Chemistry/ Block 2

10/27/08

**Title**: Using the change of temperature from water and the mystery metal as well as the mass of the water and metal to find the specific heat of the mystery metal though proportionalities in the total amount of energy gained/absorbed equation

**Purpose**: The purpose of this lab was to find the specific heat of each of the mystery metals by using our knowledge of energy transfer.

**Hypothesis**: IF we place each individual metal that has been heated to boiling temperature into water that is at room temperature then we can affirm that there would be a change in temperature because heat energy flows from high temperature to low temperature.

**Materials**:

4 Styrofoam cups

4 mystery metals

Thermometer

Graduated Cylinder

Tongs

2 beakers with 400 mL of water at room temperature

*Metals*:

Gold Colored = Metal A

Brown Colored = Metal B

Copper Colored = Metal C

Silver Colored = Metal D

**Procedure**:

First, we weighed the first metal, which was Metal A, in order to find its mass. Second, we took one beaker and heated the 400 mL of water with the first mystery metal at the water’s boiling point; the metal was heated with the water because the temperature should be equally balanced between both substances, so they would both be the same temperature at the end. We heated both the water and the metal at boiling point because we wanted the boiling point to be the initial temperature of the metal, in order to use in our change in temperature portion of our energy transfer equation. Next, once the water and metal were at a boiling point of about 100̊ Celsius we removed the metal from the water and placed it into a Styrofoam cup containing 100 mL of room temperature water. Then, we took the temperature of the water and the metal in the Styrofoam cup; this was done in order to find the final temperature. Afterwards, we repeated each of the mentioned steps for each metal.

Our final step was to solve for each metal’s specific heat, which is given in “Data and Calculations.” In order to solve for each metal’s specific heat, we first solved for the water that we used energy absorbed/released: by multiplying its mass (mwater) by its change in temperature

(∆Twater) and it’s specific heat, which we knew from a previous lab. Then, tried solving for the metals specific heat by using proportions between the two equations because we knew if they had the same temperature, they would also have the same amount of energy released/absorbed as a total substance. Our equation for the specific heat of the metals (Cpmetal) came out as: energy released/absorbed by water (qwater) divided by the metals mass (mmetal) times the metals change in temperature, which was the same as the water’s change in temperature (∆Tmetal).

**Data and Calculations**:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Mystery Metals | Mass of Metals | Mass of Water | Initial Temperature | Final Temperature | Change in Temperature | Specific Heat of Metals |
| Metal A | 53.87 g | 100 g | 100.0̊ C | 27.0̊ C | 73.0̊ C | 7.8 J/ ̊C |
| Metal B | 48.96 g | 100 g | 101.1̊ C | 27.9̊ C | 73.2̊ C | 8.5 J/ ̊C |
| Metal C | 55. 97 g | 100 g | 101.3̊ C | 27.6̊ C | 73.3̊ C | 7.5 J/ ̊C |
| Metal D | 17.26 g | 100 g | 102.0̊ C | 26.1̊ C | 75.9̊ C | 24.2 J/ ̊C |

*Equation*:

(M) ∙ (∆t) ∙ (Cp) = (M) ∙ (∆t) ∙ (4.184)

Mass of Change specific mass of change specific

Metal in temp. heat water in temp. heat

Of metal of metal of water of water

Therefore:

qwater

\_\_\_\_\_\_\_\_\_\_\_\_\_ = Cpmetal

Mmetal \* ∆Tmetal