

Heat and Temperature Lab

Name: _____ Per: ___ EN: ____

Temperature is the measure of the average kinetic energy of the particles in a sample. It is measured with a thermometer. The most commonly used units of temperature are °Celsius or °Fahrenheit, although Kelvin is also useful.

Heat is the total quantity of thermal energy in a sample. It depends upon both mass and temperature. Heat is commonly measured in calories. A calorie is the heat needed to raise the temperature of 1 gram of water 1° Celsius.

Heat (calories) = Mass (grams) x temperature (°C) x specific heat $Q = m\Delta TC$

Read through the entire lab to predict which beaker will have the greatest heat, then make your prediction.

Hypothesis:

If _____ then _____
because _____.

Materials:

2 Beakers (250 mL)
hot plate

Celsius Thermometer
Beaker Tongs

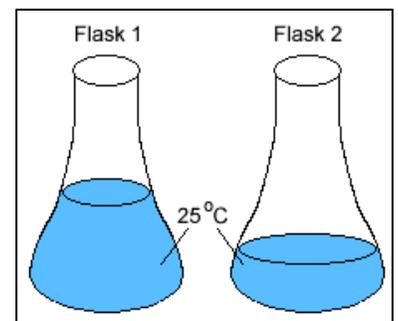
Safety Goggles
Clock or Timer

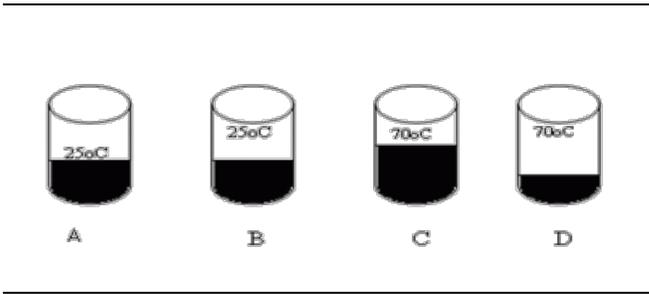
1. Pour 50 mL of cool tap water into one beaker and 200 mL of water into the second.
2. Record the initial (starting) metric temperatures of both beakers below. (They should be equal.) Be sure not to let the thermometer touch the glass of the beaker since you want the temperature of the water only.
3. Heat the first beaker for exactly one minute. Don't turn off or adjust the heat while you record the final temperature of the first beaker at level 10.
4. Heat the second beaker 1 minute at the same heat (level 10) and record the data below.

	Mass of Water	Heating Time	Starting Temp.	Final Temp.	Temp. Change	Ratio
Beaker 1						
Beaker 2						

- A. Which beaker had the greater temperature change? _____
- B. Which one had the greater mass of water? _____
- C. Which one had the most heat energy added by the flame? _____
- D. Is the relationship between the mass of an object being heated and its change in temperature, Direct or indirect? _____
- E. To the right, which container has the higher temperature? _____
- F. To the right, which container has more heat energy? _____
- G. Why does flask 2 have more heat energy?

H. The units for heat energy are _____ and the units for temperature are _____.





I. To the left, identify which beaker contains the most heat?
Explain:

J: To the left, identify which beaker with the lowest temperature? Explain:

K. Modeling: Draw a diagram that illustrates the main point of this activity.

L. Design your own question and protocol using the materials available at the counter about the specific heat of different solutions. Ex. sugar water, starch water, salt water....

Question: _____?

Hypothesis:

If _____ then _____
because _____.

	Mass of Water	Heating Time	Starting Temp.	Final Temp.	Temp. Change	Ratio
Beaker 1						
Beaker 2						

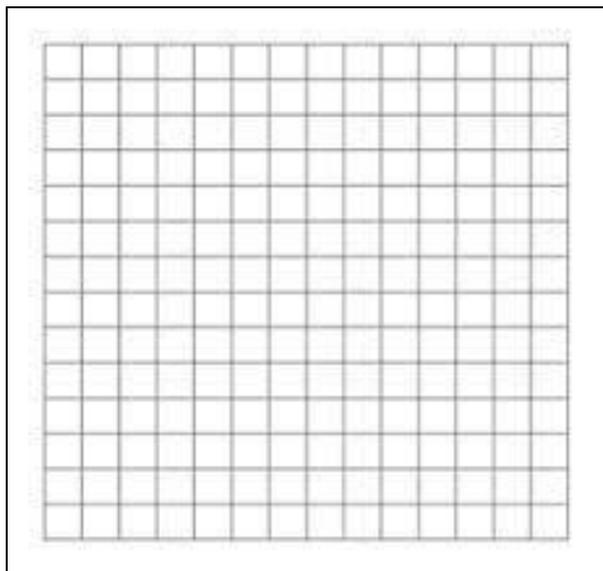
Claim: _____

Evidence: _____

Class results:

Substance							
Ratio							

Graph the rates of heating per solution:



Temperature (which measures average kinetic energy of the molecules) can be measured using three common scales: Celsius, Kelvin and Fahrenheit. We use the following formula to convert from one scale to another. Celsius is the scale most desirable for laboratory work. Kelvin represents the absolute scale. Fahrenheit is the old English scale which is never used in lab.

$$^{\circ}\text{C} = \text{K} - 273$$

$$\text{K} = ^{\circ}\text{C} + 273$$

$$^{\circ}\text{F} = 9/5(^{\circ}\text{C}) + 32$$

$$^{\circ}\text{C} = 5/9(^{\circ}\text{F} - 32)$$

Complete the following chart. All measurements are good to 1°C or better.

	$^{\circ}\text{C}$	K	$^{\circ}\text{F}$
1	0°C		
2			212°F
3		450 K	
4			98.6°F
5	-273°C		
6		294 K	
7			77°F
8		225 K	
9	-40°C		