Name:_____ PERIOD:_____DATE____ **The Bunsen Burner**

Part I: Introduction:

The Bunsen burner reacts methane (CH_4) with oxygen gas (O_2) in the air to produce gaseous carbon dioxide (CO_2) and gaseous water (H_2O). This is referred to as *complete combustion.* $CH_4\,(g) + 2\,O_2\,(g)\ CO_2\,(g) + 2\,H_2O\,(g)$ + heat. If insufficient oxygen is available, we would have an incomplete combustion, producing poisonous carbon monoxide (CO), soot (C), and a cooler yellow flame. It is important to learn how to control the type and the temperature of the flame. A hotter, bluer flame is needed and is accomplished by mixing more air with the methane gas.

Part II: The equipment

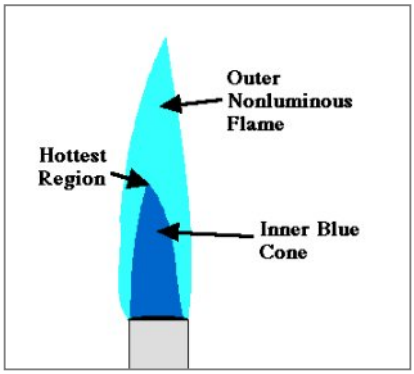
A. The Flint Striker: used to light Bunsen burner
- Has two arms, a metal flint, and a metal cap.
- One of the arms moves towards the other arm to create a spark
- The spark can then ignite any escaping gas.

Draw *a Flint Striker:*

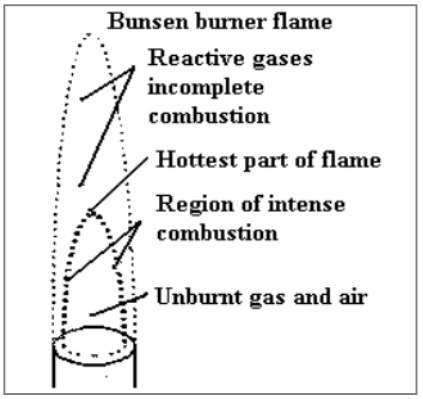
B. The Bunsen Burner

The Bunsen Burner Parts
A. The Base: supports burner
B. Gas Inlet: connects the gas jet at the lab station to the Burner via rubber tubing
C. Gas Control Valve: regulates the amount of gas flow (twistable)
D. Collar & Air Vents: can be turned to adjust the intake of air (larger holes more air will be drawn into the barrel)
E. Barrel : where the gas and air mix

Label *the Bunsen Burner*:



C. The Bunsen Burner Flame:
- Safety Flame: yellow-orange color. 300°C. This flame should never be used to heat anything, only to show that the burner is on.
- Blue Flame: medium flame, it is difficult to see in a well-lit room. 500°C.
- Roaring Blue Flame: has an inner blue cone. It is the only of the three that makes a noise. 700°C.



Part III: Lighting the Burner

1. Connect the hose to the desk gas jet.
2. Close the gas control valve on the Bunsen burner
3. Close the vents on the Bunsen burner.
4. Turn on the desk gas jet by moving the handle from the perpendicular position to the parallel position.
5. Use a flint striker to create a spark or strike a match
6. Turn the gas control valve slightly, ¼ to the left, counter clock wise
   - If you hear the gas, it is on too high
7. Ignite the gas by holding the flint striker or the match to the side of the barrel.
   - Do not hold it directly above the Bunsen burner, this is unsafe
   - If your flame sputters, turn off the gas at the control valve. The gas was on too high.
8. Adjust the air vent so that it is open
   - The flame will be more controlled, almost colorless, and the inner blue cone will appear.
9. Adjust the gas control valve to allow more gas in the barrel to adjust the height of flame.
10. Turn the Bunsen burner off by moving the gas control valve to the right, clockwise
11. Turn the gas jet off by moving the handle back to a perpendicular position.

Part V: Lighting the Burner

CUTTING TUBING: Your teacher will first demonstrate this procedure.
Measure a 30cm piece of glass tubing from one end and cut it at that measurement by using the following technique:

1. Make a deep scratch at a right angle to the tubing by pushing the edge of a triangular file away from your body. DO NOT saw the glass. A single scratch should be sufficient. Use a firm, steady stroke.
2. Grasp the tubing with both hands, with the thumbs meeting on the tubing opposite the scratch.
3. Break it by pushing outward with your thumbs.

