HC$_{hemistry}$ Name _____Per_____

"Candle Activity"

Objective: To practice making observations and linking these to scientific interpretations.

II. Procedure:

A. Mass Change During Candle Combustion.

1. Place a candle on a small glass square. Measure the mass of the candle and glass to the nearest 0.01 gram.

2. Measure the mass of the candle and glass again at the end of Part C and record.

B. Behavior of a Candle Flame Under Various Conditions.

1. Light the candle. (CAUTION: Long hair or loose clothing can swing into the candle flame.) Invert a large beaker (1000 mL) over the burning candle. Record the time required to extinguish the flame.

2. Relight the candle and repeat Step 1 using the smaller beaker (600 mL).

3. Hold a piece of glass tubing ***(NOT the test tube)*** with the test tube holder so that one end is within the very center of the flame. This region appears to be less bright than the rest of the flame. You will observe a white smoke travel up the tube. When it reaches the other end place a lighted match or bunsen burner flame next to it and watch very closely. Record your observations.

4. Wind a piece of copper wire around a pencil to form a coil leaving a length unwound as a handle. Remove the pencil. Carefully lower the coil over the *candle* flame. Raise and lower the coil several times. Record your observations.

5. Fill a paper Dixie Cup about two thirds full with water. Place it on the wire gauze on the ring stand. Light the bunsen burner and place it beneath the Dixie Cup. Watch for a minute or two. Record your observations.

C. Determination of Products Formed as a Candle Burns.

1. Quickly remove a piece of cobalt chloride paper from the desiccator and place a drop of tap water on it. Record your observation.

2. While the candle is burning, invert the large beaker over the flame for a few seconds. Quickly test any liquid formed on the glass with another piece of cobalt chloride paper. Record your observation.

3. Examine the bottom of the beakers for any charred residue. Record your observations.

4. Take your 250 mL Erlenmeyer flask and invert it over the burning candle until the candle is extinguished. Remove the flask quickly and place it upright. Add about 10 mL of lime water solution to the flask. Swirl the solution in the flask and watch for changes. Carbon dioxide gas causes lime water to turn cloudy

