TITRATIONS !!!!!

A TITRATION is a process in which a measured amount of a solution is reacted with a known volume of a known concentration of another solution until a desired equivalence pt is reached

The EQUIVALENCE POINT is (aka stoichiometric point or end point) is where the ratio of moles of each species equals the mole ratio in the balanced eqtn . . . usually indicated by a COLOUR Δ !!

IN CHEMISTRY 11 we will only deal with titrations of NEUTRALIZATION REACTIONS!!!

Example 2. When a 25.0 mL sample of unknown concentration of Sodium hydroxide is titrated with 23.5 mL of 0.100 M Sulfuric Acid, the equivalence point is reached. What is the *concentration of NaOH*?

Step 1. Write out the balanced equation:

$$H_2SO_4 + 2NaOH \longrightarrow Na_2SO_4 + 2H_2O$$

Step 2. Use the known concentration + volume to solve for moles

mol = L × M

$$0.0235\ \cancel{L} \times \frac{0.100\ mol\ H_2SO_4}{1\ \cancel{L}} = 0.00235\ mol\ H_2SO_4$$

Step 3. Use the MOLE BRIDGE to calculate the moles of the unknown

$$0.00235\ mol\ H_2SO_4 \times \frac{2\ mol\ NaOH}{1\ mol\ H_2SO_4} = 0.00470\ mol\ NaOH$$

Step 4. Divide the moles of unknown by volume of unknown to solve for concentration

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

$$\frac{0.00470\ mol\ NaOH}{0.0250\ L} = \boxed{0.188\ M\ NaOH}$$

Example 3. What *volume of 0.200 M KOH* is required to react with 125 mL of 0.250 M H_3PO_4 in order to produce K_2HPO_4 according to this balanced equation: H_3PO_4 (aq) + 2 KOH (aq) → K_2HPO_4 (aq) + 2 H_2O (l)

Step 1. Identify the balanced equation:

$$H_3PO_4 + 2\ KOH \longrightarrow K_2HPO_4 + 2\ H_2O$$

Step 2. Use the known concentration + volume to solve for moles

$$0.125\ \cancel{L} \times \frac{0.250\ mol\ H_3PO_4}{1\ \cancel{L}} = 0.0313\ mol\ H_3PO_4$$

Step 3. Use the MOLE BRIDGE to calculate the moles of the unknown

$$0.0313\ mol\ H_3PO_4 \times \frac{2\ mol\ KOH}{1\ mol\ H_3PO_4} = 0.0625\ mol\ KOH$$

Step 4. Divide the moles of unknown by molarity of unknown to solve for volume

$L = \frac{mol}{M}$ ∴

$$\frac{0.0625\ mol\ KOH}{0.200\ M\ KOH} = \boxed{0.313\ L\ KOH} \text{ or } 313\ mL$$