THE PROPERTIES OF SOLUTIONS

Chapter 13 Outline

Text Problems: #43, 47, 49, 53, 55, 72, 76, 80
+ Supplementary Questions (attached)

Text Sample Problems: The text has a number of excellent sample problems (solved in detail) in each section. I would recommend that you study these problems + the "follow up" problems, which have brief solutions at the end of the chapter.

Sect.	Title and Comments	Required?
1.	Types of Solutions: Intermolecular Forces and Solubility	YES
2.	Why Substances Dissolve: Understanding the Solution Process	YES
3.	Solubility as an Equilibrium Process You are NOT responsible for Henry's Law to determine solubilities of gases in liquids. I will mention it only briefly.	YES
4.	Concentration Terms	YES
5.	Colligative Properties of Solutions Skip the subsection on Volatile Non-Electrolyte Solutions	YES

Chapter 13

Supplementary Homework Questions

S1. The process of dissolving is favored if the _____ interactions are weaker than the _____ interations.

a. solute-solvent; solute-solute and solvent-solvent
b. solvent-solvent; solute-solute and solute-solvent
c. solute-solute and solvent-solvent; solute-solvent
d. solute-solvent and solvent-solvent; solute-solute
e. solute-solute; solute-solvent and solvent-solvent

S2. Two liquids which mix together in all proportions are said to be _____; they mix because _____.

a. miscible; their intermolecular interactions are dissimilar
b. miscible; their intermolecular interactions are similar
c. miscible; their densities are dissimilar
d. immiscible; their intermolecular interactions are similar
e. immiscible; their intermolecular interactions are dissimilar

S3. The concentration unit one part per billion (one ppb) is equivalent to one _____ of solute per of solution.

a. mg; g
b. μg; g
c. mg; kg
d. μg; kg
e. ng; kg

S4. If 750 mL of a certain solution contains 50.0 g Na_2SO_4, the sodium ion concentration, $[Na^+]$, is

a. 0.264 M
b. 0.315 M
c. 0.469 M
d. 0.560 M
e. 0.939 M

S5. The freezing points of the following aqueous solutions, from highest to lowest, are:

0.25 m glucose, $C_6H_{12}O_6$ 0.15 m $CaCl_2$ 0.20 m NH_4NO_3

a. $C_6H_{12}O_6 > NH_4NO_3 > CaCl_2$
b. $C_6H_{12}O_6 > CaCl_2 > NH_4NO_3$
c. $CaCl_2 > C_6H_{12}O_6 > NH_4NO_3$
d. $CaCl_2 > NH_4NO_3 > C_6H_{12}O_6$
e. $NH_4NO_3 > C_6H_{12}O_6 > CaCl_2$

S6. A sample of the strong electrolyte, potassium phosphate (K_3PO_4, M=212.3) is dissolved in 400 grams of water. The boiling point of the solution is 102.65 ^oC. How many grams of K_3PO_4 are contained in the mixture?

S7. The vapor pressure of liquid toluene, $C_6H_5CH_3(l)$ [M=92], is 94.0 torr at 40 ^oC. When 25.0 grams of an unknown non-volatile compound is dissolved in 184 grams of toluene at 40 ^oC, the vapor pressure of the mixture is 84.6 torr. Calculate the Molar Mass of the unknown compound, in g/mol.

S8. An aqueous solution of phosphoric acid, H_3PO_4, contains 285 g H_3PO_4 in 400 mL solution, and has a density of 1.35 g/mL. Calculate

(a) the weight % H_3PO_4 in this solution.

(b) the concentration in mol/L of this solution

S9. The solvent, toluene, has a normal boiling point of 110.6 ^oC and a boiling point elevation constant of 3.33 $^oC/m$. When 12.0 grams of an unknown substance, X, is added to 240 grams of toluene, the boiling point is 111.9 ^oC.
Calculate the Molar Mass of the unknown compound.

Answers to the Supplementary Homework Questions are posted on the course web site.
Questions about these Problems will be answered in Recitation