5.3 Representing Enthalpy Change

Method 1: Thermalchemical Equations with Energy Terms

- Enthalpy change is included in the balanced chemical equation.
- Energy on reactant side if the reaction is endothermic.
- Energy on product side if the reaction is exothermic.
- E.g. $H_2O_{(l)} + 285.8\ kJ \rightarrow H_{2(g)} + \frac{1}{2}O_{2(g)}$ (endothermic)
  $H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)} + 285.8\ kJ$ (exothermic)

Method 2: Thermalchemical Equations with Δ H Values

- Enthalpy change is outside the balanced chemical equation.
- ΔH is negative for exothermic reactions
- ΔH is positive for endothermic reactions

E.g. $H_2O_{(l)} \rightarrow H_{2(g)} + \frac{1}{2}O_{2(g)}$ $\Delta H = +285.8\ kJ$ (endothermic)
$H_{2(g)} + \frac{1}{2}O_{2(g)} \rightarrow H_2O_{(l)}$ $\Delta H = -285.8\ kJ$ (exothermic)

Note that the units are kJ not kJ/mol – this is because the enthalpy change applies to the reactants and products as written. Per mole $H_2O_{(l)}$ in equation 1 and per mole $H_{2(g)}$ in equation 2.

If equation 2 were rewritten:
$2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(l)}$ then $\Delta H = -571.6\ kJ$

Method 3: Molar Enthalpy of Reaction

- In this method, ΔH_x, the energy change associated with the reaction of one mole of a substance.
- $\Delta H°_x$ the energy change associated with the reaction of one mole of a substance at 100kPa and a specified temperature. (In the textbook it will always be SATP so you can interchange the 2 values)
- E.g. $\Delta H_{decomposition}$ of $H_2O_{(l)} = +285.8\ kJ$
  $\Delta H_{formation}$ of $H_2O_{(l)} = -285.8\ kJ$

Method 4: Potential Energy Diagram: See diagrams page 318

Homework

- Practice 1,2,3,4,5 and Questions 1,2,3,4