# Calorimetry Basics Worksheet

## Data and Calculations Table

| | Trial 1 | Trial 2 | Trial 3 |
|---|---|---|---|
| **Mass of Metal Shot Used, $m_{metal}$ (g)** | | | |
| **Mass of Dry Calorimeter (g)** | | | |
| **Mass of Calorimeter Plus Water (g)** | | | |
| **Mass of Water, $m_{water}$ (g)** | | | |
| **Specific Heat of Water (J/g °C)** | 4.184 | 4.184 | 4.184 |
| **Initial Temperature of Water in Calorimeter, $T_{water}$ (°C)** | | | |
| **Initial Temperature of Heated Metal Shot, $T_{metal}$ (°C)** | | | |
| **Final Temperature of Mixture, $T_{mixture}$ (°C)** | | | |
| **Temperature Change of Water, $\Delta T_{water}$ (°C)** | | | |
| **Temperature Change of Metal Shot, $\Delta T_{metal}$ (°C)** | | | |
| **Heat Energy Gained by Water (J)** | | | |
| **Specific Heat of Metal (J/g °C)** | | | |
| **Average Specific Heat of Metal (J/g °C)** | | | |
| **Literature Value for the Specific Heat (J/g °C)** | | | |
| **Percent Error (%)** | | | |
| **Identity of Unknown Metal** | | | |

# Post-Lab Questions and Calculations

*Show work for all three trials below. Use a separate sheet of paper if additional space is necessary.*

1.  Calculate the

    *a.* mass of the water by subtracting the mass of the dry calorimeter from the mass of the calorimeter plus water. Record this mass as $m_{water}$ in the Data Table.

    *b.* temperature change of the water , $\Delta T_{water}$, by subtracting the initial temperature of the water from the final temperature of the mixture. Record this temperature change in the Data Table. Be sure to include the correct sign with your answer.

    *c.* temperature change of the metal, $\Delta T_{metal}$, by subtracting the initial temperature of the metal shot from the final temperature of the mixture. Record this temperature change in the Data Table. Be sure to include the correct sign with your answer.

2.  Use Equation 3 to calculate the heat energy gained by the water. Record this value in the Data Table.

3.  Use Equations 4 and 5 to calculate the specific heat of the unknown metal in J/g °C. Record this value in the Data Table.

4.  Determine the average specific heat of the unknown metal by averaging the three trials. Record this value in the Data Table. (*Note:* If one of the trials is significantly different, omit this value when determining the average. If time permits, perform another trial.)

5.  Determine the identity of the unknown metal used by comparing the experimental specific heat value to the literature specific heat values listed in Table 1.

6.  Experimental procedures will no doubt lead to some degree of difference from the published literature value. Determine the percent error for specific heat for the metal used. This can be done by comparing the value obtained in the lab (experimental value) with the literature value. Use the equation for percent error below. Record this value in the Data Table.

$$\% \text{ Error } = \frac{|\text{ Experimental value } - \text{ Literature value }|}{\text{Literature value}} \times 100\%$$

7.  Compare the experimental and literature specific heat values. How do they compare?

8.  Suggest possible reasons for discrepancies between the experimental and literature values.