

How does temperature affect air pressure?

Teaching and Learning Focus

In this investigation, your students will explore the effect of temperature on air pressure:

- Changing air temperature changes the space taken up by the air.
- Changing air temperature changes the pressure exerted by air.

Materials Needed

For two demonstrations:

- three identical new tennis balls
- access to a refrigerator
- Flip chart and markers
- 2 small toy balloons, same size but different colors
- tape measure or a piece of string long enough to encircle an inflated balloon
- bowl of ice water
- bowl of water at room temperature

Safety

This investigation is considered generally safe to do with students.

Setting the Scene

Put two tennis balls into the refrigerator for two hours. Keep the third ball at room temperature. Take one ball out of the refrigerator and show it to your students with the room temperature ball. Tell them which is which and ask them to observe what happens to the balls when you drop them. Drop the balls at the same time from several feet up. Ask students which ball bounced higher and why. Next, drop the second ball from the refrigerator, but don't let the students know if it is warm or cold. Ask them to infer from the ball's behavior whether it has been in the refrigerator or not.

Presenting the Investigation Question

Introduce your students to the investigation question: "*How does temperature affect air pressure?*"

Have your students discuss the question in pairs, then in groups, and then as a whole class. Record their answers on the flipchart.

Have your students brainstorm ideas about how this investigation question could be investigated.

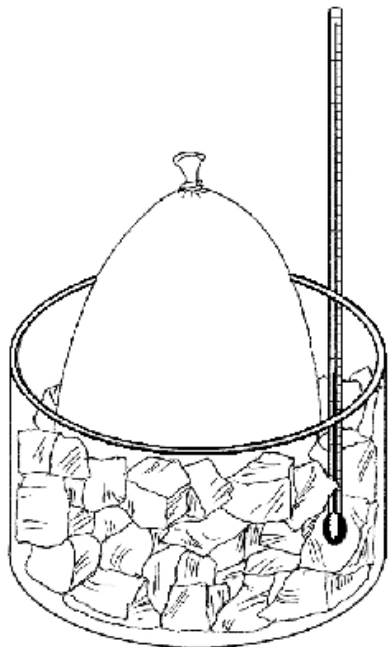
1. Design an experiment that could be used to test the investigation question.
2. What materials would be needed?
3. What would you have to do?
4. What would be measured?
5. How long would the experiment take?

Assessing What Your Students Already Know

Students may have had experiences with sports balls (soccer or beach balls) that get smaller and less firm in the winter time. They may have also noticed that tennis balls don't bounce as high in cold weather as they do in warmer weather. They may not, however, have connected this with air pressure and temperature. This investigation will help them to make that connection.

Exploring the Concept

1. **This is best to do as a demonstration with student help.** Blow up both balloons to the same size. Show the students how to use the tape measure to measure the circumference of each balloon. (*Alternatively, mark a piece of string with the circumference of one balloon, and attempt to duplicate the circumference on the second balloon.*) The balloons should be as identical as possible in circumference before tying the tops.



2. On the board or flip chart, ask a student volunteer to record the circumference in inches for each balloon using the balloon color for identification.
3. Immerse one of the balloons in the bowl of ice water and the other balloon in the bowl at room temperature. Wait 10 minutes.
4. Ask a student to re-measure the circumference of each balloon, and record this measurement using the color of each balloon for identification. (*The balloon in cold water will be noticeably smaller in size.*)
5. Ask students to write down any ideas they might have to explain what they saw.

Applying Students' Understanding

To assess your students' understanding, ask them what they think will happen when you place warm water in your metal cup. (*Empty and dry the cup before filling it with warm water. This time, air will not be cooled, and it will not form liquid condensation on the surface.*)

Revisiting Investigation Question 2

Complete this investigation question by asking your students to reflect on "How can clouds form?" and how their answers may have changed as a result of this investigation.

Weather Unit Sections

Introduction

Air

Temperature

Wind

Clouds

Weather

How can you tell the speed of the wind?

How does temperature affect air pressure?

Revisit the concept of Weather
