soil type, soil moisture*), and describe how geographical factors determine the distribution of species in these regions
- A1.3 compare different kinds of ecosystems in terms of their biodiversity (e.g., a climax forest versus a rejuvenated forest, natural versus managed land, a cultivated field versus a greenhouse)

#### A2. Factors Affecting Growth and Product Quality

- **A2.** demonstrate an understanding of the effects of biotic and abiotic factors on growth and product quality
- A2.1 describe the effects of abiotic factors (e.g., light, temperature, soils, nutrients, topography, moisture, climate change, ethylene gas) on plant and/or animal growth and post-harvest quality (e.g., a southern exposure may increase yields by increasing available light; too little moisture may stunt growth and reduce yields; too much moisture may encourage growth of mould and mildew; ethylene gas acts as a ripening agent for picked fruits)
- A2.2 describe the effects of biotic factors (e.g., pests, diseases, weeds) on plant and/or animal growth and post-harvest quality (e.g., form defects, stunted growth, reduced yields, damaged fruit)
- A2.3 describe the effects of interactions between abiotic, biotic, and cultural factors in a variety of environments (e.g., gardens, greenhouses, barns, florists' coolers, fields, forest stands)
- A2.4 describe a variety of integrated pest management techniques (e.g., cultural [tilling and mulching], physical [crop rotation], environmental [introduction of beneficial insects], biological [fungi, nutrients], chemical [pheromones, chemical pesticides]), and identify situations in which they can be applied effectively

## A3. Designs and Processes

- A3.1 describe how design or planning processes are used in a variety of green industry applications (e.g., preparation of species prescriptions, crop rotation plans, environmental assessments, site layouts, event plans)
- A3.2 explain processes and techniques relating to the propagation, maintenance, and care of plants and/or animals (e.g., animal breeding, taking cuttings, seeding, irrigation, pruning, clipping, feeding, clearing)

# B. Green Industry Skills

## **B1. Design and Production**

- **B1.1** develop a design or process for a green industry application (e.g., a landscape design, a crop production plan, a herd management procedure, a plant propagation schedule)
- **B1.2** devise an effective management plan or site layout for a specific application (*e.g.*, *a forest prescription*, *a herd management plan*, *an event plan*, *a landscape construction plan*, *a block layout and harvesting plan*, *animal housing*)
- **B1.3** demonstrate an understanding of and apply techniques related to the propagation, maintenance, and post-harvest handling of a variety of species (*e.g., pruning, scarification of forest floor, artificial insemination, transplanting large trees, cut flower conditioning*)
- **B1.4** demonstrate an understanding of and apply designs and production processes that promote biodiversity, increase ecosystem function, and reduce maintenance requirements *(e.g., mulching, sustainable water gardening, rooftop gardening, naturalizing landscapes)*

## **B2.** Plant and Animal Management Strategies

- **B2.** apply management strategies for assessing and controlling biotic and abiotic factors that affect plant and/or animal quality
- **B2.1** perform a variety of procedures (*e.g.*, *pest counts, microscopic investigations, visual inspections, estrous cycle monitoring*) to assess biotic conditions that affect plant and/or animal quality
- **B2.2** perform a variety of procedures (e.g., soil and air temperature measurement, water analysis, form defects analysis, air quality assessment, nutritional assessment, monitoring ethylene gas concentrations) to assess or measure abiotic conditions that affect plant and/or animal quality
- **B2.3** apply techniques for controlling pests and disorders of plants and/or animals (*e.g., fogging, density planting, encouraging beneficial insects, constructing barriers, setting live traps, inoculations, animal tagging*)
- **B2.4** demonstrate an understanding of and apply management techniques that enhance environmental sustainability within the green industries (*e.g., sustainable herd management practices, measures that enhance forest succession, preferential use of native species*)

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** assess the impact of the green industries on the environment and describe ways of enhancing environmental sustainability
- **C1.1** assess the environmental sustainability of various practices and procedures used in the green industries (*e.g., harvesting methods, wood product manufacturing methods, naturalized landscaping, global floral sourcing, environmental farm plans, crop rotation, large-scale farming)*
- **C1.2** describe ways of reducing negative or enhancing positive environmental consequences through the use of particular materials, products, processes, and disposal methods *(e.g., nutrient recycling, spot spraying for insects and fungus, using organic fertilizer, composting, xeriscaping)*
- **C1.3** describe methods used in the green industries to balance economic sustainability with environmental responsibilities (e.g., selective breeding, selective cutting, organic production methods, environmental best management practices)
- **C1.4** describe the benefits of alternative practices that reduce the environmental impact of green industry operations (e.g., living walls, naturalscaping, forest certification, tree marking guidelines, fibre crops, armatures and grid work, alternative animal housing systems)
- **C1.5** identify legislation, regulations, standards, and guidelines relating to environmental protection that affect operations in the green industries (*e.g. Clean Water Act, Nutrient Management Act, species importation regulations, tree-cutting bylaws, pest control regulations)*

## D. Professional Practice and Career Opportunities

## **D3.** Career Opportunities

**D3.1** identify careers in the green industries (*e.g., arborist, florist, herder, greenhouse worker, forester*), and describe the nature and scope of the work involved

# HAIRSTYLING AND AESTHETICS, GRADES 11 AND 12

# Hairstyling and Aesthetics, Grade 11, Workplace Preparation (TXJ3E)

## C. Industry Practices, the Environment, and Society

## **C1. Industry Practices and the Environment**

- **C1.** describe the environmental impact of practices and products in the hairstyling and aesthetics industry, and identify safe practices and environmentally friendly solutions to problems
- **C1.1** identify and explain environmental and health issues related to various products used in the hairstyling and aesthetics industry (*e.g., the need for biodegradable products and refillable containers; the need for warnings/controls for carcinogenic/toxic ingredients; the need for proper ventilation in salons/spas)*

