TIFFIN
FOUNDED 1638

Chemistry Curriculum Overview

Chemistry is an exciting and vibrant science subject and the main aim of the curriculum is not only to develop excellent chemistry students, which is reflected in the exam results, but also to instil an enthusiasm and passion for chemistry. Investigative skills and techniques are at the heart of chemistry and we have embedded frequent opportunities for our learners to develop these at all stages of the curriculum. Our curriculum reflects the vast number of our students for whom chemistry will form part or all of their further studies and to this end, from year 7 to year 13, we deliver our lessons with the expectation that our students will take the skills and knowledge they have gained here on into their future careers

The scientific skills learnt in Year 7 are then further built upon in Year 8, a one year KS3 course, with topics covering the foundations of Chemistry including Atoms and Molecules, Acids and Metals, and Earth Science. The lessons are built around the practical nature of Chemistry, employing many of the skills learnt in Year 7, and further developing their individual and group work skills. These lessons further encourage cross-curricular links (e.g. Geography and Earth Science) to encourage lateral thinking from our pupils. The year promotes engagement and enthusiasm in Chemistry further.

Chemistry is a compulsory subject at KS4, however we aim to teach in such a way that stimulates interest and maintains enthusiasm through a three year GCSE. We choose to follow AQA GCSE Chemistry as it shows a good sequence of topics through the course. This is delivered by subject-specialists at GCSE, including our combined science groups, all teachers with exceptional knowledge of Chemistry. Our extraordinarily high uptake and retention of students into A-Level Chemistry reflects our success with engaging pupils in KS3-KS4. The AQA course is followed to continue the progression through the topics, and encompasses as much practical work as possible.

Students leave Chemistry at Tiffin with a rigorous education but also hopefully with a great passion for good science.

KS3 Chemistry Curriculum

	Year 8	Year 9 (GCSE)
Autumn Term 1	**Introduction to chemistry** Chemicals and the safe study of them **The Particle Model of Matter** Using particle theory to explain states of matter. Changes of state Physical and chemical changes Properties of matter	**Atomic Structure** What is an atom made of? Elements on the Periodic table Word and symbol equations Separation techniques History of atomic structure Electronic structure
Autumn Term 2	**The Particle Model of Matter** (See above) **Elements, Mixtures and Compounds** What are elements, mixtures and compounds? Understanding Chemical Formulae Separating Mixtures Making Solutions and using Solubility curves	**The periodic table** The structure of the periodic table History of the development of the periodic table Group 1 chemistry Group 7 chemistry Transition metals
Spring Term 1	**Elements, Mixtures and Compounds** (See above)	**Bonding** Ionic bonding Covalent bonding Metallic bonding
Spring Term 2	**Acids** Defining acids and alkalis in terms of the pH scale Writing word equations for the reactions of acids The reactivity series and its links with reactions of acids	**Structure** Properties of ionic compounds Properties of simple molecular compounds Properties of giant covalent compounds Properties of metals Nanoparticles
Summer Term 1	**Metals** The reactivity series Corrosion and rusting	**Chemical changes - Metals** Reaction with oxygen and water Word and symbol equations to represent these reactions Oxidation and Reduction
Summer Term 2	**Earth and rocks** The structure of the Earth Types of Rocks and the Rock Cycle Composition of Air Combustion and Fossil fuels Chemicals from oils History of the Atmosphere and Earth	**Chemical change - Acids** Reactions with metals, bases, carbonates Word and symbol equations to represent these reactions Making salts required practical Strong/weak acids Concentrated/Dilute acids/pH

KS4 Chemistry Curriculum

	Year 10	Year 11
Autumn Term 1	**Quantitative chemistry** Conservation of mass Relative formula mass from atomic mass Moles Avogadro's constant Reacting masses Solution calculations and titrations Percentage Yield and Atom economy Gases	**Analysis** Definitions of pure and formulations Chromatography Identification of gases Identification of positive ions Identification of negative ions Spectroscopy
Autumn Term 2	**Electrolysis** Electrolysis of molten ionic compounds Electrolysis of ionic solutions Half equations Aluminium extraction	**Organic Chemistry** Crude oil and fractional distillation Alkanes Alkenes Alcohols Polymers
Spring Term 1	**Energy changes** Energy conservation Exothermic and Endothermic reactions Reaction profile diagrams Bond breaking and bond making Chemical cells Fuel cells	**Earth's resources** Potable water Phytomining Bioleaching Life cycle assessments Metal extraction **Using materials** Corrosion and alloys Glass, ceramics and polymers Haber process NPK fertilisers
Spring Term 2	**Rate of Reaction** Definition of rate Calculating rate using graphs Factors affecting rate of reaction Collision theory Catalysts	**Revision**
Summer Term 1	**Extent of Reaction** Reversible reactions Le Chatelier's principle Effect of changing conditions	**Revision**
Summer Term 2	**Chemistry of the Atmosphere** Atmosphere Pollution	

