Solution Stoichiometry

10.0 ml of 0.150 *M* sulfuric acid solution is titrated with a sodium hydroxide solution and the equivalence point[1] is reached on the addition of 20.0 mL of the base. What is the concentration of the base?

H_2SO_4 (*aq*)	+	2 NaOH (*aq*)	→	Na_2SO_4 (*aq*)	+	2 H_2O (*l*)
10.0 mL		20.0 mL				
0.150 *M*		? *M*				

mol of H_2SO_4 *stoichiometry* *concentration of NaOH*

$$10.0\text{ mL} \times \frac{0.001\text{ L}}{\text{mL}} \times \frac{0.150\text{ mol } H_2SO_4}{\text{L}} \times \frac{2\text{ mol NaOH}}{1\text{ mol } H_2SO_4} \times \frac{1}{0.0200\text{L}} = 0.150\ M\ \text{NaOH}$$

Alternately since you are using mL for changing to moles and from moles to concentration, you could omit the ml to L conversion.

mmol of H_2SO_4 *stoichiometry* *concentration of NaOH*

$$10.0\text{ mL} \times \frac{0.150\text{ mol } H_2SO_4}{\text{L}} \times \frac{2\text{ mol NaOH}}{1\text{ mol } H_2SO_4} \times \frac{1}{20.0\text{ mL}} = 0.150\ M\ \text{NaOH}$$

You should understand this method of solution stoichiometry.

However, there is a faster way to deal with titration reactions in solutions.

$$a\ \text{A}\ (aq) + b\ \text{B}\ (aq) \rightarrow$$

a and *b* are the coefficients of substances A and B in a balanced reaction.

$$\frac{C_A \times V_A}{a} = \frac{C_B \times V_B}{b}$$

This equation should be memorized and will save you valuable time in solving solution reaction problems.

[1]Titration involves carefully adding one solution to another until the two have completely reacted. The equivalence point is when all of the original acid has reacted with the base. You will perform several titrations in the lab.10