**C1.2** describe and apply practices for the recycling and responsible disposal of waste from salon/ spa operations (e.g., routines to reduce, reuse, and recycle; techniques for safe handling), and identify some sustainable purchasing practices for the hairstyling and aesthetics industry (e.g., purchasing products available in refillable containers, products with natural ingredients, non-toxic cleaning products, energy-saving products)

# Hairstyling and Aesthetics, Grade 12, Workplace Preparation (TXJ4E)

# C. Industry Practices, the Environment, and Society

## C1. Industry Practices and the Environment

- **C1.** evaluate practices and products in the hairstyling and aesthetics industry in terms of their impact on the environment
- **C1.1** summarize best practices for the safe handling, recycling, and disposal of waste (*e.g., use of biodegradable products and refillable containers, proper methods for storing and disposing of products and chemicals*) and develop a method (*e.g., a checklist*) for evaluating/monitoring the practices of individual salons/spas
- **C1.2** evaluate the hairstyling and aesthetics industry in terms of its use/non-use of environmentally friendly practices and products (*e.g.*, *use of recycling programs for mannequins; use of non-toxic versus carcinogenic/toxic ingredients; use of energy-saving products*)

# HEALTH CARE, GRADES 11 AND 12

# Health Care, Grade 11, University/College Preparation (TPJ3M)

## C. Health Care, the Environment, and Society

## C1. Health Care and the Environment

- **C1.** describe the impact of health care industry activities on the environment and identify ways of minimizing their harmful consequences
- **C1.1** describe the potential impact on the environment of biohazardous waste from health care facilities (*e.g., body fluid and human tissue, sharps containing bacteria or viruses*)
- **C1.2** identify safe methods for the handling, storage, and disposal of waste and biohazardous materials *(e.g., use of checklists, sharps containers, double wrapping, proper labelling)*
- **C1.3** describe good environmental practices that can be applied in the health care industry *(e.g., using energy-efficient lighting; reducing, reusing, or recycling packaging material; storing information electronically instead of on paper)*

# Health Care, Grade 11, College Preparation (TPJ3C)

# C. Health Care, the Environment, and Society

#### C1. Health Care and the Environment

- **C1.** describe the impact of health care industry activities on the environment and identify ways of minimizing their harmful consequences
- **C1.1** describe the potential impact on the environment of biohazardous wastes from health care facilities (e.g., body fluid and human tissue, sharps containing bacteria or viruses)
- **C1.2** identify safe methods for the handling, storage, and disposal of wastes and biohazardous materials *(e.g., use of checklists, sharps containers, double wrapping, proper labelling)*
- **C1.3** describe good environmental practices that can be applied in the health care industry (*e.g.*, *using energy-efficient lighting; reducing, reusing, or recycling packaging material; storing information electronically instead of on paper*)

# Health Care, Grade 12, University/College Preparation (TPJ4M)

## C. Health Care, the Environment, and Society

#### C1. Health Care and the Environment

- **C1.** assess the impact of the health care industry on the environment, and identify legal requirements and guidelines for protecting the environment from harmful consequences
- **C1.1** describe the environmental impact of technological advances in the health care field *(e.g., single-use devices create end disposal issues, as incineration results in heavy metal toxicity and landfilling creates biohazardous leachate; because of the increased use of pharmaceuticals, traces of prescription drugs are now being found in surface water)*
- **C1.2** research and report on laws, regulations, guidelines, and information sources pertaining to the disposal of medical waste (e.g., Atomic Energy Control Board radioactive materials; Workplace Hazardous Materials Information System [WHMIS] chemical hazards)
- **C1.3** identify some environmental impacts of a health care product over its complete life cycle *(e.g., use of harmful chemicals in manufacturing the product, energy consumption for manufacturing and transportation of raw materials and completed products, packaging waste, impact of the product when disposed of, impact of drug residues in human body wastes)*

# Health Care, Grade 12, College Preparation (TPJ4C)

## C. Health Care, the Environment, and Society

#### C1. Health Care and the Environment

- **C1.** describe the impact of the health care industry on the environment, and identify legal requirements and guidelines for protecting the environment from harmful consequences
- **C1.1** identify the environmental impact of technological advances in the health care field *(e.g., single-use devices create end disposal issues, as incineration results in heavy metal toxicity and landfilling creates biohazardous leachate; because of the increased use of pharmaceuticals, traces of prescription drugs are now being found in surface water)*

- C1.2 research and report on laws, regulations, guidelines, and information sources pertaining to the disposal of medical waste (e.g., Atomic Energy Control Board – radioactive materials; Workplace Hazardous Materials Information System [WHMIS] – chemical hazards; Ontario Regulation 102/94 – waste management)
- **C1.3** identify some environmental impacts of a health care product over its complete life cycle (e.g., use of harmful chemicals in manufacturing the product, energy consumption for manufacturing and transportation of raw materials and completed products, packaging waste, impact of the product when disposed of, impact of drug residues in human body wastes)

# Child Development and Gerontology, Grade 12, College Preparation (TOJ4C)

# C. Health Care, the Environment, and Society

## C1. Health Care and the Environment

- **C1.** analyse how environmental factors affect children and older adults, and how products and services related to the care of these groups may affect the environment
- **C1.1** analyse the environmental impact of products developed to meet the needs of children and the elderly *(e.g., landfill issues throw-away toys, batteries, disposable diapers, plastic baby bottles)* and identify more sustainable alternatives with respect to the use of such products
- **C1.2** analyse the impact of a degraded environment and other environmental hazards on children and the elderly (*e.g.*, *increased rates of respiratory problems*, *detrimental effects of lead paint*, *effects of environmental estrogens*)

