CHEM 101

Thermochemistry

Notes by: Jahvea Marston

University at Buffalo

Chapter 5

Energy: the ability to transfer heat or do work.

Energy used to cause the temperature of an object to rise is called heat (q)

Energy used to cause an object that has mass to move is called work (w)

$$\Delta E = q + w$$

First Law of Thermodynamics

Conservation of Energy

- Energy cannot be created nor destroyed
  - The total energy of the universe is constant

The system includes the molecules we want to study

The surroundings are everything else.

State Functions

The internal energy of a system is independent of the path by which the system achieved that state.

- ΔE depends only on $E_{initial}$ and E_{final}

Heat

Energy can also be transferred as heat

Heat flow from warmer objects to cooler objects.

Enthalpy: the heat content of a substance

Also a state function

- ΔH

Enthalpy of Reaction

The changes in enthalpy, ΔH, is the enthalpy of the products minus the enthalpy of the reactants:

$$\Delta H = H_{products} - H_{reactants}$$

$$\Delta H = H_{initial} - H_{final}$$

Units of Energy

The SI unit of energy is the joule (J):

$$1\ J = 1\ \frac{kgm^2}{s^2}$$

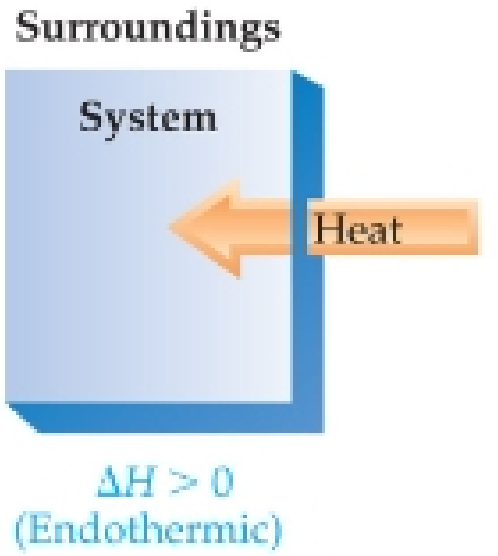
An older, non-SI unit is still in widespread use, the calorie (cal):

$$1\ cal = 4.184\ J$$

Exchange of Heat between System and Surroundings

When heat is absorbed by the system from the surroundings, the process is endothermic, $q > 0$.

ΔH is + (positive)



When heat is released by the system into the surroundings, the process is exothermic, $q < 0$:

ΔH is − (negative)