Calorimetry is the measurement of the heat flow into or out of a system for chemical and physical processes.

- The insulated device used to measure the absorption or release of heat in chemical or physical processes is called a **calorimeter**.

Constant-Pressure Calorimeters

The **enthalpy** (*H*) of a system accounts for the heat flow of the system at constant pressure.

- The heat absorbed or released by a reaction at constant pressure is the same as the change in enthalpy, symbolized as ΔH.

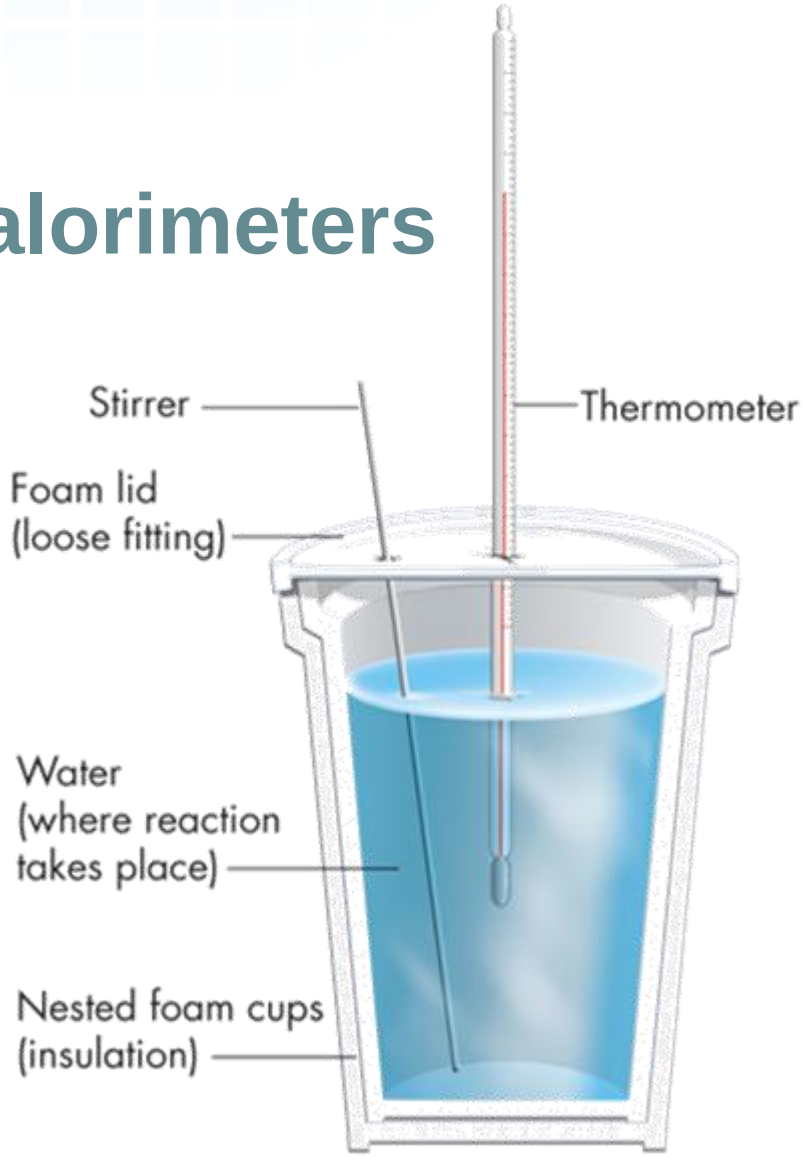
Constant-Pressure Calorimeters

The value of ΔH of a reaction can be determined by measuring the heat flow of the reaction at constant pressure.

- In this textbook, the terms *heat* and *enthalpy change* are used interchangeably.
- In other words, $q = \Delta H$.

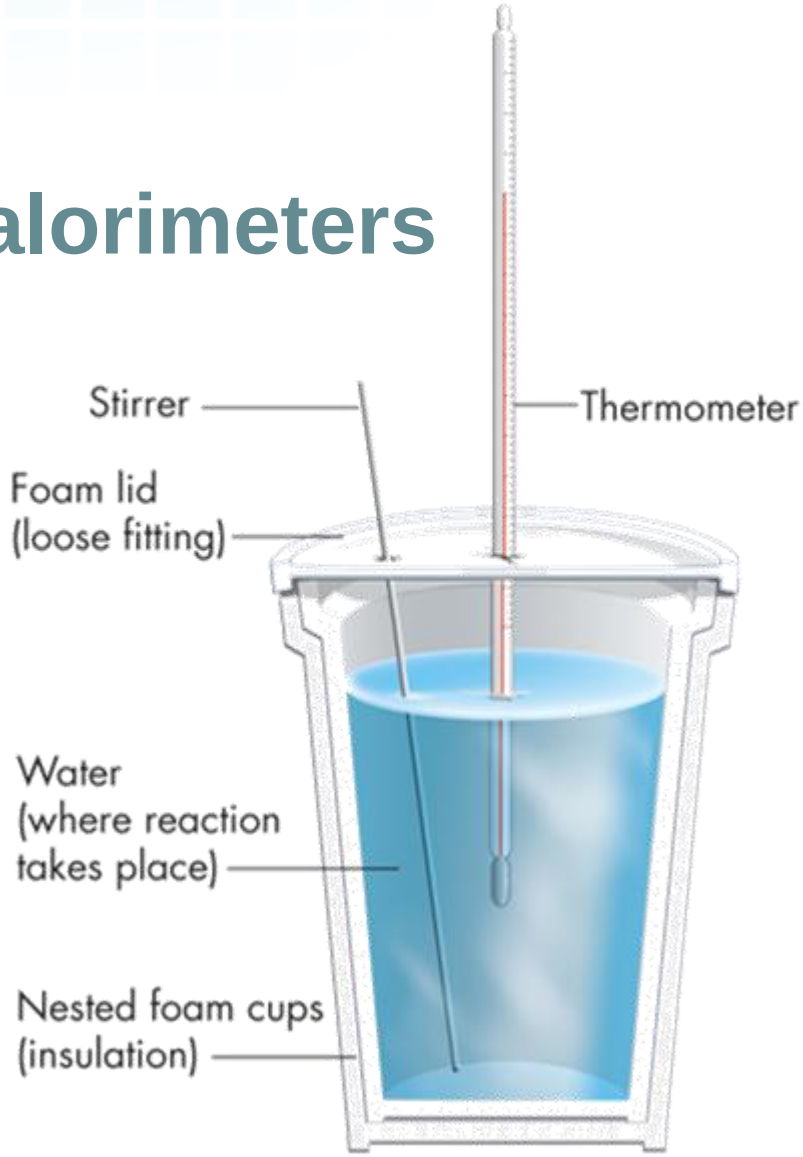
Constant-Pressure Calorimeters

- To measure the enthalpy change for a reaction in aqueous solution in a foam cup calorimeter, dissolve the reacting chemicals (the system) in known volumes of water (the surroundings).



Constant-Pressure Calorimeters

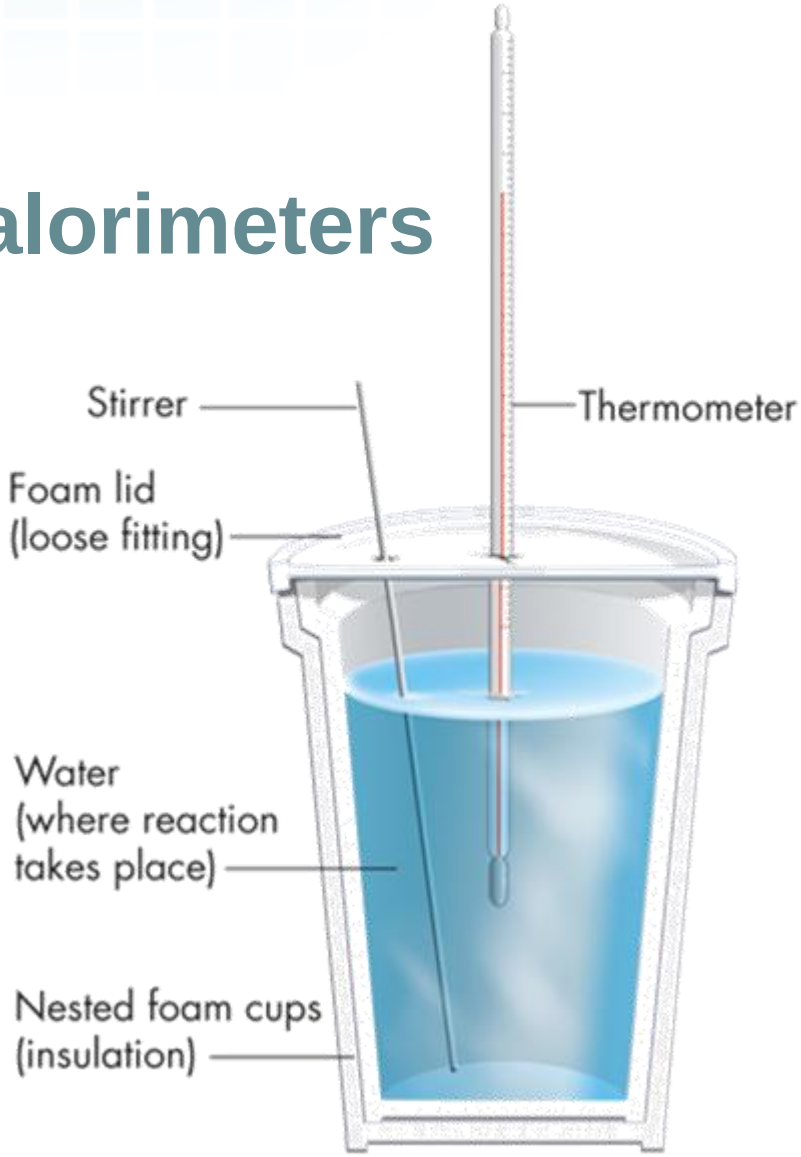
- Measure the initial temperature of each solution, and mix the solutions in the foam cup.
- After the reaction is complete, measure the final temperature of the mixed solutions.



Constant-Pressure Calorimeters

You can calculate the heat absorbed or released by the surroundings (q_{surr}) using the formula for the specific heat, the initial and final temperatures, and the heat capacity of water.

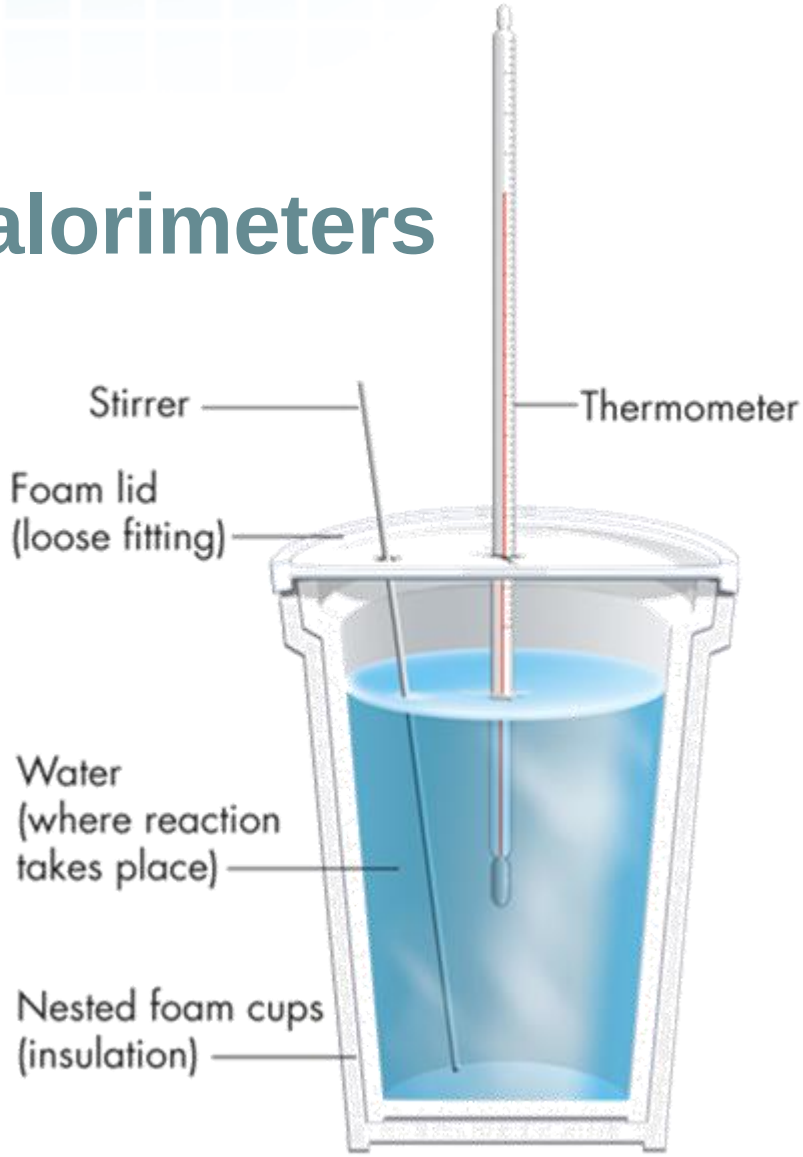
$$q_{surr} = m \times C \times \Delta T$$



Constant-Pressure Calorimeters

$$q_{surr} = m \times C \times \Delta T$$

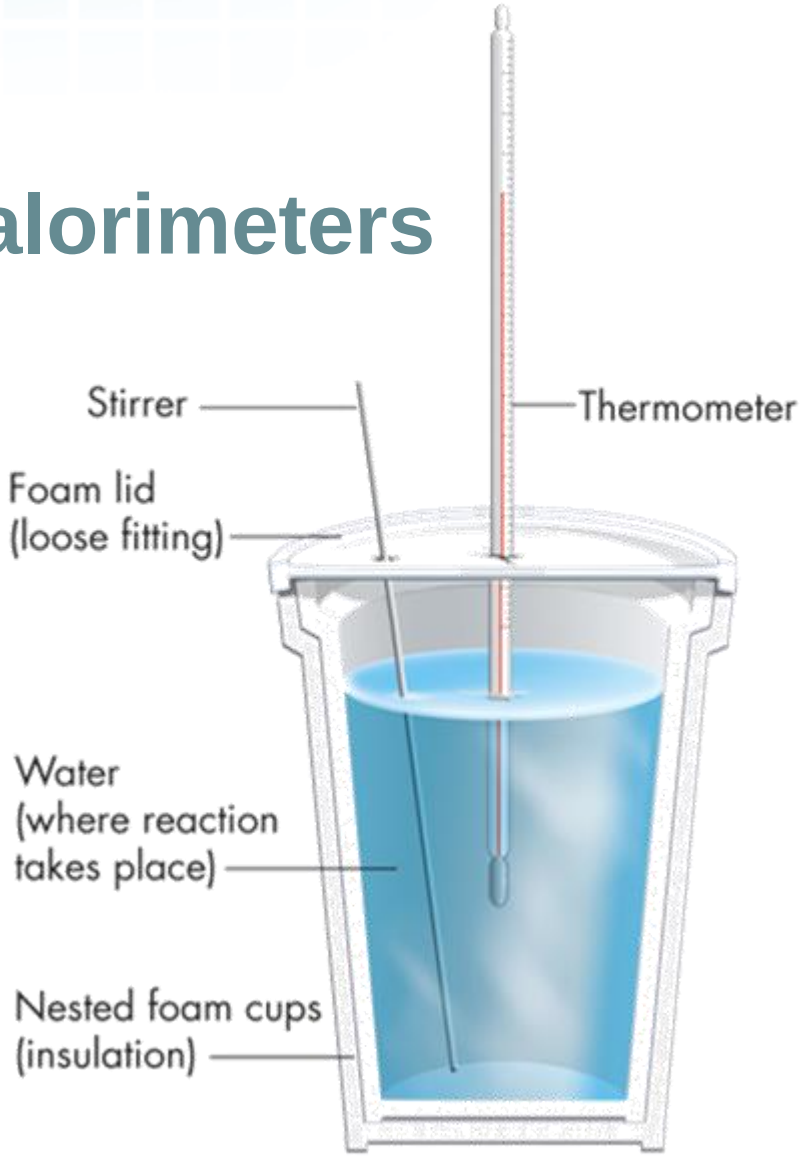
- m is the mass of the water.
- C is the specific heat of water.
- $\Delta T = T_f - T_i$



Constant-Pressure Calorimeters

The heat absorbed by the surroundings is equal to, but has the opposite sign of, the heat released by the system.

$$q_{surr} = -q_{sys}$$



Constant-Pressure Calorimeters

The enthalpy change for the reaction (ΔH) can be written as follows:

$$q_{sys} = \Delta H = -q_{surr} = -m \times C \times \Delta T$$

- The sign of ΔH is positive for an endothermic reaction and negative for an exothermic reaction.