# Health Care: Support Services, Grade 12, Workplace Preparation (TPJ4E)

# C. Health Care, the Environment, and Society

## C1. Health Care and the Environment

- **C1.** identify the impact of medical wastes on the environment, and describe ways of protecting the environment from these hazards
- **C1.1** identify the environmental impact of technological advances in the health care field (e.g., single-use devices create end disposal issues, as incineration results in heavy metal toxicity and landfilling creates biohazardous leachate; because of the increased use of pharmaceuticals, traces of prescription drugs are now being found in surface water)
- C1.2 research and report on laws, regulations, guidelines, and information sources pertaining to the disposal of medical waste (e.g., Atomic Energy Control Board – radioactive materials; Workplace Hazardous Materials Information System [WHMIS] – chemical hazards; Ontario Regulation 102/94 – waste management)

# D. Professional Practice and Career Opportunities

## D1. Health and Safety

**D1.3** describe and apply safe methods for the handling, storage, and disposal of waste and biohazardous materials *(e.g., use of a sharps container)* 

# HOSPITALITY AND TOURISM, GRADES 11 AND 12

# Hospitality and Tourism, Grade 11, College Preparation (TFJ3C)

# A. Hospitality and Tourism Fundamentals

## A1. The Tourism Industry

- A1.2 explain how various types of services, events, and activities from around the province (*e.g.*, *youth hostels, air transportation, ecotourism, weddings, guided tours*) are associated with one or more sectors of the tourism industry
- A1.6 explain the effect of the weather and seasonal changes on the availability, pricing, and quality of products and services within the tourism industry

## A3. Culinary Knowledge

A3.7 describe the effects of climate and season on the availability, quality, price, and nutritional value of food products and services

# C. Industry Practices, the Environment, and Society

## C1. Industry Practices and the Environment

- **C1.** demonstrate an understanding of factors that affect the relationship between the tourism industry and the environment
- **C1.1** explain the need for environmentally friendly waste management in the various sectors of the tourism industry (*e.g.*, *with regard to disposal of cooking oil and garbage, recycling of plastic and glass, composting of organic waste*)
- **C1.2** define environmental sustainability as it applies to the various sectors of the tourism industry (*e.g.*, *staying within the carrying capacity of environmentally sensitive areas; using energy-efficient buildings, equipment, and transportation; reusing and/or recycling waste products)*
- **C1.3** explain how the relationship between food producers and food consumers affects the environment (e.g., production of organic foods in response to consumer demand results in less use of chemical fertilizers and pesticides; the Slow Food movement supports local food production and the continuing use of traditional food products; culinary tourism increases consumer awareness of and helps to support traditional food producers in many parts of the world)
- C1.4 assess the ecological footprint of an event or activity

# C2. Industry Practices and Society

**C2.3** describe the social responsibility of companies and workers in the tourism industry (e.g., with regard to equal employment opportunities, conservation and preservation of the environment, relations with local communities)

# Hospitality and Tourism, Grade 11, Workplace Preparation (TFJ3E)

# C. Industry Practices, the Environment, and Society

## **C1. Industry Practices and the Environment**

- **C1.** demonstrate an understanding of ways in which various practices of the food and beverage services sector of the tourism industry affect the environment
- **C1.1** describe environmentally friendly disposal procedures for waste food products and food packaging *(e.g., composting, recycling)*
- **C1.2** create a plan to implement an environmentally friendly disposal procedure for waste food products and/or food packaging (*e.g.*, *a plan to set up a composting or recycling program in the school cafeteria, a plan to encourage the use of biodegradable containers for take-out food*)
- **C1.3** explain how the food and beverage services sector can support the achievement of environmentally responsible goals *(e.g., goals of ecotourism, conservation goals, preservation goals)*
- C1.4 assess the ecological footprint of an event or activity

## **C2. Industry Practices and Society**

**C2.1** describe the social and economic impact of new products and technologies used in the food and beverage services sector (e.g., marketing of organic and genetically modified foods has raised consumer awareness of health and environmental issues; use of combination ovens has reduced labour costs and product wastage; ...)

# Hospitality and Tourism, Grade 12, College Preparation (TFJ4C)

# A. Hospitality and Tourism Fundamentals

## A1. Management Techniques and Strategies

A1.4 summarize the necessity for policies and procedures (e.g., ... procedures for dealing with environmental issues such as waste) to support management objectives in the tourism industry

# C. Industry Practices, the Environment, and Society

## **C1. Industry Practices and the Environment**

- **C1.** demonstrate an understanding of factors that affect the relationship between the tourism industry and the environment
- **C1.1** explain why the tourism industry has a responsibility to protect the environment and encourage the sustainable use of natural resources (*e.g.*, *by reducing*, *reusing*, *and recycling waste; by using energy efficiently; by using biodegradable cleaning products*)
- C1.2 analyse how tourism has affected the environment within or outside the local community *(e.g., the effects of increased tourist traffic, increased water use, rising property values)*
- **C1.3** identify, through research, an appropriate code of ethics and/or guidelines for sustainable tourism and describe how they could be applied locally and globally

**C1.4** identify and describe ways in which the tourism industry could offset its impact on the environment (*e.g., develop or support a tree planting program, develop or contribute to a carbon offset fund*)

## **C2. Industry Practices and Society**

**C2.1** describe, on the basis of research, how the tourism industry has changed in recent years (*e.g.*, *growth in tourist numbers, greater variety of tourist destinations, growing popularity of eco/ adventure tourism and culinary tourism*) and explain how these changes have affected local and provincial communities and their economies

