
Teacher Package

Science Exemplar Task Biology, Grade 11, College Preparation (SBI3C) Teacher Package

Title: A Respiratory Health Report

Time Requirement: 5–6 periods of 75 minutes each

Expectations Addressed in the Exemplar Task

This task gives students the opportunity to demonstrate achievement of all or part of each of the expectations listed below. Expectations 1 and 5 are from the Animal Anatomy and Physiology strand of the course. Expectations 2, 3, and 4 are from the list of expectations that precedes the strands of the course in the curriculum document and that applies to all strands of the course.

Students will:

1. design and carry out an experiment related to animal physiology, identifying specific variables;
2. communicate the procedures and results of investigations and research for specific purposes using data tables and laboratory reports;
3. demonstrate the skills required to plan and carry out investigations, using laboratory equipment safely, effectively, and accurately;
4. compile, organize, and interpret data, using appropriate formats and treatments, including tables, flow charts, graphs, and diagrams;
5. demonstrate an understanding of the connections among health, preventive measures, and treatment, and of their social and economic implications.

Description of the Task

Present the following instructions and scenario to students:

You are a respiratory technician who does vital capacity testing across the province. Vital capacity is a measure of an individual's lung capacity, and can be an important indicator of personal health. An individual's breathing system can be affected by environmental factors. Reductions in air quality in many parts of the world have made breathing difficult for many people.

You have been asked by a doctor to come to her community to test the vital capacities of its residents. Over the past few months, the doctor has noticed that many more people than usual have come into her clinic with respiratory problems.

When you arrive in the community, you discover that your equipment has not arrived with you. Instead of wasting valuable time, you decide to build an apparatus to measure the vital capacities of the residents in the community.

Design, build, and test the apparatus. Once your apparatus is working well, compile a data set for the community. Using the data and your research, write a submission to the doctor to describe the results of your study.

Final Product

Each student will submit a respiratory health report that contains the following:

- a labelled scientific diagram of the assembled apparatus (see Appendix A)
- procedural instructions for building and operating the apparatus
- a table organizing the collected data including:
 - qualitative data (e.g., gender, health information)
 - quantitative data (e.g., vital capacity, age, height)
- a written submission to the doctor that uses the collected data and research to provide:
 - graphical information
 - data analysis (e.g., averages, ranges)
 - a description of common factors affecting vital capacity, including respiratory ailments (e.g., asthma, emphysema)
 - an analysis of the implications for the health of the community
 - suggestions for improving vital capacity, or maintaining normal vital capacity, in the community
- a bibliography

Note: The bibliography will not be assessed as part of the exemplar task but is included to ensure that all the sources used by the student to complete the task are cited.

Assessment and Evaluation

The final draft of the respiratory health report will be assessed and evaluated using the task-specific rubric provided.* Introduce the rubric to the students when you introduce the task. Review the rubric with the students to ensure that each student understands the criteria and the descriptions for achievement at each level. Allow ample time for a thorough reading and discussion of the assessment criteria outlined in the rubric.

Some students may perform below level 1. Although the rubric does not include descriptions of achievement below level 1, the characteristics of these students' work should be reviewed in relation to the criteria outlined in the rubric.

*The rubric is reproduced on pages 10–11 of this document.

Teacher Instructions

Prior Knowledge and Skills

To complete this task, students are expected to have some experience in, or some knowledge and skills relating to, the following:

- measuring volume using water displacement (e.g., displacement by an irregular object)
- requirements for scientific diagrams
- collecting, recording, and interpreting data
- the human respiratory system
- research and ethical use of the Internet
- safe handling of laboratory materials

Note: It is suggested that, before students begin the task, teachers review related demonstrations used throughout the course.

Accommodations

Accommodations that are normally provided in the regular classroom for students with special needs should be provided in the administration of this performance task.

