Name _____Date _____ Per. _____

LAB: Observing the Bunsen Burner

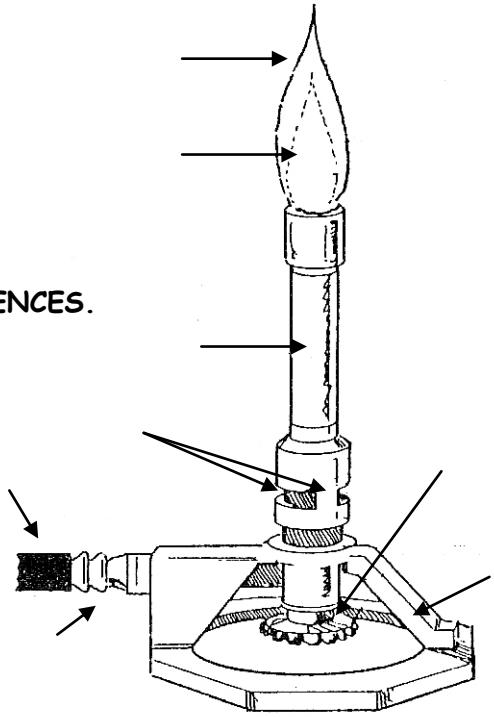
Background: Robert Wilhelm Bunsen is credited with inventing the laboratory Bunsen burner in 1855. Bunsen, born in 1811, was a German chemist and teacher. He needed a burner for his research in isolating chemical substances – one that had a high-intensity, non-luminous flame that wouldn't interfere with the colored flame emitted by chemicals being tested. Peter Desaga was a University of Heidelberg (where Bunsen worked) mechanic who actually invented and built the first Bunsen burner to Bunsen's specifications. Bunsen also invented the hydrojet filter pump, a photometer (to measure the intensity of light), and the Bunsen battery (a chemical battery). Early in his career, Bunsen was blinded when a chemistry experiment of his exploded in his face.

Problem: What are the parts of the Bunsen burner, and how can the burner be used safely?

Materials: Bunsen burner, paper clip, crucible tongs, 600 mL beaker, iron ring stand with ring, wire gauze, thermometer, graduated cylinder

Procedure:

1. Examine the burner and learn the names of its parts. Label the parts of the burner on the diagram at the right.



2. Look through the center of the burner and notice the hole running through the base. This is for the gas. **Answer the following observation questions. USE COMPLETE SENTENCES.**
   a. What do you see at the base of the barrel?
   b. What do you think is the purpose of this hole?

3. **List the purpose of the following:**
   a. air holes
   b. needle valve
   c. barrel
   d. base
   e. hose

4. Turn the needle valve clockwise until it stops. **DO NOT TIGHTEN THE NEEDLE VALVE. YOU ONLY NEED TO TURN IT UNTIL IT STOPS.** Screw the barrel all the way down until it stops. Now unscrew the needle valve by turning it counter-clockwise 3 turns. Turn on the gas at the gas outlet by turning the handle straight out so it is pointing at the hose on the burner. Use the striker to light the burner. **BE CAREFUL!**

The flame should be yellow (luminous). This is a dirty flame that is unsuitable for heating because it forms soot. Now open the air holes until a non-luminous (pale blue) flame is produced. Turn the barrel to do this.

Answer the following question using a complete sentence:

a. What did you have to adjust on the burner in order to get the yellow flame to become a blue flame?

5. The room should be darkened for the following procedure. Open the air holes completely by turning the barrel counter clockwise and reduce the size of the flame by adjusting the needle valve. Now you should see two blue cones coming out of the barrel of the burner. Test the inner cone by holding a straight paper clip with the crucible tongs, then insert the clip so that it sits on the top of the barrel. Now raise the paper clip slowly into the outer cone and observe that happens.

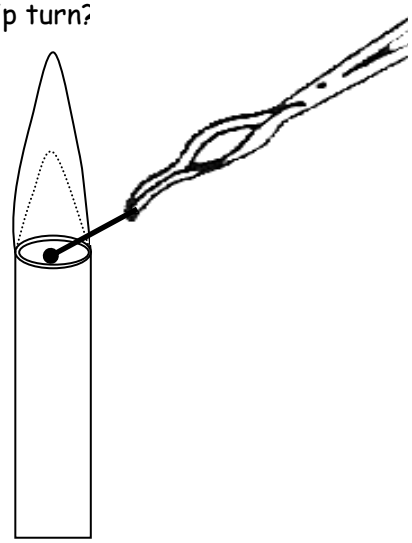
Answer the following questions using complete sentences:

a. In which part of the burner flame is the most heat given off?

b. What color did the paper clip turn when held on top of the burner barrel (just under the blue cones)?

c. When held at the top of the inner blue cone, what color did the paper clip turn?

6. Now turn off the burner. Ask your teacher for a wooden match. Using the tongs, hold the match so that the red tip is inserted into the barrel just slightly. Turn on the gas and light the burner. If you are lucky, and are holding the match in the right spot, the match will not light.



Answer the following question using complete sentences:

a. Describe what happened to the match head after you lit the burner.

b. The match head is supposed to stay unlit. What does this tell you about the temperature at the top of the burner, just inside the inner blue cone?

<u>If you have time, you may do the following:</u>

7. Pour 450 mL of water into the beaker. Measure and record the starting temperature of the water.

8. Predict what the water temperature will be after heating for two (2) minutes using a non-luminous flame:

If I use a non-luminous flame, I think the water will reach a temperature of _____ ^{0}C

9. Test your hypothesis by placing the beaker on the wire gauze on the ring stand. Heat the water over a non-luminous flame for two (2) minutes. Measure and record the new temperature.

Heating over luminous and non-luminous flames

Type of Flame	Water Temp. (^{0}C)
None (start temp.)	
Non-luminous	
Luminous	

10. Predict what the water temperature will be after heating for two minutes using a luminous flame:

If I use a luminous flame, I think the water will reach a temperature of _____ ^{0}C

11. Repeat the experiment using a luminous (yellow) flame. Measure and record the temperatures.

12. Conclusion: After heating water with a luminous and nonluminous flame, the flame that heats water the best is _____.

13. Turn off the burner, clean your station, and answer the conclusion questions.

<u>Conclusion Questions</u> **Answer these question using complete sentences.**

1. In step 4, what color flame was produced when the barrel had the air holes blocked? _____

_____

2. Why is a luminous flame unsuitable for heating? _____

_____

3. In order to get the flame to be non-luminous (blue), you had to adjust the barrel. What did this allow into the barrel so that the flame will burn hotter? _____

_____

4. Where is the hottest part of the flame located? _____

_____

5. Where do you turn off the gas to the burner? _____

_____

6. What substance is in the air that allows the flame to burn? _____

_____

7. Where do the gas and oxygen come together and mix in a burner? _____

_____

8. What is the needle valve used for in the Bunsen burner? _____

_____

9. How can a match remain unlit in the middle of the burner flame? _____

_____