It Doesn't Look Hot!

A Safety Demonstration

Introduction

Hot objects don't necessarily look hot! Teach your students that care must be taken whenever working with hot objects. Carelessness often results in burns or destruction of costly equipment.

Concepts

- Heat Safety
- Burns
- Laboratory safety

Materials

Bunsen burner
Corrugated cardboard, 30 cm × 30 cm
Glass tubing, borosilicate, 20–30 cm length
Hot plate, 4″ × 4″ or 7″ × 7″
"Hot" sign
Porcelain crucible or Pyrex® evaporating dish
Ring stand, ring, and pipe stem triangle
Soda bottle, plastic, dry
Soft wood, e.g., pine 2″ × 4″, small piece
String, 30-cm length
Tongs

Safety Precautions

Do not leave the plastic bottle suspended over the hot plate for more than 2–3 minutes. Always wear chemical splash goggles. Be careful not to burn yourself—don't let the safety demonstration turn into a safety accident.

Procedure

Heat Rises Demonstration

Warning: Do not leave hot plates on for any length of time without a vessel on top. Hot plates will overheat and damage the porcelain top or heating element.

1. Turn a hot plate on high. Place a "Hot" sign in front of the hot plate.
2. Use string or wire to suspend a 2-L plastic (PETE) soda bottle from the ring stand.
3. Position the bottle over the preheated hot plate such that the bottle is 15–20 cm above the hot surface. This may need to be adjusted based on your hot plate.
4. Observe. The bottle, which is made from an expanded polymer, will begin to shrivel within 15 seconds as the heat rises from the surface of the hot plate.
5. Remove the bottle within two minutes to avoid a fire or damage to the hot plate.
6. Turn off the hot plate.

Hot Objects Don't Look Hot — Part I

1. Have a container of water available to extinguish any fires.
2. Place an old porcelain crucible or Pyrex® evaporating dish on a pipe stem triangle and ring stand. Do not use a cracked vessel.
3. Heat the vessel strongly for 2–3 minutes using a Bunsen burner. Make sure to get the hottest possible flame by adjusting the gas and air supply. Stop heating when the vessel begins to glow red.
4. Use nonrubberized tongs to remove the hot vessel and immediately set it on a piece of soft lumber.
5. Observe. The wood will begin to smoke feverishly as the hot vessel chars the wood. (*Note:* Soot from the smoke may be

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difficult to clean off the vessel—use old glassware.)

Hot Objects Don't Look Hot — Part II

1. Have a container of water available to extinguish any fires.
2. Heat the end of a piece of borosilicate glass tubing strongly for about a minute using a Bunsen burner. Stop when the glass begins to glow red and the flame has been a bright yellow color for 20–30 seconds.
3. Remove the glass tubing from the flame. Observe how quickly the red color disappears and both ends now look the same.
4. Lay the glass tubing on a piece of corrugated cardboard.
5. Observe. The cardboard will begin to smoke feverishly and the hot glass will char or even ignite the cardboard.

Discussion

The best discussion of burn safety is to relate personal stories and previous student accidents involving hot items. Burns are a fairly common laboratory accident, but they can easily be avoided by paying careful attention to proper safety procedures.

Review the following safety rules from Flinn Scientific's High School Safety Contract when heating substances—

49. Exercise extreme caution when using a gas burner. Take care that hair, clothing, and hands are a safe distance from the flame at all times. Do not put any substance into the flame unless specifically instructed to do so. Never reach over an exposed flame. Light gas (or alcohol) burners only as instructed by the teachers.
50. Never leave a lit burner unattended. Never leave anything that is being heated or is visibly reacting unattended. Always turn the burner or hot plate off when not in use.
51. You will be instructed in the proper method of heating and boiling liquids in test tubes. Do not point the open end of a test tube being heated at yourself or anyone else.
52. Heated metals and glass remain very hot for a long time. They should be set aside to cool and picked up with caution. Use tongs or heat-protective gloves if necessary.
53. Never look into a container that is being heated.
54. Do not place hot apparatus directly on the laboratory desk. Always use an insulating pad. Allow plenty of time for hot apparatus to cool before touching it.
55. When bending glass, allow time for the glass to cool before further handling. Hot and cold glass have the same visual appearance. Determine if an object is hot by bringing the back of your hand close to it prior to grasping it.

Demonstrating the properties of hot objects and discussing safety rules will help prevent accidents and burns while working in the laboratory.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12
Evidence, models, and explanation

Content Standards: Grades 5–8
Content Standard F: Science in Personal and Social Perspectives; personal health; natural hazards; risks and benefits

Content Standards: Grades 9–12
Content Standard F: Science in Personal and Social Perspectives; personal and community health; natural and human-induced hazards

References

Bilash, B., Shields M. *A Demo A Day, A Year of Biological Demonstrations;* Flinn Scientific: Batavia, IL; 2001, p 11.
Flinn Scientific's Student Safety Contract; Flinn Scientific: Batavia, IL, 2005.

Materials for *It Doesn't Look Hot!* are available from Flinn Scientific, Inc.

Catalog No.	Description
AP7233	4'' × 4'' Hot Plate
AP7234	7'' × 7'' Hot Plate
AP1017	Bunsen Burner, Natural Gas
AP4236	Flinn Student Safety Contract
SE039	Hot Vessel Gripping Device
AP3240	Zetex® High Temperature Gloves

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.