



Key Stage 4 Chemistry National Curriculum Overview

Students should be taught about:

Atomic Structure and the Periodic Table

- a simple model of the atom consisting of the nucleus and electrons, relative atomic mass, electronic charge and isotopes
- the number of particles in a given mass of a substance
- the modern Periodic Table, showing elements arranged in order of atomic number
- position of elements in the Periodic Table in relation to their atomic structure and arrangement of outer electrons
- properties and trends in properties of elements in the same group
- characteristic properties of metals and non-metals
- chemical reactivity of elements in relation to their position in the Periodic Table

Structure, Bonding and the Properties of Matter

- changes of state of matter in terms of particle kinetics, energy transfers and the relative strength of chemical bonds and intermolecular forces
- types of chemical bonding: ionic, covalent, and metallic
- bulk properties of materials related to bonding and intermolecular forces
- bonding of carbon leading to the vast array of natural and synthetic organic compounds that occur due to the ability of carbon to form families of similar compounds, chains and rings
- structures, bonding and properties of diamond, graphite, fullerenes and graphene

Chemical Changes

- determination of empirical formulae from the ratio of atoms of different kinds
- balanced chemical equations, ionic equations and state symbols
- identification of common gases
- the chemistry of acids; reactions with some metals and carbonates
- pH as a measure of hydrogen ion concentration and its numerical scale
- electrolysis of molten ionic liquids and aqueous ionic solutions
- reduction and oxidation in terms of loss or gain of oxygen

Energy Changes in Chemistry

- measurement of energy changes in chemical reactions (qualitative)
- bond breaking, bond making, activation energy and reaction profiles (qualitative)

Rate and Extent of Chemical Change

- factors that influence the rate of reaction: varying temperature or concentration, changing the surface area of a solid reactant or by adding a catalyst
- factors affecting reversible reactions



Chemical Analysis

- distinguishing between pure and impure substances
- separation techniques for mixtures of substances: filtration, crystallisation, chromatography, simple and fractional distillation
- quantitative interpretation of balanced equations
- concentrations of solutions in relation to mass of solute and volume of solvent

Chemical and Allied Industries

- life cycle assessment and recycling to assess environmental impacts associated with all the stages of a product's life
- the viability of recycling of certain materials
- carbon compounds, both as fuels and feedstock, and the competing demands for limited resources
- fractional distillation of crude oil and cracking to make more useful materials
- extraction and purification of metals related to the position of carbon in a reactivity series

Earth and Atmospheric Science

- evidence for composition and evolution of the Earth's atmosphere since its formation
- evidence, and uncertainties in evidence, for additional anthropogenic causes of climate change
- potential effects of, and mitigation of, increased levels of carbon dioxide and methane on the Earth's climate
- common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources
- the Earth's water resources and obtaining potable water