Your notes

GCSE Chemistry: revision notes

Acids, alkalis and neutralisation

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Start here: acids, bases and alkalis

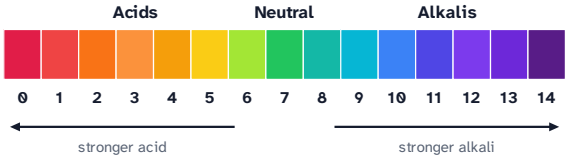
- **Acids** are substances that give hydrogen ions (H^+) when they dissolve in water. **Alkalis** give hydroxide ions (OH^-).
- A **base** is anything that neutralises an **acid**, such as a metal oxide or hydroxide. An **alkali** is a base that dissolves in water.
- When an **acid** reacts with an **alkali**, the H^+ and OH^- ions join to make water: $H^+ + OH^- \rightarrow H_2O$. This is **neutralisation**.

Acids and alkalis

- **Acids** produce hydrogen ions (H^+) in aqueous solution. Examples: hydrochloric **acid** (HCl), sulfuric **acid** (H_2SO_4) and nitric acid (HNO_3).
- **Alkalis** are soluble **bases**. Their aqueous solutions contain hydroxide ions (OH^-). Example: sodium hydroxide (NaOH).
- **Bases** are substances that neutralise **acids**, such as metal oxides and metal hydroxides.

The pH scale

- The **pH scale** runs from 0 to 14 and measures how acidic or alkaline a solution is.
- A neutral solution has pH 7. **Acids** have pH below 7; **alkalis** have pH above 7.
- pH can be measured with **universal indicator** (red for **strong acids** through green for neutral to purple for strong **alkalis**) or with a pH probe.



Neutralisation

- In **neutralisation**, hydrogen ions from the **acid** react with hydroxide ions from the **alkali** to make water: $H^+(aq) + OH^-(aq) \rightarrow H_2O(l)$.
- **Acid** + **alkali** → salt + water.

Acids and metals

- **Acids** react with metals above hydrogen in the reactivity series to form a salt and hydrogen.
- Magnesium + hydrochloric **acid** → magnesium chloride + hydrogen: $Mg + 2HCl \rightarrow MgCl_2 + H_2$.
- Test for hydrogen: a lighted splint gives a squeaky pop.
- (Higher) These are redox reactions: the metal atoms lose electrons (oxidised) and the hydrogen ions gain electrons (reduced).

Strong and weak acids (Higher)

- A **strong acid** is completely ionised in aqueous solution: hydrochloric, nitric and sulfuric **acids**.
- A **weak acid** is only partially ionised: ethanoic, citric and carbonic **acids**.
- As pH decreases by one unit, the hydrogen ion concentration increases by a factor of 10.
- Strong and weak are about how much the **acid** ionises; **concentrated** and dilute are about how much **acid** is in a given volume.

Exam tip

- Learn how salts get their names: hydrochloric **acid** gives chlorides, sulfuric **acid** gives sulfates and nitric **acid** gives nitrates.
- Link to ions: **acids** make H^+ ions and **alkalis** make OH^- ions, which join to make water.

Common mistakes

- Writing 'chlorine' instead of 'chloride' in a salt's name.
- Mixing up strong and **concentrated**. Strong means fully ionised; **concentrated** means a lot of **acid** in the water.

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Worked examples

Name the salt made when sulfuric acid reacts with sodium hydroxide.

The first part of the name comes from the metal in the base. **sodium**

The second part comes from the acid: hydrochloric acid makes chlorides, nitric acid makes nitrates, sulfuric acid makes sulfates. **sulfate**

Answer: Sodium sulfate (and water)

Key terms

Acid	A substance that produces H^+ ions in aqueous solution.
Alkali	A soluble base that produces OH^- ions in aqueous solution.
Base	A substance that neutralises an acid, such as a metal oxide or hydroxide.
pH scale	A scale from 0 to 14 that measures acidity or alkalinity.
Neutralisation	The reaction between an acid and a base, forming a salt and water.
Universal indicator	A mixture of dyes that changes colour with pH.
Strong acid	An acid that is completely ionised in water.
Weak acid	An acid that is only partially ionised in water.
Concentrated	Containing a large amount of solute in a given volume.

Quick questions

Cover the answers and test yourself: remembering is what makes it stick.

1. What ions do acids produce in water?
2. What ions do alkalis produce in water?
3. What is the pH of a neutral solution?
4. What are the products of an acid reacting with an alkali?
5. What is the ionic equation for neutralisation?
6. What gas is made when magnesium reacts with hydrochloric acid?
7. What colour is universal indicator in a strong alkali?
8. What is a strong acid? (Higher)

Answers

1. Hydrogen ions (H^+)
2. Hydroxide ions (OH^-)
3. 7
4. A salt and water
5. $H^+ + OH^- \rightarrow H_2O$
6. Hydrogen

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7. Purple
8. An acid that is completely ionised in water

What to do next

Practise 11 questions on this topic

Try 7 exam questions, with mark schemes

Read the lesson, one step at a time

Free revision for GCSE and KS3 at lycolearn.co.uk. Some notes are for one exam board only, and say so in brackets.

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