**Calorimetry**

**Measuring quantities of heat is called calorimetry.** **We can measure heat energy by measuring the temperature change it produces in a reference material, which is almost always water**.

One of the major uses of calorimetry is to measure specific heats of metals. Specific heats are useful for engineers and manufacturers. This use of calorimetry is based upon the **law of conservation of energy – energy is neither created nor destroyed but can be transformed from one form to another.** In this application, **hot metal is added to cold water in an insulated container called a calorimeter. Heat flows from the hot metal to the cold water. Thermal equilibrium is when the two objects reach the same final temperature. The heat lost by the hot metal is gained by the cold water as they come to the same final temperature.** If you measure the temperature changes you can calculate the heat gained by the water and thus the heat lost by the metal, and finally can calculate the specific heat of the metal.

1. A 175 gram sample of a metal at 93.50C was added to 105 grams of water at 23.50C in a perfectly insulated container. The final temperature of the water and metal was 33.80C. Calculate the specific heat of the metal in J/g0C.
2. A 185 gram sample of copper at 98.00C was added to 102 grams of water at 20.00C in a perfectly insulated calorimeter. The final temperature of the copper-water mixture was 31.20C. Calculate the specific heat of copper using this data.

1. A chemistry student added 225 grams of aluminum at 85.00C to 115 grams of water at 23.00C in a perfect calorimeter. The final temperature of the aluminum-water mixture was 41.40C. Use the student’s data to calculate the specific heat of aluminum in joules/gram0C.

1. A student was given a sample of a silvery gray metal and told that it was either bismuth, specific heat 0.122 J/g0C, or cadmium, specific heat 0.232 J/g0C. The student measured out a 250 gram sample of the metal, heated it to 96.00C and then added it to 98.5 grams of water at 21.00C in a perfect calorimeter. The final temperature in the calorimeter was 30.30C. Use the student’s data to calculate the specific heat of the metal sample.