

Discussion and Notes

Do you have the right type of laboratory burners for your gas supply and your school science needs? Burners are available for natural gas, artificial gas, and bottled gas. Please consult your current Flinn Scientific Catalog/Reference Manual for information to help you select the right type of burner for different applications.

For a quick review of the construction and principles of operation of a Bunsen burner, see the Flinn Scientific Safety Fax publication "Bunsen Burner Basics." Please e-mail us at flinn@flinnsci.com to request a pdf of the Safety Fax, which includes a short worksheet or quiz.

Bunsen Burner and Hot Plate Safety

If there is one image that instantly evokes memories of science classes for most people, it is the Bunsen burner. Unfortunately, for some people, the images also bring back memories of pain. Burns caused by handling hot glassware or equipment and by touching hot surfaces are common accidents in school science labs. Accidents caused by the ignition or explosion of flammable liquids when working with flames are comparatively rare, but when they do occur, they are often catastrophic, resulting in severe injuries to teachers, students, and onlookers. The purpose of this safety training note is to review the hazards of working with Bunsen burners and hot plates in school science labs.

Duty of Care

Teachers owe their students a duty of care to instruct them in the proper use of laboratory equipment and to warn them of the potential dangers associated with their use. Regardless of how you are using heat or flames—whether observing physical and chemical properties in an introductory physical science class or sterilizing inoculating loops in a senior-level elective—you cannot assume that students understand the hazards of working with laboratory burners. Reviewing the safety rules every time you work with Bunsen burners or hot plates will reinforce safe laboratory practices, increase safety awareness, and reduce the risk of accidents.

Using Bunsen Burners Safely

- ◆ Remove all flammable and combustible materials from the lab bench and surrounding work area when Bunsen burners will be used. Do NOT use a Bunsen burner in any lab when working with flammable liquids or solvents.
- ◆ Review the basic construction of a Bunsen burner and inspect the burner, attached tubing, and gas valve before use. Check for holes or cracks in the tubing and replace the tubing if necessary.
- ◆ Use only heat-resistant, borosilicate glassware when using a Bunsen burner. Check the glassware for scratches, nicks or cracks before use and discard defective glassware—cracked glassware may shatter without warning when heated.
- ◆ Wear chemical-splash goggles whenever working with chemicals, heat or glassware in the science lab. Tie back long hair when working with a Bunsen burner, and do not wear loose, long-sleeved clothing. Never reach over an exposed flame!
- ◆ Instruct students in the proper procedure for lighting a Bunsen burner. Close or partially close the air vents on the burner to make it easier to light. Turn on the gas and bring a lighted match or lighter alongside the barrel of the burner, then slowly raise the flame over the top of the burner from the side.
- ◆ Adjust the air supply to obtain a small, bright blue, cone-shaped flame. For slow, uniform heating, brush the burner flame across the bottom of glassware or rotate a test tube in the flame when starting to heat. For boiling water baths, add boiling stones to the water to prevent superheating, "bumping," and possible splattering.
- ◆ Never leave a lit burner unattended. Always turn off the gas at the gas source when finished using a Bunsen burner.
- ◆ To reduce heat stress, allow hot glassware or equipment to cool slowly before moving or removing the object. Remember that hot objects remain HOT for a very long time—use tongs and handle with care!

Using Hot Plates Safely

Hot plates offer convenience and important safety benefits for use in preparing hot water baths for mild to moderate heating.

