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Lab 8 Assignment

Solubility (Fill in the blank/Short answer) (See CHM 1010 for Solubility Course Material)

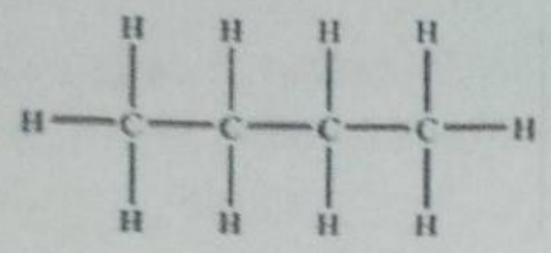
1. Henry's law states that the solubility of a gas in a liquid is proportional to the **_ pressure (P) of the gas**_____.

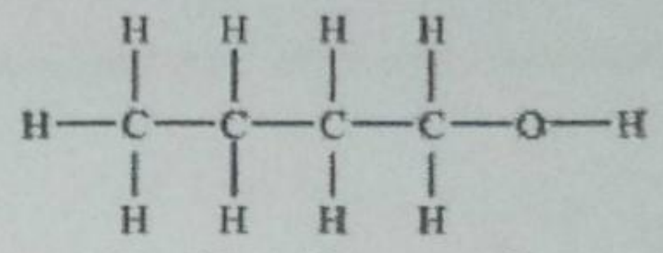
2. Describe two ways to increase the solubility of gaseous CO_2 in water?

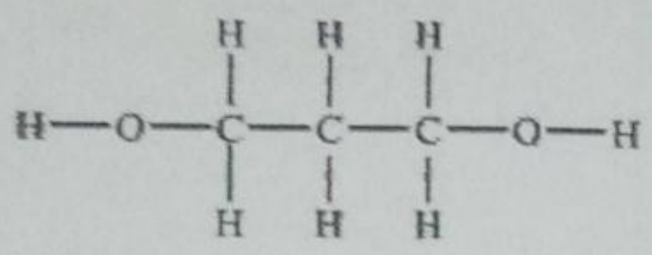
(I) The solublity of CO_2 in liquid increases with increase the pressure on liquid.

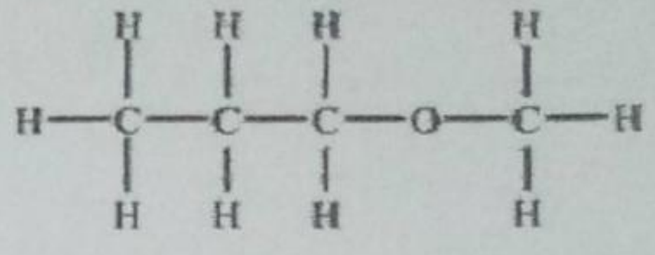
(II) The solublity of CO_2 liquid decreases with increase in temperature.

3. Which compound will be the most soluble in water? Clearly describe why in a couple sentences.

A) 

B) 

C) 

D) 

'C' is more soluble water. Since water is polar solvent and cC is more polar hence it has a higher solubility compared to the other compounds

Concentrations (Problem Solving)

1. The maximum level of lead allowed in drinking water is 15 mg/kg. What is this concentration in units of parts per million?

1 part per million (1ppm) = 1mg/Kg

1ppт 15mg/Kg= -x15mg / kg = 15 ppm 1mg/Kg

Hence maximum level of lead allowed in drinking water is 15ppm.

2. A solution is made by dissolving 3.88 g of NaCl in enough water to make 67.8 mL of solution. What is the concentration of sodium chloride in units of weight/volume percent?

Mass of NaCl = 3.88g

Volume = 67.8ml

Concentration = $\frac{3.88}{67.8} \times 100 = 57.22 g/L$

3. A solution is made by mixing 569 mL of water and 238 mL ethanol. What is the concentration of ethanol in units of volume/volume percent?

Molarity = $\frac{\text{Moles}}{\text{Volume in Ltrs}}$. $\frac{238}{(238+569)} \times 100 = 29.49\% \ V/V \ C_2H_5OH$

4. A saline solution used in intravenous drips for patients who cannot take oral fluids contains 0.92% (w/v) NaCl in water. How many grams of NaCl are contained in 575 mL of this solution?

