THE LAB BURNER

Part A. Using A Lab Burner

Background Information

Often a chemist needs to heat materials in a laboratory. One of the most efficient ways to do this is to use a Bunsen burner. Bunsen burners are made in a variety of designs. In every one, however, the burner functions by the combustion of a mixture of air and gas. In most burners, the amounts of air and of gas can be controlled. In some situations portable burners are used instead of Bunsen burners. Electric hot plates may be used as well.

In this investigation, you will learn the parts of the Bunsen burner and their functions. You will also learn how to use the burner safely in the laboratory.

Problem:

How can the Bunsen burner be safely used to heat materials in the laboratory?

Materials:

Bunsen burner or portable	Beaker tongs
Iron ring	
Ring stand	Safety goggles
2 -250mL beakers	100mL graduated cylinder
Wire gauze	

Procedure:

1. Examine your burner when it is not connected to the gas outlet. If your burner is the type that can be taken apart, unscrew the barrel (or burner tube) from the base and locate the parts shown in Figure 1, think about their functions.

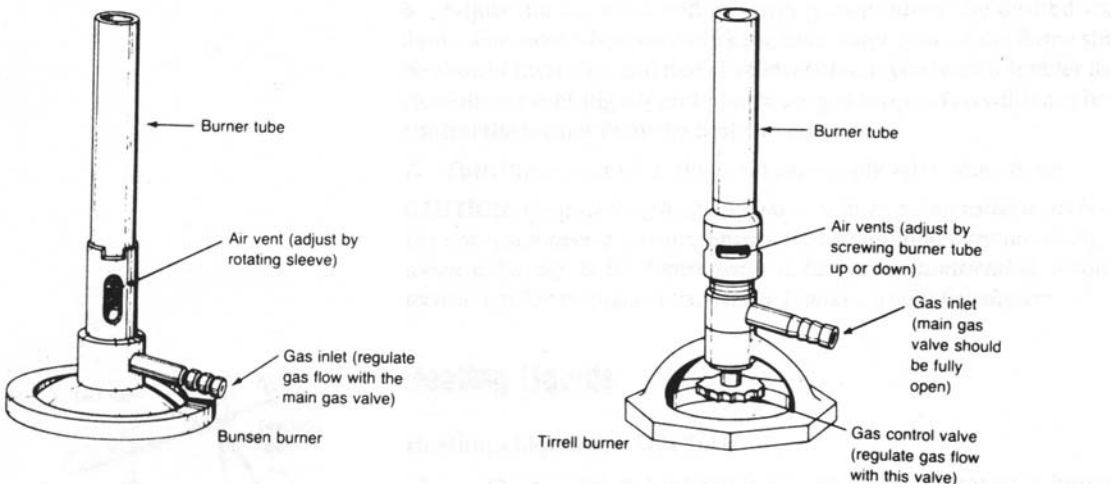


Figure 1: The Lab Burners

a) The ***barrel (burner tube)*** is the area where the air and gas mix.
b) The ***collar*** (where the air vent is) can be turned to adjust the intake of air. If you turn the collar so that the holes are larger, more air will be drawn into the barrel.
c) The ***air vent openings*** are the holes in the collar through which the air is drawn.
d) The ***base*** supports the burner so that it does not tip over.
e) The ***gas intake tube*** brings the supply of gas from the outlet to the burner.
f) The ***spud*** is the small opening through which the gas flows. The small opening causes the gas to enter the barrel with great speed.

2. Reassemble the Bunsen burner if necessary and connect the tube to the gas outlet. Put on safety goggles. Make sure that the burner is away from all flammable materials.

3. Adjust the collar so that the air intake openings are half-open. If using a lighted match hold it about 2cm above and just to the right of the barrel. Hold the match in this position while you open the gas valve slowly until it is fully open. The burner can be turned off by using the valve. Do not lean over the burner when lighting it. (*note if the gas seems to blow out the flame, close the air intake...light the flame…then readjust the air intake to get a proper flame*)

4. Practice relighting the burner several times. Adjust the collar so that the flame is blue and a pale blue inner cone is visible. (see the flame diagram on the next page)

5. Adjust the flow of gas until the flame is about 6 cm high. Some burners have a valve in the base to regulate the flow of gas, (if no valve is present the flow of gas can be adjusted at the gas outlet valve.) After adjusting the flow of gas, shut off the burner. Leave your safety goggles on as you proceed with step 6.

