59-240 Lecture 8 Thermochemistry

- Chemical reactions
  - exothermic, $q < 0$
  - endothermic, $q > 0$
  - also described in terms of ΔH
- Standard Enthalpy Changes
  - $\Delta_{rxn}H^{o}$
  - standard states
    - pure substance
    - 1 bar
    - 298 K
- Standard Enthalpies associated with Phase Transitions
  - $\Delta_{trs}H^{o}$
    - melting/freezing
    - boiling/condensing
    - sublimation
- Enthalpies of Processes
  - phase transitions
  - mixing/solution
  - hydration
  - atomization
  - redox chemistry
  - reaction
  - combustion
  - formation
  - activation
- Standard Reaction Enthalpies
  - $\Delta_{rxn}H^{o}$
  - $\Delta_r H^\circ = \sum_{\text{products}} \nu H^\circ_m - \sum_{\text{reactants}} \nu H^\circ_m$
  - Hess' Law
- Standard Formation Enthalpies
  - $\Delta_f H^{o}$
  - reference states
    - stable form of element
    - 1 bar
    - specified T
- Kirchoff's Law
  - $\Delta_r H^\circ(T_2) = \Delta_r H^\circ(T_1) + \int_{T_1}^{T_2} \Delta_r C_p^\circ \, dT$
  - $\Delta_r C_p^\circ = \sum_{\text{products}} \nu C^\circ_{p,m} - \sum_{\text{reactants}} \nu C^\circ_{p,m} = \sum_{J} \nu_J C^\circ_{p,m}(J)$