

A Check on the Density of Maple Syrup Level 2, Sample 1

A



Confederation Maple Syrup Company Quality Control Report

A. Hourly Qualitative Check of Samples

1. What are the technicians trying to find out with their test?

IN THE TECHNICIANS TEST THEY ARE TRYING TO
FIND OUT IF THE UNKNOWN'S HAVE A DENSITY GREATER
EQUAL TO, OR LESS THAN THE STANDARD SOLUTION.

2. (a) What observation, from the layered solutions, would indicate that one of the solutions is denser than the other?

FROM THE OBSERVATIONS YOU CAN TELL IF ONE
SOLUTION IS DENSER THAN THE OTHER BY WHICH
EVER SOLUTION IS ON THE BOTTOM IS DENSER
THAN THE SOLUTION ON THE TOP.

(b) Explain

THE SOLUTION THAT IS ON THE BOTTOM IS
DENSER THAN THE SOLUTION ON THE TOP. THAT
IS HOW TO TELL WHICH SOLUTION IS DENSER.

5

B

3. (a) Prepare a data table in which you can record your qualitative data for each test that you do. Include a column in which you indicate your conclusion on the test (e.g. "Therefore, Red is more dense than Green, R>G). Enter all of your data in your table.

COLOUR	BLUE	RED	GREEN	YELLOW
BLUE	X	B > R	B > G	B > Y
RED	B > R	X	R > G	Y > R
GREEN	B > G	R > G	X	Y > G
YELLOW	B > Y	R = Y	Y > G	X

11 B
27 Y
21 R
4 G

3. (b) State what you found out.

I FOUND OUT THAT BLUE HAD THE HIGHEST
DENSITY, YELLOW HAD THE SECONED GREATEST
DENSITY, RED HAD THE THIRD GREATEST DENSITY
AND GREEN HAD THE LOWEST DENSITY.

4. (a) Rank the densities of the three "unknown" sample solutions

(HIGHEST DENSITY TO LOWEST DENSITY)
1. BLUE
2. YELLOW
3. RED
4. GREEN

(b) Which "unknown" solution has the same density as the yellow "standard" solution?

I THINK THAT THE RED UNKNOWN SOLUTION
HAS THE SAME OR CLOSEST DENSITY TO THE
STANDERED YELLOW SOLUTION.

6

C

5. Why would "Confederation" want their product to have a minimum density of 1.1 g/mL, BUT no higher or lower than this value?

THE CONFEDERATION WOULD WANT THEIR PRODUCT TO HAVE NO MORE OR LESS THAN A 1.1 DENSITY, BECAUSE THEY WANT THEIR SYRUP TO ~~BE~~ ALL HAVE THE SAME THICKNESS AND NOT ALL DIFFERENT DENSITIES.

B. Daily Quantitative Tests

6. (a) Use the equipment necessary to find the density of the "unknown" solution that has the same density as the yellow "standard" solution. Prepare a chart in the space below and enter your quantitative measurements in it.

liquid	volume	mass	density
blue	10 ml	11.3 g	1.13 g
green	10 ml	9.8 g	0.98 g
yellow	10 ml	10.2 g	1.02 g
red	10 ml	10 g	1 g

6. (b) Use the data from 6(a) to calculate the density of the solution, showing all work.

DENSITY'S : $\frac{(m)}{(V)}$ $\frac{(m)}{(V)}$ (D)

BLUE = $11.3 \div 10 = \underline{1.13g}$

GREEN = $9.8 \div 10 = \underline{0.98g}$

YELLOW = $10.2 \div 10 = \underline{1.02g}$

RED = $10 \div 10 = \underline{1g}$

D

7. (a) Did the results from the layering activity in 4 (a) and 4(b) match your calculated results?

YES THE RESULTS FROM THE LAYERING ACTIVITY MATCHED MY CALCULATED RESULTS BECAUSE ALL THE DENSITIES ARE PROOF OF 4A.

7. (b) Account for any errors that could have occurred.