6. Arrange the apparatus as pictured in Figure 3.

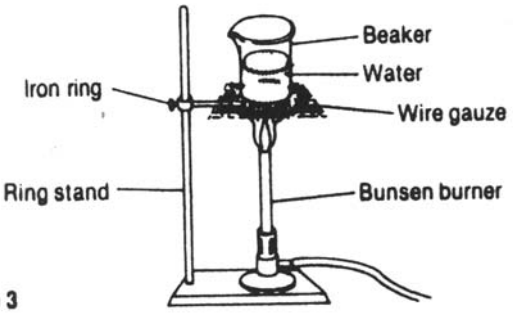


Figure 3

7. Adjust the iron ring so that the bottom of the beaker is about 2 cm above the mouth of the barrel. Measure 100mL of water in the graduated cylinder and pour it into a 250 mL beaker.

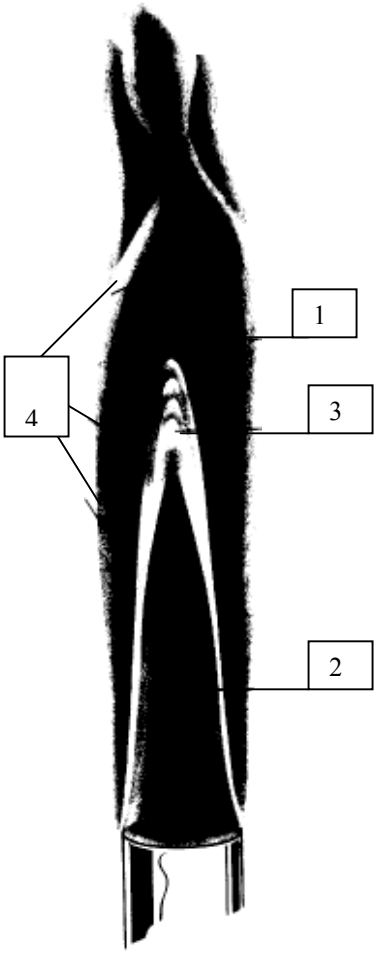
8. Light the burner and heat the beaker. The bottom of the beaker should just be touching the top of the inner cone of the flame. Record the time it takes for the water to start boiling rapidly. Using the tongs carefully remove the beaker.

9. Repeat the procedure with the other beaker at a height of about 6 cm above the mouth of the barrel. Record the time it takes for the water to start boiling rapidly at this height. Be sure that the starting temperature of the water is the same in each trial.

The Burner Flame

1. Light the burner and adjust **it** so that you have a blue, almost invisible flame. This is the type of flame you will normally use.

2. Examine the flame closely. Note the different cones that are visible.



a) *Outer* cone. This is the hottest part of the flame because fuel combustion is most complete here.

b) *Inner* cone. This cone is blue in color and not as hot as the outer cone. The gas has not had a chance to burn completely in this region.

c) *Base* cone. There is a dark cone in the interior of the flame. It is the mixture of gases before they start to burn.

3. Occasionally you will need to use a yellow flame. This is produced by shutting off most of the air supply. With little air in the fuel mixture, the gas burns incompletely. Unburned carbon in the flame glows to produce the yellow color. This type of flame deposits soot on objects placed in **it.** Do not use a yellow flame unless instructed to do so.

4. Turn off the burner and place a paper clip on a match just below the head. Suspend the match on the top of the barrel of the burner. Be sure the match head is in the center of the barrel. Now light the burner. Note what happens to the match head. What does this suggest about the dark, inner portion of the flame?

A burner flame is the site of a complex mixture of chemical events which you may wish to investigate as you acquire a working knowledge of chemistry. For the present you should know that (1) in the diagram is the hottest point in the flame, (2) is in a zone composed of unburned gas and air, (3) is in a zone of burning gases, and (4) is in a zone of partially burned, still hot, gases.

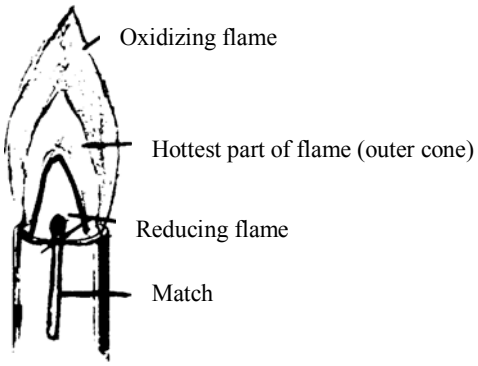


Figure . A properly adjusted burner flame.

Burner Lab:

Observations:

DATA TABLE: Boiling of Water

Height above burner *(cm)*	Time to boil *(min)*
2	
6	

CONCLUSION:

1. What would happen if the air intake openings were made very small?

2. If the burner did not light even after the gas outlet valve was open, what might be wrong?

3. Where is the hottest part of the flame? Where did the water boil the soonest ?

4. Why is it important to make sure that the volume of water and the starting temperature are the same in each trial ?