- ◆ Use only heat-resistant, borosilicate glassware, and check for cracks before heating on a hot plate. Do not place thick-walled glassware, such as filter flasks, or soft-glass bottles and jars on a hot plate. The hot plate surface should be larger than the vessel being heated.
- ◆ Do not use the hot plate in the presence of flammable or combustible materials. Fire or explosion may result—the device contains components that may ignite such material.
- ◆ Place boiling stones in liquids being heated to facilitate even heating and boiling. Do not evaporate all of the solvent or otherwise heat a mixture to dryness on a hot plate—the glass may crack unexpectedly when heated directly on a hot plate.
- ◆ Use a medium to medium-high setting of the hot plate to heat most liquids, including water. Do not use the high setting to heat low-boiling point liquids. The hot plate surface can reach a maximum temperature of 540 °C.
- ◆ Do not place metal foil or metal containers on the hot plate—the top can be damaged and a shock hazard may result. Do not place ceramic crucibles or evaporating dishes on a hot plate.
- ◆ Be careful when removing hot glassware or pouring hot liquids from the hot plate. Use tongs or silicone rubber heat protectors (gripping devices).
- ◆ Turn off the hot plate when not in use. The surface of a hot plate stays hot for quite some time—and looks exactly the same as a “cold” hot plate! Place a bold, laminated “HOT” caution sign in front of the hot plate immediately after use.

It Doesn't Look Hot!

- ◆ Teach students that hot objects don't necessarily look hot. Use caution whenever working with heat or flames—most minor laboratory burns result from carelessness when handling hot objects.
- ◆ Heated metals and glass remain very hot for a very long time. They should be set aside to cool and picked up with caution. Use tongs, heat-protective gloves, or hot vessel-gripping devices as needed.
- ◆ Do not place hot apparatus directly on the laboratory desk or bench. Always use an insulating pad, and allow plenty of time for hot apparatus to cool before touching it.
- ◆ Never look directly into a container that is being heated. When heating a test tube, make sure that the “mouth” of the test tube is not pointing at anybody (including yourself)!

Flinn Scientific Values Your Support

Flinn Scientific has provided your Science Department Safety Training Notes. Without your orders, the safety training notes and the indispensable *Flinn Scientific Catalog/Reference Manual* would not be possible. Please continue to support our efforts to improve safety in school science labs by ordering your science supplies and laboratory chemicals from Flinn Scientific.

Next Month's Topic

General Safety Rules for Science Teachers

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Please e-mail us at flinn@flinnsci.com to request a pdf of our safety demonstration “It Doesn't Look Hot!” The Safety Fax contains three short activities to reinforce the safety warning that hot objects must be handled with care.

Discussion and Notes

Did you know? Regular safety training relating to hazards in the workplace is a key requirement of both the federal and most state right-to-know laws.

Bunsen Burner and Hot Plate Safety

Safe Laboratory Practices When Working with Flames or Heat

Teachers owe their students a duty of care to instruct them in the proper use of laboratory equipment and to warn them of the potential hazards associated with their use. Understanding the basic principles of operation of Bunsen burners and reviewing the safety rules for using laboratory burners and hot plates will improve safety awareness and reduce accidents.

This safety training note should take only 6–8 minutes to present. The discussion period will vary depending on the issues that need to be addressed or additional questions that teachers may have about Bunsen burners and hot plates.

It is important to keep a copy of these safety training notes and a signed attendance sheet to verify that regular safety training meetings were held. The sign-up sheet is almost as important as the training notes and is usually the first thing that is requested and reviewed by regulatory inspectors. A copy of the sign-up sheet that we suggest using may be found at www.flinnsci.com/signup.pdf.

Materials (one per staff member)

- ◆ Flinn Scientific Science Department Safety Training Notes, Volume 10–4
- ◆ Sign-up sheet (one for group)

Additional Questions for Discussion

1. Does the department have a plan for inspecting Bunsen burners or other laboratory burners on a regular basis and replacing defective equipment?
2. Review any minor burns or safety “incidents” that may have occurred in the department over the past year due to the improper use of burners or hot plates. How could these incidents have been prevented?
3. What safety rule for working with Bunsen burners and hot plates is most often ignored or forgotten by the students? What rule is the hardest to enforce?
4. Does the school use alcohol burners? Discuss the special safety considerations for working with alcohol burners: The teacher should fill the burners before class and *remove the alcohol bottle from the lab* where the burners will be used.

We Welcome Your Comments

Are the Science Department Safety Training Notes useful to you? Are they working for you and your department? Do you have any suggestions for topics that you would like to see covered or for how we can improve these notes? We really want to hear from you! Please e-mail us with your comments and suggestions. Our e-mail address is flinn@flinnsci.com.