

Year 11 Chemistry Curriculum Overview - Term 1

Combined Science – Chemistry

Unit 4: Chemical Changes – Electrolysis.

Key topics include:

- **What is Electrolysis?:** Understanding how ionic compounds can be broken down into their constituent elements when an electric current is passed through them.
- **Electrolysis of Molten and Aqueous Solutions:** Learning the difference between electrolysis of molten compounds (e.g., molten lead bromide) and aqueous solutions (e.g., sodium chloride solution), and what products are formed at the electrodes.
- **Electrolysis of Aluminium:** Examining how electrolysis is used to extract metals like aluminium from their ores in industry.
- **Electrolysis of Brine:** Exploring the industrial process of electrolysis of brine (salt water) to produce useful products like chlorine, hydrogen, and sodium hydroxide.
- **Half Equations:** Learning how to represent what happens at the electrodes during electrolysis using half equations. Practical work will involve setting up electrolysis experiments using different solutions and observing the products formed at the electrodes.

Unit 6: The Rate and Extent of Chemical Change.

Key topics include:

- **Factors Affecting Rate:** Investigating how temperature, concentration, surface area, and the presence of a catalyst affect the rate of a chemical reaction.
- **Measuring Rates of Reaction:** Students will learn different methods for measuring how fast a reaction occurs, such as measuring the production of gas or observing colour changes.
- **Collision Theory:** Understanding how particles must collide with enough energy (activation energy) to react and how increasing the frequency of collisions increases the reaction rate.
- **Reversible Reactions and Dynamic Equilibrium:** Introducing the concept of reversible reactions and how they reach dynamic equilibrium, where the rate of the forward reaction equals the rate of the reverse reaction.

Practical work will include experiments to measure the effects of concentration and temperature on the rate of reactions, such as the reaction between sodium thiosulfate and hydrochloric acid.

Triple Science – Chemistry

Unit 6: The Rate and Extent of Chemical Change.

Key topics include:

- **Collision Theory and Activation Energy:** A more detailed exploration of how particle collisions and energy levels affect the speed of chemical reactions.
- **Catalysts and Reaction Pathways:** Investigating how catalysts speed up reactions without being used up, and how they reduce the activation energy required for reactions.
- **Le Chatelier's Principle:** Understanding how changes in temperature, pressure, and concentration affect the position of equilibrium in reversible reactions, and how this principle is applied in industrial processes.

Practical work will involve a deeper investigation into how different factors affect reaction rates and conducting experiments to explore reversible reactions in detail.

Unit 7: Organic Chemistry.

Key topics include:

- **Hydrocarbons and Alkanes:** Learning about the structure and properties of alkanes, a type of hydrocarbon with single bonds between carbon atoms.
- **Crude Oil and Fractional Distillation:** Exploring how crude oil is separated into useful fractions, such as petrol, diesel, and kerosene, through fractional distillation.
- **Alkenes and Cracking:** Understanding alkenes, which contain double bonds, and how they are produced from larger hydrocarbons through cracking.
- **Uses of Hydrocarbons:** Examining the wide range of uses for hydrocarbons, from fuels to making plastics, and understanding their environmental impact.
- **Polymers:** Introducing students to the formation of polymers (plastics) from smaller molecules called monomers, and discussing their everyday applications.

Practical work will include observing the cracking of hydrocarbons and exploring the properties of different types of organic compounds.

This term, following the AQA KS4 Chemistry curriculum, our Year 11 students will focus on advanced concepts that build on their foundational knowledge, helping them prepare for their upcoming GCSE exams. The overview below outlines what Combined Science and Triple Science students will be covering this term.

Combined Science (Chemistry) – Unit 7: Organic Chemistry

Our Combined Science students will study Unit 7, Organic Chemistry, which explores the chemistry of carbon-based compounds, focusing on the properties, reactions, and real-world uses of organic molecules.

1. Introduction to Organic Chemistry

- Students will learn about hydrocarbons, which are the simplest organic compounds, consisting solely of carbon and hydrogen atoms.
- We will focus on alkanes and alkenes, exploring how these molecules are categorized based on the type of bonds they contain (single or double) and how this affects their chemical reactivity and structure.

2. Fractional Distillation and Crude Oil

- Students will study crude oil, a complex mixture of hydrocarbons, and how it is separated into useful fractions through fractional distillation.
- We will discuss the importance of different fractions, such as gasoline, kerosene, and diesel, in everyday life and the role of the oil industry in producing essential fuels and materials.

3. Reactions of Hydrocarbons

- This topic covers the chemical reactions of hydrocarbons, including combustion and addition reactions, and why alkanes and alkenes react differently due to their bonding.
- Students will also explore environmental issues related to hydrocarbon use, such as air pollution and the production of greenhouse gases.

4. Cracking and the Production of Fuels

- Students will learn about cracking, a process that breaks down larger hydrocarbon molecules into smaller, more useful ones, such as petrol and ethene.
- We will examine how cracking is used to meet demand for specific fuels and products, helping students understand the economic and practical aspects of organic chemistry.

Triple Science (Chemistry) – Unit 7: Organic Chemistry and Unit 8: Chemical Analysis

In addition to completing Unit 7, Triple Science students will begin Unit 8, Chemical Analysis, which covers methods used to identify substances and analyze their composition, a crucial area of chemistry with applications in fields such as forensics, environmental science, and quality control.

1. Chemical Analysis and Purity

- Students will learn about the concepts of purity and mixtures, understanding how impurities affect the properties of substances and their melting and boiling points.
- We will discuss the importance of purity in products, such as pharmaceuticals, where even small impurities can be significant.

2. Chromatography

- This section introduces chromatography, a key technique for separating and identifying substances in mixtures.
- Through practical activities, students will learn how paper chromatography works and use it to analyze various samples, building skills in data interpretation and analysis.

3. Identification of Ions and Gases

- Students will study tests to identify common ions and gases, including flame tests, precipitation reactions, and gas tests.
- These analytical techniques allow students to gain hands-on experience in laboratory testing and understand how these methods are applied in fields such as forensic science and environmental monitoring.