CHEM 142 REVIEW GUIDE- CHAPTER 12: SOLUTIONS

Sections 12.1 - 12.4 (Tro, 2nd edition)

1. *Terminologies*: solution, solute, solvent, miscible (vs. immiscible) liquids, dissolution,

2. Know the common *types of solutions* and give examples of each (Table 12.1)

3. *Concepts*: Be able to explain the following:
   (a) Intermolecular forces (IMFs) of attractions that exist in solution and relative strengths

   (weakest) LDF < Dipole-dipole < H-bonding < Ion-dipole (strongest)
   Nonpolar Polar Polar Ionic

   (b) What types of molecules exhibit hydrogen-bonding in solution?
   (c) Effect of IMF on solubility - Given a solute and a solvent predict whether mixing will take place based on the general rule "Like dissolves like".
   NOTE: Do not just say "Benzene is more soluble in hexane, C_6H_{14}, than in water because like dissolves like, instead, say something like "Substances of similar polarity are likely to dissolve in each other due to similar IMFs. Thus, nonpolar benzene will dissolve better in a nonpolar solvent like hexane than in a polar solvent like water.
   Practice: In terms of solubility, explain the difference between normal cells and sickle-cell
   (d) Explain effect of temperature on solubility of solids
   (e) Explain effect of temperature on solubility of gases
   (f) Explain effect of pressure (of a gas) on solubility (S) of gases in liquids - Henry's law:
   $S_{gas} = k_H P_{gas}$
   (g) Answer end-of-chapter Problems 29, 31, 33, 43, 45 and 47 (pp. 556-557)

Section 12.5 Concentration Units

1. Understand the following *concentration units* and know how to convert one unit to another (Ex. Mass % to Molarity, M) - see Table 12.5, p. 529 or lecture notes
   (a) Molarity, M
   (b) Molality, m
   (c) Mole fraction, Xi, or mole %
   (d) Mass % or parts-per-hundred (pph), ppm and ppb

2. Tabulate quantities (see below) to help you sort out solution, solvent and solute.

	Solute	Solvent	Solution
mol			
g			
mL			

3. Understand the importance of density of *solution* or density of *solvent* (and solutes, if liquid) when determining concentration of solutions. Density allows you to convert:
   g -> mL or
   mL -> g

Section 12.5 *- Cont.*

4. Problem solving
   - Work on Example 12-4 (p.533)
   - Work on examples given in the lecture and on assigned problems
   - Work on end-of-chapter Problems 51, 53, 55, 57, 59, 61, 63 and 67 (p. 557)

Sections 12.6 Colligative Properties

1. Explain the following *colligative properties* in terms of solute and solvent molecules:
   (a) Vapor pressure lowering
   (b) Boiling point elevation
   (c) Freezing point depression
   (d) Osmosis & Osmotic pressure

2. Determine and use van't Hoff's factor, ***i***, in colligative properties calculations
   Example: Ionic compound, $Ca(NO_3)_{2\ (aq)}$; $i = 3$;
   Molecular compound, C_6H_6; $i = 1$

3. Problem solving:
   - Work on example(s) given in the lecture and assigned problems
   - Work on Examples 12.8, 12.9, 12.10, 12.11 and 12.12
   - Work end-of-chapter Problems 77, 79, 81, 83, 85 and 87 (p. 558)