

WJEC (Wales) Chemistry A-level

SP 3.9 - Titration Using a pH Probe

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SP 3.9 - Titration Using a pH Probe

Aim

To obtain **titration curves** for strong and weak acids and alkalis.

Apparatus and Chemicals

- Deionised water
- 0.1 mol dm^{-3} HCl solution
- 0.1 mol dm^{-3} CH_3COOH solution
- 0.1 mol dm^{-3} NaOH solution
- 0.1 mol dm^{-3} NH_3 solution
- 25 cm^3 bulb/volumetric pipette with safety filler
- 50 cm^3 burette and funnel
- Burette clamp and stand
- 100 cm^3 beaker
- 250 cm^3 conical flask
- pH meter
- Data logger (optional)
- pH 4 buffer solution
- pH 9 buffer solution
- 0.1 mol dm^{-3} HCl solution
- 0.1 mol dm^{-3} CH_3COOH solution
- 0.1 mol dm^{-3} NaOH solution
- 0.1 mol dm^{-3} NH_3 solution

Safety Considerations

- ★ pH 4 buffer solution - irritant
- ★ pH 9 buffer solution - irritant
- ★ 0.1 mol dm^{-3} HCl solution - irritant
- ★ 0.1 mol dm^{-3} CH_3COOH solution - irritant
- ★ 0.1 mol dm^{-3} NaOH solution - irritant
- ★ 0.1 mol dm^{-3} NH_3 solution - irritant



Method

1. Calibrate the pH meter by immersing the electrodes in the pH 4 **buffer solution**, swirl the beaker, and adjust the reading to 4.0. Remove the electrode, wash with distilled water and immerse in the pH 9 buffer solution. The pH should read 9.0.
2. Using the pipette and filler, transfer 25.0 cm³ of acid to the conical flask and measure the pH.
3. Add the alkali, 5 cm³ at a time up to 50 cm³, and measure the pH after each 5 cm³ addition. **Wash the electrode** with distilled water between measurements.
4. If there is time available, **repeat** the procedure for all combinations of acid and alkali. If not, collaborate with other students so that your class has at least one set of results for each of the **following combinations**:
 - HCl and NaOH
 - CH₃COOH and NaOH
 - HCl and NH₃
 - CH₃COOH and NH₃
5. Plot graphs of volume of alkali against pH. Read off the pH at the **equivalence point** for each titration.