$\frac{W}{V} = 0.92\%$

This implies that: 0.92g of NaCl dissolved in 100ml

$\frac{0.92 \times 575}{100}$

$= 5.29g$ of NaCl

5. A saline solution used in intravenous drips for patients who cannot take oral fluids contains 0.92% (w/v) NaCl in water. What volume of the saline solution must be administered to the patient in order to deliver 7.7 g of NaCl?

0.92g of NaCl — 100ml of solution

7.7g — x

$\frac{7.7 \times 100}{0.92} = 236.95g$

236.95ml

6. What is the molarity of a solution made by dissolving 3.09 moles of NaCl in 1.50 L of solution?

Molarity = $\frac{\text{Moles}}{\text{Volume in L}}$. $\frac{3.09}{1.50} = 2.06M$

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7. What is the molarity of a solution made by dissolving 36.29 g of NaCl in 2.30 L of solution?

Moles of NaCl = $\frac{36.29}{58.5} = 0.6203$

Molarity = $\frac{\text{Moles}}{\text{Volume in L}}$

$\frac{0.6203}{2.30}$

$= 0.2697\text{M}$

8. How many grams of glucose ($C_6H_{12}O_6$) are contained in 555 mL of a 1.77 M glucose solution?

Moles = $\frac{\text{Molarity} \times \text{Volume}}{1000}$

$\frac{555 \times 1.77}{1000} = 0.9823$

Mass = Moles x R.M.M.

0.9823×180

$= 176.8239$

Colligative Properties: Freezing point depression / boiling point elevation (Problem Solving)

1. What is the boiling point of a solution formed by dissolving 0.75 mol of KCl in 1.00 kg of water?

Molarity = $\frac{0.75}{1} = 0.75 \text{ Mol kg}^{-1}$

Boiling Point $H_2O = 100^\circ c$

$K_i = 0.52^\circ c \text{ Kg mol}^{-1}$

$i = 2$

$T - T_i = i \times K_i \times \text{Molarity}$

$T - 100 = 2 \times 0.52 \times 0.75$

$T - 100 = 0.78$

$T = 100 + 0.78$

$T = 100.78^\circ C$

2. What is the freezing point of a solution formed by dissolving 0.75 mol of NaCl in 1.00 kg of water?

Molarity = $\frac{0.75}{1} = 0.75 \text{ Mol kg}^{-1}$

Vanhoffs factor = 2

Freezing Point water = $0^\circ C$

$0 - T = 2 \times 1.86 \times 0.75$

$-T = 2.7$

Freezing Point = $-2.7^\circ C$

3. What mass of NaCl would you need to add to 1.00 kg of water to achieve a freezing point of -5°C?

Change in freezing point

$\Delta T_f = K_f \times \text{Molarity}$

$T_f = 5^\circ c$

$K_f = \frac{\text{Mass of solute} \times 1000}{\text{Molar mass of solute} \times \text{weight of sol}}$

$5 = \frac{1.86 \times \text{Mass of salt} \times 1000}{58.5 \times 1000}$

Mass of salt = 157.25g

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4. At room temperature, the saturated concentration of NaCl is **357 g/L**. Express this concentration in units of Molarity.

$$\text{Molarity} = \frac{\text{Mass in L}}{\text{R.F.M}}$$

$$= \frac{357}{58.5} = 6.103\text{M}$$

Colligative Properties: Osmosis Questions (Fill in the blank/Short answer)

1. A hypotonic solution has **HIGH**_____osmotic pressure than/as body fluids.

2. If cells (for example, red blood cells) are placed in a hypertonic solution, what happens to their morphology?

The cell shrink since water is being transported out of the cell. Crenation of red blood cells occurs in hypertonic solutions, leading to a decrease in the ability to carry oxygen

If cells (for example, red blood cells) are placed in an isotonic solution, what happens to their morphology?

The cell retains its size and retain the ability to travel appropriate speeds within veins of small diameter.

3. Red Blood Cells are placed into a solution, and the cells begin to swell in a process called hemolysis. How should the solution be classified?

Hypotonic