

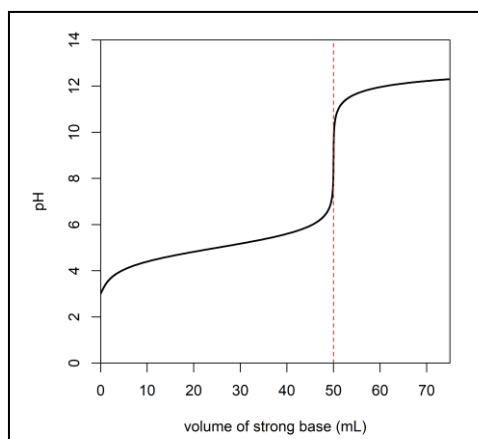
Video worksheet – volumetric analysis – indicators.

[Click](#) to revise indicators.

Acid-base indicators		
Name	pH range	Colour change from lower pH to higher pH in range
thymol blue (1st change)	1.2–2.8	red → yellow
methyl orange	3.1–4.4	red → yellow
bromophenol blue	3.0–4.6	yellow → blue
methyl red	4.4–6.2	red → yellow
bromothymol blue	6.0–7.6	yellow → blue
phenol red	6.8–8.4	yellow → red
thymol blue (2nd change)	8.0–9.6	yellow → blue
phenolphthalein	8.3–10.0	colourless → pink

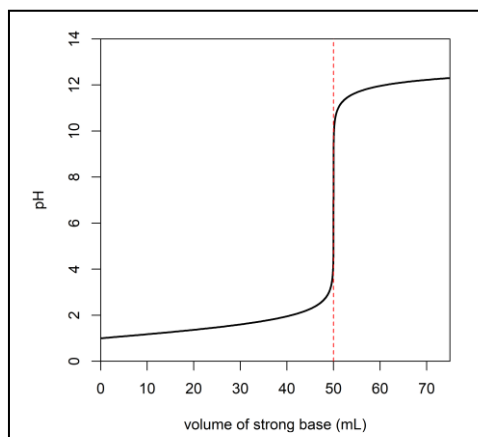
1. A solution of acetic acid was analysed using volumetric analysis. A 20.00 mL sample was titrated using 1.00M NaOH. The pH curve, shown on the right was obtained. Bromothymol blue was used as the indicator.

- Suggest how this selection would impact the average titre obtained.
- Suggest other possible indicators
- What type of error does the use of bromothymol blue represent? Explain.

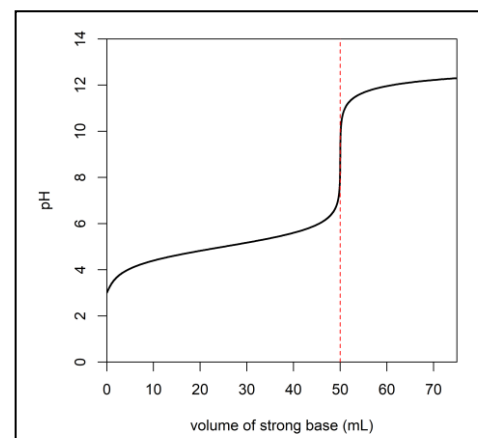


2. A solution of hydrochloric acid was analysed using volumetric analysis. A 20.00 mL sample was titrated using 1.00M NaOH. The pH curve, shown on the right was obtained. Methyl orange is selected as the indicator.

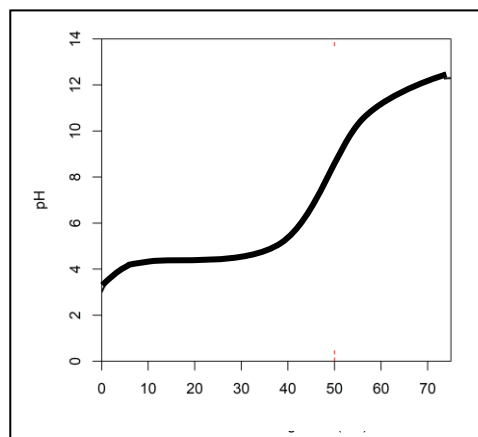
- Suggest how this selection would impact the average titre obtained.
- Suggest one other possible indicator.
- Give the colour change to look out for.



3. Suggest a reason why methyl orange would or would not be a suitable indicator for the titration of a citric acid solution with 0.100 M NaOH.



4. A student is performing a titration to determine the concentration of a weak acid solution using a weak base and an indicator that changes color in the pH range 5.0 – 8.0. However, the endpoint of the titration is reached before the equivalence point is reached. Explain why this could happen and suggest an alternative indicator for this titration.



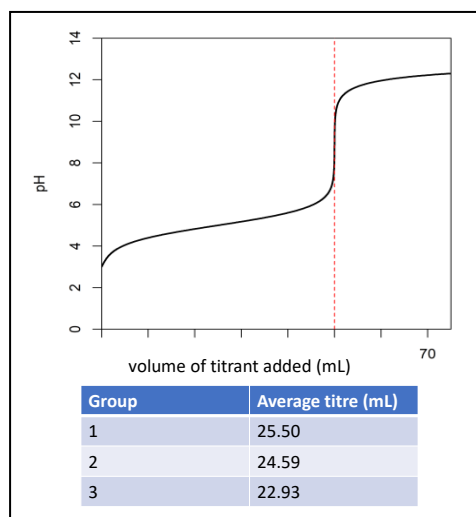
5. The concentration of an unknown solution of citric acid is to be determined using an acid-base titration. Two solutions are available to use as the titrant, 0.100 M NaOH and 0.100 M  $\text{CH}_3\text{NH}_2$ . A 0.100 M solution of a weak base, methanamine ( $\text{CH}_3\text{NH}_2$ ) was chosen as the titrant. Phenol red is the only indicator available. Many attempts to obtain an accurate value for the equivalence point continue to fail.

- Suggest a reason for this failure
- Make one alteration to the procedure and explain how this will improve the analysis.

6. The pH curve of a particular titration is shown on the right. Three groups of students conducting this investigation were given a choice of three indicators, thymol blue, bromothymol red and phenol red. Each group produced concordant results, as shown in the table on the right, that were used to find the average titre. All three groups used a different indicator.

- Identify the groups that used each of the three indicators. Explain your reasoning.

- Group 3 obviously obtained the lowest concordant results. Are the results obtained by group three: repeatable, accurate? Explain



- What type of error caused group three's results to be lower? Explain.