Materials and Resources

- found materials (e.g. 4-L vinegar bottles, large water bottles, plastic tubs)
- rubber tubing or surgical tubing
- graduated cylinders
- rulers or metre sticks
- markers, tape, and paper towels
- soft cardboard (for disposable mouthpieces), or plastic mouthpieces with alcohol swabs for sterilization

Plagiarism

It is important that you discuss copyright issues with your students. Their bibliographies must list all sources used for research, and if any quotations are taken directly from a source, they must be appropriately recognized. Copyright applies to text and visual materials taken from both the Internet and print sources. Plagiarism is defined as “using the work (or part of it) of another person and claiming it as your own”.¹

Task Instructions

Preparatory Notes:

- Book computer time in the library or computer lab in advance for Internet research.
- Review the human respiratory system with the class, and define vital capacity.

1. Canadian Intellectual Property Office, Industry Canada, *A Guide to Copyrights* (Hull, Quebec: Canadian Intellectual Property Office, Industry Canada, 2000), p. 20.

- Remind students to collect found materials before the task begins, and to bring the materials to school.
- Keep a mop handy for any water spills.
- Remind students to ensure that the maximum volume of water to be displaced from the bottle in a trial will fit into the tub without spilling over.
- Have students practise inverting the bottle into the tub before they do their first trial.
- Have students make a disposable mouthpiece for the vital-capacity apparatus from soft cardboard, or provide alcohol swabs for the sterilization of a plastic mouthpiece between users.
- Ask your colleagues to volunteer as test subjects for the task. You might call on teachers, administrators, secretarial staff, student teachers, caretaking staff, et cetera. Members of these groups might then be included in a “sample community” for the task.

Day 1

- Explain the task and the task-specific rubric to the students.
- Have students research vital capacity and the factors influencing it.
- Have students investigate appropriate designs for apparatus that can be used to measure vital capacity, and analyse the designs.

Days 2 and 3

- Have each student design and assemble his or her own apparatus.
- Have students draw a labelled scientific diagram with appropriate measurements (see Appendix A).
- Have students write the procedural instructions for building and operating the apparatus (see Appendix B).
- Have students test the apparatus using themselves or a classmate as the “patient”. Instruct students to keep in mind proper safety procedures, i.e., either a disposable mouthpiece must be replaced or a plastic mouthpiece must be washed with alcohol before it is used by another student.
- Have students record how well the apparatus works, so that they can make and explain any modifications to the apparatus (see Appendix B).
- Have students create a list of individuals to be tested on day 4 (e.g., other students, teachers, administrators, caretakers, parents).

Day 4

- Have students create a data table that shows the variables they will include when they gather data (see Appendix C).
- Have students test the vital capacities of the individuals in the list created on day 3. These individuals now assume the role of the residents of the community mentioned in the Description of the Task.

- Ensure that safety precautions are in place, i.e., either a disposable mouthpiece must be replaced or a plastic mouthpiece must be washed in alcohol after each use.
- Have students record their findings in the data table.

Day 5

- Have students write a first draft of their submission to the doctor. Remind students to include:
 - graphical information;
 - an analysis of the data they have collected;
 - reasons for the respiratory problems in the community;
 - solutions for the community.

Day 6

- Have students edit their own work. Remind them to check their spelling, punctuation, and grammar.
- Remind students to use the checklist to ensure that they have included all components required in the Respiratory Health Report (see Appendix D).
- Have students make a final copy of the Respiratory Health Report.

