

Chapter 19 (+ 6) Thermodynamics

Concepts:

- enthalpy H , entropy S , Gibbs free energy, G
- sign conventions for ΔH , ΔS , ΔG
- state function
- elements in standard state ΔH_f° , $\Delta G_f^\circ = 0$
- meaning of ΔH_f° and ΔG_f°
- 3 Laws of Thermodynamics
- exothermic vs endothermic
- spontaneous vs nonspontaneous
- relationship between ΔG , ΔH , ΔS (table)
- equilibrium ($\Delta G = 0$)

Calculations

- Hess' Law: $\Delta H = \sum n \Delta H_f^\circ \text{ prod} - \sum n \Delta H_f^\circ \text{ react}$
use for ΔS , ΔG

- heat Q mass (Q is directly proportional to)

- $\Delta S_{\text{surroundings}} = - \frac{\Delta H_{\text{sys}}}{T(K)}$

- $\Delta S_{\text{universe}} = \Delta S_{\text{system}} + \Delta S_{\text{surroundings}}$

- $\Delta G = \Delta H - T \Delta S$
(kJ) (kJ) (K) (J/K)

Phase Changes
have $\Delta G = 0$

- at equil, $\Delta G = 0 \Rightarrow T_{\text{eq}} = \frac{\Delta H}{\Delta S}$ watch units!