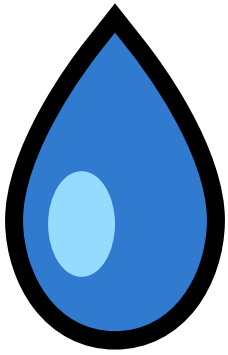
Learning and Evaluation Situation

Science and Technology

Elementary, Cycles 2 and 3

Mysterious Layers

The Buoyancy of Fluids



Student Booklet

alloprof

Grade	Elementary, cycles 2 and 3
Subject:	Science et technology
Activity Duration:	100 minutes
Student's Name:	
Partner's Name:	

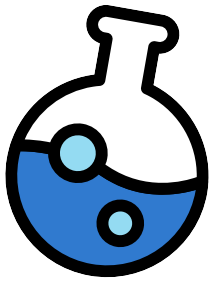
Scenario

Why do some substances float while others sink? To find the answer, you will carry out two scientific experiments. As with any experiment, you will need to write a hypothesis, do an experimental procedure with the substances, and analyze the results to reach your conclusion.

Experiment 1

Materials and Equipment

- 100 mL of liquid A
- 100 mL of liquid B
- 100 mL of liquid C
- A scale
- A large container



Part A: Find the Mass of Each Liquid

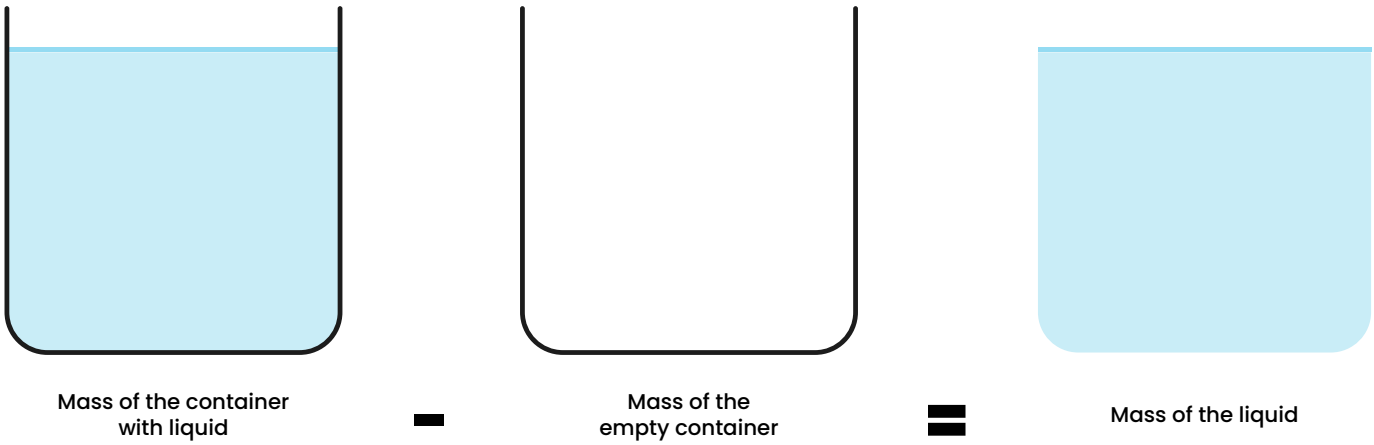
Procedure

Liquids A, B, and C are each in a container. To find the mass of each liquid, **subtract** the container's mass with the liquid from the container's mass when empty. Follow these steps:

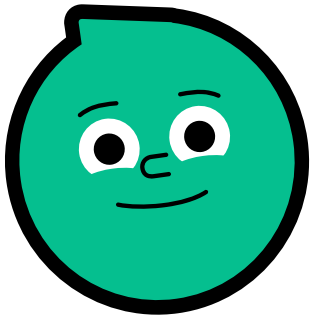
Step 1. Use the scale to measure the mass of the container holding liquid A. Write down the mass in the data table.

Step 2. Look for the mass of the empty container, written on container A. Write down the mass in the data table.

Step 3. Calculate the mass of liquid A. Write down the mass in the data table.



Step 4. Repeat steps 1 to 3 with liquids B and C.



Data Table

	Step 1	Step2	Step 3
Liquid	Mass of Container with Liquid (g)	Mass of Empty Container (g)	**Mass of Liquid (g)**
Liquid A			
Liquide B			
Liquid C			

Show Your Work

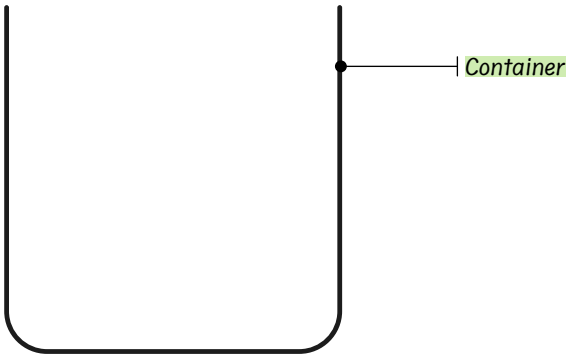
Part B: Find the Buoyant Force of Each Liquid

Hypothesis

Question 1.

