Name_____

Date_____ Period_____

Wicked Chemistry: (from Al Guenther's Science Solutions)

BACKGROUND: To most people a candle is just a decoration or a source of light and heat. But to a scientist a candle is like a whole laboratory full of demonstrations and experiments in chemistry and physics! An English scientist named Michael Faraday first demonstrated the science of a candle in 1848. Today you will re-enact some of Michael Faraday's demonstrations. Using a candle, you will investigate the states of matter, experience a combustion reaction, confirm the Law of Conservation of Mass and witness expansion and contraction.

CAUTION: Goggles and aprons are mandatory! Remember you are working with fire and melted wax, BE CAREFUL NOT TO BURN YOURSELF! Do not get wax on the table nor the glassware and please clean the foil pan, glassware and the table when you finish the activity.

MATERIALS: candle attached to foil pan, small baby food jar, large pickle jar, forceps, glass tube, matches, goggles, apron, floating candle in tray of water with detergent.

PROCEDURE: 1. Get a foil pan with an attached candle, forceps holding a glass tube and matches. Be sure to keep the candle, forceps/glass tube and the matches in the foil tray. Also get a small baby food jar and a large pickle jar for later use.

2. Light the candle. After it burns for 1 minute, examine it closely. Label the drawing to the right, telling which state of matter the wax is in at points A, B, and C. (solid, liquid, gas or plasma)

A._____

B._____

C._____

3. Pour the melted wax from the candle into the foil pan. When the wax has hardened, observe it again. Has the wax changed into a different substance as a result of having been melted and solidified? _____ Does the melting and solidifying of wax represent a physical or a chemical change?

_____ Why?_____

4. Hold a lighted match in one hand, while with the other hand, lower the mouth of the small baby food jar over the flame of the candle. As soon as the candle flame goes out, lift the beaker and hold the lighted match 1 or 2 centimeters above the wick of the candle.

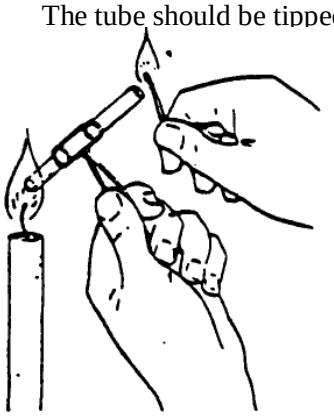
What happened?_____

(You may have to try this several times.)

What substance above the wick ignited?_____ What color was it?_____

Where did it come from?_____

5. Hold the glass tube with the forceps so that the lower end of the tube is in the yellow part of the flame. The tube should be tipped upward at about a 45° angle as shown in the diagram.



What color is smoke that comes out of the glass tube? _____
Candle wax is made of carbon and hydrogen. $C_{25}H_{52}$.
Which of these elements makes up the smoke? _____

6. Hold the glass tube as before, but now hold it lower into the dark part of the flame just above the wick.
What color is the smoke that comes out of the tube this time? _____
Light a match, and try to ignite the smoke. You might have to try this a few times. With practice you should be able to keep the smoke coming through the tube and keep it lit. Does this mean that the wax in the dark part of the flame just above the wick is burning or not burning?
_____

7. Hold the large pickle jar mouth down over the candle flame until it "fogs" inside the jar. This only takes a few seconds. Be careful not to let the flame touch the jar. Remove the jar from the flame and wipe your fingers around the inside to feel the "fog" that formed. What substance is the "fog" made of?

_____Where did the "fog" come from?_____
(Hint: Which elements are in wax and which element in the air combines with substances that burn?)

8. Hold the outside bottom of the pickle jar above (not touching) the flame for 5 seconds. Did any deposit form on the bottom of the jar? Yes or No Now lower the pickle jar into the flame. Did any deposit form on the outside bottom of the jar this time? Yes or No What color is it?_____

What element is it? _____ Where did it come from?_____
(Hint: Remember the black smoke?) (Please clean the black substance off both jars with a paper towel)

9. Take your large pickle jar to the tray filled with water. Push the pickle jar mouth down, over an unlit floating candle, into the water. Does water rise into the jar? Yes or No Explain why or why not.

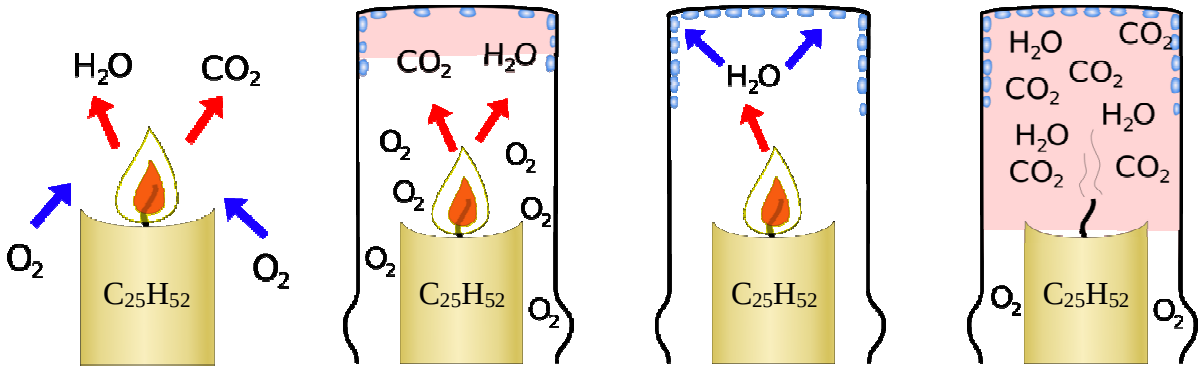
_____

10. Light the floating candle and let it burn for 1 minute. Push the pickle jar mouth down, over the lit floating candle, into the water. CAREFULLY OBSERVE THE MOUTH OF THE JAR.

What happens to the flame?_____ Why?_____

What happen to the water level inside the jar? _____ Explain why. (in detail)

_____
(Hint: Think about all the things you observed and about what happens to the gas in the jar)



CLEAN FOIL PAN DISCARD ALL USED MATCHES & WAX WIPE BOTH JARS