# Hospitality and Tourism, Grade 12, Workplace Preparation (TFJ4E)

# A. Hospitality and Tourism Fundamentals

## A2. Planning Nutritious Meals

A2.4 identify the differences (*e.g., with respect to yield, nutrition, freshness, taste*) between locally grown and/or organically grown fruits and vegetables and those grown using traditional cultivation techniques (*e.g., use of fertilizer and pesticides*) and/or harvested unripe and transported long distances

## A3. Food Handling and Storage

A3.4 demonstrate effective management of resources and inventory (e.g., in terms of portion control, waste management, and energy conservation)

# C. Industry Practices, the Environment, and Society

## **C1. Industry Practices and the Environment**

- **C1.** demonstrate an understanding of how various practices connected with the tourism industry in general and the food and beverage services sector specifically affect the environment, and how these effects can be reduced
- **C1.1** identify the effects that the tourism industry has on the environment (*e.g., undeveloped areas exploited for commercial gain, environmentally sensitive areas affected by pollution and waste disposal, infrastructure expanded and upgraded, areas of natural beauty preserved as tourist attractions)*
- **C1.2** describe how the food and beverage services sector can both protect the environment and encourage the sustainable use of natural resources (*e.g.*, *by choosing new locations on or near existing infrastructure to reduce the need for new infrastructure, providing guests with the option not to have linens washed daily, composting organic waste from restaurants, reusing cooking oil as a biofuel, using locally grown produce to reduce the need for long-distance transportation*)
- **C1.3** identify, through research, an appropriate code of ethics and/or guidelines for sustainable tourism and describe how they could be applied to the operation of local food and beverage services facilities
- **C1.4** identify ways in which the food and beverage services sector could offset its impact on the environment (e.g., develop or support a tree planting program, develop or contribute to a carbon offset fund)

# MANUFACTURING TECHNOLOGY, GRADES 11 AND 12

# Manufacturing Engineering Technology, Grade 11, University/College Preparation (TMJ3M)

# A. Manufacturing Technology Fundamentals

#### A1. Design Process

- A1.3 explain why technological concepts (e.g., aesthetics, control, environmental sustainability/ stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) are important considerations in the design process ...
- A1.4 explain how the application of technological concepts in design or other problem-solving processes can result in products that better meet human needs or wants (e.g., a ramp to replace a stairway, a lever-type door handle to replace a round knob, a remote control to operate a television, energy-efficient devices to replace inefficient ones)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which the manufacturing industry affects the environment
- **C1.1** analyse the effects that various manufacturing activities have on the environment (e.g., the effects of waste disposal, power consumption, processing of raw materials; effects on Aboriginal hunting and gathering grounds)
- **C1.2** explain the benefits of using environmentally friendly processes and products in the manufacturing process
- **C1.3** explain how various sources of power generation *(e.g., coal, nuclear, wind, solar, geothermal)* and transportation methods *(e.g., truck, rail, ship)* used in manufacturing affect the environment

## C2. Technology and Society

- **C2.2** explain how the manufacturing industry affects the local and provincial economy (e.g., with respect to job creation, standards of living, sustainability and conservation of the environment, impact on First Nation communities)
- **C2.3** describe recent trends in the local manufacturing industry (*e.g., globalization, rise in energy costs, increase in environmental awareness)* and their effect on the local community or the province as a whole, and predict future trends

# Manufacturing Technology, Grade 11, College Preparation (TMJ3C)

## A. Manufacturing Technology Fundamentals

## A1. Design Process

A1.3 explain why technological concepts (e.g., aesthetics, control, environmental sustainability/ stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) are important considerations in the design process ...

# C. Technology, the Environment, and Society

## C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which the manufacturing industry affects the environment
- **C1.1** describe the benefits of using environmentally friendly products in the manufacturing process *(e.g., the benefits of water-based versus solvent-based adhesives)*
- **C1.2** identify a variety of alternative fuels (*e.g., biodiesel, ethanol, hydrogen, electric power in hybrid systems*) and energy sources (*e.g., wind power, solar power, waste-to-energy*) and explain how use of these fuels and energy sources can reduce the environmental impact of the manufacturing industry
- **C1.3** explain how various sources of power generation used in manufacturing (*e.g., coal, nuclear, solar, wind, hydrogen fuel cell, tidal, geothermal*) affect the environment (*e.g., construction of large hydroelectric dams can affect animal habitats and patterns of behaviour*)
- **C1.4** describe environmentally responsible practices that can be followed during the design and manufacture of a product (*e.g.*, *minimize waste*, *consider using renewable or recyclable materials*, *design and manufacture products that last or can be repaired as opposed to throw-away products*, *use processes that have minimal impact on workers and the local environment*)
- C1.5 demonstrate the use of proper techniques for the disposal of waste products

## C2. Technology and Society

**C2.1** explain how the manufacturing industry affects the local and provincial economy (e.g., with respect to job creation, standards of living, sustainability and conservation of the environment, impact on First Nation communities)

# Manufacturing Technology, Grade 11, Workplace Preparation (TMJ3E)

# A. Manufacturing Technology Fundamentals

## A2. Design Process

A2.4 explain why technological concepts (e.g., aesthetics, control, environmental sustainability/ stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) are important considerations in the design process ...

