Dougherty Valley • AP Chemistry

Solutions and Their Properties

S-72

STUDY LIST From Paul Groves

Separation Techniques

- ☐ Identify the property that is being exploited when using various separation techniques such as decanting, filtration, distillation, chromatography
- ☐ Explain the difference between paper chromatography, TLC chromatography, and column chromatography and when you would use one versus the other.
- ☐ Identify unknown compounds based on information given about the separation technique. Example – the more polar compound will vaporize at a higher temperature during the distillation process, or the polar substance will travel a shorter distance on a polar chromatography substrate etc.

Concentration Units

- ☐ Define solute, solvent, and solution
- ☐ Define molarity, molality, mole fraction, weight percent, ppm
- ☐ Convert one concentration into another
- ☐ Realize that density is sometimes needed for calculations involving molarity
- ☐ Dilutions can be calculated using $M_1V_1 = M_2V_2$

Terminology

- ☐ Define unsaturated, saturated, and supersaturated. (DEMO—Hand warmer)
- ☐ Define and identify electrolytes versus non-electrolytes.
- ☐ Compare these terms with dilute and concentrated. ($AgNO_3$ 970 g/100g & AgCl .00127 g/100g)
- ☐ Solids and gases are called soluble and insoluble.
- ☐ Liquids are called miscible and immiscible. (TOY—Ocean Waves)
- ☐ Define dissolution versus dissociation.

Solubility

- ☐ Some ions result in a compound always being soluble in water. Know that list!
- ☐ Identify the ways to change solubility for solids and gases. Changing temperature, pressure, particle size, etc.
- ☐ Write net ionic equations including phases by using solubility rules.
- ☐ Draw and/or analyze particulate diagrams for solubility questions.
- ☐ Describe (and calculate) how the presence of a common ion can effect the degree of dissociation.

Math of the Properties of Solutions

- ☐ ~~Henry's Law – solubility of a gas in a liquid is proportional to the pressure of the gas. $S_g = k_H P_g$~~
- ☐ ~~Know and be able to do simple problems with Raoult's Law: $P_{solvent} = X_{solvent} P°_{solvent}$ to figure out the vapor pressure **above** a solution~~
- ☒ ~~Recognize that a volatile solute (esp. alcohol) will add to the vapor pressure and LOWER the BP whereas solutions of solids in water RAISE the BP.~~

~~Colligative Properties – More Math~~

- ☒ ~~Elevation of the BP, ΔT_b~~
  - ~~$\Delta T_b = k_b \cdot m$ (k_b = the molal boiling point elevation constant = ΔT_b @ 1 m)~~
- ☒ ~~Depression of the FP/MP, ΔT_f~~
  - ~~$\Delta T_f = k_f \cdot m$ (k_f = the molal freezing point depression constant = ΔT_f @ 1 m)~~
- ☒ ~~This can be used to determine molar mass:~~

$$M = \frac{K_f \times w \times 1000}{\Delta T \times W}$$

~~(COMPUTER SIMULATION – RAST)~~

- ~~Substances that split into ions have a multiplying effect on colligative properties.~~

~~(elevation of BP in sol'n: sugar vs salt)~~

- ~~This is called the van't Hoff factor, i.~~

~~Ex. NaCl, i=2; $CaCl_2$, i=3~~

~~(simple for dilute solutions)~~

Flashback to Thermochemistry

- Heats of solution =

  Requires energy to break solvent-solvent & solute-solute bonds – Energy released by making solute-solvent bonds (esp. hydration)

  (can be exothermic or endothermic) (endothermic implies Entropy is impt)

  (DEMO—baggies of NH_4Cl and $CaCl_2$)

Ksp

- Define Ksp and molar solubility.
- Understand the difference between Ksp and molar solubility in terms of why molar solubility can be more useful in a practical way.
- Perform calculations involving Ksp and molar solubility.
- Perform Ksp problems that involve the common ion effect.