If you were to pour liquids A, B, and C into one container, they would form three layers, with liquids floating one on top of the other. In your opinion, in what order would the liquids form layers?

Answer with a drawing of your hypothesis and then explain your answer.
Make sure your drawing clearly identifies liquids A, B, and C.

Drawing	*Explain your hypothesis*
	

Procedure

Step 5. Carefully pour liquid A, followed by liquid B into the large container.

Step 6. Wait 30 seconds.

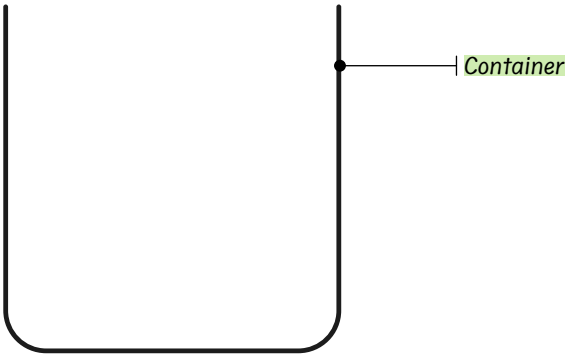
Step 7. Carefully add liquid C to the large container.

Step 8. Wait 30 seconds until you see the liquids form three layers.

Results

Step 9. Draw the resulting mixture. Be sure to clearly identify liquids A, B, and C.

Drawing



Results Analysis

Question 2.

Compare the layers of liquids you predicted in your hypothesis with the layers obtained in the experiment. How are they similar? How are they different?

Question 3.

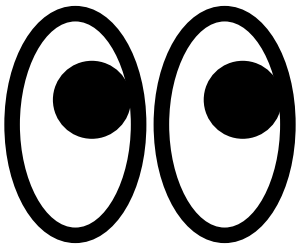
Circle the correct answer to complete your results analysis.

a. The three liquids are of [*equal volume / different volume*].

b. The three liquids are of [*equal mass / different mass*].

c. Liquid [*A / B / C*] is the heaviest.
It is [*on the top / in the middle / at the bottom*] of the container.

d. Liquid [*A / B / C*] is the lightest.
It is [*on the top / in the middle / at the bottom*] of the container.



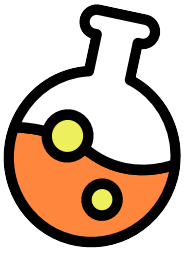
Conclusion of Experiment 1

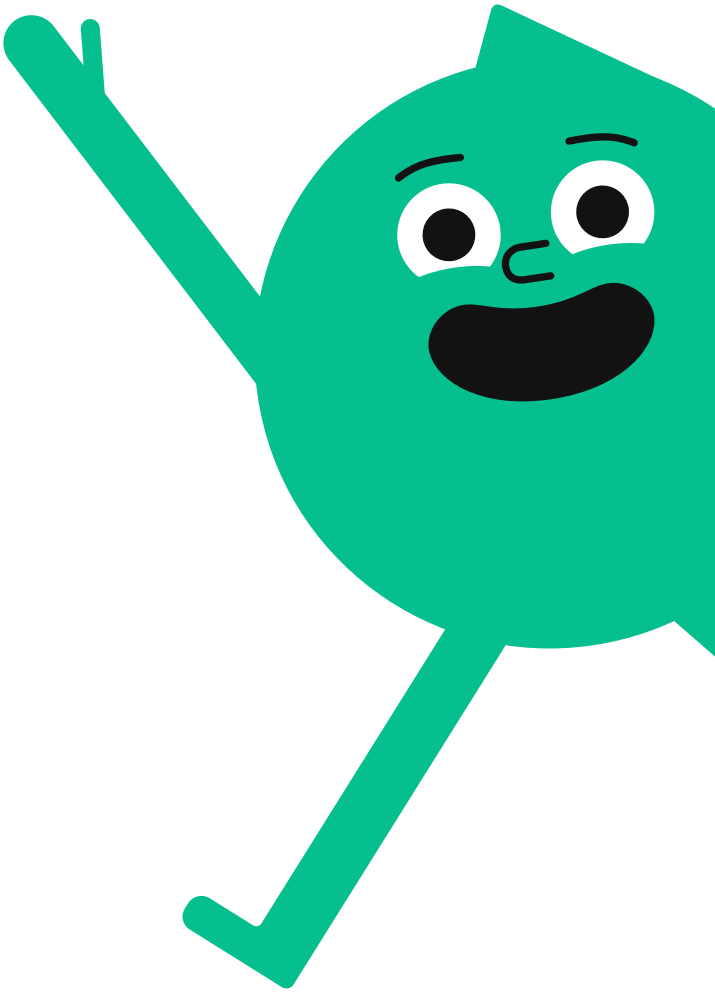
Question 4.