# C. Technology, the Environment, and Society

# C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which the manufacturing industry affects the environment
- **C1.1** explain the importance of the proper storage, disposal, and recycling of obsolete and waste products in manufacturing
- **C1.2** describe the benefits of using environmentally friendly products in the manufacturing process *(e.g., the benefits of water-based versus solvent-based chemicals)*
- **C1.3** explain how various sources of power generation used in manufacturing *(e.g., coal, nuclear, solar, wind, hydrogen fuel cell, tidal, geothermal)* affect the environment

**C1.4** identify conservation strategies that the manufacturing industry could employ (*e.g., minimize water usage, convert to energy-efficient lighting, exploit transportation efficiencies, reduce paper usage by communicating electronically*)

## C2. Technology and Society

**C2.3** identify ways in which the manufacturing industry affects the culture and society of a community or region (*e.g.*, ... *increasing industrial activity in the community/region, which some people may see as a threat to their way of life and/or the environment)* 

# Manufacturing Engineering Technology, Grade 12, University/College Preparation (TMJ4M)

# C. Technology, the Environment, and Society

## C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which the manufacturing industry affects the environment, and make informed decisions based on this understanding
- **C1.1** identify potentially harmful consequences of manufacturing activities for the environment *(e.g., waste disposal, greenhouse gas emissions, water and energy consumption, the depletion of non-renewable resources)*, and formulate alternatives to reduce the severity of these consequences
- **C1.2** assess and compare energy sources (*e.g., renewable water, wind, solar, geothermal; non-renewable coal, oil and gas, nuclear)* used in manufacturing, and identify ways of increasing environmentally friendly energy use
- C1.3 assess the carbon footprint of a manufactured product
- **C1.4** explain the benefits of developing an environmentally friendly product *(e.g., a windmill that develops energy from wind power)* and assess its potential effectiveness

## C2. Technology and Society

**C2.2** explain the importance of demographics, geography, and strategic plant location as factors to be considered in setting up a successful manufacturing facility, and describe possible short-term and/or long-term societal implications locally and beyond *(e.g., regional or provincial planning issues, effects on the indigenous population, ecosystem and/or habitat considerations)* 

# Manufacturing Technology, Grade 12, College Preparation (TMJ4C)

# A. Manufacturing Technology Fundamentals

## A1. Design Process

A1.3 explain why technological concepts (e.g., aesthetics, control, environmental sustainability/ stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) are important considerations in the design process ...

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of the importance of using sustainable and environmentally friendly manufacturing practices
- **C1.1** demonstrate the proper selection and disposal of oils, fluids, and materials used in manufacturing
- **C1.2** explain how the three Rs (reduce, reuse, recycle) can minimize the effect the manufacturing industry has on the environment
- **C1.3** explain the advantages and disadvantages of using various renewable and sustainable energy sources *(e.g., solar, hydrogen fuel cell, wind, geothermal, tidal)* in manufacturing
- **C1.4** assess the benefits of using environmentally friendly products and processes in manufacturing *(e.g., long-term cost savings, creation of positive company image by establishing "green" credentials)*
- **C1.5** follow environmentally responsible practices during the design and manufacture of a product (e.g., minimize waste, consider using renewable or recyclable materials, design and manufacture products that last or can be repaired as opposed to throwaway products, use processes that have minimal impact on workers and the local environment)

# Manufacturing Technology, Grade 12, Workplace Preparation (TMJ4E)

## A. Manufacturing Technology Fundamentals

## A2. Design Process

A2.5 demonstrate a working knowledge of ways in which technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) are important considerations in the design process ...

## C. Technology, the Environment, and Society

## C1. Technology and the Environment

- **C1.** demonstrate an understanding of the importance of using sustainable and environmentally friendly manufacturing practices
- **C1.1** demonstrate an understanding and application of the three Rs in a manufacturing facility (e.g., reduction of waste through efficient selection and conversion of materials, reuse of materials when possible, effective collection and recycling of materials and/or fluids)
- C1.2 demonstrate the use of proper techniques for the disposal of obsolete and/or waste products
- **C1.3** describe the advantages and disadvantages of using various renewable and sustainable energy sources (*e.g., solar, hydrogen fuel cell, wind, geothermal, tidal*) and alternative fuels (*e.g., biodiesel, ethanol*) in manufacturing
- **C1.4** follow environmentally responsible practices during the design and manufacture of a product (*e.g., minimize waste, consider using renewable or recyclable materials, design and manufacture products that last or can be repaired as opposed to throwaway products, use processes that have minimal impact on workers and the local environment)*

## C2. Technology and Society

**C2.2** explain how the globalization of manufacturing industries affects Canadian society locally, provincially, and/or nationally (e.g., explain the effects of trade agreements, worker health and safety standards or the lack of such standards, environmental standards or the lack of such standards)

# **TECHNOLOGICAL DESIGN, GRADES 11 AND 12**

# Technological Design, Grade 11, University/College Preparation (TDJ3M)

## A. Technological Design Fundamentals

#### A1. Design Process

A1.1 describe ways in which society, the environment, and the economy inspire and/or affect technological design (e.g., need for barrier-free access or alternative-energy vehicles), with reference to key technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ...

# C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmentally responsible design practices, and apply them in the technological design process and related activities
- **C1.1** demonstrate an understanding of environmental issues that affect the design of products and/ or processes (e.g., gasoline consumption, pollution, greenhouse gases, habitat loss, extinction of species, depletion of natural resources)
- **C1.2** describe, advocate, and apply best practices for conserving energy and other resources when designing a product or process (*e.g.*, *reuse or recycle lumber and other materials; use materials with recycled content; use wood glue instead of hot glue; use renewable energy sources, high-efficiency motors and appliances, and passive heating and cooling of buildings)*
- **C1.3** describe ways to reduce the waste produced by the manufacture and use of products (*e.g.*, *cutting patterns that minimize leftover materials, use of materials that are easily recycled, energy management controls in electronic equipment*), and apply such practices when developing and building prototypes

## C2. Technology and Society

- **C2.1** research and compare technological eras *(e.g., agricultural, industrial, information)*, and describe ways in which societal needs influenced these eras
- **C2.3** demonstrate an understanding of ways in which history, trends, culture, and geography have inspired technological design

