INTRODUCTORY LAB# 1 – CANDLE

OBJECTIVES: In this lab you will
* make some qualitative observations of a chemical reaction
* make some quantitative observations of a chemical reaction
* determine the products formed by the burning candle by tests and observations
* Preparation of tables to record observations and data as directed in the Analysis.

EQUIPMENT:
- Candle w/matches
- dropper
- 50 ml Graduate cylinder
- 600 ml beaker
- clock or watch with second hand
- limewater solution
- beaker (250 or 1000 ml)
- Erlenmeyer flask (250 ml) w/stopper
- test tube holder
- large test tube (18 x 150 mm)
- thermometer
- copper wire

PROCEDURE:

A. The Behavior of a Candle Flame Under Various Conditions.
1. Place a candle on a small glass square or other holder, as directed by your teacher. Note appearance, odor, & color of the unlit candle.
2. Light the candle and allow it to burn for 2 minutes. CAUTION: Hair can swing into the candle flame. Note any changes. Briefly describe the burning candle.
3. Invert a large beaker (600 ml) over the burning candle. Record the time required to extinguish the flame.
4. Relight the candle and repeat Step 3 using a beaker that is either larger (1000 ml) or smaller (250 ml) than the one used in Step 3.
5. Relight the candle, blow out the flame and immediately place a lighted match in the smoke about 2 cm above the wick. Note the result. Repeat several times.
6. Make a coil with 30 cm of copper wire. Carefully lower the copper coil into the flame. Note the behavior of the flame.

B. Determination of Products Formed as a Candle Burns.
1. While the candle is still burning, invert a large beaker (600ml) over the flame for a few seconds. Note any droplets of liquid (fog forming on the sides and/or top of beaker) that may form.
2. Relight the candle and invert a 250 ml beaker over the candle until it extinguishes the flame. Examine the bottom of the beaker for any charred (black) deposits. Record observations.
3. Invert a 250 ml Erlenmeyer flask over the burning candle until the flame is out. Remove the flask and quickly place it upright. Add about 10 ml of limewater solution to the flask. Stopper the flask, shake the solution, & watch for changes in the solution. Carbon dioxide causes limewater to turn cloudy.

C. Taking Quantitative Measurements
1. Mass the candle to 0.01 gram and record in your data table.
2. Obtain a large test tube, test tube holder, and thermometer. Measure out exactly 20.0 ml of water and pour into the test tube. Check the temperature of the water and record. Hold the test tube just above the candle flame and heat the water for FIVE minutes. Check the water temperature every 30 seconds while heating. Record the time/temperature data in your table.
3. Extinguish the candle flame. When the candle is cool, measure and record its mass.

DATA & OBSERVATIONS
Prepare 2 tables to organize your observations and data of the candle under the various conditions described in the Procedure. The following is a sample format for your tables. NOTE: They are incomplete! You must finish the tables! Your tables will be your Data Sheet for this lab.

<table>
<thead>
<tr>
<th>Observations:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Candle</strong></td>
</tr>
<tr>
<td>Appearance:</td>
</tr>
<tr>
<td>Odor:</td>
</tr>
<tr>
<td>Color:</td>
</tr>
<tr>
<td>Other:</td>
</tr>
<tr>
<td><strong>Burning Candle</strong></td>
</tr>
<tr>
<td>Appearance:</td>
</tr>
<tr>
<td>Odor:</td>
</tr>
<tr>
<td>Color:</td>
</tr>
<tr>
<td>Other:</td>
</tr>
<tr>
<td><strong>Light match</strong></td>
</tr>
<tr>
<td>Copper coil</td>
</tr>
<tr>
<td>Continue with observations to include water droplets, charred deposits, limewater results, etc.</td>
</tr>
</tbody>
</table>
DATA

| Time to Extinguish Candle | Small beaker ___________ s |
|                          | Large beaker ___________ s |
| Mass of Candle: Part C   | Before burning __________ g |
|                          | After burning __________ g |
| Temperature Every 30 seconds | Initial temp. _____ 150 seconds _________ 30 seconds _____ 180 seconds _________ Continue in like manor. |

DON'T FORGET TO COMPLETE YOUR TABLES!!!

CALCULATIONS:

1. The change in the mass of the candle during part C.
2. The change in the mass of the candle per minute.
3. The change in the temperature of the water.
4. The change in the temperature of the water per minute.
5. Prepare a graph of your data from Part C, plot elapsed time (seconds) on the abscissa (X axis) and temperature (°C) on the ordinate (Y axis).

QUESTIONS:

1. What are the differences between quantitative and qualitative measurements? Give examples from this lab.
2. What do you think were the three products formed as the candle burned?
3. Why was the candle flame extinguished when covered with a beaker?
4. Why was the flame extinguished when the copper coil was placed in the flame?
5. If we assume that a candle reacts with oxygen, O\textsubscript{2}, in the air and the only products are energy, carbon dioxide, CO\textsubscript{2}, and water, H\textsubscript{2}O, what two elements must be present in the candle?
6. On the basis of this experiment, what is the difference between an observation and an interpretation?