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Subject Curriculum Map:	Chemistry	Year Group:	10

Term	Autumn 1		Autumn 2		Spring 1	Spring 2	Summer 1	Summer 2
Topic	Chemistry of the atmosphere review	Atomic structure & ionic bonding	Metallic structures & bonding	Electrolysis	Covalent bonding	Organic Chemistry	Chemical changes (reactions of acids)	Energy changes
Big Question	How has the atmosphere changed over time?	How do metals and non –metals react together?	What is the structure of a metal?	What happens when electricity is passed through ionic compounds?	How do non-metals react together?	What is carbon chemistry?	How do acids react?	Does a reaction take in heat or release heat energy?
Content	•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 •Separation of mixtures	• Ionic bonding occurs in compounds formed from metals combined with non-metals. • An ionic compound is a giant structure of ions. Ionic compounds are held together by strong electrostatic forces of attraction between oppositely charged ions. These forces act in all directions in the lattice and this is called ionic bonding.	• Metals consist of giant structures of atoms arranged in a regular pattern. • The electrons in the outer shell of metal atoms are delocalised and so are free to move through the whole structure.	• The process of electrolysis • Electrolysis of molten ionic compounds • Using electrolysis to extract metals • Electrolysis of aqueous solutions • Representation of reactions at electrodes as half equations	•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: covalent •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.	• Crude oil, hydrocarbons and alkanes • Fractional distillation and petrochemicals • Properties of hydrocarbons • Cracking and alkenes • Structure and formulae of alkenes • Reactions of alkenes • Alcohols • Carboxylic acids • Addition polymerisation	•the chemistry of acids; reactions with some metals and carbonates, metal oxides and metal hydroxides •pH as a measure of hydrogen ion concentration and its numerical scale •reduction and oxidation in terms of loss or gain of oxygen. •Preparation of a soluble salt	•Measurement of energy changes in chemical reactions (qualitative) •Bond breaking, bond making, activation energy and reaction profiles (qualitative).
Assessment	• Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.							

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Subject Curriculum Map:	Chemistry	Year Group:	11

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Topic	Energy changes review & chemical cells	Quantitative chemistry	Rates and extent of reaction	Using resources	Analytical Chemistry	Exams
Big Question	How can reactions in equilibrium be manipulated? How can chemical reactions generate electricity?	How can chemical reactions be quantified numerically?	How can we change the rate of a chemical reaction?	How are resources used and what impacts do some resources have on the environment?	separated if they are mixed together?	
Content	•Measurement of energy changes in chemical reactions (qualitative) •Bond breaking, bond making, activation energy and reaction profiles (qualitative). • Cells and batteries • Fuel cells	• chemical formulae •percentage by mass calculations •conservation of mass •use the range of a set of measurements about the mean as a measure of uncertainty. • understand that the measurement of amounts in moles can apply to atoms, molecules, ions, electrons, formulae and equations, for example that in one mole of carbon (C) the number of atoms is the same as the number of molecules in one mole of carbon dioxide (CO_2). • use the relative formula mass of a substance to calculate the number of moles in a given mass of that substance •Reaction mass calculations •balance an equation given the masses of reactants and products. •Limiting reagents and their effect on mass of product made.	• Calculating rates of reaction • Factors which affect the rates of chemical reactions • Collision theory and activation energy • Catalysts • Reversible reactions • Energy changes and reversible reactions • Equilibrium • The effect of changing conditions on equilibrium • The effect of changing concentration • The effect of temperature changes on equilibrium • The effect of pressure changes on equilibrium • The Haber process is used to manufacture ammonia, which can be used to produce nitrogen-based fertilisers.	•common atmospheric pollutants: sulphur dioxide, oxides of nitrogen, particulates and their sources •Natural resources, supplemented by agriculture, provide food, timber, clothing and fuels. • Finite resources from the Earth, oceans and atmosphere are processed to provide energy and materials •state examples of natural products that are supplemented or replaced by agricultural and synthetic products •distinguish between finite and renewable resources given appropriate information. •distinguish between potable water and pure water •describe the differences in treatment of ground water and salty water •give reasons for the steps	•pure substance is a single element or compound, not mixed with any other substance. •Use Melting point and boiling point data to distinguish pure substances from mixtures. •Formulations are made by mixing the components in carefully measured quantities to ensure that the product has the required properties. •Knowledge of formulations such as fuels, cleaning agents, paints, medicines, alloys, fertilisers and foods. •identify formulations given appropriate information. •name components in proprietary products. •explain how paper chromatography separates mixtures •Chromatography required practical	

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Subject Curriculum Map: Chemistry | **Year Group:** 12