# D. Professional Practice and Career Opportunities

## D1. Health and Safety

- D1. describe and apply health, safety, and environmental practices related to technological design
- **D1.2** adhere to appropriate personal and environmental health and safety standards and procedures with respect to processes, materials, tools, equipment, and facilities throughout the design process and when performing related activities (*e.g.*, ... *ensure adequate ventilation and ergonomic seating and other workplace arrangements;* ... *store materials and dispose of wastes properly*)

# Technological Design and the Environment, Grade 11, Open (TDJ3O)

# A. Technological Design Fundamentals

## A1. Design Process

- A1. describe the design process, and identify ways in which technological design can address an environmental need or challenge
- A1.1 describe the purpose of design for a given project (e.g., cleaner energy, reduced carbon footprint, less manufacturing waste) in terms of key technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ...
- A1.2 describe the need for technological designs that take environmental factors into account (e.g., fuel-efficient vehicles, non-toxic paints and pesticides, renewable energy sources, sustainable production of materials)

## A2. Research, Planning, and Organization

- **A2.** describe and apply strategies, techniques, and tools for researching, planning, and organizing projects to meet a specific environmental or other need
- A2.1 identify and apply strategies for gathering information from various sources (*e.g., books, Ministry of the Environment website, interview with a naturalist*) for a design project that meets an environmental need
- A2.3 plan ways to apply the principles of sustainability and minimize environmental harm throughout the design process for a project (*e.g.*, *plan to use recycled materials*, *limit the use of energy-consuming equipment*)

## A4. Making and Testing Models and Prototypes

A4.3 identify criteria for assessing the environmental friendliness of a design and of the processes required to produce it (e.g., by-products, waste, energy consumption, reuse and/or recycling of materials, biodegradability)

## **A5. Reporting and Presenting**

- **A5.** demonstrate an understanding of the technical and environmental terminology and the communication methods and formats used in the design process
- A5.1 demonstrate an understanding of technical and environmental terminology used in the design process (e.g., drafting versus drawing, scale versus ruler, greenhouse gases, parts per billion, fossil fuel)

# B. Technological Design Skills

#### B1. Research, Planning, and Organization

- **B1.** use appropriate tools and strategies to research, plan, and organize design projects that have environmentally sound designs and production processes
- **B1.1** gather and summarize relevant information for developing various designs (*e.g., Canadian Standards Association [CSA] publications, Ontario Building Code, environmental criteria*)
- **B1.2** investigate and describe economic and environmental factors that should be considered during the design process
- **B1.3** select and apply effective planning and organizational tools and strategies (*e.g., sequence chart, time sheet, swatch book, checklists, file management*) to develop environmentally sound design projects

## **B3.** Making and Testing Models and Prototypes

**B3.3** test models and/or prototypes, and evaluate designs using student-generated criteria (*e.g., by-products, waste, energy consumption, biodegradability, reliability, durability)* 

#### **B4. Reporting and Presenting**

- **B4.** report on the progress, environmental rationale, and results of the design process, using appropriate formats and styles
- **B4.1** present a report summarizing the design choices, progress, and results of the design project, with an emphasis on how the design deals with environmental concerns, using a variety of tools (*e.g., presentation software, interactive white board, web pages, word-processing software*)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmentally responsible design practices and strategies, and apply them in the technological design process and related activities
- C1.1 identify environmental issues that affect technological design (e.g., pollution, greenhouse gases, resource use, ozone depletion)
- **C1.2** describe and apply best practices for conserving energy and other resources when designing a product or process (*e.g.*, *reuse or recycle materials*, *use wood glue instead of hot glue*, *use energy management systems for computers*)
- **C1.3** research and report on organizations and/or community partners that foster environmentally friendly design practices (*e.g.*, *Ontario Centre for Environmental Technology Advancement, other Canadian environmental technology advancement centres*)
- **C1.4** describe innovative technological designs (*e.g., alternative energy sources, more efficient automobiles, ways of reducing manufacturing waste*) that were developed in response to changes in the environment (*e.g., global warming, pollution, rainforest destruction*)
- C1.5 compare the environmental impact of various products that are used for the same purpose (e.g., plastic bags versus paper bags or reusable cloth bags, paper cups versus polystyrene foam cups)

## C2. Technology and Society

**C2.1** research and report on how society influences technology (e.g., higher energy costs spur development of more efficient vehicles, increasing population density leads to the construction of taller buildings, environmental awareness leads to development of alternative energy sources)

## D. Professional Practice and Career Opportunities

## **D1. Health and Safety**

- **D1.** describe and apply appropriate health, safety, and environmental practices and standards throughout the design process
- **D1.1** investigate and describe health, safety, and environmental laws, regulations, standards, and agencies that can affect technological design (e.g., Ontario Environmental Bill of Rights, Clean Water Act, Canadian Standards Association [CSA] standards, Workplace Hazardous Materials Information System [WHMIS])
- **D1.2** demonstrate an understanding of and follow personal and environmental health and safety procedures with respect to processes, materials, tools, equipment, and facilities throughout the design process and when performing related activities (*e.g.*, ... *ensure adequate ventilation and ergonomic seating and other workplace arrangements;* ... *store materials and dispose of wastes properly*)

## **D2.** Career Opportunities

**D2.1** identify a variety of career opportunities related to technological design (*e.g., civil engineer, architect, mechanical engineering technician, environmental technologist, landscape designer, fashion designer, interior designer)* 

# Technological Design, Grade 12, University/College Preparation (TDJ4M)

## A. Technological Design Fundamentals

## A1. Design Process

A1.1 describe environmental and societal needs (e.g., barrier-free access, alternative-energy vehicles) that influence product designs, with reference to key technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ...

