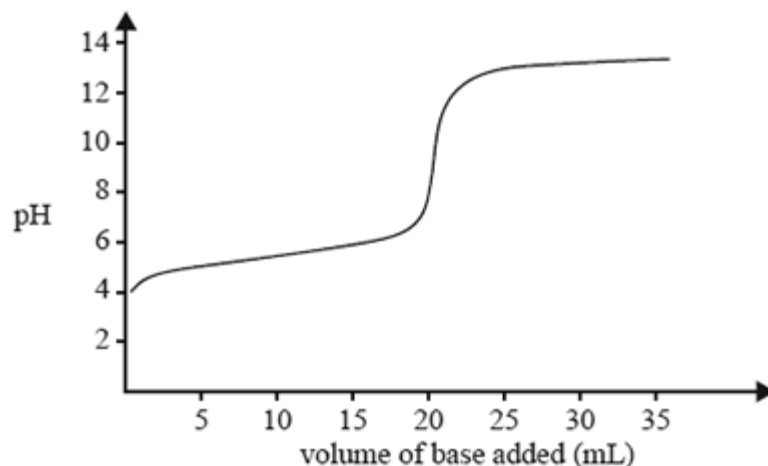


Friday Worksheet

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.

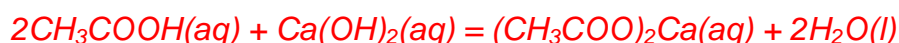


Refer to the acid-base indicator data provided in the data book and identify the indicator that would be least suitable to detect the end point of this neutralisation. Explain why.

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 $\text{Ca}(\text{OH})_2$ solution.

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



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

Step 1 Find the mol of ethanoic acid

$$n(\text{CH}_3\text{COOH}) = C \times V = 0.200 \times 0.0300 = 6.00 \times 10^{-3}$$

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

According to the equation above 3.00×10^{-3} mol of $\text{Ca}(\text{OH})_2$ would be required to react with 6.00×10^{-3} of ethanoic acid.

$$V = n / C = 3.00 \times 10^{-3} / 0.160 = 0.0188 \text{ L} = 18.8 \text{ mL}$$

3) Consider the titration curve on the right.

a) What is the likely acid being used from the list below? Explain

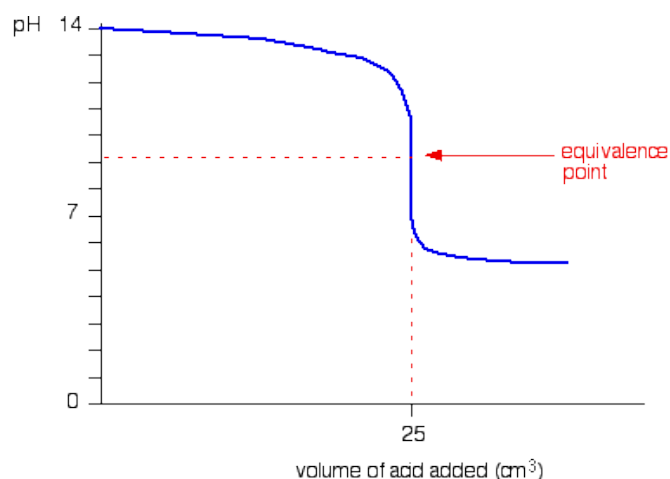
i) HCl

ii) H₂SO₄

iii) NH₄⁺

It is a weak acid, most likely NH₄⁺.

The pH of the acid solution in the conical flask only reaches a pH of 5, indicating a very weak acid

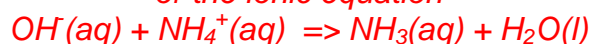


b) Explain, using your chosen acid as an example, why the equivalence point is at a pH significantly above 7.

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

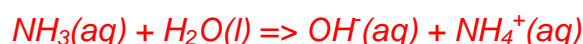


or the ionic equation



At the equivalence point the species present are NH₃, H₂O and Na⁺

The NH₃ will react with the water to produce OH⁻ ions making the solution basic..



Acid-base indicators

Name	pH range	Colour change		K _a
		Acid	Base	
Thymol blue	1.2–2.8	red	yellow	2 × 10 ⁻²
Methyl orange	3.1–4.4	red	yellow	2 × 10 ⁻⁴
Bromophenol blue	3.0–4.6	yellow	blue	6 × 10 ⁻⁵
Methyl red	4.2–6.3	red	yellow	8 × 10 ⁻⁶
Bromothymol blue	6.0–7.6	yellow	blue	1 × 10 ⁻⁷
Phenol red	6.8–8.4	yellow	red	1 × 10 ⁻⁸
Phenolphthalein	8.3–10.0	colourless	red	5 × 10 ⁻¹⁰