HOW LONG SOAP BUBBLES HOLD?

3 to 5 years

TEACHER´S GUIDE

Theme:	How long soap bubbles hold?
Target concepts:	The lifetime of the soap bubble depends on the thin layer of water which constitutes the surface.
Challenge:	Relate the lifetime of the bubbles with the nature of the soap and temperature of the experiment.

INTRODUCTION

The soap bubbles consist of a film of water containing soap with air and have a limited lifetime (several seconds) due to their rupture by contact with an object or between them. A set of soap bubbles constitute foam. In this experiment, we will relate the lifetime of the soap bubbles formed to the nature of the soap and the temperature of experiments.

DESCRIPTION OF ACTIVITY

Material

- Liquid soap (2 mL)
- Dish detergent (2 mL)
- Glycerine (10 mL)
- Water (30 mL)
- Four glass flasks
- Four Petri dishes
- Eight beakers (50 mL)
- Eight watch glasses
- Two measuring cylinders (10 mL)
- Four glass rods
- Ice
- Two to four chronometers
- Labels
- Four straws for liquids
- Pasteur pipettes

Experimental procedure

1. Label each glass flask (4) with the name of one of the mixtures of soap (liquid soap, liquid soap + glycerine, dish detergent or dish detergent + glycerine).
2. In each of the glass flask introduce the respective mixture:
   Flask 1 – liquid soap (10 drops) + water (5 mL, measured with a 10 mL measuring cylinder) ;
   Flask 2 – liquid soap (10 drops) + water (2.5 mL, measured with a measuring cylinder of 10 mL + 2.5 mL glycerine, measured with another 10 mL measuring cylinder);
   Flask 3 – dish detergent (10 drops) + water (5 mL, measured with a 10 mL measuring cylinder);
   Flask 4 – dish detergent (10 drops) + water (2.5 mL, measured with a measuring cylinder of 10 mL + 2.5 mL glycerine, measured with another 10 mL measuring cylinder).
3. Keep the mixtures overnight.
4. Label eight beakers of 50 mL as follows:
   Beakers 1 and 2 – liquid soap;
   Beakers 3 and 4 – liquid soap + glycerine;
   Beakers 5 and 6 – dish detergent;
   Beakers 7 and 8 – dish detergent + glycerine.
5. Add to each beaker (1 to 8) an equal amount of the respective content from each glass flask (1 to 4).
6. Place the beakers 2, 4, 6 and 8 on ice.
7. Place ice in four Petri dishes.
8. Place four watch glasses on ice contained in the Petri dishes.
9. Introduce a straw in the content of the beaker 1 and blow to a watch glass (not iced) to create a soap bubble.
10. Determine the lifetime of this soap bubble with a chronometer.
11. Repeat steps 9 and 10 for the other contents (beakers 3, 5 and 7).
12. Repeat steps 9 and 10 for the cooled solutions using the cooled watch glasses.

Inquiry

During the experiment the teacher will ask:

— Is the lifetime of the soap bubbles the same for any mixture?
— Does the temperature affect the lifetime of the soap bubbles?
— Does glycerine change the lifetime of soap bubbles?
— In which solution / mixture the soap bubbles have a longer lifetime?
— Is it possible to create new soap bubbles inside other soap bubbles?

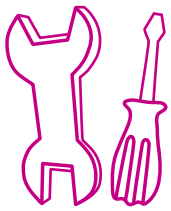
Throughout these experiments students will be able to realize that:

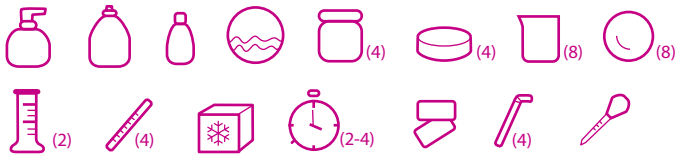
- The solutions used form soap bubbles when shaken.
- Temperature affects the lifetime of the soap bubbles.
- The nature of the soap influences the lifetime of the soap bubbles.
- The addition of glycerine increases the lifetime of the soap bubbles.

1. EXPERIMENT PREPARATION

PUPIL INQUIRY SHEET

WHAT WILL YOU NEED?





- Liquid soap (2 mL)
- Dish detergent (2 mL)
- Glycerine (10 mL)
- Water (30 mL)
- Four glass flasks
- Four Petri dishes
- Eight beakers (50 mL)
- Eight watch glasses
- Two measuring cylinders (10 mL)
- Four glass rods
- Ice
- Two to four chronometers
- Labels
- Four straws for liquids
- Pasteur pipettes

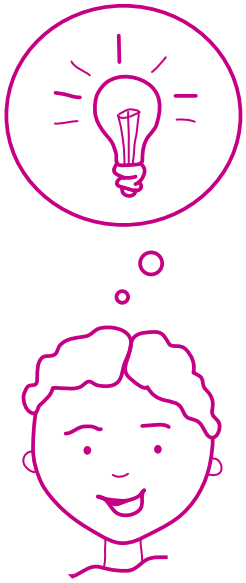
WHAT IS THE PROBLEM TO SOLVE?
WHAT ARE WE INTERESTED TO DISCOVER WITH THIS EXPERIMENT?

Does the lifetime of the soap bubbles depend on the temperature?

☐ Yes
☐ No

Does the size of soap bubbles depend on the nature of soap?

- ☐ Yes
- ☐ No



Is it possible to create new soap bubbles inside other soap bubbles?

- ☐ Yes
- ☐ No

Why do you think this?

_____

_____

_____

_____.

2. LET'S MAKE THE EXPERIMENTS

HOW CAN WE DO THIS?

1. On your desk there are 4 glass flasks with the name of several mixtures containing soap, as follows:
   Flask 1 – liquid soap;
   Flask 2 – liquid soap + glycerine;
   Flask 3 – dish detergent;
   Flask 4 – dish detergent + glycerine.
2. Label eight beakers of 50 mL as follows:
   Beakers 1 and 2 – liquid soap;
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   Beakers 5 and 6 – dish detergent;
   Beakers 7 and 8 – dish detergent + glycerine.
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8. Determine the lifetime of this soap bubble with a chronometer.
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DATA REGISTER

Complete the table for each experiment performed at room temperature and at 0 °C indicating the correct symbol for the lifetime of soap bubbles from each mixture.

MIXTURE	ROOM TEMPERATURE	T = 0 ºC (ICE)
Liquid soap 		
Liquid soap + glycerine 		
Dish detergent 		
Dish detergent + glycerine 		

Fast Medium Slow

3. AFTER THE EXPERIMENT

WHAT DID YOU LEARN FROM THIS EXPERIEMENT?

(You can tick more than one answer)

- ☐ The temperature influences the lifetime of soap bubbles.
- ☐ The formation of new soap bubbles inside other soap bubbles depends on the nature of the soap.
- ☐ The formation of new soap bubbles inside other soap bubbles depends on the temperature.
- ☐ The size of soap bubbles depends on the nature of the soap.
- ☐ The size of soap bubbles depends on the temperature.
- ☐ Glycerine increases the lifetime of soap bubbles.

Go back to the first page and check if your answers were correct:

- ☐ Yes
- ☐ No