Exercise walk-through

Brønsted–Lowry theory of acids and bases ▪ 7.2

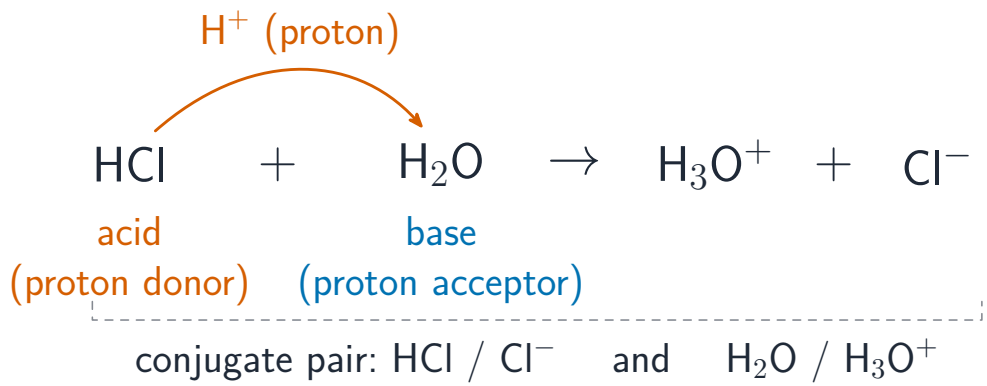
eXercise

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

Method — Brønsted–Lowry acids and bases

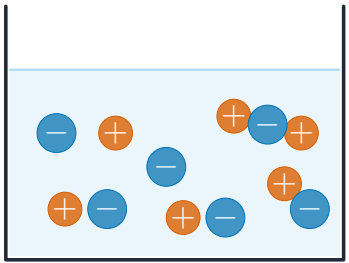
Common acids: HCl, H SO , HNO , CH COOH. Common alkalis: NaOH, KOH, NH .



Method — Strong vs weak

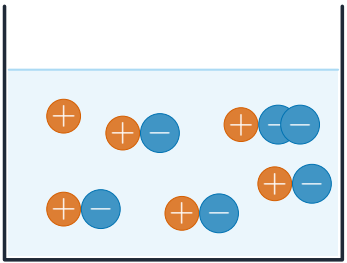
A strong acid has a **lower pH**, fizzes faster with a metal, and conducts better than a weak acid of the same concentration. **Neutralisation:** $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$, forming a **salt** 盐.

Method — Strong vs weak



strong acid

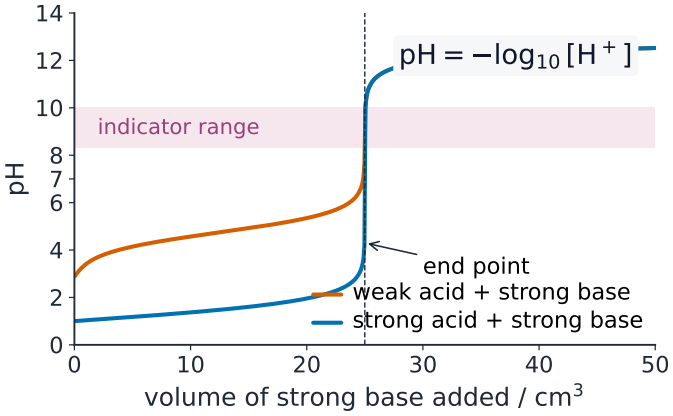
fully dissociated: many ions



weak acid

mostly molecules: few ions

Method — Titration curves and indicators



Practice 2.1 ▪ 2 marks

Define a Brønsted–Lowry **acid** and **base**.

Solution 2.1

Method: Brønsted–Lowry acids and bases

Worked steps

an acid is a proton (H) donor B1; a base is a proton acceptor B1.

Practice 2.2 ▪ 2 marks

State the difference between a strong acid and a weak acid.

Solution 2.2

Method: Strong vs weak

Worked steps

a strong acid is fully dissociated into ions in water B1; a weak acid is only partly dissociated B1.

Exam-style 3.1 ▪ 1 mark

In the Brønsted–Lowry theory, a base is a:

A proton donor

B proton acceptor

C electron donor

D electron acceptor

Solution 3.1

Method: Brønsted–Lowry acids and bases

A proton donor

B proton acceptor ✓

C electron donor

D electron acceptor

Worked steps

B. A base is a proton acceptor.

Exam-style 3.2 ▪ 1 mark

Compared with a weak acid of the same concentration, a strong acid has a:

A higher pH

B lower pH and more ions

C smaller volume

D larger molar mass

Solution 3.2

Method: Strong vs weak

A higher pH

B lower pH and more ions ✓

C smaller volume

D larger molar mass

Worked steps

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

Exam-style 3.3 ▪ 1 mark

(a) Write the ionic equation for the neutralisation of an acid by an alkali.
(b) Explain why a strong acid conducts electricity better than a weak acid of the same concentration.

Solution 3.3

Method: Strong vs weak

Worked steps

(a) $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$ B1.
(b) a strong acid is fully dissociated, so has more ions M1; more ions carry more charge, so it conducts better A1.

Exam-style 3.4 ▪ 3 marks

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.

Solution 3.4

Method: Strong vs weak

Worked steps

measure the pH of each with a pH meter — HCl gives a lower pH (M1); add the same reactive metal to each — HCl fizzes faster (M1); both show HCl has more H ions / is more dissociated, so it is stronger (A1).