Ionic Solutions : Notes/W.S.-10

A solution is a homogeneous mixture . It consists of a **solute** dissolved in a **solvent** . The solvent is usually water. The solute is the smaller component of the solution.

In an **ionic solution** , the solute is an **ionic compound** , such as Na_2S. An ionic compound is composed of a metallic ion and a non-metallic ion.

Atoms in an ionic compound are held together by an **ionic bond** . An ionic bond results from the attraction between a negative and a positive ion.

Some ionic compounds are very soluble, but others are only slightly soluble.

When an ionic solid dissolves in water, it dissociates into positive and negative ions. For example; $Na_2S(s) \rightarrow 2Na^{+}(aq) + S^{2-}(aq)$. The (s) means solid and the (aq) means aqueous (dissolved in water).

Ionic solutions will conduct electricity because they contain both positive and negative ions.

When **n** moles of a compound are dissolved in **L** liters of water, we say that the **concentration** or molarity **M** is given by:

$$M = \frac{n}{L}$$

The molarity is usually written in square brackets. For example; $[Mg(NO_3)_2] = 0.37$ M, means that; a magnesium nitrate solution has a molarity of 0.37 moles/liter. The concentration can also be measured in grams/liter.

If we keep adding solute to the solvent until no more can be added, we have a **saturated solution** . Excess solute will fall to the bottom of the container. The maximum concentration is called the **solubility** . The solubility generally increases with temperature.

1) Define the following terms.

a) solution

b) solute

c) ionic compound

d) molarity

e) saturated solution

f) solubility

2) Write the dissociation equations.

a) $KI(s) \rightarrow$ b) $FeCl_2(s) \rightarrow$

c) $NaOH(s) \rightarrow$ d) $Na_2SO_4(s) \rightarrow$

3) Suppose that 3.5 moles of $NH_4Cl(s)$ is added to 0.75 liters of water.

a) Write the dissociation equation.

b) Find the molarity.

c) Find the concentration in grams/liter.

d) Find the solubility in g/l and M (mol/liter), if the maximum amount of dissolved NH_4Cl in 1.0 liter of water is 380 g at 20.°C.

4)a) Find the concentration in mol/l, if 18g of NaOH is added to 250 ml of water. Convert grams to moles first.

b) Find the number of liters required if a 3.7 M solution is prepared using 0.24 moles of $CaCl_2(s)$

5) If 0.65 moles of $Sr(OH)_2(s)$ is dissolved in 240 ml of water :

a) Write the dissociation equation.

b) Find the molarity for $Sr(OH)_2$.

c) Find the molarity for the strontium ion.

d) Find the molarity for the hydroxide ion.

e) Find the new molarity for the $Sr(OH)_2$ solution if 530 ml of water is added.

6) Find the molarity if 38 ml of a 0.67 M NaCl solution is added to 76 ml of a 1.3 M NaCl solution.

7) A chemist adds 7.5g of NaOH to 100. ml of water. How much more water must the chemist add to make a solution with a concentration of 1.2 M?

Answers : 1)a) It is a homogeneous mixture., b) It is the component of a solution that is present in the smaller amount., c) It is a compound formed from metallic and non-metallic ions., d) It is the concentration of a solution in mol/l., e) It is a solution in which no more solute can be added., visit www.mrowen.com f) It is the concentration of a saturated solution., 2)a) $KI(s) \rightarrow K^+(aq) + I^-(aq)$, b) $FeCl_2(s) \rightarrow Fe^{2+}(aq) + 2Cl^-(aq)$, c) $NaOH(s) \rightarrow Na^+(aq) + OH^-(aq)$, d) $Na_2SO_4(s) \rightarrow 2Na^+(aq) + SO_4^{2-}(aq)$, 3)a) $NH_4Cl(s) \rightarrow NH_4^+(aq) + Cl^-(aq)$, b) 4.7 M, c) 250 g/l, d) 380 g/l, 7.1 M, 4)a) 1.8 M, b) 65 ml, 5)a) $Sr(OH)_2(s) \rightarrow Sr^{2+}(aq) + 2OH^-(aq)$, b) 2.7 M, c) 2.7 M, d) 5.4 M, e) 0.84 M, 6) 1.1 M, 7) 56 ml.