SOME ERRORS THAT COULD OF OCCURED ARE:

- 1) DROPPING THE SOLUTION INTO ANOTHER SOLUTION TOO FAST.
- 2) CALCULATING THE DENSITY WRONG.
- 3) MIXING THE WRONG SOLUTIONS.
- 4) FORGETTING TO SUBTRACT THE WEIGHT OF THE GRATED CYLINDER FROM THE MASS OF THE SOLUTION COMBINED WITH THE GRATED CYLINDER.

Daily Tours

8. (a) A tour of Grade 5 students from an elementary school has just arrived at your laboratory. Explain, in language they can understand, how you used the equipment in 6(a) to determine the actual density of one of the unknown sample solutions.

WITH THE EQUIPMENT WE USED IN 6(A)
WE DETERMINED THE DENSITY TAKING THE AMOUNT
OF COLOURFUL LIQUID AND DIVIDING
THAT AMOUNT BY HOW MUCH THE COLOURFUL
LIQUID WEIGHED.

8. (b) Explain to the students what skills are necessary for a quality control technician AND why your job is important to the company.

THE SKILLS THAT ARE NECESSARY FOR A QUALITY
CONTROL TECHNICIAN ARE BEING ABLE TO KNOW
HOW TO USE ALL OF THE EQUIPMENT AND TO
KNOW WHAT YOU ARE DOING AT ALL TIMES. ALSO
YOU MUST BE CAREFUL NOT TO BREAK THE
EQUIPMENT. MY JOB IS IMPORTANT BECAUSE
YOU ALWAYS WANT THE SYRINGE TO BE THE
SAME AND NOT DIFFERENT.

Teacher's Notes

Knowledge/Understanding

- The student demonstrates some understanding of the concept of density (e.g., shows understanding that the "denser solution is at the bottom"), but does not explain his or her answers fully.
- The student applies the density formula with some competence (e.g., substitutes and calculates correct values, but does not include the formula or use correct units in density calculations).

Inquiry

- The student interprets the data with some accuracy.
- The student uses technical skills and procedures with some accuracy (e.g., in question 8a, omits major steps in the procedure for determining density quantitatively, but addresses some sources of error in question 8b).
- The student enters conclusions in the qualitative chart, but does not include the observations on which they are based.

Communication

- The student displays data in charts that are only partially complete and partially organized (e.g., fails to include complete set of observations in qualitative chart).
- The student uses scientific terms and SI units with some appropriateness (e.g., understands that volume is measured in millilitres and mass in grams, but uses incorrect SI units).
- The student demonstrates some sense of audience and purpose (e.g., by trying to use simple language), but does not include sufficient detail to make the explanation clear to Grade 5 students.

Making Connections

- The student shows some awareness of the skills required for the occupation (e.g., refers to generalized skills and comments on the importance of ensuring consistency in the product).

Comments/Next Steps

- The student should include all observations on which conclusions are based, and should provide more details to justify explanations.
- The student should work on identifying and using correct SI units.
- The student should work on skills for communicating to a particular audience and for a particular purpose.

A

Confederation Maple Syrup Company
Quality Control Report



A. Hourly Qualitative Check of Samples

1. What are the technicians trying to find out with their test?

The technicians are trying to find out which one of the "unknown" is as dense as the yellow (standard) solution.

2. (a) What observation, from the layered solutions, would indicate that one of the solutions is denser than the other?

From my observations of the layered solutions of which one was denser if they were either on the bottom or layered on the top.

(b) Explain

Well Green is on the top, blue is on the bottom therefore blue would be denser than green.

B

3. (a) Prepare a data table in which you can record your qualitative data for each test that you do. Include a column in which you indicate your conclusion on the test (e.g. "Therefore, Red is more dense than Green, R>G). Enter all of your data in your table.

↪ chart

[see following page]

3. (b) State what you found out.

I found out, Green is the lightest Red is as dense as the standard & blue is the densest.

4. (a) Rank the densities of the three "unknown" sample solutions (densest to lightest)
 Ⓐ Blue
 Ⓑ Red
 Ⓒ Green

(b) Which "unknown" solution has the same density as the yellow "standard" solution?

Red has the same density as yellow.