Term	Autumn 1		Autumn 2		Spring 1		Spring 2		Summer 1		Summer 2	
Topic	Amount of substance	Atomic Structure	Bonding and structure	Organic chemistry introduction & alkanes	Enthalpy and kinetic energy	Alkenes & halogenoalkanes	Chemical equilibrium and concentrations	Alcohols	Redox reactions, group 2 and group 7	Organic analysis & group 2 + 7 trends	Period 3	Kp for homogeneous systems
Big Question	How do we quantify the amount of a substance?	How are protons, neutrons and electrons arranged to form the elements and their isotopes?	How does electron arrangement affect how a molecule forms?	How do chemists describe the vast array of chemicals that exist in a clear and understandable way?	What affects do kinetic, potential and enthalpy have on activation energy?	What is an alkene and how can they be used? What is a halogenoalkane and how do they react?	How far will reactions go and how can we predict yield of reversible reactions?	How can alcohols be produced ?	What are the reactions, properties and test and uses for group 2 and 7 elements and their ions?	How can organic molecules be analysed?	How has the periodic table developed and how is it used to describe and predict elemental behaviours?	How can we calculate the equilibrium constant and the effect of temperature on it?
Content	•empirical and molecular formulae •balanced chemical equations (full and ionic) •the Avogadro constant and the amount of substance (mole) • relative atomic mass and relative isotopic mass •calculation of reacting masses, mole concentrations, volumes of gases, per cent yields and atom economies •simple acid–base titrations • non-structured titration calculations, based solely on experimental results	•structure and electronic configuration of atoms (up to Z = 36) in terms of main energy levels and s, p and d orbitals • ions and isotopes; use of mass spectrometry in determining relative atomic mass and relative abundance of isotopes	• ionic and covalent bonding in terms of electron arrangements •Examples of simple covalent, giant covalent, ionic and metallic structures •permanent and induced dipole–dipole interactions between molecules, including hydrogen bonding. •Electronegativity and its application to bond type. •physical properties of materials •electron pair repulsion theory •shapes of simple molecules	•Functional groups •drawing structural, displayed and skeletal formulas for given organic compounds •economic reasons for cracking alkanes • removing sulfur dioxide from flue gases using calcium oxide or calcium carbonate. • explaining methane and chlorine reaction as a free-radical substitution mechanism •write balanced equations for the steps in a free-radical mechanism.	•enthalpy changes of reaction, formation and combustion. • use of Hess's law to calculate enthalpy changes •use of energetics, including entropy, to predict the feasibility of reactions •collision theory. •Activation energy and its relationship to the qualitative effect of temperature changes on rate of reaction •Boltzmann distribution •catalysts and activation energy •determination and use of rate •Using orders of reactions	• outline the nucleophilic substitution mechanisms •carbon–halogen bond enthalpy influences on the rate of reaction. •the role of the reagent as both nucleophile and base •Ozone depletion •organic synthesis, including characteristic reactions of alkenes •Electrophilic addition reactions of alkenes •formation of major and minor products •drawing the repeating unit from a monomer structure •drawing the repeating unit from a section of the polymer chain •drawing the structure of the monomer from a section of the polymer •the nature of	• the dynamic nature of equilibria • Homogeneous reactions, the qualitative effects of temperature, pressure and concentration changes on the position of equilibrium •calculation of Kc and reacting quantities •effect of temperature changes on Kc	•Comparison of ethanol production including equations and mechanisms •Biofuels and their environmental issues. •oxidation of alcohols and ways of distinguishing between the products produced •Reactions of functional groups	•oxidation states and their calculation • oxidation and reduction as electron transfer, applied to reactions of s, p and d block elements •Oxidising and reducing ability of halogens and halide ions •Testing for halide ions •Uses of chlorine and chlorate	•precise atomic masses and the precise molecular mass to determine the molecular formula of a compound. •use infrared spectra and the Chemistry Data Sheet or Booklet to identify particular bonds, and therefore functional groups, and also to identify impurities •Periodic trends group 2 and group 7 elements •Solubilities of the hydroxides and sulfates of group 2 •Reactions of group 2 elements with water •Uses of group 2 compounds	• the trends in atomic radius and first ionisation energy •melting points of the elements •atomic radius and first ionisation energy. •trends in electronegativity • trends in the boiling point of the elements in terms of their structure and bonding. • trend in the melting point of the oxides of the elements •trends in the reactions of the oxides with water	•Calculate partial pressures from mol fractions and partial pressures •Construction of expression for Kp •Perform calculations involving Kp •Predict the qualitative effects of changes in temperature and pressure on the position of equilibrium •Predict the qualitative effects of changes in temperature on the value of Kp and the effect if any of a catalyst on Kp

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Subject Curriculum Map: Chemistry — Year Group: 13

