

BioMedical Admissions Test (BMAT)

Section 2: Chemistry

Topic C9: Acids, Bases, and Salts

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Topic C9: Acids, Bases, and Salts

Definitions

Acid

An **acid** is a **proton donor**. This means that it **dissociates** to form **H⁺ ions** in solution.

→ For example, in H₂SO₄, each molecule dissociates to form 2H⁺ ions and 1 SO₄²⁻ ion.

A **strong acid** **fully dissociates** to form H⁺ ions in solution.

→ For example, HCl is a strong acid.

A **weak acid** **partially dissociates** in a **reversible reaction** to form H⁺ and the other ion.

→ An example of this is carboxylic acids such as propanoic acid.

The **concentration** of an acid or base is dependent on how many moles of acid or base there are per volume of solution.

→ A base or acid is either **dilute** or **concentrated**.

→ You can have a concentrated weak acid or a dilute strong base.

pH

pH measures the **concentration of H⁺** in a solution.

→ A low pH means a high concentration of H⁺ ions.

→ A change of 1 pH means there has been a change in H⁺ ions by a factor of 10.

Base

A **base** is a **proton acceptor** or contains an OH⁻ ion. Proton acceptor means that it is able to accept a H⁺ ion in solution.

→ A soluble base is an **alkali**.

A **strong base** **fully dissociates** to form OH⁻ ions in solution.

→ For example, NaOH is a strong base.

A **weak base** only **partially dissociates** to form ions in solution.

→ For example, ammonia in water only partially forms ammonium and OH⁻ ions.



Reactions of Acids

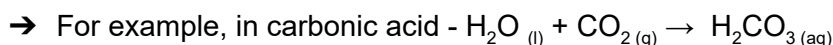
There are some reactions of acids which you need to know.

Reactant	Products	Example
Metals	Salt + Hydrogen	$2\text{Na}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow 2\text{NaCl}_{(aq)} + \text{H}_{2(g)}$
Metal Carbonates	Salt + Carbon Dioxide + Water	$\text{Na}_2\text{CO}_{3(aq)} + 2\text{HCl}_{(aq)} \rightarrow 2\text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)} + \text{CO}_{2(g)}$
Metal Oxides	Salt + Water	$2\text{Na}_2\text{O}_{(s)} + 2\text{HCl}_{(aq)} \rightarrow 2\text{NaCl}_{(aq)} + \text{H}_2\text{O}_{(l)}$

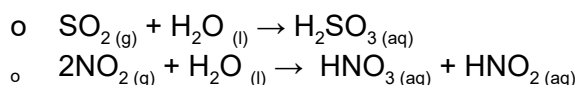
- The hydrogen produced will be seen as **effervescence (bubbling)**.
- The reactions between a metal carbonate and an acid and between a metal oxide and an acid are **neutralisation** reactions not **redox** reactions.

Non-metallic Oxides

Some non-metallic oxides form acidic solutions when reacted with water.

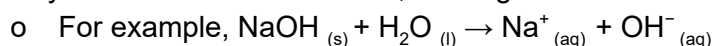


→ This also occurs in acid rain where sulfur and nitrogen react to form sulfuric and nitric acid.

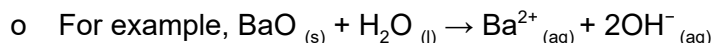


Reactions of Bases

Some metal hydroxides dissolve in water, forming OH^- ions.



Some metal oxides react with water to form an alkaline solution.



Reactions of Acids with Bases

Acids and bases react in **neutralisation reactions**.

→ These are often exothermic as the ions are already dissociated and so no endothermic bond breaking occurs.

→ The product is water + a salt.

