Demo: Crush the Can!

FOR THE TEACHER

Summary
In this demonstration, students will analyze how the change in temperature of a gas can affect the pressure and volume of the gas. Students will watch an engaging demonstration involving a heat source, water vapor and an empty soda can.

Grade Level
Middle and High School

Objectives
By the end of this demonstration, students should be able to
- Recognize relationships between temperature, volume and pressure of a gas.

Chemistry Topics
This demonstration supports students’ understanding of
- Gases
- Gas Laws
- Volume
- Temperature
- Pressure

Time
Teacher Preparation: 5 minutes
Lesson: 10 minutes

Materials
- Water (~5ml)
- Bunsen burner (hot plate may be substituted)
- Ring stand
- Ring clamp
- Wire mesh
- Striker
- Empty soda can with tab removed
- Beaker tongs
- Large beaker or bowl of ice and water

Safety
- Students should wear proper safety gear during chemistry demonstrations. Safety goggles and lab apron are required.
- Always use caution around open flames. Keep flames away from flammable substances.
- Always be aware of an open flame. Do not reach over it, tie back hair, and secure loose clothing.
- Open flames can cause burns. Liquid wax is hot and can burn the skin.
Teacher Notes

- It is encouraged for the teacher to practice this before demonstrating it in their classroom. It may take a couple attempts in order to feel confident with the timing of moving the can from the wire mesh to the ice water.
- This is a quick demonstration, so you may want to do this multiple times in order for students to understand what is happening, and connect their observations to the content.
- Procedure:
  1. Put a mixture of ice and water into a large beaker or bowl.
  2. Place Bunsen burner on the ring stand. Attach the ring clamp so that it is a few inches above the top of the burner. Put wire mesh on ring clamp.
  3. Rinse out the soda can and then add about 5 ml of water to it.
  4. Light the burner with the striker.
  5. Use the tongs to put the can on the wire mesh.
  6. Allow the water in the can to heat and vaporize. You should be able to hear the water boiling and see water vapor coming out of the can.
  7. Turn off the burner and quickly pick up the can with the tongs, invert it over the ice water and submerge the can about an inch or two into the water.
  8. The sudden drop in temperature will condense the water vapor, reducing the pressure in the can. Since the atmospheric pressure is greater than the pressure in the can, it causes the can to crush.
- Note: You can also use a hot plate to heat the water in the can, but it takes a bit longer.