Term	Autumn 1		Autumn 2		Spring 1		Spring 2		Summer 1		Summer 2
Topic	Optical Isomerism, aldehydes & ketones	Transition metals & reactions in aqueous solution	Carboxylic acids and derivatives, aromatic chemistry	Acids and bases	Amines & condensation polymers	Rate equations	Organic synthesis & NMR	Electrochemistry	Chromatography	Thermodynamics	Consolidation and revision
Big Question	How do stereoisomers affect plane polarised light differently?	How do the 3d block elements behave?	What happens when the carbonyl group is attacked by nucleophiles? What is the structure of chemicals like benzene and what are its substitution reactions?	What are acids and bases?	What are amines and how can they be usesful in organic synthesis?	What does the mathematical relationship between rate of reaction and concentration show?	How are organic compounds synthesised and analysed?	How can chemicals be used to generate an electric potential to power electronic devices?	How does chromatography separate substances in a mixture?	What is enthalpy and how does this link to the free-energy changes in a reaction?	How can we consolidate and apply the content covered for A level Chemistry
•Content	• drawing the structural formulas and displayed formulas of enantiomers •understand how racemic mixtures (racemates) are formed and why they are optically inactive. •overall equations for reduction reactions using [H] as the reductant •nucleophilic addition mechanism s •production of mixtures of enantiomers.	• Transition metal characteristics of elements Ti–Cu arise from an incomplete d sub-level in atoms or ions. • Substitution reactions • Shapes of complex ions • Formation of coloured ions • Variable oxidation states • Catalysts • explain, in terms of the charge/size ratio of the metal ion, why the acidity of $[M(H_2O)6]^{3+}$ is greater than that of $[M(H_2O)6]^{2+}$ • describe and explain the simple test-tube reactions of: $M^{2+}(aq)$ ions, limited to M = Fe and Cu, and of $M^{3+}(aq)$ ions, limited to M = Al and Fe, with the bases OH^-, NH_3 and CO_3^{2-}	•The structures of carboxylic acids and esters. • mechanism of nucleophilic addition–elimination reactions of acyl chlorides with water, alcohols, ammonia and primary amines. •thermochemical evidence from enthalpies of hydrogenation •substitution reactions occurring in preference to addition reactions. •electrophilic substitution mechanisms of nitration of the nitronium ion and acylation using $AlCl_3$ as a catalyst	•Convert concentration of hydrogen ions into pH and vice versa. •Bronsted–Lowry theory of acid–base reactions. •The ionic product of water, Kw; pH dissociation constants of weak acids, Ka. •Calculation of pH for weak acids •Buffer solutions •use Kw to calculate the pH of a strong base from its concentration. •Construct expressions for Ka • Perform calculations relating the pH of a weak acid to the concentration of the acid •convert Ka into pKa and vice versa. •sketch and explain the shapes of typical pH curves. •the action of acidic and basic buffers	. Primary aliphatic amines can be prepared by the reaction of ammonia with halogenoalkanes and by the reduction of nitriles. • explain the difference in base strength in terms of the availability of the lone pair of electrons on the N atom. • Nucleophilic properties of the amines • Condensation polymers • Biodegradability and disposal of polymers • Amino acids, proteins and DNA • Enzymes • Action of anticancer drugs	•the terms order of reaction and rate constant •perform calculations using the rate equation • qualitative effect of changes in temperature on the rate constant •perform calculations using the equation $k = Ae^{-Ea/RT}$ •use the rearranged equation with experimental data to plot a straight line graph with slope $-Ea/R$	• use reactions in this specification to devise a synthesis, with up to four steps, for an organic compound. •Tetramethylsilane used as a standard •chemical shift data from data to suggest possible structures or part structures for molecules •determine the relative numbers of equivalent protons in a molecule •use the n+1 rule to deduce the spin–spin splitting patterns of adjacent, non-equivalent protons, limited to doublet, triplet and quartet formation in aliphatic compounds.	•use Eϴ values to predict the direction of simple redox reactions •calculate the EMF of a cell •write and apply the conventional representation of a cell. •use given electrode data to deduce the reactions occurring in non-rechargeable and rechargeable cells •deduce the EMF of a cell •how the electrode reactions can be used to generate an electric current. •electrode potentials and their applications	•thin-layer chromatography (TLC) • column chromatography (CC) •gas chromatography (GC) •calculate Rf values from a chromatogram •compare retention times and Rf values with standards •lattice enthalpy	•construct Born–Haber cycles to calculate lattice enthalpies enthalpy changes •perfect ionic model •define enthalpy of hydration •perform calculations of an enthalpy change using these cycles •entropy changes •Gibbs free energy	•Retrieval activities •Construction of organic pathways •Past examination papers •Revision strategies •Youtube and online tutorials •Customised examination questions
Assessment	• Pupils will be assessed through homework activities, lesson starter activities, end of Unit class tests and a range of required practicals aimed at assessing the pupils' practical abilities.										