Chem 1 Dr. Casagrande/Mrs. Rinaldi

Chapter 13.2-4 & 15 Review Sheet: Solids, Liquids & Solutions

Chapter 13.2 – 13.4

1. Three intermolecular forces: Hydrogen bonding (strongest), dipole-dipole & dispersion forces.
2. Strength of IMF depends on polarity of the material.
3. Hydrogen bonding present when H bonded to N, O or F
4. Viscosity and surface tension depend on IMF. Viscosity decreases with temperature.
5. For most materials, solids are denser than liquids.
   a. Solid water (ice) less dense than liquid water due to H-bonding
6. Crystalline solids have long-range structure; amorphous solids lack long-range order.
7. Melting, boiling & sublimation absorb energy. Freezing, condensation & deposition release energy.
8. Phase changes occur at constant T (KE constant, Potential Energy changing)
   a. Potential energy changes due to changes in intermolecular distances
9. Vapor pressure decreases and boiling point increases as IMF increases.
10. Boiling point is T at which vapor pressure equals atmospheric pressure.
    a. BP decreases as pressure decreases (higher elevation), increases as IMF increases
11. Phase Diagrams, including phase changes, triple & critical points

Chapter 15

1. Water dissolves ionic and polar covalent solutes due to dipole-dipole and ion-dipole forces
2. Solvation rate is affected by temperature, agitation, and particle size.
3. Use the solubility curves to determine solubility or temperature
4. The solubility of *most* solids increases with temperature; gases decrease.
5. Henry's Law: Solubility of gases is directly proportional to their pressure: $\frac{S_1}{P_1} = \frac{S_2}{P_2}$
6. Saturated solutions contain maximum amount of solute; unsaturated solutions contain less solute than possible; supersaturated solutions contain more (must heat and slowly cool).
7. Perform solution concentration problems using the Molarity & dilution equations (on reference sheet)
8. Describe the process of preparing a Molar solution from the solid solute, including what kind of glassware you would use (remember the lab).
9. Describe the process of preparing a Molar solution from a concentrated stock solution, including what kinds of glassware you would use (remember the lab).
10. Use the stoichiometry flowchart on Chart G to solve problems involving volumes and concentrations.
11. Describe colligative properties: vapor pressure lowering, boiling point elevation, freezing point depression.
12. Solutions experience freezing point depression and boiling point elevation because solute blocks solvent.
13. The particles in a colloid remain suspended due to electrostatic attraction to dispersing medium.
    a. Can be separated using centrifuge.
14. Colloids and suspensions scatter light (the Tyndall effect) because particle size is large.

- Chapter 13 Chapter Assessment pp. 414-415 #37, 38, 39, 41, 44, 49, 51, 52, 53, 58, 60
- Chapter 15 Chapter Assessment pp. 484-485 #48, 49, 50, 57, 58, 60, 61, 62, 63, 64, 67, 68, 76(a,c), 77(a,c), 78(a,c), 79(a,c), 80, 81
- Ch. Extra Review Problems:

1. What is the solubility of SO_2 at 15.8 atm if the solubility of SO_2 is 0.25 g/L at 1.50 atm?

2. At what pressure will the solubility of a gas be 0.98 g/L if the solubility at 0.85 atm is 0.14 g/L?

3. What is the molarity of a solution containing 73.8 g $SrBr_2$ in a volume of 250 mL?

4. How many grams of NaF are in 300. mL of a 0.350 M solution?

5. How many L of a 2.53 M solution of RbCl contains 8.29 g of RbCl?

6. What is the final concentration of a solution when 75.0 mL of 8.50 M HCl is diluted to 500.0 mL?

7. How many mL of 16.0 M H_2SO_4 stock solution must be used to make 250 mL of 0.600 M solution?

8. How many mL of 0.58 M $BaCl_2$ are needed to completely react with 10.0 mL of 0.58 M $Al_2(SO_4)_3$? The balanced reaction is:

$$3\ BaCl_2(aq) + Al_2(SO_4)_3(aq) \rightarrow 3\ BaSO_4(s) + 2\ AlCl_3(aq)$$

9. How many mL of 1.08 M $Fe_2(SO_4)_3$ are needed to fully react with 50.0 mL of 0.298 M KOH according to the following balanced reaction?

$$Fe_2(SO_4)_3(aq) + 6\ KOH(aq) \rightarrow 3\ K_2SO_4(aq) + 2\ Fe(OH)_3(s)$$

10. How many mL of 0.682 M HF would be needed to form 29.8 g SiF_4 with excess SiO_2 by the following balanced reaction?

$$SiO_2(s) + 4\ HF(aq) \rightarrow SiF_4(s) + 2\ H_2O(l)$$

11. How many grams of $Al(OH)_3$ are required for complete reaction with the HBr in 615 mL of a 0.375 M HBr solution? The balanced equation for the reaction is:

$$Al(OH)_3(s) + 3\ HBr(aq) \rightarrow AlBr_3(aq) + 3\ H_2O(l)$$

12. What is the concentration of $FeCl_2$ in 15.00 mL of a solution that reacts with 12.83 mL of 0.105 M $KMnO_4$ according to the following balanced equation?

    $8\ HCl\ (aq) + KMnO_4\ (aq) + 5\ FeCl_2\ (aq) \rightarrow 4\ H_2O\ (l) + MnCl_2\ (aq) + 5\ FeCl_3\ (aq) + KCl\ (aq)$

    a. How many *moles* of $FeCl_2$ reacted?

    b. What is the concentration of the $FeCl_2$ solution, in M?

13. What is the concentration of NaI solution if 25.00 mL reacts with excess $Pb(NO_3)_2$ to produce 2.78 g PbI_2 according to the following balanced equation?

$$Pb(NO_3)_2\ (aq) + 2\ NaI\ (aq) \rightarrow PbI_2\ (s) + 2\ NaNO_3\ (aq)$$

    a. How many *moles* of NaI reacted?

    b. What is the concentration of the NaI solution, in M?

Answers: 76a) 2.5 M; c). 5.64 M; 77a) 0.0202 M; c) 0.0847 M; 78a) 0.0320 mol; c) 0.648 mol; 79a) 0.0589 g KOH; c) 5.92 g NH_4OH; 80) 36.8 mL; 81) 1.00×10^3 mL; Extra Problems: 1) 2.63 g/L; 2) 5.95 atm; 3) 1.19 M; 4) 4.41 g; 5) 0.0271 L [27.1 mL]; 6) 1.28 M; 7) 9.38 mL; 8) 30.0 mL $BaCl_2$; 9) 2.30 mL $Fe_2(SO_4)_3$; 10) 1,680 mL HF; 11) 6.00 g $Al(OH)_3$; 12a) 0.00674 mol $FeCl_2$; 12b) 0.449 M; 13a) 0.0121 mol NaI; 13b) 0.484 *M*.