C

Conclusions	Observations	Solution	solution added
B > R	the red solution rises to the top	Blue	Red
B > G	the green solution forms a layer on top.	Blue	Green
B = B	the two similar/same solutions mixed	Blue	Blue
B > Y	the yellow formed a layer on top.	Blue	yellow
R = R	the two solutions mixed	Red	Red
R > G	the green rises to form a layer on top	Red	Green
R = Y	the two solutions mixed together	Red	Yellow
R < B	the blue sink to the bottom below the red.	Red	Blue
G < R	the red sink to the bottom	Green	Red
G < Y	the yellow sink to the bottom	Green	yellow
G < B	the blue sink to the bottom	Green	Blue
G < G	they mixed	Green	Green
Y = Y	the two solutions mix.	yellow	yellow
Y = R	the two solutions mix	yellow	Red
Y > G	green formed a layer on top	yellow	Green
Y < B	the blue sink to the bottom	yellow	blue

[back of page 6]

D

5. Why would "Confederation" want their product to have a minimum density of 1.1 g/mL, BUT no higher or lower than this value?

The "Confederation" would want to have the minimum density of 1.1 g/ml, because they would want to have "genuine maple syrup" so that they would get more people to buy their syrup.

B. Daily Quantitative Tests

6. (a) Use the equipment necessary to find the density of the "unknown" solution that has the same density as the yellow "standard" solution. Prepare a chart in the space below and enter your quantitative measurements in it.

solution	mass	volume
Red	64.6 g	64 ml
Blue	-	-
Green	-	-

6. (b) Use the data from 6(a) to calculate the density of the solution, showing all work.

$$D = \frac{M}{V}$$

$$D = \frac{64.6 \text{ g}}{64 \text{ ml}}$$

$$D = 1.01$$

E

7. (a) Did the results from the layering activity in 4 (a) and 4(b) match your calculated results?

The calculated results matched the results from the layering activity in 4(a) & 4(b). Because we chose Red & red is what matched the standard solution.

7. (b) Account for any errors that could have occurred.

The test tube may not have been thoroughly cleaned therefore leaving some substances still within the test tube. Also some calculation could have been wrong if past mistakes were unknowingly made.

8

F

Daily Tours

8. (a) A tour of Grade 5 students from an elementary school has just arrived at your laboratory. Explain, in language they can understand, how you used the equipment in 6(a) to determine the actual density of one of the unknown sample solutions.

The way the equipment in 6(a) was used was we measured the mass & volume of the "Red" solution & then use the mathematical equation $D = \frac{m}{V}$ to get the needed density which should equal the standard solution.

8. (b) Explain to the students what skills are necessary for a quality control technician AND why your job is important to the company.

Some skills that are necessary for this job are accuracy, safety, checking it over, prior knowledge & education in math. must be able to calculate accurately & quickly. must also know science.

9

Teacher's Notes**Knowledge/Understanding**

- The student demonstrates some understanding of the concept of density (e.g., states that “blue would be denser than green”), but does not express density as mass per unit volume.
- The student applies the density formula with some competence (e.g., displays the formula and substitutes correctly, but omits units for density).

Inquiry

- The student interprets data on density and ranks unknown densities accurately.
- The student uses technical skills and procedures with some accuracy (e.g., displays all possible combinations of solutions in the observation chart, but fails to show the masses that gave 64.6 g, and performs only one trial).
- The student draws conclusions supported by the data and identifies some potential sources of experimental error.

Communication

- The student creates charts that display partial organization (e.g., organizes the first chart in a somewhat logical sequence).
- The student uses scientific terms with some accuracy (e.g., uses appropriate language for density comparisons, with the exception of the term “lightest” in conjunction with density ranking), and uses SI units and styles with some appropriateness (e.g., generally uses appropriate units, but makes some errors in notation).

Making Connections

- The student demonstrates some awareness of the skills required for the occupation (e.g., addresses several skills but does not connect them to the importance of the job).

Comments/Next Steps

- The student should make sure to include all steps in a procedure.
- The student should try to communicate with greater clarity and should work on skills for communicating appropriately to a particular audience.