SOME PRACTICAL EXAMPLES

(1) How many grams of $AgNO_3$ are required to prepare 50 ml of 0.100 M $AgNO_3$?

Approach (Vol)(conc) = mole → g

Number of mole in 50 ml of 0.100 M $AgNO_3$ = (50 ml)(0.100 M)

= (0.050 L)(0.100 $\frac{mol}{L}$)

= 0.0050 mol

g $AgNO_3$ = (M Wt $AgNO_3$)(mole $AgNO_3$)

= (170 $\frac{g}{mol}$)(0.0050 mol)

= **0.85 g**

Ans 0.85 g of $AgNO_3$ is required to dissolve in water to make up to a final volume of 50 ml

(2) HCl as purchased is 12 M. What volume is required to prepare 100 ml of 0.20 M HCl ?

Approach mole for 100 ml of 0.20 M HCl → volume for 12 M

Number of mole in 100 ml of 0.20 M HCl = (100 ml)(0.20 M)

= (0.100 L)(0.20 $\frac{mol}{L}$) = 0.020 mol

Let V be the volume of 12 M required

Then (V)(12 M) = 0.020 mol

$V = \frac{0.020\ mol}{12\ \frac{mol}{L}}$ = **0.0017 L**

Ans of 12M HCl

Ans If we dilute 1.7 ml of 12 M with water to a final volume of 100 ml, we will get the final conc of this HCl soln to be 0.20 M.

(3) What is the molar conc. of a HCl solution if 40.0 ml of the soln required to neutralize the base in 50.0 ml of 0.200 M NaOH ?

$HCl_{(aq)} + NaOH_{(aq)} \longrightarrow H_2O\ (l) + NaCl\ (aq)$

Approach (V)(M) $_{NaOH}$ → $\frac{mole}{NaOH}$ → $\frac{mol}{HCl}$ → M HCl

mole NaOH = (50.0 ml)(0.200 M)

= (0.0500 L)(0.200 $\frac{mol}{L}$) = 0.0100 mol

1 mole HCl is required to react with 1 mole NaOH

mole NaOH = mole HCl

0.0100 mol = (40.0 ml)(x)

$x = \frac{0.0100\ mol}{0.0400\ L}$ = **0.250 M**

(4) If 50.0 ml of 0.400 M NaOH are required to neutralize the acid in 20.0 ml of an H_2SO_4 soln, what is the molar conc. of the H_2SO_4 soln ?

$H_2SO_4(aq) + 2NaOH\ (aq) \longrightarrow 2H_2O\ (l) + Na_2SO_4(aq)$

Approach (V)(M) $_{NaOH}$ → $\frac{mole}{NaOH}$ → $\frac{mole}{H_2SO_4}$ → M H_2SO_4

mole NaOH = (50.0 ml)(0.400 M) = (0.0500 L)(0.400 $\frac{mol}{L}$) = 0.0200 mol

$\frac{1}{2}$ mol H_2SO_4 is required to react with 1 mol NaOH

mol H_2SO_4 = $\frac{1}{2}$ mol NaOH = $\frac{1}{2}$ (0.0200 mol) = 0.0100 mol

= (20.0 ml)(x)

$x = \frac{0.0100\ mol}{20.0\ ml} = \frac{0.0100\ mol}{0.0200\ L}$ = **0.500 M**