Chemistry 22

EXPERIMENT 5
THE GAS BURNER

I. Introduction

The most commonly used gas burners are the Bunsen or Tirrill types. They are similar in that they both have an air adjustment at the base of the barrel; they differ in that the Tirrill type also has a gas adjustment screw at the bottom of the burner. Any laboratory burner uses natural gas, which is primarily methane (CH_4).

In the burner, methane mixes with air entering through the holes in the collar at the base of the barrel. When ignited, the methane then combines with the oxygen in the air during the process of burning to form water vapor and carbon dioxide. If the holes are partially or completely closed , there is insufficient air for complete combustion of the methane and instead of carbon dioxide forming, carbon monoxide or just carbon will form. When carbon forms as happens when the holes are completely closed, the burner burns with a yellow sooty flame called a luminous flame for it is so easily visible. When the holes are open to allow the proper amount of air to enter, the burner burns with a blue, almost invisible, flame; so it is called a non-luminous flame. If there is too much air coming in from the collar, the flame may "roar" or lift up off of the barrel or even "strike back"; that is, it will travel down the tube and burn at the small opening in the base of the burner. The collar and tube of the burner may get quite hot and you may smell melting or burning rubber from where the rubber tubing attaches to the burner. Turn off the gas supply and partially close the air holes by turning the collar of the burner after it has cooled: then relight the burner.

II. Procedure

1. Observe the gas outlet on the laboratory bench. It is off when it is parallel to the pipe [turned either to the right or to the left.] It is on when it is turned 90 degrees toward you in the perpendicular position.
2. Observe the movable collar at the base of the barrel and the gas adjustment screw at the very base of the burner. Disassemble your burner by unscrewing the barrel and the gas adjustment screw. Draw and label each part on the report sheet.
3. Reassemble your burner, attach one end of the rubber tubing to the burner and the other end to the gas outlet. Light the burner as follows:
    a) Light your match and hold it just to the side of the top of the barrel and open the gas outlet to the perpendicular position.
    b) Bring the lighted match to the top of the burner from the side and adjust the air supply by turning the collar until a non-luminous flame appears.
    c) Adjust the screw at the base of the burner until you have a flame with a double bluish cone. The inner cone is a bright light blue, and the outer one a more diffuse and darker blue. You may need to adjust the air again to get the best results.
4. Observe the differences in temperature within the flame by inserting the corner of your wire gauze into various parts of the flame and comparing the amount of time it takes for the wire to glow in the different parts.
Test (a) the very tip of the flame, (b) the tip of the inner blue cone and (c) the flame next to the top of the barrel. Record.
5. Place a wire gauze on a ring stand and place a beaker of cold water on the wire gauze. Dash the flame of your lighted burner across the side of the beaker once or twice.. You should be able to see evidence of one of the products of combustion of methane. Record your observations.
6. Turn the collar of your burner until the air ports are closed all the way. This should produce a yellow (luminous) flame. Hold a cold evaporating dish (or crucible) in the luminous flame with crucible tongs for about a minute and observe what happens. Record.
Cool and clean the evaporating dish, adjust the collar to open the air ports to produce the blue (nonluminous) flame and repeat the experiment. Observe and record what happens this time.

III. Observations

1-2. Sketch your burner with the wing top in place. Label the base, the barrel, the collar, the airports, and the wing top.

3-4. Sketch the double non-luminous flame, draw a lines to the top of the flame, the tip of the inner blue cone, and the base of the flame and label according to your observations when testing the comparative temperatures.

5. What appears on the glass when the flame is dashed across the beaker of cold water?

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6. (a) What occurs when the evaporating dish is held in the luminous (yellow) flame?

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(b) What occurs when the evaporating dish is held in the non-luminous (blue) flame?

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QUESTIONS: [refer to the introduction, the procedures, and your observations to answer these]

1. Why should you not hold your lighted match over the top of the burner while you turn on the gas?

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2. Proper Burner adjustment:

a). When you lighted your burner, it had a luminous flame. What should you do to get the proper flame?

_____

b). When you lighted your burner, it had a loud "roaring" sound. What should you do to correct it.?

_____

c). When you lighted your burner, the flame disappeared down into the barrel . What do you do?

_____

4. What product of combustion is shown to be present--

(a) By the results of dashing the flame across the cold beaker surface._____

(b) By the results of holding the evaporating dish in the luminous flame_____

5. Why did the deposit in (b) not appear when you held the evaporating dish in the non-luminous (blue) flame?

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