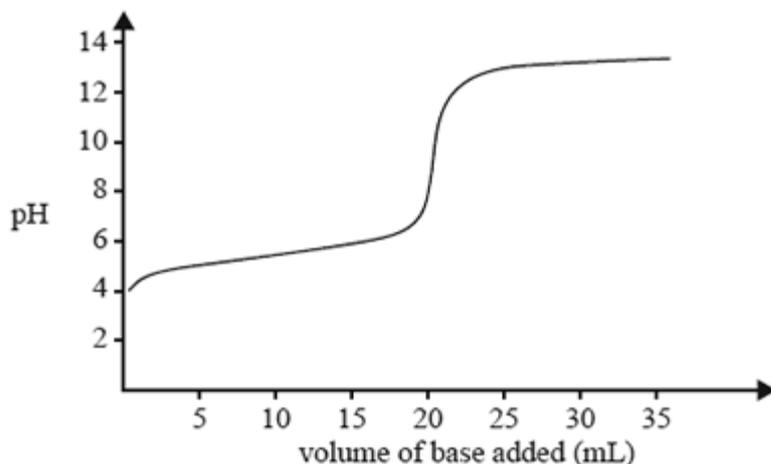


## Friday Worksheet

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.

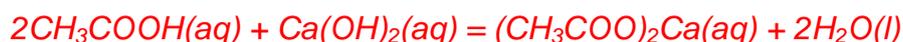


Refer to the acid-base indicator data provided in the data book and identify the indicator that would be least suitable to detect the end point of this neutralisation. Explain why.

*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  $\text{CH}_3\text{COOH}$  (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  $3.00 \times 10^{-3}$  mol of  $\text{Ca}(\text{OH})_2$  would be required to react with  $6.00 \times 10^{-3}$  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

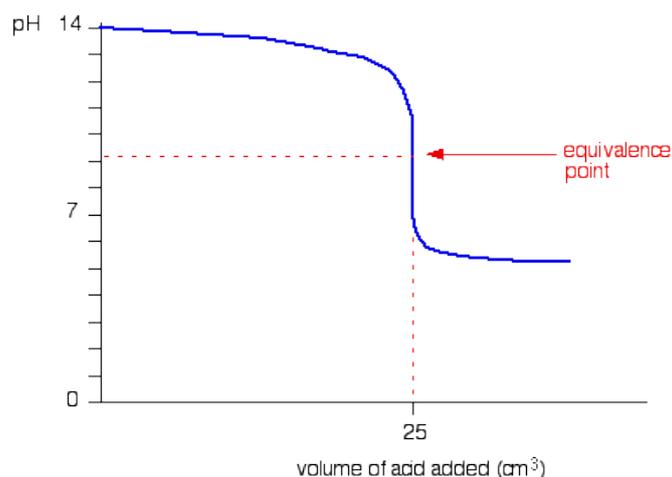
i) HCl

ii) H<sub>2</sub>SO<sub>4</sub>

iii) NH<sub>4</sub><sup>+</sup>

*It is a weak acid, most likely NH<sub>4</sub><sup>+</sup>.*

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

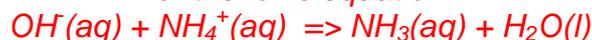


b) Explain, using your chosen acid as an example, why the equivalence point is at a pH significantly above 7.

*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 NH<sub>3</sub>, H<sub>2</sub>O and Na<sup>+</sup>*

*The NH<sub>3</sub> will react with the water to produce OH<sup>-</sup> ions making the solution basic..*



#### Acid-base indicators

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