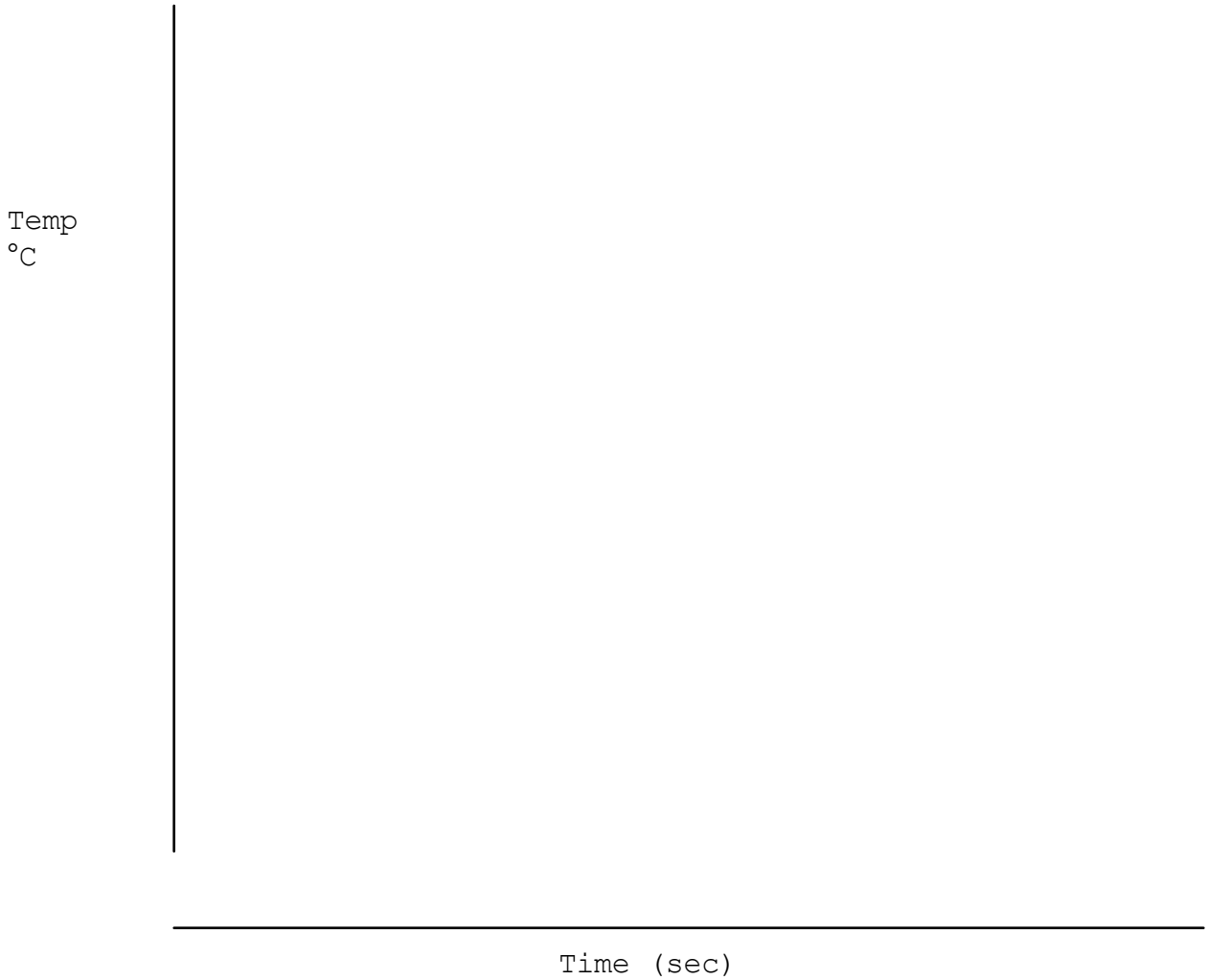
5. Fill your test tube half way up with water. Holding it carefully with the test tube holder (REMEMBER, squeezing the holder opens it up and drops what you want to hold !!!), place a thermometer with your other hand in the water. **DO NOT LET THE THERMOMETER REST ON THE BOTTOM OF THE TEST TUBE. HOLD IT JUST ABOVE THE BOTTOM OF THE TEST TUBE**. After a minute, record the temperature of the water as "Initial Temperature". Next, hold the test tube just above the *candle* flame while your partner watches the time and lets you know whenever 30 seconds has elapsed until you've gone 2 minutes straight. On every 30 second mark, tell your partner the temperature so he or she can record it.

6. Extinguish the candle and let it cool. Measure and record its final mass.

III. Results:

Procedure	Observations and Data Fill in during class	Interpretation *(wait until homework)*
Part A **burning of candle** (1 and 2)	Beginning Mass _____ Final Mass _____ (remember to record at end of lab)	
Part B (1 and 2)	Beaker Size _____ Time _____ Beaker Size _____ Time _____	
3 Small glass tube		
4 Copper Coil		
5 Teacher Demo!		
Part C 1 Cobalt Chloride Paper		
2 Paper on inside of beaker		
3 Charred Residue		
4 Residue in Flask		
5 Take Data!	Initial Temp: (at 0 seconds of heating)_____ Temperature at 30 seconds _____ Temperature at 60 seconds _____ Temperature at 90 seconds _____ Temperature at 120 seconds _____	

IV. Analysis: Graph the temperatures and times from Step 5 of Part C.



V. Conclusions:

1.a. On the basis of this experiment, describe the difference between an observation and an interpretation.

b. What are some of the limitations of this experiment?

2.a. Find out the difference between qualitative and quantitative measurements. Which of the investigations of the burning candle involved quantitative measurements?

b. What other quantitative measurements might be made other than the ones you performed? (Give two examples)

3. Based on your analysis of Part C (Steps 2, 3, 4, and 5), identify four products formed as a candle burns.

4. What do you think caused the effect you saw when the copper coil was lowered over the candle flame?

5. If it is assumed that a candle reacts with oxygen (O_2), in the air and the only products are energy, carbon dioxide (CO_2), and water (H_2O), what two elements must be present in the composition of a candle?

6.a. Do you think a candle with a larger diameter would produce a larger flame?

b. How could you find out?

c. Would this be a qualitative or quantitative investigation?

7. Where does the energy coming from the burning candle originate?