List of Appendices

Appendix A: Apparatus Diagram

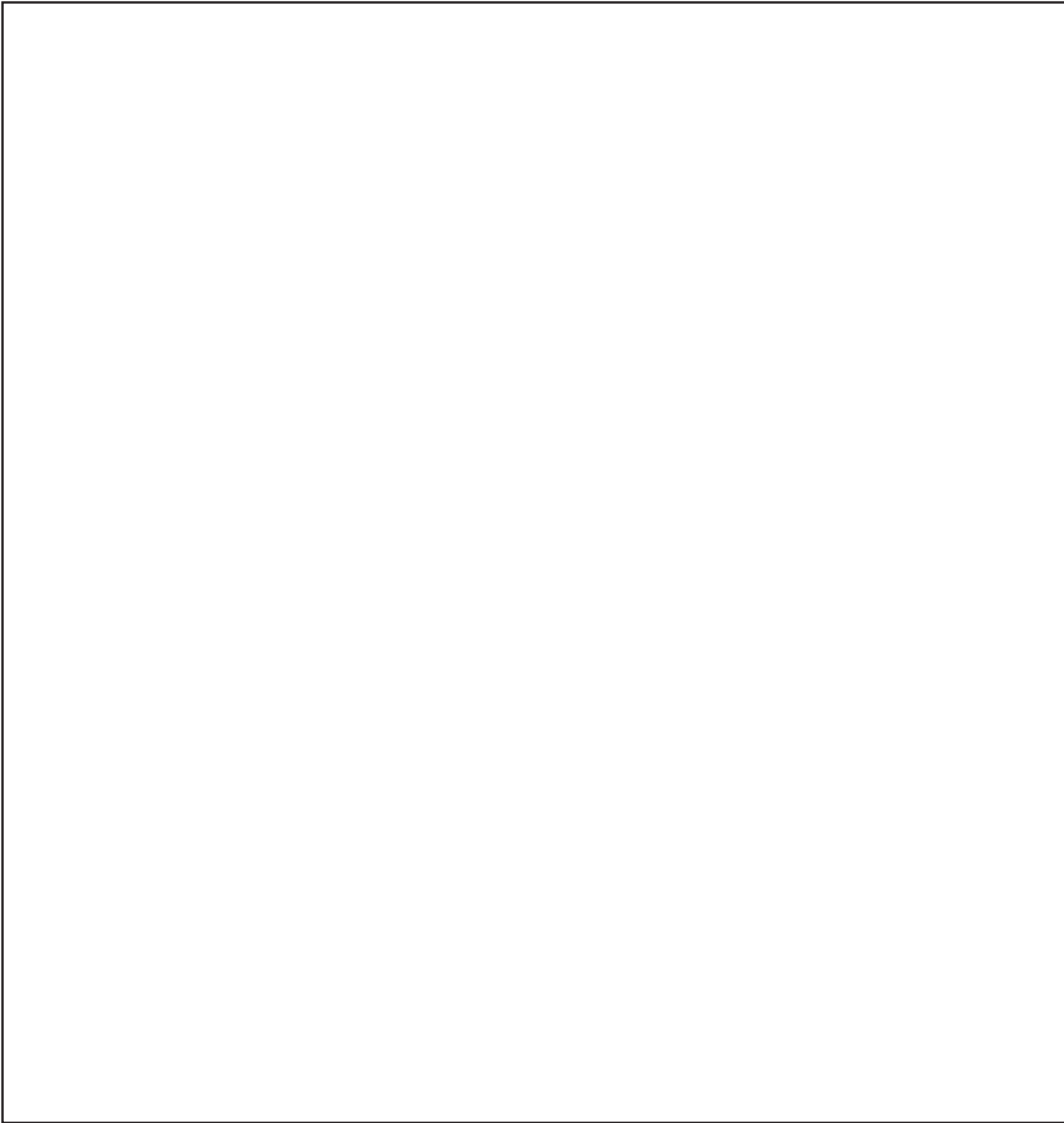
Appendix B: Procedures for Building and Operating the Apparatus

