

## **Lab #1: Observations and Explanations of a Burning Candle**

### **Objective:**

To use the scientific method to describe and explain the chemistry of a burning candle

### **Introduction:**

In reality, the study of a burning candle is filled with science. In order to delve deeper into the chemistry of how a candle burns you need to observe, question, investigate, assemble facts, organize information, explain irregularities, and communicate results.

This activity is designed to help you become familiar with the scientific method a chemist uses to understand and ultimately to solve problems. You will also explore the physical and chemical properties of a candle.

You will be asked to observe a candle under certain conditions and to investigate the properties and products formed while a candle is burning. By making careful observations and explaining patterns, you will be asked to draw conclusions about the physical and chemical nature of a candle.

### **Materials:**

Candle in a Holder	Stopwatch or Clock w/ second hand	2 beakers of different sizes
Butane lighter or Matches	Colored Pencils	Electronic Balance

### **Safety:**

- Tie back hair, loose clothing and jewelry
- Handle lighted candle with care
- Dispose of matches in trash can only after they are cooled

### **Procedure and Observations:**

*\*\*For this lab report, do not include the procedure section. However, an organized observations section is required. Make a table with three columns: Procedure Number, What you did, Quantitative or Qualitative Observations.*

1. Take the mass of an unlit candle and record the result.
2. Light the candle, and carefully observe it as it is burning. Make a list of at least 15 different observations under the observation of your lab report. In addition, make labeled drawings with colored pencils or include a picture or photo and label the different parts of the lit candle.
3. Place the larger beaker upside down over the candle. Observe the candle for a few minutes and answer the following questions in the observation of your activity report.
  - a. What happens to the flame?
  - b. Record the time it takes for the flame to almost go out, but not completely.
  - c. Before the flame goes completely out, carefully lift the beaker from the candle and place it on the table. What happens to the flame?
4. Replace the same beaker over the candle a second time. Record the time it takes for the flame to go completely out.
5. Remove the beaker and place it on the table. Do you observe anything inside the beaker? Describe what you see.
6. Take the mass of the candle after burning. Be careful of the hot liquid wax.

7. Think of a hypothesis (i.e. “if-then” statement) or a possible explanation for what is happening when a candle burns. Write the following in your data section and fill in the blank: “If a candle burns, then \_\_\_\_\_.”
8. Relight the candle and using the smaller beaker. Repeat steps 3 and 4 to test your hypothesis using the smaller beaker. Record your observations in the same way as before.

**Analysis:**

1. Compare your list of ten observations with another group of students. What were the similarities and differences?
2. a. List several physical properties/changes of the candle.  
b. What is the chemical property/change of the candle exhibited in this lab?
3. a. What is the wax of the candle reacting with during the burning? (Complete Combustion - for hints on Combustion, see pg. 110 and 111 in your text.)  
b. What are the two products of this reaction? What evidence in your observations supports this?
4. a. Define the Law of Conservation of Mass. (Hint: look it up through the index of your textbook)  
b. Describe in words how the law of conservation of mass satisfied when a candle burns.  
c. What happens to the mass of the candle? Why? Explain.
5. a. Compare the times that it takes the candle to go out when using the two different size beakers.  
b. Develop a short theory (explanation) of several sentences to explain the differences.  
c. No theory answers all questions. What are two questions that your theory doesn't address?

**Conclusions:**

1. Read Section 1.2 of your text. Write a paragraph about the steps of the scientific method (i.e. observation, hypothesis, and experiment) and how they were used in this lab. Distinguish between a theory and a law; how or where could they fit into this experiment?
2. Write a summary paragraph that describes and explains the burning of a candle. Some questions you may consider: What is occurring during the burning process? Why was the flame extinguished when you covered it with the beakers? What are the gases found in air? How do you think gases in the air affect the behavior of the flame? Why does the size of the beaker alter the time the candle stays lit?
3. Paraffin wax is actually a mixture of hydrocarbons. If we assume one of the hydrocarbon compounds has the formula  $C_{25}H_{52}$ , write an unbalanced chemical equation to represent the burning reaction in this lab. (Hint: see pg. 111 of textbook)