

Chapter 12 Physical Properties of Solutions

Problems - Page 535 – 541 **Set 1:**16, 22, 24, 29, 31; **Set 2:** 34, 38, 45, 52, 60; **Set 3:** 62, 66, 74, 90, 93; **Set 4:** 94, 96, 101, 107, 108, 114 **Set 5:** 120, 123, 128, 134.

I. SOLUTIONS

A. A solution is

B. There are two parts to a solution ;

1.

2.

C. The dissolving process - dissolving mechanism

1.

2.

3.

4.

5.

6.

7.

8.

9.

D. Factors that affect the dissolving process

1.

2.

3.

4.

5.

a.

6. Most solids having a positive  $\Delta H$  are more soluble in hot water, why?

E. Measuring concentrations

1. Molarity (M) is

a. Standard solutions are

2. Molality (m) is

3. The mole fraction is

4. Mass percent is

5. Normality is

F. There are nine possible solution combinations

SOLVENT	SOLUTE	COMMON EXAMPLES
		He-O <sub>2</sub> (deep sea diver's gas)
		air- water (humidity)
		air-naphthalene (mothballs)
		water-CO <sub>2</sub> (carbonated bev)
*	*	water-acetic acid (vinegar)
		water-salt (seawater)
		Pd-H <sub>2</sub> (gas stove lighter)
		Ag - Hg (dental amalgam)
		gold - silver (ring) alloys

\*Two liquids that are mutually soluble in all proportions are miscible.

## II. Colligative and colloidal properties

### A. Colligative properties are

- 1.
- 2.
- 3.
- 4.

### B.

1. A French chemist, Francis Raoult, first stated this principle that the

Mathematically  $P = P^0 \cdot x$

Where  $P$  is the vapor pressure of the solution or the partial pressure of the solvent over a solution;  $P^0$  is the mole fraction of the solvent in the solution; and  $x$  is the vapor pressure of the pure solvent.

a. Raoult's law describes

b. The ratio of molecules

c. We can use Raoult's law to determine the decrease in vapor pressure,  $\Delta P$ , where  $\Delta P = P^0 - P$ ; where  $x$  is the mole fraction of the solute.

C. Using colligative properties

1.

2.

3.

a.

b.

c.

(van't Hoff Factor).

4. Molar mass can be determined using the boiling point elevation and freezing point depression. Just remember the units and poof its magic!
5. Use of differences in vapor pressure.
  - a.

D. Osmotic pressure

1.

2.

3.

4. Osmotic pressure can be expressed in an equation since it is a colligative property.

a.  $\Pi = iMRT$  where  $\Pi$  is the osmotic pressure  $M$   
= molarity,  $R$  is the ideal gas constant (  $0.0821$   
 $\text{Latm/moleK}$  or  $8.31\text{LkPa/moleK}$ ), and  $T$  is the Kelvin  
temperature.

E. Debye-Hückel Theory

1.

2.

F. Colloids

1.

2.

3.

4. Classification

a. Aerosols –

c. Foams –

d.

c. Emulsions –

e. Sols –

e. Gels -

5. Size

TYPE	PARTICLE SIZE	PERMANENCE
SOLUTION		
COLLOID		
SUSPENSION		

6. Properties

a. Tyndall effect –

b. Brownian motion –

c. Adsorption -

d. Electrophoresis -

e. Hydrophilic and Hydrophobic Colloids

7. Uses (misc.)

a. Semipermeable membranes used to separate ions and colloids used in

b.

G. Solution equilibrium

1. The point at which

2. A solution that contains



3. A solution that contains
  
4. The amount of solute
  
5. Solubility can be
  
6. Differing solubilities can be