Topic:	Stoichiometry	Lesson #:	5
	Concentration of ions in solution		
Name:			

SEMI-NOTES

THEORY / EXAMPLES	NOTES / WORKING SPACE
Terms used in dissociation of ions in solution: • **Ions** o A positively or negatively charged atom or polyatomic group o e.g. Na^+ , Cl^- , SO_4^{2-} • **Dissociation** o Separation of positive and negative ions from an ionic lattice undergoing dissolving or melting	
Concentration of water (2 types): **1) Molar concentration (C):** $$C = \frac{n}{V}$$ • units are $\left(\frac{mol}{L}\right)$ or **M** (for 'Molarity', not to be confused with M_r) **2) Mass concentration, or Density (D):** $$D = \frac{m}{V}$$ • units are $\left(\frac{g}{L}\right)$	
• As well as using '**C**' to represent the concentrations we can also use square brackets, **[** and **]** e.g. **C**(K^+) = **[**K^+**]** = 0.25 **mol** L^{-1} = 0.25 **M** • which means 'the ionic concentration of K^+ ions in solution is 0.25 M	
The following steps outline the process for solving 'calculating concentration of ions in solution' problems: **Step 1:** Write a balanced equation for the reaction e.g. $Al_2(SO_4)_{3(s)} \xrightarrow{H_2O} 2Al^{3+}_{(aq)} + 3SO_4^{2-}{}_{(aq)}$	
Step 2: Calculate the **concentration** (in **M**) from given information • **Step 2a:** First determine **number of moles** $$n = \frac{m}{M_r}$$ • **Step 2b:** Then calculate the **concentration** (in **M**) $$C = \frac{n}{V}$$	
Step 3: Determine the **mole** and **concentration** ratio from the equation • Volume is kept constant • ∴ n α C	

- ∴ mol ratio and concentration ratio are equivalent

e.g. if $n(Na^+) = n(Cl^-)$
, then $C(Na^+) = C(Cl^-)$
, or $[Na^+] = [Cl^-]$

Step 4: Calculate the ion concentration of the unknown substance required

EXAMPLE 3 – Your turn!
10.0 g of magnesium nitrate ($Mg(NO_3)_2$) is dissolved into 500 mL of water.
Determine the:

a) Concentration of the solution?
b) Concentration of each ion in the solution?

Step 1: Write a balanced equation for the reaction
CLUES:
- Sodium carbonate ($Mg(NO_3)_2$) is an ionic substance
- An ionic substance dissolved in water implies that a 'dissociation' reaction has occurred

_____

Step 2: Calculate the concentration (in M) from given information

- **Step 2a:** First determine number of moles, i.e. $\boldsymbol{n}\ (\boldsymbol{Mg(NO_3)_2})$

- **Step 2b: C**alculate the concentration (in M) , i.e. $[\boldsymbol{Mg(NO_3)_2}]$

Step 3: Determine the **mole** and **concentration ratio** from the equation
- Volume constant
- ∴ n α C
- ∴ mol & concentration ratio equivalent

- Mole ratio of $Mg(NO_3)_2 : Mg^{2+}$?

$\boldsymbol{n}\ (Mg(NO_3)_2) : \boldsymbol{n}\ (Mg^{2+}) =$ _____

- Concentration ratio of $Mg(NO_3)_2 : Mg^{2+}$?

$\boldsymbol{C}\ (Mg(NO_3)_2) : \boldsymbol{C}\ (Mg^{2+}) =$ _____

Step 4: Calculate the ion concentration of the unknown substance required i.e. $[Mg^{2+}]$ and $[NO_3^-]$	
Determine: $[NO_3^-]$	
Determine: $[Mg^{2+}]$	
In summary: a) Concentration of the solution? $[Mg(NO_3)_2] =$ _____ M b) Concentration of each ion in the solution? $[Mg^{2+}] =$ _____ M $[NO_3^-] =$ _____ M	

Now complete the following questions from your text book:
 	
• **CHAPTER 15**
  • **11 – 13**
 	
• **CHAPTER 15 REVIEW:**
  • **8 (Multiple Choice)**
  • **31 – 34 (Review questions)**
 	
• These must be completed before proceeding with the next lesson	

WHAT TO DO NEXT? • Once completed return to the main course page • Refer to the next item on the list	