Chapter 4
Reactions in Aqueous Solution

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Sea water contains roughly 28.0 g of NaCl per litre. What is the molarity of sodium chloride in sea water?

$$MM\ NaCl = 58.44\ g/mol$$

$$n = \frac{m}{MM}$$

$$n = \frac{28}{58.44} = 0.479\ mol$$

$$M = \frac{n}{V(L)}$$

$$M = \frac{0.479}{1}$$

$$M = 0.479\ \mathrm{M}$$

What is the molarity of a solution that contains 5.5 moles of solute in 600 ml ?

$$M = \frac{n}{V(L)}$$

$$M = \frac{5.5}{0.6}$$

$$M = 9.167 \text{ M}$$

How many moles of Na_2CO_3 are there in 1.5 L of 0.7 M solution?

$$M = \frac{n}{V(L)}$$

$$0.7 = \frac{n}{1.5}$$

$$n = 1.05\ mol$$

What mass of solute is needed to prepare 1.00 L of 0.125 M of K_2SO_4

$$MM_{K_2SO_4} = 174.257\ g/mol$$

$$M = \frac{n}{V(L)} \qquad M = \frac{m}{MM \times V(L)}$$

$$m = MM \times M \times V(L)$$

$$m = 174.257 \times 0.125 \times 1$$

$$m = 21.8\ g$$

How many grams of $BeCl_2$ are required to prepare 200 mL of a solution of 1.5 M $BeCl_2$?

$$M_{BeCl2} = 9.01 + (2 \times 35.45) = 79.91\ g/mol$$

$$m = MM \times M \times V(L)$$

$$m = 79.91 \times 1.5 \times 0.2$$

$$m = 23.973\ g$$

What is the concentration of chloride ion in 0.2 M NaCl solution?

Depends on the number of chloride ion in the compound

$\therefore$ con. of Cl^- = con. of NaCl = **0.2 M**

multiplying the molarity by the number of ions present

What is the concentration of chloride ion in 0.2 M $CaCl_2$ solution?

Depends on the number of chloride ion in the compound

$\therefore$ con. of Cl^- = 2x con. of $CaCl_2$ = 2 x 0.2 = **0.4 M**

What are the concentrations of potassium ion and sulphate ion in 4M solution of K_2SO_4?

Depends on the number of each ion

Conc. Of K^+ = 2x4=**8 M**

Conc. Of SO_4^{-2} = 1x4= **4M**

How many milliliters would you need to prepare 150.0 mL of 0.5 M $NaNO_3$ from a stock solution of 2.00 M $NaNO_3$?

V_1=? M_1=2 M V_2=150 ml M_2=0.5 M

$$M_1V_1=M_2V_2$$

$$V_1=M_2V_2/\ M_1$$

V_1=0.5x150/2=**37.5 ml**

What is the concentration of $NaNO_3$ solution prepared by diluting 100ml of 3M to 300ml?

V_1=100ml M_1=3 M V_2=300 ml M_2=? M

$$M_1V_1=M_2V_2$$

$$M_2= M_1V_1/V_2$$

M_2= 3x100/300 = **1M**

A sample of 60 g of NaCl dissolved in 400ml, what is the concentration of chloride ion in the solution

Con. of Cl^- ion = Con. of NaCl=?

M=n/V, n=m/MM

$\therefore$ M=m/MM.V

M= 60/ 58.53x0.400= 2.56 M

$\therefore$ con. of Cl^-= **2.56 M**

A sample of 55 g of $AlCl_3$ dissolved in 500ml, what is the concentration of chloride ion in the solution

Con. of Cl^- ion = **3x** Con. of $AlCl_3$=?

M=n/V, n=m/MM

$\therefore$ M=m/MM.V

M=55/133.33x0.5=0.825 M (salt)

Con. of Cl^- = 3 x0.825 = **2.47 M**