Gibb's Free energy:

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The Gibbs free energy of a system at any moment in time is defined as the enthalpy of the system minus the product of the temprature times the entropy of the system

$$\boxed{G = H - TS}$$

G = Gibbs free energy. (KJ mol^{-1})
H = heat of combustion, ethalpy (KJ mol^{-1})
T = Temprature (kelvin)
S = entropy (J°K^{-1})

The change in the Gibbs free energy of the system that occurs during a reaction is therefore equal to the change in the enthalpy of the system minus the change in the product of the temprature times the entropy of the system

$$\boxed{\Delta G = \Delta H - \Delta(TS)}$$

If the reaction is run at constant temprature. this equation can written as follows

$$\boxed{\Delta G = \Delta H - T\Delta S}$$

If ΔG is less than 0 ($\Delta G < 0$) for any reaction, reaction will be favorable or spontaneous and if $\Delta G > 0$ reaction will be unfavorable or non-spontaneous.

Spontaneous chemical reactions:

A spontaneous reaction is a reaction that favors the formation of products at the conditions under which the reaction is occuring. The entropy of the system increases during a combustion reaction. The combination of energy decreases and entropy increases dictates that combustion reactions are spontaneous reactions.

In other words entropy can be difined as for a ~~[illegible]~~ reversible change taking place at a fixed temprature (T), the change in entropy (ΔS) is equal to heat energy absorbed or evolved divided by the temprature T. That is

$$\boxed{\Delta S = \frac{q}{T}}$$

If heat is absorbed, then ΔS is positive and there will be increase in entropy. If heat is evolved ΔS is negative and there is a decrease in entropy. The unit of entropy is calories per degree per mole i.e cal $mol^{-1} K^{-1}$ ~~[illegible]~~ and in SI unit it is Joules per mole per degree i.e $J mol^{-1} K^{-1}$.

Enthalpy

The total heat content of a system at constant pressure is equivalent to the internal energy E plus the PV energy. This is called enthalpy of the system and is represented by the symbol H.

$H = E + PV$ where E = internal energy
P = Pressure
V = volume

If ΔH be the difference of enthalpy of a system in final state (H_2) and in the initial state (H_1).

$$\Delta H = H_2 - H_1$$

$$\Delta H = (E_2 + P_2V_2) - (E_1 + P_1V_1)$$

$$\Delta H = (E_2 - E_1) + (P_2V_2 - P_1V_1)$$

$$\Delta H = \Delta E + \Delta PV$$ If P is constant while gas is expanding

$$\boxed{\Delta H = \Delta E + P\Delta V}$$