

Specific Heat Capacity Lab Exercise
Chemistry
5 points

Name: _____

Partner: _____

USE BLUE/BLACK INK!!!!

Date: _____ Hour: _____

Goal:

The goal of this lab is to determine the number of kiljoules of heat energy given off per gram of a burning candle.

Hypothesis:

Research:

1 kJ = _____ J

In the equation

$$q = c \times m \times \Delta T,$$

what does each symbol stand for?

q = _____

c = _____

m = _____

ΔT = _____

Materials:

- | | |
|-----------------------------|----------------------|
| 1 digital thermometer | 1 test tube clamp |
| 1 iron ring | 1 ringstand |
| 1 can | 1 glass stirring rod |
| 1 candle | 1 index card |
| 1 100 mL graduated cylinder | 1 lighter or match |
| 1 cg balance | 1 plastic funnel |
| 1 ruler | 1 funnel brush |
| 1 heat resistant pad | 1 stopwatch |
| 1 #4 1-hole rubber stopper | |

Hazards:

The student safety contract applies, although contact lenses may be worn. Be cautious of hot, dripping wax.

Procedure:

1. Physically and chemically clean the graduated cylinder and funnel.
2. Rinse out the can.

3. Mass out 100.0 mL of distilled water
 - a. mass the empty can
 - b. carefully measure 100.0 mL of distilled water using the graduated cylinder
 - c. pour the water into the can using the funnel
 - d. mass the can with the water
4. Mass the candle and the index card
5. Set up the experiment
 - a. place the index card on the base of the ringstand
 - b. place the candle on the index card
 - c. put the iron ring on the ringstand
 - d. hang the can on the iron ring by threading the stirring rod through the can's tab
 - e. position the can 5 cm (2") above the top of the candle
 - f. insert the digital thermometer into the rubber stopper
 - g. clamp the digital thermometer to the ring stand
 - h. move the digital thermometer until it is in the water as far as possible without touching the bottom
6. Take the temperature of the water in the can (making sure the thermometer is not touching the metal can at all)
7. Light the candle
8. Heat the water for 10 minutes
9. Blow out the candle
10. Continue to watch the thermometer for the highest temperature.
11. Mass the candle and the index card
12. Clean up

Data:

Balance # _____

Mass of empty can _____ g

Mass of can + 100.0 mL of water _____ g

Mass of candle + index card before lighting _____ g

Starting temperature of water (before heating) _____ °C

Highest temperature of water during/after heating _____ °C

Mass of candle + index card after burning _____ g

Observations and sketch of set-up:

Calculations:

- 1) How many joules of heat energy were absorbed by the water during the experiment?

$q =$ _____

$c =$ _____

$m_{\text{water}} =$ _____

$T_{\text{final}} =$ _____

$T_{\text{initial}} =$ _____

$\Delta T =$ _____

- 2) Use dimensional analysis to convert your answer to question #1 to kilojoules.

_____ $\left(\frac{\text{_____}}{\text{_____}} \right)$

- 3) How many grams of the candle were burned during the experiment? (show subtraction)

- 4) Calculate the number of kilojoules of heat energy per gram of candle burned by dividing your answer to question #2 by your answer to question #3.

- 5) List three variables that could have affected your results.

- 6) Was a control group needed for this experiment? If so, what should it have been, and why was one needed? If one was not needed, why not?