Appendix C: Table of Results

Appendix D: Checklist

Appendix A: Apparatus Diagram

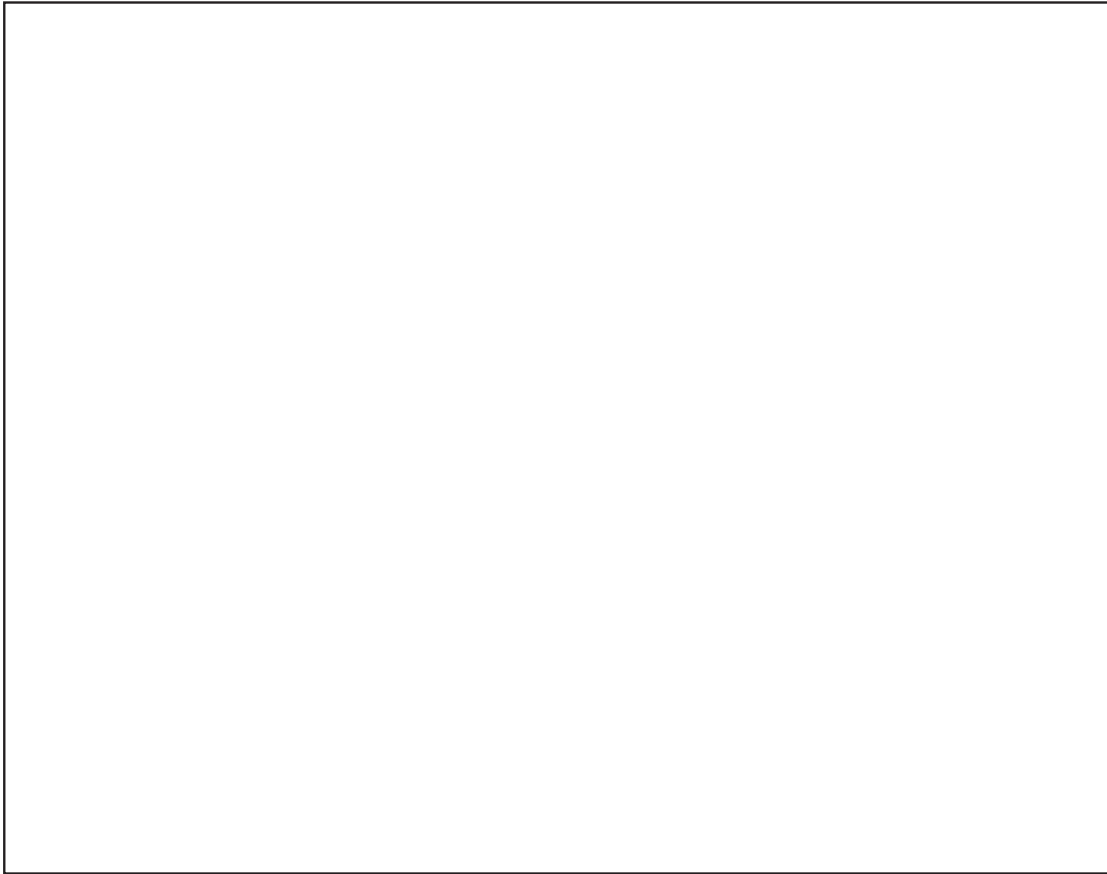
Scientific Diagram of Apparatus



Submit Appendix A as part of your final report.

Appendix B: Procedures for Building and Operating the Apparatus

Instructions



Design Modifications and Reasons



Submit Appendix B as part of your final report.

Appendix C: Table of Results

Vital Capacity in a Community

Patient	Sex (M/F)	Vital Capacity (cm ³)	Smoker/ Non-smoker	Personal Health Information Notes
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				

Do not submit Appendix C as part of your final report. Create your own table and submit that. This appendix is provided only to give you examples of variables that you might use in your own table.

Appendix D: Checklist

Before you submit your final respiratory health report, check to make sure that all of the following components have been included:

- a labelled scientific diagram of your apparatus (Appendix A)
- procedural instructions for building and operating the apparatus (Appendix B)
- any design modifications you made (Appendix B)
- a data table of the results of your investigation
- a written submission to the doctor that includes:
 - your graphical information
 - an analysis of your data
 - the reasons you think there are respiratory problems in the community
 - solutions you recommend to the community
- a list of all research sources you used

