7 • Thermochemistry

Introduction
Every substance has a particular specific heat, which is its resistance to changing its temperature. Objects with higher specific heat values require more energy to change their temperature. We can use calorimetry (the measure of heat) to determine the specific heat of an object.

In an isolated system, energy is conserved; that is, energy is neither lost nor gained. Heat is the energy that is transferred from a hot object to a cold object, and the temperatures of the objects change until their temperatures are equal (or the objects are in thermal equilibrium).

When heat is transferred, the amount of energy lost by the hot object is the same amount that is gained by the cold object. We can calculate the amount of heat that is lost or gained with the following formula:

\[ q = m \cdot C \cdot \Delta T \]

where \( q \) is the heat in J, \( m \) is the mass of the object in g, \( C \) is the specific heat in J/g °C, and \( \Delta T \) is the change in temperature (\( T_{\text{final}} - T_{\text{initial}} \)) in °C. The sign of \( q \) gives the direction of heat transfer: if \( q > 0 \), energy is absorbed by the object, and if \( q < 0 \), energy is released from the object.

Beginning Question
What is the specific heat of aluminum?

Procedures
These are the materials and equipment available to you:

- Aluminum slab in boiling water
- ~ 150 mL cold water
- Electronic Balance
- Tongs
- Foam Cup
- 100 mL graduated cylinder
- Temperature Probe

You are also given that the density of water is 1.0 g/mL, and the specific heat of water is 4.184 J/g °C.

- Design a procedure to determine the specific heat of aluminum. Write the steps you performed.
Data Table
- What measurements will you need to take? Create a Data Table based on your procedures to record your measurements.

Discussion
1. Draw a pictorial representation of the heat transfer that takes place in the experiment.

2. What is your experimental value for the specific heat of aluminum? Show all your work.

3. The accepted value for the actual specific heat of aluminum is: ________________
   Find the % error of your experimental value.

4. Reflect on this activity. State what was easy or difficult about this activity, how you felt while doing it, what worked/didn’t work, or what you would do differently next time.