CHM 161 – Chemistry for the Life Sciences
Study Guide for Exam III - 2012

Worked example = w.e.

Chapter 6: Chemical reactions: Mole and Mass Relationships

Figure 6.2 (p. 167) summarizes conversions between moles and grams

- Mole to mole conversions (using balanced equations) *worked example* 6.5, *problems* 6.8, 6.9
- Mole to gram conversions (using molecular weights) *w.e.* 6.3,6.4,6.6,6.7; *problems* 6.5, 6.10, 6.11, 6.42, 6.44, 6.45, 6.49
- Gram to gram conversions (using both); *problems* 6.64,6.68

g reactant ----> mol reactant ----> mol product ----> g product

Chapter 7: Chemical Reactions: Energy, Rates and Equilibrium

7.3 – Exothermic and Endothermic Reactions ΔH

ΔH (enthalpy or heat) is negative (exothermic, heat is a product); ΔH is positive (endothermic, heat is a reactant); ΔH is measured in kcal/mol

Problems: Worked examples 7.1 and 7.2, 7.1a-b, 7.2a-b,

7.4 – Free Energy ΔG and Entropy ΔS

ΔG is negative (spontaneous reaction); ΔG is positive (non-spontaneous reaction)

$\Delta G = \Delta H - T\Delta S$ where T = temperature (degrees K) and S = entropy (cal/mol·K)

For an ideal reaction to be spontaneous, ΔG is negative, ΔH is negative and ΔS is positive.

w.e. 7.5, 7.6; *Problems*: 7.5b,c, 7.6, 7.7, 7.34, 7.42, 7.43,

7.5 – Reactions Rates

Reaction Energy Diagrams; activation energy

w.e. 7.7; *Problems*: 7.44, 7.45, 7.48

7.6 – Effects of Temperature, Concentration and Catalysts on Reaction Rates

Know the effects of these three parameters on a reaction. What is a catalyst (problem 7.48)?

7.7 – Reversible Reactions and Chemical Equilibrium

Define chemical equilibrium

7.9 – Le Chatelier's Principle

Effect on a reaction at equilibrium of *concentration change*, *temperature change*, *pressure change* (see Table 7.4, p. 203)

w.e. 7.10, *Problems*: 7.17, 7.62a,c, 7.63a,c, 7.64, 7.65, 7.68, 7.82a,c

Chapter 8: Gases, Liquids and Solids (mostly gases)

8.5 – Boyle's Law: Relation between Volume and Pressure (Temp. held constant)

$P_1V_1 = P_2V_2$ P and V are *inversely* proportional

w.e. 8.5, *Problems*: 8.8, 8.9 , 8.48, 8.49, 8.50

8.6 – Charles' Law: Relation between Volume and Temperature (Pressure held constant)

$V_1/T_1 = V_2/T_2$ V and T (degrees K)are *directly* proportional

w.e. 8.6, *Problems*: 8.11, 8.54, 8.55

8.7 – Gay-Lussac's Law: Relation between Pressure and Temperature

$P_1/T_1 = P_2/T_2$ P and T (degrees K) are *directly* proportional (Volume held constant)

w.e. 8.7, *Problems*: 8.12, 8.60, 8.61

8.8 – Combined Gas Laws: Relationship between Pressure, Volume and Temperature

$\mathbf{P_1V_1/T_1 = P_2V_2/T_2}$ *<u>If you learn this equation, you will know the previous three equations</u>*

w.e. 8.8, *Problems*: 8.13, 8.56, 8.62-64

8.9 – Avogadro's Law: Relation between Volume and Moles

$\mathbf{V_1/n_1 = V_2/n_2}$ V and number of moles (n) are *directly* proportional (P =1 atm, T = 273K)

w.e. 8.9, *Problems:* 8.15, 8.71, 8.72, 8.73

8.10 – Ideal gas law **PV = nRT** where **R** = 0.0821 when **P** is in atm; 62.4 when **P** is in mm Hg;

V = Liters; **n** = moles of gas, **T** is in degrees K

w.e. 8.10, 8.11; also *Problems*: 8.16, 8.17, 8.78, 8.80, 8.83. 8.84

8.11 – Partial Pressure and Dalton's Law:

$\mathbf{P_{total} = {}_{gas\ 1} + P_{gas\ 2} + P_{gas\ 3} \ldots}$

w.e. 8.12, *Problems*: 8.19, 8.20, 8.16, 8.88