



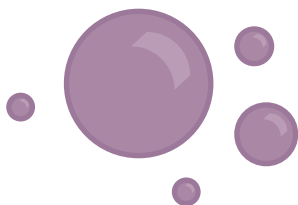
Gases are all around us. Air is a mixture of gases, and those gases take up space. In this activity, you will see what happens when you warm a gas and when you cool it!

Materials

Disposable paper or plastic cup (3 oz.)
Measuring spoon (1 teaspoon)
Liquid dishwashing detergent
Water
Plastic bottle (½ L, empty)
Warm water
2 bowls
Ice

ADAPTATION *ADAPTATION: A magnifying glass may be used to see the soap film.*

SAFETY! *SAFETY: Be sure to follow Milli's Safety Tips and do this activity only with adult supervision! Do not drink any of the liquids used in this activity. Eye protection must be worn by everyone performing this activity.*



Procedure

1. In the cup, mix 1 teaspoon of liquid detergent with about 2 teaspoons of water to make a bubble solution.
2. Dip the open top of the bottle into the detergent solution. Carefully tilt and lift the bottle out so that a film of bubble solution covers the opening of the bottle. Draw a picture of your bottle in the "What Did You Observe?" section.
3. Gently hold your hands around the bottle, without squeezing. What happens to the film? Write your answer and draw a picture of what happens to the film in the "What Did You Observe?" section.
4. Ask your adult partner to place some warm tap water in a bowl. If the soap film has popped, re-dip the bottle into the detergent solution. Place the bottom of the bottle in the warm water. What happens? Write your answer and draw a picture of what happens to the film in the "What Did You Observe?" section.
5. Put some ice and water in another bowl. Now place the bottom of the bottle into the ice water. What happens? Write your answer and draw a picture of what happens to the film in the "What Did You Observe?" section.
6. Pour the water and the bubble solution down the drain. Throw the bottle and the cup in the trash. Thoroughly clean the work area, and wash your hands.

Where's the Chemistry?

Gases, like most solids or liquids, take up more space (expand) when they are heated. The opposite is also true. Most solids, liquids, and gases take up less space (contract) when they are cooled. The difference is that gases expand a lot more than liquids or solids when heated and contract a lot more when cooled.





What Did You Observe?

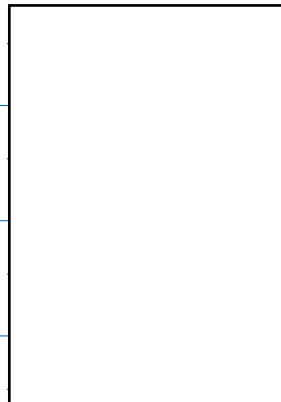
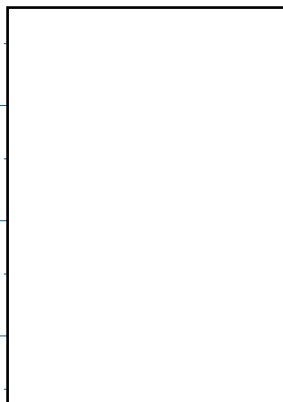
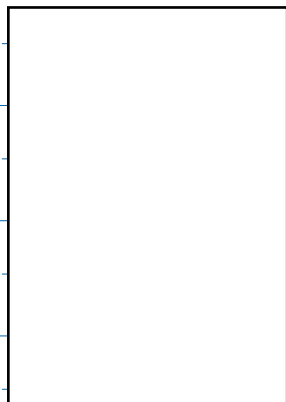
Draw a picture of your bottle for each description below.

Bottle with film

Bottle with hands around it

Bottle in warm water

Bottle in ice water



What happened to the film of bubble solution when you warmed the bottle with your hands?

What happened to the film of bubble solution when you put the bottle in warm water?

What happened to the film of bubble solution when you put the bottle in ice water?



The American Chemical Society develops materials for elementary school age children to spark their interest in science and teach developmentally appropriate chemistry concepts. The *Activities for Children* collection includes hands-on activities, articles, puzzles, and games on topics related to children's everyday experiences.

The collection can be used to supplement the science curriculum, celebrate National Chemistry Week, develop Chemists Celebrate Earth Day events, invite children to give science a try at a large event, or to explore just for fun at home.

Find more activities, articles, puzzles and games at www.acs.org/kids.

Safety Tips

This activity is intended for elementary school children under the direct supervision of an adult. The American Chemical Society cannot be responsible for any accidents or injuries that may result from conducting the activities without proper supervision, from not specifically following directions, or from ignoring the cautions contained in the text.

Always:

- Work with an adult.
- Read and follow all directions for the activity.
- Read all warning labels on all materials being used.
- Wear eye protection.
- Follow safety warnings or precautions, such as wearing gloves or tying back long hair.
- Use all materials carefully, following the directions given.
- Be sure to clean up and dispose of materials properly when you are finished with an activity.
- Wash your hands well after every activity.

Never eat or drink while conducting an experiment, and be careful to keep all of the materials used away from your mouth, nose, and eyes!

Never experiment on your own!

For more detailed information on safety go to www.acs.org/education and click on "Safety Guidelines".