## A2. Research and Project Management

A2.2 describe strategies for organizing, planning, and managing the human, material, and financial resources for a design project and related activities, with an emphasis on advocacy of design ideas and rationales, diplomacy in dealing with clients and suppliers, and marketing of design solutions (*e.g.*, ... *advocating for environmentally sound materials*, ...)

# B. Technological Design Skills

#### **B3.** Making and Testing Models and Prototypes

**B3.3** analyse products and/or processes on the basis of student-justified criteria (*e.g., aesthetics, ergonomics, performance, functionality, cost, environmental stewardship*), with an emphasis on marketability

## C. Technology, the Environment, and Society

## C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmentally responsible design practices, and apply them in the technological design process and related activities
- **C1.1** identify and analyse environmental effects of a particular industry or technological system *(e.g., mass transit system, strip mining, sewer system)*, and recommend practices that are economically and environmentally sustainable
- C1.2 describe ways in which environmental issues influence the design of products and/or processes
- **C1.3** describe, advocate for, and apply best practices for conserving energy and other resources when designing a product or process (*e.g.*, *reuse or recycle lumber and other materials; use materials with recycled content; use wood glue instead of hot glue; use renewable energy sources, high-efficiency motors and appliances, and passive heating and cooling of buildings)*
- C1.4 describe ways to reduce the waste produced by the manufacture and use of products (e.g., *cutting patterns that minimize leftover materials, use of materials that are easily recycled, energy management controls in electronic equipment*), and apply such practices when developing and building prototypes

## C2. Technology and Society

- **C2.1** independently research and report on political, economic, cultural, and/or environmental issues that affected technological innovations in the past (*e.g., traffic congestion spured development of compact vehicles, increasing population density led to the construction of taller buildings)*
- **C2.2** describe examples of how culture, economics, and politics could influence the future design of products and/or processes (e.g., environmental awareness and rising costs for fossil fuels could increase the development and use of alternative energy sources)

## D. Professional Practice and Career Opportunities

## **D1. Health and Safety**

- **D1.** describe and apply personal and environmental health and safety standards and practices related to technological design
- **D1.2** adhere to and promote personal and environmental health and safety standards and procedures with respect to processes, materials, tools, equipment, and facilities throughout the design process and when performing related activities (*e.g.*, ... *ensure adequate ventilation and ergonomic workplace arrangements;* ... *store materials and dispose of wastes properly;* ...)

# Technological Design in the Twenty-first Century, Grade 12, Open (TDJ4O)

# A. Technological Design Fundamentals

## A1. Design Process

- A1.1 describe the purpose of design for a given project (e.g., technological convergence, costefficient products, smaller living spaces) with reference to key technological concepts (e.g., aesthetics, control, environmental sustainability/stewardship, ergonomics, fabrication, function, innovation, material, mechanism, power and energy, structure, safety, systems) ...
- A1.2 describe ways in which societal needs, including environmental and economic factors, influence technological design (e.g., need for products that are smaller, lighter, faster, safer, and/or easier to use)

# B. Technological Design Skills

## B1. Research, Planning, and Organization

- **B1.2** investigate and report on societal factors that influence technological design (*e.g., news media, politics, religion, environment, gender, cultural and ethnic diversity*)
- **B1.4** research and identify relevant design criteria and constraints relating to societal influences *(e.g., ... use of environmentally friendly materials, ...)*

## C. Technology, the Environment, and Society

## C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmentally responsible design practices and strategies, and apply them in the technological design process and related activities
- **C1.1** demonstrate an understanding of environmental issues that affect product design (*e.g., finite non-renewable resources, pollution, wastes, greenhouse gases, climate change, ozone depletion, life cycle of products)*
- **C1.2** describe, promote, and apply design practices that conserve energy and other resources (e.g., reuse or recycle lumber and other materials, use materials with recycled content, use wood glue instead of hot glue, use energy-management software for computers and other electronic equipment, use renewable energy, use high-efficiency motors and appliances)
- **C1.3** demonstrate an understanding of technological, political, and social strategies for managing the relationship between society and the environment (*e.g., technological developments to improve energy efficiency and/or reduce emissions, lobbying governments for regulations and/or funding to improve the environment, education about environmental issues)*
- **C1.4** explain how good design can reduce the wastes produced by the manufacture and use of products

## C2. Technology and Society

**C2.2** describe how society influences technology (e.g., higher energy costs spur development of more efficient vehicles, increasing population density leads to the construction of taller buildings, environmental awareness leads to development of alternative energy sources)

# D. Professional Practice and Career Opportunities

#### **D1. Health and Safety**

- **D1.** describe and apply appropriate health, safety, and environmental practices and standards throughout the design process
- **D1.2** adhere to personal and environmental health and safety standards and procedures with respect to processes, materials, tools, equipment, and facilities throughout the design process and related activities (*e.g.*, ... *ensure adequate ventilation and ergonomic seating and other workplace arrangements;* ... *store materials and dispose of wastes properly*)

# TRANSPORTATION TECHNOLOGY, GRADES 11 AND 12

# Transportation Technology, Grade 11, College Preparation (TTJ3C)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmental issues related to the use of materials and procedures in the service, repair, and recycling of vehicles or craft
- **C1.1** describe the legislative requirements concerning the use of environmentally friendly products in the repair and service of vehicles or craft, and explain the costs and benefits of using such products
- **C1.2** explain the importance of the proper processing of waste products *(e.g., batteries, used oil, antifreeze, refrigerant, tires)* as a means of minimizing the environmental impact of the transportation industry
- **C1.3** describe appropriate actions to be taken in the event of a spill of waste products (*e.g.*, *gasoline*, *antifreeze*), and demonstrate the ability to safely implement such actions (*e.g.*, *outline the steps described in an emergency action plan and carry them out*)

