IGCSE Chemistry

Revision Sheet · 考前速记

Learn these by heart before the exam. 考试前把这些内容背熟。

Atoms and the mole

Atomic structure 原子结构: protons (+1) and neutrons in the nucleus, electrons (−1) in shells; proton number defines the element

Isotopes 同位素: atoms of the same element with the same protons but different neutrons; relative atomic mass = average allowing for abundance

$$\text{moles} = \frac{\text{mass}}{M_r}$$ 摩尔

$$\text{concentration} = \frac{\text{moles}}{\text{volume (dm}^3\text{)}}$$ 浓度

Electron shells fill 2, 8, 8; group number = outer electrons, period number = number of shells.

Bonding and the Periodic Table

Ionic bonding 离子键: a metal gives electrons to a non-metal; oppositely charged ions form a giant lattice – high melting point, conducts when molten or dissolved

Covalent bonding 共价键: non-metal atoms share pairs of electrons; usually small molecules with low melting points that do not conduct

Metallic bonding 金属键: a lattice of positive ions in a sea of delocalised electrons – conducts and is malleable

Group I (alkali metals): reactivity increases down the group. Group VII (halogens): reactivity decreases down the group.

Group 0 (noble gases) are unreactive – full outer shells. Transition metals: coloured compounds, act as catalysts.

Reactions and energetics

Oxidation and reduction 氧化与还原: OIL RIG – Oxidation Is Loss of electrons, Reduction Is Gain; oxidation is also gain of oxygen

Exothermic vs endothermic 放热与吸热: exothermic releases heat (temperature rises); endothermic takes in heat (temperature falls)

Rate of reaction 反应速率: faster with higher concentration, higher temperature, larger surface area, and a catalyst – more frequent successful collisions

Catalyst 催化剂: speeds up a reaction and is unchanged at the end; lowers the activation energy

Reversible reaction at equilibrium (⇌): raising temperature favours the endothermic direction; raising pressure favours the side with fewer gas molecules.

Acids, bases and salts

Acids: pH < 7, turn litmus red. Alkalis: pH > 7, turn litmus blue. Neutral: pH = 7.

acid + base → salt + water 中和

Acid + metal → salt + hydrogen; acid + carbonate → salt + water + carbon dioxide.

Electrolysis 电解: an electric current splits a molten or dissolved ionic compound; positive ions (cations) go to the cathode, negative to the anode

Tests: hydrogen pops with a lit splint; oxygen relights a glowing splint; CO_2 turns limewater milky.

Organic and analysis

Homologous series 同系物: a family with the same general formula and functional group (alkanes, alkenes, alcohols, acids)

Alkanes C_nH_{2n+2} (saturated, single bonds); alkenes C_nH_{2n} (unsaturated, C=C double bond).

Test for an alkene: it decolourises orange bromine water; alkanes do not.

Complete combustion → CO_2 + water; incomplete combustion → toxic carbon monoxide + soot.

Flame tests: lithium red, sodium yellow, potassium lilac, copper blue-green.