AQA A-level Chemistry Year 12 and Year 13- course overview

A-level AQA Chemistry provides students with a comprehensive and challenging understanding of the fundamental principles that underpin the chemical sciences. Throughout the course, students develop their knowledge of physical, inorganic, and organic chemistry, exploring topics such as atomic structure, bonding, energetics, kinetics, equilibrium, and the chemistry of elements and compounds. They will also gain practical laboratory skills through required experiments, learning how to plan investigations, analyse data, and evaluate results with accuracy and confidence. The course encourages critical thinking, problem-solving, and the application of scientific concepts to real-world contexts, preparing students for further study in chemistry and related fields, as well as a wide range of careers in science, medicine, and engineering.

Year 12 Chemistry content

Advent 1

In the study of Amount of Substance (mass), students learn how to measure and calculate quantities in chemistry, including using the mole concept, relative atomic mass, and balanced equations to determine reacting amounts. In Atomic Structure, students explore the fundamental nature of atoms, including the behaviour of electrons, energy levels, and subatomic particles, as well as how models of the atom have developed over time and how atomic structure influences chemical properties.

Key areas of study:

- Amount of Substance (mass)
- Atomic Structure

Advent 2

In *Bonding*, students explore how atoms combine to form compounds, studying ionic, covalent, and metallic bonding, as well as the properties and structures that arise from these different types of interactions. In *Amount of Substance (liquids and gases)*, students build on their understanding of the mole by applying it to reactions involving solutions and gases, including calculations with concentration, gas volumes, and the ideal gas equation.

Key areas of study:

- Bonding
- Amount of substance (Liquid and gas)

Lent 1

In *Alkanes and Haloalkanes*, students study the structure, properties, and reactions of these important organic compounds, including combustion, substitution reactions, and mechanisms such as free radical substitution. They also learn how structure influences reactivity and how these compounds are used in everyday life. In *Redox, Group 2 and Group 7*, students explore oxidation and reduction processes in terms of electron transfer and oxidation states, alongside studying the physical and chemical properties of Group 2 (alkaline earth metals) and Group 7 (halogens), including trends in reactivity and practical applications of these elements.

Key areas of study:

- Alkanes and Haloalkanes
- Redox, Group 2 and Group7

Lent 2

In *Alkenes*, students study unsaturated hydrocarbons, focusing on their structure, bonding, and reactivity, including key reactions such as addition and polymerisation, as well as the role of catalysts and reaction conditions. In *Energetics*, students explore energy changes in chemical reactions, including concepts such as enthalpy, exothermic and endothermic processes, bond energies, and methods for measuring and calculating energy changes in the laboratory.

Key areas of study:

- Alkenes
- Energetics

Trinity

In *Alcohols and Analysis*, students study the structure, properties, and reactions of alcohols, including oxidation and substitution, as well as techniques used to identify organic compounds, such as spectroscopy and chromatography. In *Kinetics*, students explore the rates of chemical reactions, investigating factors that affect rate, rate equations, and the role of catalysts. In *Kc (equilibrium constant)*, students learn how to describe chemical equilibrium quantitatively, using equilibrium expressions to calculate and predict the position of equilibrium under different conditions.

Key areas of study:

- Alcohol and Analysis
- Kinetics
- Kc (equilibrium constant)

Year 13 Chemistry content

Advent 1

In *Carbonyls*, students examine compounds containing the carbonyl functional group, including aldehydes and ketones, focusing on their structure, reactions, and characteristic properties. In *Carboxylic Acids and Derivatives*, students explore a wider range of organic compounds, such as carboxylic acids, esters, and acyl chlorides, studying their synthesis, reactions, and practical uses. In *Kp* (equilibrium constant for gas-phase reactions), students extend their understanding of equilibrium to gaseous systems, learning how to calculate and interpret equilibrium constants based on partial pressures. In *Rates*, students deepen their understanding of reaction kinetics by modelling reaction rates, analysing experimental data, and exploring the effect of factors such as concentration and temperature on reaction mechanisms.

Key areas of study:

- Carbonyls
- Carboxylic acids and derivatives
- Kp (equilibrium constant for gas-phase reactions)
- Rates

Advent 2

In *Transition Metals (Part A) and Aqueous Chemistry*, students explore the unique properties of transition metals, including variable oxidation states, coloured compounds, and their ability to form complex ions. They also study reactions in aqueous solutions, focusing on identifying ions through chemical tests and understanding how metal ions behave in water. In *Acids and Bases*, students develop a deeper understanding of acidity and alkalinity, learning about pH, strong and weak acids and bases, and how to use equilibrium concepts to explain acid–base behaviour and calculate pH in different systems.

Key areas of study:

- Transition metals part A and aqueous chemistry
- Acids and Bases

Lent 1

In *Aromatic Compounds and Amines*, students study benzene and its unique bonding, as well as its characteristic reactions such as electrophilic substitution. They also explore amines, focusing on their structure, basicity, and reactions,

including their importance in biological and industrial contexts. In *Electrochemistry*, students investigate redox processes in more depth, including electrode potentials, electrochemical cells, and the applications of electrochemistry in areas such as batteries, corrosion prevention, and industrial processes.

Key areas of study

- Aromatic and Amines
- Electro- chemistry

Lent 2

In *Polymers and Amino Acids*, students explore the structure and formation of polymers, including addition and condensation polymers, alongside studying amino acids, proteins, and their importance in biological systems. In *Thermodynamics*, students develop a deeper understanding of energy changes in chemical reactions, focusing on concepts such as entropy, feasibility, and free energy change to predict whether reactions are likely to occur.

Key areas of study:

- Polymers and amino acids
- Thermodynamics

Trinity

In *NMR and Synthesis*, students develop skills in analysing and interpreting spectroscopic data, particularly nuclear magnetic resonance (NMR), to deduce the structures of organic molecules. They also learn how to plan multi-step organic syntheses, applying their knowledge of reactions and mechanisms to design efficient routes between compounds. In *Transition Metals (Part 2)*, students extend their understanding of transition metal chemistry, including more detailed discussions of complex ions, ligand substitution, and the role of transition metals as catalysts in industrial and biological processes.

Key areas of study:

- NMR (Nuclear Magnetic Resonance) and Synthesis
- Transition Metals 2