KS5 Chemistry Curriculum

	Year 12		Year 13	
Autumn Term 1	**Atomic Structure (& Periodicity)** Atomic structure Arrangement of electrons Ionisation energies Time of flight mass spectrometry	**Amount of substance** Relative mass of atoms and compounds Moles Reacting masses Solution calculations and titrations Percentage Yield and Atom economy Ideal gas equation	**Thermodynamics** Entropy Gibbs free energy Rate equation Rate equations Order of reaction Arrhenius equation	**Carbonyl chemistry and stereochemistry** Oxidation of alcohols Reduction of aldehydes and mechanism Reaction with KCN **Carboxylic acids** Naming carboxylic acids Esterification Vegetable oils and animal fats
Autumn Term 2	**Bonding** Ionic, covalent and metallic bonding Link to properties Shapes of covalent molecule Polarity Intermolecular forces	**Intro to Organic Chemistry** Empirical, molecular, general, structural, displayed and skeletal structures Isomerism Naming organic molecules	**Acids and Bases** Proton donors and acceptors pH of a strong acid pH of a weak acid Using Kw pH curves and indicators Buffers	**NMR** H1 and C13 NMR to find structures **Rate Equation** **Aromatics**
Spring Term 1	**Kinetics** Collision theory Maxwell Boltzmann distributions Effect of changing the conditions Catalysts **Energetics (& Born Haber cycles)** Standard enthalpy changes and Calorimetry Hess's Law Bond enthalpies Born Haber and solutions	**Alkanes** Fractional distillation Cracking Pollution Free radical substitution **Haloalkanes** Nucleophilic substitution Elimination Ozone depletion	**Electrode Potentials** Cells Standard Hydrogen Electrode Calculate EMF Measuring EMF Electrochemical Cells	**Amines** Formation Basic properties Nucleophilic addition with halogenoalkanes, acyl chlorides and acid anhydrides, including mechanisms. **Polymers** Addition Polymers Condensation Polymers
Spring Term 2	**Chemical Equilibria (including Kp)** Dynamic equilibria Le Chatieliers principe Equilibrium constants Kc and Kp **Redox** Oxidation and reduction Oxidation states Writing redox half equations and full equations.	**Alkenes** Electrophilic addition reactions of alkenes with HBr, H_2SO_4 and Br_2 Addition polymers	**Transition Metals** Electronic structure Substitution reactions Shapes of complex ions Colours of complex ions Variable oxidation state Catalysts **Reactions of Inorganic compounds** Reactions with NH_3, OH^-, $CO3^2$	**Amino Acids, Proteins and DNA** Amino Acids structures and zwitterions Enzymes DNA Anti-cancer drugs
Summer Term 1	**Group 2** Trends Reaction with water Solubilities **Group 7** Trends Oxidising power and Reducing power	**Alcohols, Organic analysis** Making alcohols Oxidation Aldehydes and ketones **Organic analysis** Chemical tests for functional groups IR and Mass spectrometry	**Period 3 compounds** Reactions of Na and Mg with water. Reactions of Na, Mg, Al, Si, P and S with oxygen. Melting points of period 3 oxides. Reactions of period 3 oxides with water.	**Organic synthesis** Devise synthetic routes Chromatography How chromatography works TLC, gas and column chromatography
Summer Term 2	**Exam feedback and review.** **Consolidation of identified knowledge gaps.** Teacher directed and supported project work and/or progressing to learn new material. 6th Form Progression Programme.	**Exam feedback and review.** **Consolidation of identified knowledge gaps.** Teacher directed and supported project work and/or progressing to learn new material. 6th Form Progression		

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