FIRE POLISHING: The method of smoothing the sharp edges is called fire-polishing. The edges of the cut tubing are very sharp! They must be smoothed out before being used.

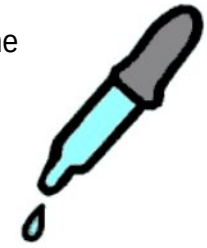
1. Hold the end of the tubing in the burner flame and roll the glass in your fingers. Rolling the tubing while heating gives the glass a uniform temperature. As the flame above the tubing yellows, the glass softens and sharp edges become round.
2. Cool on asbestos pad, NOT ON THE LABORATORY TABLE!
3. After the first end of the tubing cools, repeat the above procedure to fire-polish the second end.

BENDING TUBING AT 90^{o} angle:

1. Place a wing top on the barrel of the burner to spread the flame. This gives a more uniform heat over a larger area. An uneven flame heats the glass unevenly and produces a poor bend.
2. Hold the glass rod with both hands over the wing top flame so that the middle of the tubing will be heated.
3. Rotate the glass in the flame continuously so that the heating is uniform. When the flame above the tubing becomes an intense yellow, the glass will be soft enough to bend easily.
4. Bend it to make a smooth 90^{o} angle. REMEMBER: HOT GLASS LOOKS LIKE COLD GLASS. Glass tubing must be dry or it will crack.

CREATING A GLASS EYE DROPPER:

Measure a 10 inches long piece of glass tubing from one end and cut it at that measurement by using the CUTTING TUBING technique:



1. Rotate a piece of tubing in the flame until quite soft. Do not let this one sag.
2. Instead, when it is soft pull it apart and draw the glass into a thin tube and let cool.
3. With a triangular file, separate the thin tube in the middle with a clean break. These will be used as eyedroppers in subsequent laboratories. Show these to your teacher for credit.

Making Your Own Glass Stuff

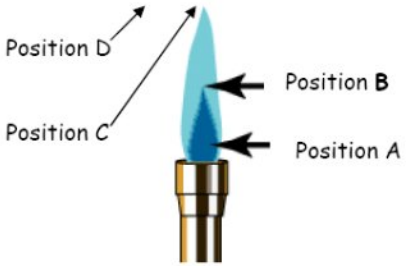
You may now use any remaining glass tubing to create anything you would like. Here are a few tips:

1. REMEMBER: You cannot *see* when the glass is hot, so always assume that it is
2. You may try and blow the glass to make it larger. To do this:
    a. Heat up one end of the glass tubing and then seal it off by pressing it against the lab bench (so there is no longer an opening)
    b. Now evenly heat a section of the glass tubing. Once it becomes flexible, begin blowing in the open end of the tubing
    c. If you make the bubble too big, it will burst

