Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Lab # Determining the Specific Heat of a Metal**

**PURPOSE:** To determine the specific heat of an unknown metal.

**INTRODUCTION:**

Your group will be using a calorimeter to measure the change in temperature of a sample of water with a known mass. The water will be changing temperature due to the addition of the unknown metal that will be at a temperature of 100. °C. The heat for the metal will be released into the water until the metal and water reach the same temperature. **The heat lost by the metal will be equal to the heat gained by the water.**

**PROCEDURE:**

1. Weigh the mass of an empty calorimeter (Styrofoam cup) and record the mass on your data table.
2. Fill the cup approximately half way with water and record this as mass of calorimeter and water
3. Determine the temperature of the water and record as initial water temperature.
4. Record the mass of the calorimeter, water and 200.g brass weight.
5. The initial temperature of the brass weight is on your data table. **(*The brass weight was just removed from a beaker of boiling water.)***
6. Monitor temperature in your calorimeter until the temperature remains constant. Record this as the final water and brass temperature.

**DATA TABLE:** Complete the data table using the information gathered in the procedure. One has been done for you. All boxes in the data table must be used.

|  |  |
| --- | --- |
| Mass empty calorimeter |  |
|  |  |
|  |  |
|  |  |
|  |  |

**CALCULATIONS:** Show work and be attentive to units and significant figures. Calculate each of the following.

1. The mass of the unknown metal sample (label mm)
2. The mass of the water sample (label mw)
3. The change in temperature for the metal sample (label as Δtm)
4. The change in temperature of the water sample (label as Δtw)
5. The heat energy gained by the water (label as Qw and use mw and Δtw)
6. The specific heat of the unknown metal (use Qw, mm and Δtm). You are using Qw since the heat lost by the metal = heat gained by the water.

**QUESTIONS:**

1. What was the purpose of heating the brass weight to 100°C before placing it in the calorimeter?
2. How would using a “real calorimeter” give more accurate results?
3. Define specific heat capacity:
4. Calculate the amount of heat needed to heat 30.0 grams of aluminum from 25.0°C to 47.5°C. The specific heat of aluminum is 0.899 J/g°C.

1. Assume the same amount of heat energy as calculated in question #1 was used to heat a 30.0 gram sample of water that was initially at 25.0°C. Would you expect the final temperature of the water to be less than, equal to, or greater than 47.5°C. Explain.

1. An 18.6 gram sample of water at 35.5°C absorbs 3750 Joules of heat energy. Determine the final temperature of the water.

1. Describe the difference between heat and temperature.