

4.8 Acid-Base Reactions

Name: _____ Class: _____ Date: _____

Total: 12 marks

KEY WORDS brønsted-lowry 布朗斯特 • neutralization 中和
 • conjugate acid-base pairs 共轭酸碱对 • acid 酸 • base 碱

Objective

Build the skills to answer exam questions on **acid-base reactions**.

You must be able to:

- identify **Brønsted-Lowry** 布朗斯特-劳里 acids (proton donors) and bases (proton acceptors)
- write **neutralization** 中和 as acid + base $\rightarrow$ salt + water
- identify **conjugate acid-base pairs** 共轭酸碱对

1 Worked examples

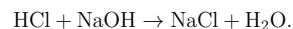
Study these first. Each one shows the method for a question type used later — follow the steps and you can do the Practice and Exam-style questions yourself.

■ Brønsted-Lowry definition

An **acid** donates a proton (H^+); a **base** accepts one. In $\text{HCl} + \text{H}_2\text{O} \rightarrow \text{H}_3\text{O}^+ + \text{Cl}^-$, HCl donates ($\rightarrow$ acid), water accepts ($\rightarrow$ base).

■ Neutralization

Acid + base $\rightarrow$ **salt** + **water**:



The net ionic form is $\text{H}^+ + \text{OH}^- \rightarrow \text{H}_2\text{O}$.

■ Conjugate pairs

When an acid donates its proton, what remains is its **conjugate base**. HCl (acid) $\rightarrow \text{Cl}^-$ (conjugate base). H_2O (base) $\rightarrow \text{H}_3\text{O}^+$ (conjugate acid). A pair differs by **one H^+** .

■ Identifying pairs

Look for two species that differ by a single proton on each side of the equation.

2 Practice

Now apply the methods above.

2.1 Define a Brønsted-Lowry acid. [1]

2.2 Write the products of $\text{HNO}_3 + \text{KOH}$. [2]

2.3 What is the conjugate base of HF? [1]

3 Exam-style questions

3.1 A Brønsted-Lowry base is a [1]

- **A** proton donor
- **B** proton acceptor
- **C** electron donor
- **D** hydroxide only

3.2 Consider $\text{NH}_3 + \text{H}_2\text{O} \rightleftharpoons \text{NH}_4^+ + \text{OH}^-$.

(a) Identify the acid and base on the left. [2]

(b) Identify the conjugate acid-base pairs. [2]

3.3 Write the balanced molecular equation for the neutralization of sulfuric acid H_2SO_4 with sodium hydroxide. [3]

Solutions

2.1 A proton (H^+) donor.

2.2 $\text{KNO}_3 + \text{H}_2\text{O}$ (salt + water).

2.3 F^- .

3.1 **B** — a proton acceptor.

3.2 (a) H_2O is the acid (donates H^+); NH_3 is the base (accepts). (b) $\text{NH}_3/\text{NH}_4^+$ and $\text{H}_2\text{O}/\text{OH}^-$.

3.3 $\text{H}_2\text{SO}_4 + 2\text{NaOH} \rightarrow \text{Na}_2\text{SO}_4 + 2\text{H}_2\text{O}$.