DO NOT TAKE ANY GLASS OUT OF THE CLASS

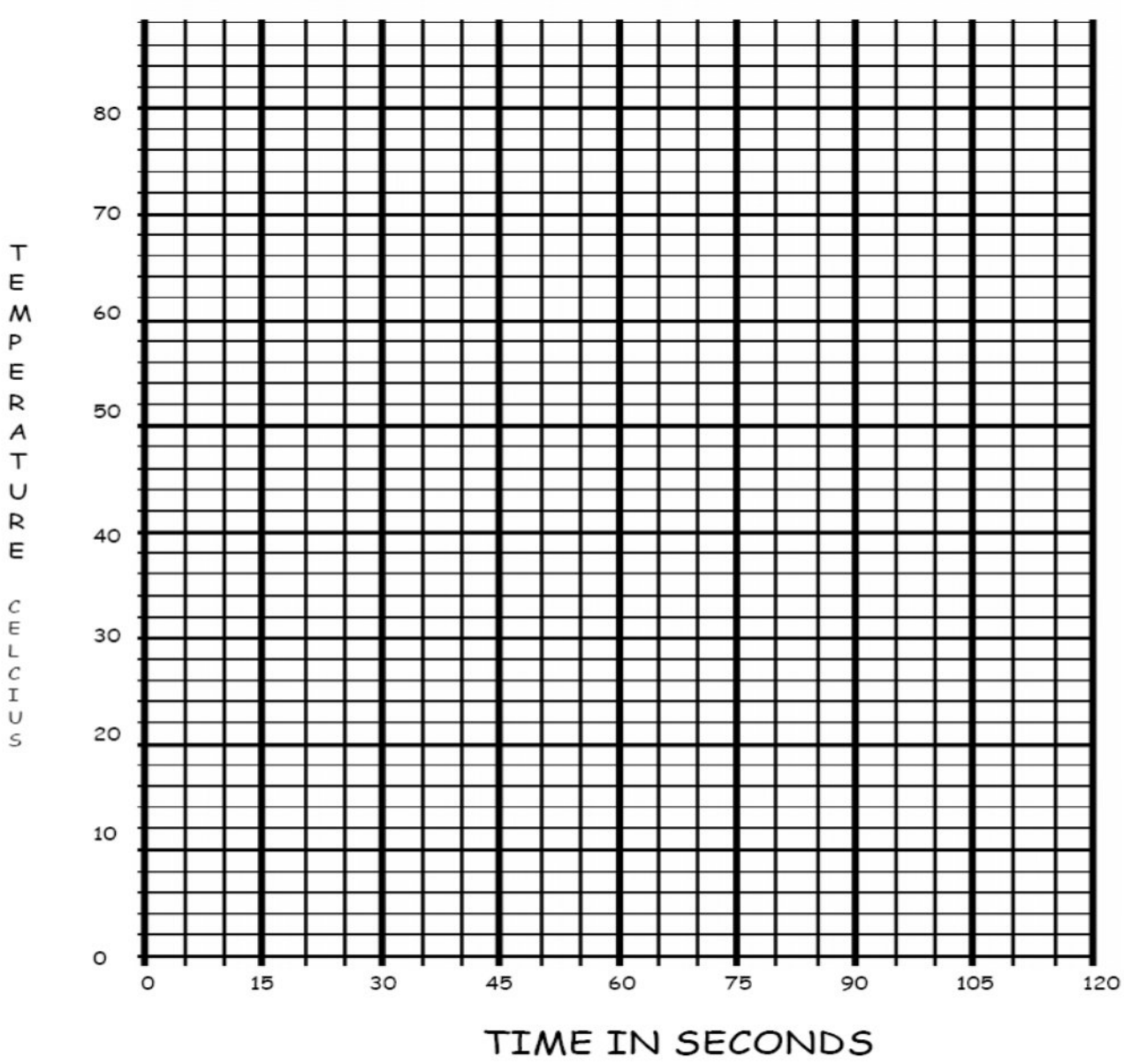
Part 3: Boiling water at four different height

A. Data Table for boiling water at the different heights:



Position	Starting Temp	15 sec	30 sec	45 sec	60 sec	75 sec	90 sec	105 sec	120 sec
A									
B									
C									
D									

B. Graphing Data *Graph your data for all four positions. Label each line.*



C. Graphing Questions: *Circle the correct answer.*

1. In the experiment above, temperature is the independent/dependent variable.
2. In the experiment above, time is the independent/dependent variable.
3. As time is increasing, the temperature is: increasing/decreasing.
4. The graph represented above is: inversely/directly proportional.
5. Position, A, B, C, D, was the best for boiling water.

Part 5: Summary Questions:

1. Chemical reaction of the Bunsen burner is:

2. What safety precautions should be taken before lighting the Bunsen burner?

3. What is "on" and "off" position of the gas jet located at your lab bench?

4. The Bunsen Burner mixes _____ with _____.

5. The orange-yellow part of a flame is about _____°C.

6. Blue color of a flame is _____ °C.

7. Top of the inner blue cone is about _____°C.

8. What would happen if the air vents were made really small?

9. How do you adjust the gas flow through the burner?

10. What happens to the flame when the gas is "turned up"?

11. Your flame on the burner sputters and then goes out. What should you do immediately?

12. State TWO reasons why a blue flame is preferred over a yellow flame in a burner.

13. Arrange the following steps in the proper sequence for lighting a burner. There are some steps where the order makes no difference- enclose these steps in parenthesis.
    A. Slightly open the gas control valve
    B. Turn on the desk gas jet located at the lab station
    C. Make sure the gas control valve is off
    D. Make sure the air vent is closed
    E. Connect the burner's tubing to the desk gas jet
    F. Light the escaping gas
    G. Open air vent to adjust the type of flame
    H. Open or close the gas control valve as needed to adjust the height of the flame

_____, _____, _____, _____, _____, _____, _____, _____

14. According to your results, where is the hottest part of the flame?

    Position A, B, C or D _____

15. Sketch a flame and label the hottest part of the flame. →

Sketch of a flame: