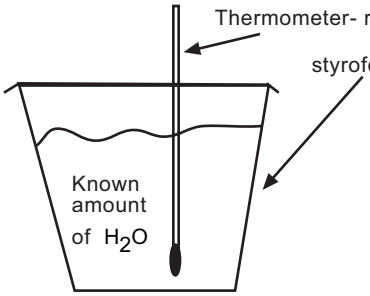
Thermochemistry: Calorimeter: Student Review Notes

A **Calorimeter** is an apparatus used to make accurate thermochemical measurements. It measures the flow of energy in the form of heat.

It contains a known capacity of a substance to absorb the heat energy (typically water).

The outside walls are insulated to eliminate the exchange of heat with the surroundings.

"Coffee-Cup" Calorimeter:



Equations used: $q_{water} = (m_{water})(S_{water})(\Delta T_{water})$

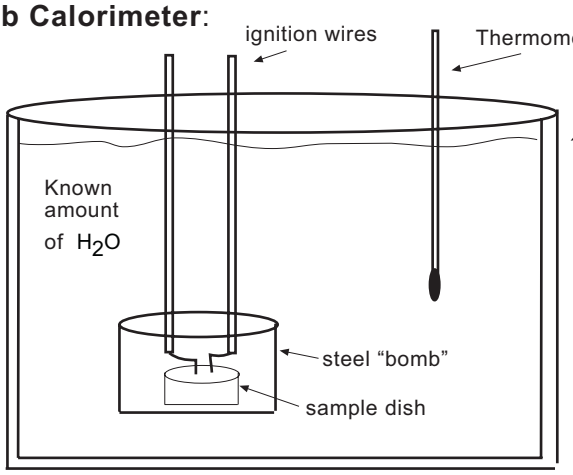
- q_{water}: heat absorbed by the water
- m_{water}: mass water
- S_{water}: specific heat water (4.184 j/g)
- ΔT_{water}: temperature change water

and

$$\Delta H = -q_{water}$$

Be very careful to understand the relationship between the sign of q_{water} and the heat of reaction. If the the temperature of the water increases, q_{water} will be positive, it has gained energy but from the point of view of the reaction, energy has been lost so ΔH will be negative and visa-versa.

Bomb Calorimeter:



Add a known amount of reactants to the sample dish
Add a known mass of water
Record the initial temperature
Ignite to start the reaction
Record the highest temperature reached
calculate ΔH_{rxn}

For a bomb calorimeter, you need to account for the heat absorbed by the water and the internal metal parts

$$q_{rxn} = -q_{calorimeter}$$

$$q_{rxn} = -(q_{water} + q_{metal})$$

$$q_{water} = (m_{water})(S_{water})(\Delta T_{water})$$

$$q_{metal} = (m_{metal})(S_{metal})(\Delta T_{metal})$$

$$q_{rxn} = -((m_{water})(S_{water}) + (m_{metal})(S_{metal}))(\Delta T)$$

This is defined as the Heat Capacity, C of the calorimeter

$$q_{rxn} = -C\Delta T$$

Remember that q_{rxn} measured this way is proportional to the amound of reactant used.