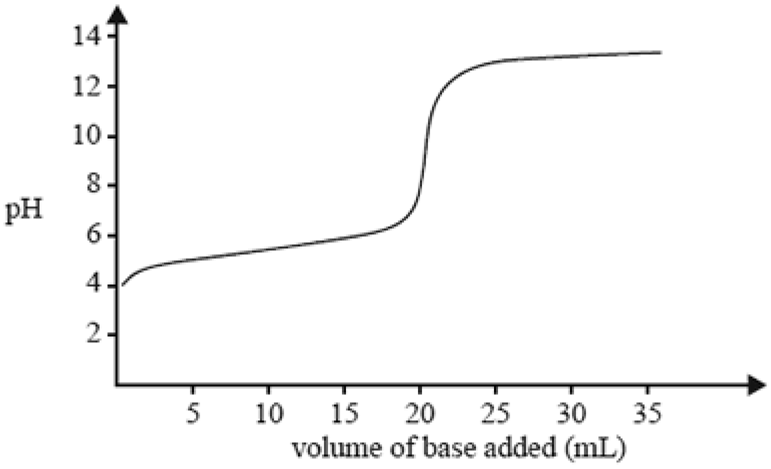
Friday Worksheet **Name: ……………….**

Volumetric 3

1) The change in pH as a 0.10 M solution of a NaOH is added to 20.0 mL of a 0.10 M solution of a ethanoic acid is shown below.



Refer to the acid-base indicator data provided in the data book and identify the indicator that would be least suitable to detect the end point of this neutralisation. Explain why.

Thymol blue. The pH range for the colour change does not even register on the graph.

2) A 30.00 mL aliquot of 0.200 M CH_3COOH (ethanoic acid) is titrated with 0.160 M $Ca(OH)_2$ solution.

a) Give the equation for the reaction between the ethanoic acid and $Ca(OH)_2$

$$2CH_3COOH(aq) + Ca(OH)_2(aq) = (CH_3COO)_2Ca(aq) + 2H_2O(l)$$

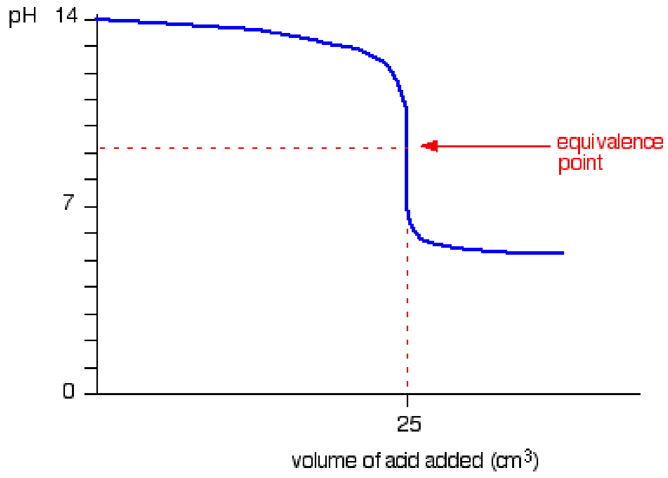
b) What volume of the $Ca(OH)_2$ solution is required to completely react with the ethanoic acid?

Step 1 Find the mol of ethanoic aicd
$n(CH_3COOH) = C \times V = 0.200 \times 0.0300 = 6.00 \times 10^{-3}$

Step 2 find the mol of $Ca(OH)_2$ required to react with the ethanoic acid.

According to the equation above 3.00×10^{-3} mol of $Ca(OH)_2$ would be required to react with 6.00×10^{-3} of ethanoic acid.
$V = n / C = 3.00 \times 10^{-3} / 0.160 = 0.0188\ L = 18.8\ mL$

3) Consider the titration curve on the right.
a) What is the likely acid being used from the list below? Explain
i) HCl
ii) H_2SO_4
iii) NH_4^+



It is a weak acid, most likely NH_4^+.
The pH of the acid solution in the conical flask only reaches a pH of 5, indicating a very weak acid

b) Explain, using your chosen acid as an example, why the equivalence point is at a pH significantly above 7.

Lets say the strong base was NaOH. The equation, therefore, will be that shown below.

$$NaOH(aq) + NH_4^+(aq) \Rightarrow NH_3(aq) + H_2O(l) + Na^+(aq)$$

or the ionic equation

$$OH^-(aq) + NH_4^+(aq) \Rightarrow NH_3(aq) + H_2O(l)$$

At the equivalence point the species present are NH_3, H_2O and Na^+
The NH_3 will react with the water to produce OH^- ions making the solution basic..

$$NH_3(aq) + H_2O(l) \Rightarrow OH^-(aq) + NH_4^+(aq)$$

Acid-base indicators

Name	pH range	Colour change	
		Acid	**Base**
Thymol blue	1.2–2.8	red	yellow
Methyl orange	3.1–4.4	red	yellow
Bromophenol blue	3.0–4.6	yellow	blue
Methyl red	4.2–6.3	red	yellow
Bromothymol blue	6.0–7.6	yellow	blue
Phenol red	6.8–8.4	yellow	red
Phenolphthalein	8.3–10.0	colourless	red