## C2. Technology and Society

- **C2.2** describe the effects that increasing transportation costs (e.g., rising fuel costs, highway tolls, environmental taxes) have on society
- **C2.3** explain how current societal needs and preferences influence transportation technology (*e.g.*, *by creating a greater demand for vehicles with improved safety features, fuel efficiency, and emission levels*)

# Transportation Technology: Vehicle Ownership, Grade 11, Open (TTJ3O)

## A. Vehicle Ownership Fundamentals

## A2. Vehicle Registration and Ownership

A2.2 describe the conditions that must be met to register a vehicle (e.g., safety standards inspection, emissions test, proof of insurance)

# D. Technology, the Environment, and Society

#### D1. Technology and the Environment

- **D1.** explain how vehicle ownership affects the environment and how vehicle owners can remedy or reduce harmful effects
- **D1.1** outline the legal requirements and environmental reasons for emission standards and for testing when required
- **D1.2** describe the options that vehicle owners have to choose environmentally friendly products *(e.g., biodegradable cleaners)* and procedures *(e.g., recycling of antifreeze)* in the repair and service of vehicles
- **D1.3** describe a vehicle owner's responsibilities with respect to recycling and/or disposing of waste products *(e.g., used oil, used batteries)* appropriately
- **D1.4** explain the importance of vehicle maintenance from an environmental perspective (*e.g.*, *keeping tires properly inflated helps to maximize fuel efficiency and reduce emissions*)

#### **D2.** Technology and Society

- **D2.2** describe the economic, environmental, and social effects that various aspects of the transportation industry have on a community (e.g., ... environmental: pollution caused by exhaust emissions and road salting; ...)
- **D2.3** assess from a consumer's point of view the pros and cons (*e.g.*, *cost*, *availability*, *performance*, *reliability*, *emission levels*) of various types of fuel/energy sources used to power vehicles (*e.g.*, *gasoline*, *propane*, *diesel*, *electrical/battery power*, *biodiesel*, *hybrid powerplant*)

# Transportation Technology, Grade 12, College Preparation (TTJ4C)

## A. Transportation Technology Fundamentals

#### A1. Understanding Engine Management Systems

A1.4 explain how environmentally harmful gases are produced through combustion and how the engine management systems control the level of emissions in the exhaust gas (e.g., through after-treatment of exhaust gases, exhaust gas recirculation, vapour recovery, positive crankcase ventilation, variable valve timing)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of environmental issues in the transportation industry, and use best practices to remedy or reduce the environmental effects of using specific products or processes
- **C1.1** demonstrate an understanding of ways in which the transportation industry affects the environment and of efforts being made to remedy or reduce harmful effects (*e.g., improved production methods, automotive parts recycling*), including ways of disposing of waste products (*e.g., used oil, used batteries, used paints/thinners*)

- **C1.2** describe appropriate actions to be taken in the event of a spill of waste products (*e.g.*, *gasoline, antifreeze*) and demonstrate the ability to safely implement such actions (*e.g.*, *implement an emergency action plan to contain and clean up the spill*)
- **C1.3** identify the procedures required to prevent the release of ozone-depleting materials and other harmful substances *(e.g., electrolyte, antifreeze, gasoline)* during the servicing of vehicle or craft systems

#### C2. Technology and Society

C2.4 assess the pros and cons of various types of fuel/energy sources (e.g., gasoline, propane, diesel, electrical/battery power, biodiesel, hybrid powerplant, hydrogen power cells) used to power vehicles or small-engine products, taking into account a variety of perspectives (e.g., consumer's perspective: cost to purchase, cost to operate, performance, emission levels; service/repair perspective: training, safety issues, new tools/equipment required)

# Transportation Technology: Vehicle Maintenance, Grade 12, Workplace Preparation (TTJ4E)

## C. Technology, the Environment, and Society

#### C1. Technology and the Environment

- **C1.** demonstrate an understanding of ways in which various aspects of the transportation industry affect the environment, and ways in which harmful effects can be remedied or reduced
- **C1.1** demonstrate an understanding of ways in which the transportation industry affects the environment and of efforts being made to remedy or reduce harmful effects (*e.g., improved production methods, automotive parts recycling*), including ways of disposing of waste products (*e.g., used oil, used batteries, used paints/thinners*)
- **C1.2** explain the pros and cons of using environmentally friendly products (*e.g., biodegradable cleaners*) and procedures (*e.g., recycling of antifreeze*) in the repair and service of vehicles or small-engine products
- **C1.3** describe appropriate actions to be taken in the event of a spill of waste products (*e.g., used oil, antifreeze, fuel*), and demonstrate the ability to safely implement such actions (*e.g., outline the steps described in an emergency action plan and carry them out*)

#### C2. Technology and Society

- C2.2 assess the pros and cons of various types of fuel/energy sources (e.g., gasoline, propane, diesel, electrical/battery power, biodiesel, hybrid powerplant, hydrogen power cells) used to power vehicles or small-engine products, taking into account a variety of perspectives (e.g., consumer's perspective: cost to purchase, cost to operate, performance, emission levels; service/repair perspective: training, safety issues, new tools/equipment required)
- **C2.3** explain how current trends in transportation technology (*e.g.*, *extended maintenance schedules, improved emission standards and testing, use of high-tech components, emphasis on fuel efficiency, manufacturers' efforts to increase the amount of recyclable material in vehicles and small-engine products)* are related to societal attitudes and behaviour

16-076 ISBN 978-1-4606-9581-4 (PDF) © Queen's Printer for Ontario, 2017