

7.2 Brønsted–Lowry theory of acids and bases

Name: _____ Class: _____ Date: _____

Total: 12 marks

KEY WORDS acid 酸 • titration curve 滴定曲线 • titration 滴定 • strong acid 强酸
• weak acid 弱酸

Objective

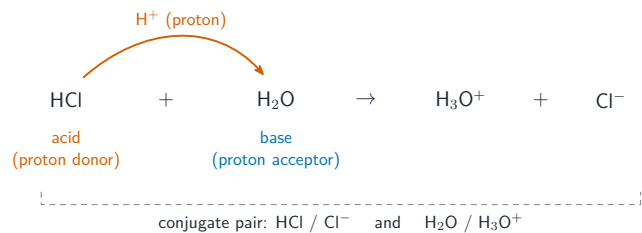
Build the skills to answer exam questions on the **Brønsted–Lowry theory** 布朗斯特-劳里理论 — proton donors and acceptors, **strong and weak** 强弱 acids/bases, **neutralisation** 中和, and titration curves.

You must be able to:

- describe the Brønsted–Lowry theory and name the common acids and alkalis
- explain strong vs weak acids and how to tell them apart
- sketch titration curves and select a suitable indicator

1 Worked examples

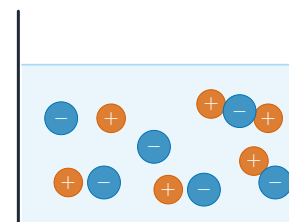
■ Brønsted–Lowry acids and bases



An acid is a proton (H^+) donor; a base is a proton acceptor — making two conjugate acid–base pairs

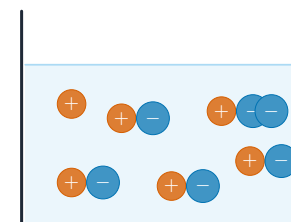
Common acids: HCl , H_2SO_4 , HNO_3 , CH_3COOH . Common alkalis: NaOH , KOH , NH_3 .

■ Strong vs weak



strong acid

fully dissociated: many ions



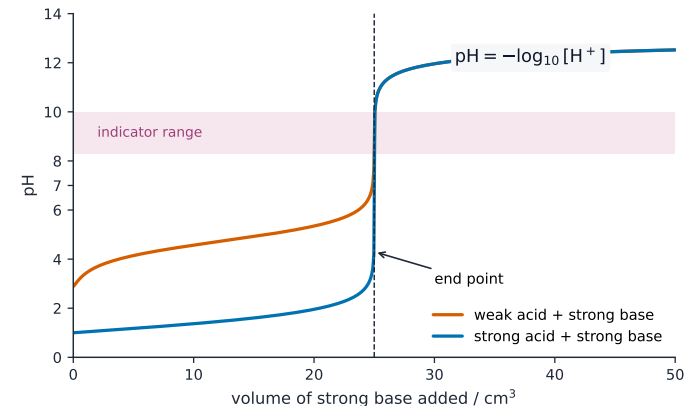
weak acid

mostly molecules: few ions

A strong acid is fully dissociated; a weak acid is only partly dissociated (not about concentration)

A strong acid has a **lower pH**, fizzes faster with a metal, and conducts better than a weak acid of the same concentration. **Neutralisation:** $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$, forming a **salt** 盐.

■ Titration curves and indicators



Choose an indicator whose colour change falls inside the steep pH jump

2 Practice

2.1 Define a Brønsted–Lowry **acid** and **base**. [2]

2.2 State the difference between a strong acid and a weak acid. [2]

3 Exam-style questions

3.1 In the Brønsted–Lowry theory, a base is a: [1]

- A proton donor
- B proton acceptor
- C electron donor
- D electron acceptor

3.2 Compared with a weak acid of the same concentration, a strong acid has a: [1]

- A higher pH
- B lower pH and more ions
- C smaller volume
- D larger molar mass

3.3 (a) Write the ionic equation for the neutralisation of an acid by an alkali. [1]

(b) Explain why a strong acid conducts electricity better than a weak acid of the same concentration. [2]

3.4 Explain how you would use a pH meter and a reactive metal to show that hydrochloric acid is a stronger acid than ethanoic acid of the same concentration. [3]

Solutions

2.1 an acid is a proton (H^+) donor; a base is a proton acceptor.

2.2 a strong acid is fully dissociated into ions in water; a weak acid is only partly dissociated.

3.1 B. A base is a proton acceptor.

3.2 B. A strong acid is fully dissociated, giving more ions and a lower pH.

3.3 (a) $\text{H}^+(\text{aq}) + \text{OH}^-(\text{aq}) \rightarrow \text{H}_2\text{O}(\text{l})$.

(b) a strong acid is fully dissociated, so has more ions; more ions carry more charge, so it conducts better.

3.4 measure the pH of each with a pH meter — HCl gives a lower pH; add the same reactive metal to each — HCl fizzes faster; both show HCl has more H^+ ions / is more dissociated, so it is stronger.