Circle the correct answer to complete your conclusion.

This experiment proved that in liquids of [*equal mass / equal volume*], [*mass / volume*] determines buoyancy. The lighter liquid [*floats / sinks*], and the heavier liquid [*sinks / floats*].

However, this experiment does not tell us if [*mass / volume*] determines buoyancy, because liquids A, B, and C all had [*the same mass / the same volume*].





Experiment 2

Materials and Equipment

- 100 g of liquid A
- 100 g of liquid B
- 100 g of liquid C
- A graduated cylinder
- A large container
- Paper towels

Part A: Find the Volume of the Liquids

Procedure

Step 1. Carefully pour all of liquid A into the graduated cylinder. Try not to spill any!

Step 2. Read the measurement shown on the graduated cylinder. Write the volume in the data table.

Step 3. Pour the liquid back into its original container.

Step 4. Use a paper towel to clean out the graduated cylinder. Make sure it is clean and dry.

Step 5. Repeat steps 1 to 4 with liquid B.

Step 6. Repeat steps 1 and 2 with liquid C. When you finish, leave liquid C in the graduated cylinder to use in the next step.

Data Table

Liquid	Volume of Liquid (mL)
Liquid A	
Liquid B	
Liquid C	

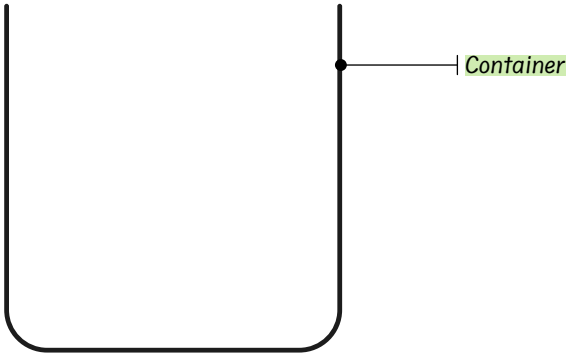
Part B: Find the Buoyant Force of Each Liquid

Hypothesis

Question 1.

If you were to pour liquids A, B, and C into one container, they would form three layers, with liquids floating one on top of the other. In your opinion, in what order would the liquids form layers?

Answer with a drawing of your hypothesis and then explain your answer. Make sure your drawing clearly identifies liquids A, B, and C.

Drawing	*Explain your hypothesis*
	

Steps

Step 7. Carefully pour liquid C, followed by liquid B into the large container.

Step 8. Wait 30 seconds.

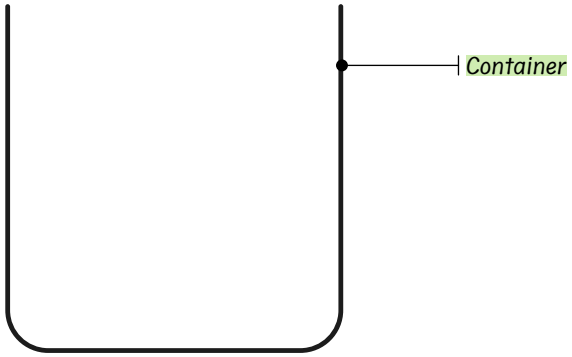
Step 9. Carefully add liquid A to the large container.

Step 10. Wait 30 seconds until you see the liquids form three layers.

Results

Step 11. Draw the resulting mixture. Be sure to clearly identify the liquids.

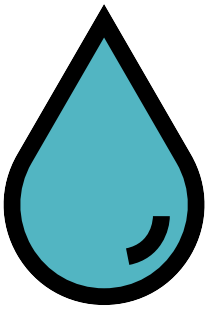
Drawing



Results Analysis

Question 2.

Compare the order of the layers of liquids you predicted in your hypothesis with the layers obtained in the experiment. How are they similar? How are they different?



Question 3.

Circle the correct answers to analyze your results.

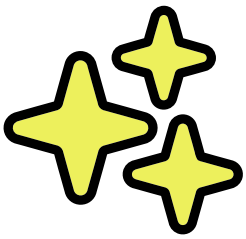
a. The three liquids are of [*equal mass / different mass*].

b. The three liquids are of [*equal volume / different volume*].

c. Liquid [*A / B / C*] has the most volume.
It is [*on the top / in the middle / at the bottom*] of the container.

d. Liquid [*A / B / C*] has the least volume.
It is [*on the top / in the middle / at the bottom*] of the container.

Conclusion of Experiment 2



Question 4.

Circle the correct answer to complete your conclusion.

This experiment proved that, in liquids of [*equal mass / equal volume*], [*mass / volume*] determines buoyancy. The liquid with more volume [*floats / sinks*], and the liquid with less volume [*sinks / floats*].

However, this experiment does not tell us if [*mass / volume*] determines buoyancy, because liquids A, B, and C all had [*the same mass / the same volume*].