Wax on, Wax off — Calories Count

Safety

1) Throughout this discovery session, we will have open flames in the laboratory. Make sure that your hair and any loose clothing that you are wearing do not come into contact with the flames.
2) **Wear your safety goggles at all times during the session.**
3) Make sure that all flames are extinguished properly when you are finished and that matches and other flammable materials are disposed of properly.

Procedure

1) Light the candle and drip a few drops of wax onto the 3 x 5 card. Place the candle on the melted wax and hold until frozen. Measure and record the mass of the candle to be tested to the nearest 0.01 gram.
2) Add 100. mL of water to the can.
3) Before lighting the candle, set up your apparatus as demonstrated by your teacher. When you are sure that everything is set up properly, record the initial temperature of the water in the can just prior to lighting the candle. Estimate the temperature to the nearest 0.1°C.
4) Light the candle and place under the soda can. Record the highest temperature reached after 5 minutes. Stir carefully with the thermometer. Continue to stir and watch the temperature even after the candle is out. The temperature may rise a little more. Weigh the candle after combustion.

Data Table

Mass of Candle Before (g)	Mass of Candle After (g)	Volume of water (mL)	Starting Temp of water ($^{\circ}$C)	Final Temp of Water ($^{\circ}$C)

Calculations:

1) What was the change in mass of the candle?
2) What was the change in temperature for the water?
3) How much energy was absorbed by the water?
4) How much energy was released by the candle?
5) What is the heat of combustion of the candle in Cal/g?

Questions

1. Which energy account for the candle was tapped into here to heat the water?

2. Draw energy bars to show the candle's energy change and the water's energy change.

3. If the Heat of Combustion of your candle turned out to be 5.83Cal/g, then what would the final temperature of 50.0g of water be if 10g of the candle was burned?

4. A food "Calorie" is equal to a kilocalorie. 1.0 calories = 4.184 joules
   a. If a snack bar has 240 Calories, how many joules are in the snack bar? (Use this number of joules in b and c)

   b. If a snack bar is "reacted" and all the heat goes into 2.5 kilograms (x 10^3g) of water at 0.0 °C. What is the final temperature?

   c. If a snack bar is "reacted" and all the heat goes into water at 0.0 °C and it is heated to 25.3 °C, how many grams of water are there?

5. Identify three sources of error. How could some of these be eliminated in future experiments? How do they affect your calorie / gram calculation?