

## HOW DOES A CALORIMETER WORK?

**Materials:** Hot plate, beaker, tongs, metal cylinder, calorimeter, thermometer, graduated cylinder

**Procedure:**

1. Find and record the mass of an aluminum cylinder.
2. Place 100 ml of tap water in the calorimeter.
3. Find and record the temperature of the water in the calorimeter.
4. Place a beaker of water on the hotplate and turn it on to high.
5. When the water is boiling place the cylinder into the beaker with the tongs. (DON'T JUST DROP IT, YOU CAN BREAK OUT THE BOTTOM OF THE BEAKER)
6. Let the metal sit in the boiling water for 5 minutes.
7. Remove the metal cylinder from the water with the tongs and quickly drop the metal into the calorimeter, close the lid, and slide the thermometer through the hole.
8. Wait until the temperature of the water stops rising and record the final temperature of the metal and water (It won't be a huge jump in temp, so take accurate measurements before & after).

**Results:**

**Part A**

SURROUNDINGS		SYSTEM	
Water		Aluminum	
<b>Mass<sub>H2O</sub></b>		<b>Mass<sub>Al</sub></b>	
<b>T<sub>INITIAL</sub> of H2O</b>		<b>T<sub>INITIAL</sub> of Al</b>	
<b>T<sub>FINAL</sub> of H2O</b>		<b>T<sub>FINAL</sub> of Al</b>	
<b>ΔT<sub>H2O</sub></b>		<b>ΔT<sub>Al</sub></b>	
<b>ΔH<sub>H2O</sub>=mCΔT</b>		<b>ΔH<sub>Al</sub> = -ΔH<sub>H2O</sub></b>	

1. Did the water gain or lose energy? Did the cylinder gain or lose energy after being transferred to the calorimeter?
2. Knowing that the energy transferred to the water is equal but opposite to the energy transferred by the cylinder, calculate the specific heat of aluminum.
3. Look up the specific heat of Aluminum on the internet in J/g°C and compare your calculated specific heat with this equation:

$$\text{Percent error} = \frac{|\text{actual value} - \text{experimental value}|}{\text{actual value}} \times 100$$

**Part B:**

On the back of this sheet; using a similar procedure and similar calculations; design and perform an experiment to find and calculate the specific heat of a cylinder of an unknown metal.

1. Locate a table of specific heats of metals and try to identify which metal is in your cylinder
2. Could specific heats be used to accurately identify unknown substances?