

Exercise walk-through

Introduction to Acids and Bases ■ 8.1

eXercise

You must be able to

- use the **Brønsted-Lowry** definitions (proton donor / acceptor)
- distinguish **strong** 强 from **weak** 弱 acids and bases
- write the ionization of an acid in water

Method — Brønsted-Lowry

An **acid** donates H^+ ; a **base** accepts H^+ . In water an acid produces H_3O^+ (hydronium); a base produces OH^- .

Method — Strong vs weak

- A **strong** acid/base ionizes **completely** (HCl, NaOH) — a single arrow.
- A **weak** acid/base ionizes **partially** (CH_3COOH , NH_3) — an equilibrium arrow.

Method — A worked ionization

Strong: $\text{HCl} \rightarrow \text{H}^+ + \text{Cl}^-$ (complete). Weak: $\text{CH}_3\text{COOH} \rightleftharpoons \text{H}^+ + \text{CH}_3\text{COO}^-$ (partial, so a small K_a).

Method — Recognising strong acids

The common strong acids are HCl, HBr, HI, HNO₃, H₂SO₄, HClO₄. Assume other acids are weak.

Practice 2.1 ■ 1 mark

Define a Brønsted-Lowry base.

Solution 2.1

Method: Brønsted-Lowry

Worked steps

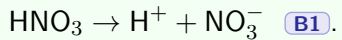
A proton (H^+) acceptor **B1**.

Practice 2.2 ■ 1 mark

Write the ionization of the strong acid HNO_3 in water.

Solution 2.2

Worked steps



Practice 2.3 ■ 1 mark

Why is a weak acid written with an equilibrium arrow?

Solution 2.3

Method: Strong vs weak

Worked steps

It only ionizes partially, so an equilibrium exists between the molecule and its ions

B1.

Exam-style 3.1 ■ 1 mark

A strong acid in water

A ionizes completely

B ionizes partially

C does not ionize

D forms OH^-

Solution 3.1

A ionizes completely



B ionizes partially

C does not ionize

D forms OH^-

Worked steps

A — ionizes completely.

Exam-style 3.2 ■ 1 mark

Compare HCl and CH_3COOH (acetic acid) at the same concentration.

- (a) Which ionizes more?
- (b) Which has the higher $[\text{H}^+]$? Explain.

Solution 3.2

Method: Strong vs weak

Worked steps

(a) HCl **B1**. (b) HCl — it is strong and ionizes completely, giving a higher $[\text{H}^+]$ than the partially-ionized weak acetic acid **M1 A1**.

Exam-style 3.3 ■ 3 marks

Write the equilibrium for the weak base ammonia NH_3 reacting with water.

Solution 3.3

Method: Strong vs weak

Worked steps

