Science

Key Stage 2 Curriculum

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.
- Common topics include: plants, animals (including humans), living things and their habitat, properties and changes of materials rocks, light, sound, electricity, space and forces.

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Autumn 1	**Introduction to science** ● Lab safety ● Using Bunsen burners **Block 1** **Cells** ● Microscopes ● Animal Cells ● Plant cells ● Specialised cells ● Organisation **Particles** ● Solids, liquids & gases ● Properties of solids, liquids and gas ● Changing state ● Diffusion ● Dissolving	**Block 1** **Digestion** ● Food groups ● Food tests ● Digestive system organs ● Journey of a sandwich ● Disease caused by poor diet **Metals and reactivity** ● Properties of metal ● Oxides ● Displacement reactions ● Alkali metals	**See, Biology, Chemistry, Physics and Applied Science**				

	● Gas pressure						
Autumn 2	**Energy 1** ● Energy stores ● Energy transfers ● Sankey diagrams ● Efficiency ● **Block 2** **Reproduction** ● Male reproductive organs ● Female reproductive organs ● Fertilisation ● Pregnancy ● Puberty ● Menstrual cycle ● Plant reproduction **Separating mixtures** ● Pure and impure ● Filtration ● Crystallisation ● Distillation ● Chromatography	**Magnets and electromagnets** ● Permanent magnets ● Magnetic fields ● Electromagnets **Block 2** **Inheritance** ● Inheritance ● DNA ● Fertilisation ● Punnet squares **Types of reaction** ● Chemical and physical reactions ● Conservation of mass ● Combustion ● Decomposition ● Endo and exo					
Spring 1	**Forces 1** ● Speed ● D-T graphs ● Force arrows ● Friction ● Drag ● Stretching ● Forces and motion	**Energy 2** ● Work done ● Power ● Domestic energy use ● Energy demand **Block 3** **Movement** ● Skeleton ● Muscles					

	Block 3 **Respiration and breathing** ● Aerobic respiration ● Lungs ● Anaerobic respiration ● Smoking and asthma ●	● Antagonistic pairs							
Spring 2	**Acids and Alkalis** ● pH scale ● neutralisation **Electricity** ● Charge ● Conductors and insulators ● Current ● PD ● Resistance ● Series ● Parallel	**Materials and the Earth** ● Structure of the Earth ● Igneous ● Sedimentary ● Metamorphic ● Rock cycle ● Atmosphere ● Climate change **Forces 2** ● Gravity and weight ● Pressure ● Floating and sinking ● Levers ● Moments							
Summer 1	**Block 4** **Photosynthesis** ● Structure of a plant ● Plant leaf ● Photosynthesis ● Factors affecting photosynthesis **Elements** ● Elements ● Compounds ● Mixtures ● Reactions	**Block 4** **Infection** ● Pathogens and disease ● Immunity ● Vaccination **Heating and cooling** ● Conduction ● Convection ● Radiation ● Insulation							

	● Periodic Table ● Equations								
Summer2	**Universe** ● Planets ● Galaxy ● Universe ● Big Bang ● **Light** ● Reflection ● Refraction ● Colour ● The eye	**Ecology** ● Keys ● Food chains ● Food webs ● Classification ● Sampling techniques ● Pooters ● Quadrats and line transits **Sound** ● What is sound ● Amplitude ● Frequency ● Waves ● Echoes							

Biology

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Autumn 1 Autumn 2	**See KS3 Science**	**Cells** ● A typical animal cell ● Plant cells ● Prokaryotic and Eukaryotic cells ● A typical Bacteria cell ● The size of cells ● Using microscopes to look at cells ● Calculating magnification ● Chromosomes ● Mitosis and the cell cycle ● Stem cells	**Infection** ● Pathogens and disease ● Viral diseases ● Bacterial diseases ● Protists and diseases ● Fungal diseases ● Preventing entry of pathogens ● The immune system ● Boosting immunity ● Antibiotics ● Developing new drugs **Bioenergetics** ● Photosynthesis ● Factors affecting Photosynthesis ● Converting glucose ● The importance of respiration ● Aerobic respiration	**Inheritance** ● Asexual reproduction ● Sexual reproduction and meiosis ● The genome ● Genetic inheritance ● Genetic crosses ● Inherited disorders ● Sex determination ● Variation ● Evolution ● Evidence for evolution ● Selective breeding ● Genetic engineering ● Principles of classification ● Extinction ● Evolution trees	**Biological molecules** Structure and function of: ● Carbohydrates ● Lipids ● Proteins ● Nucleic acids ● Water **Cells** ● Structure and function of different types of cells ● Mitosis and meiosis ● Structure and function of membranes	**Energy transfer in and between organisms** ● Photosynthesis ● Respiration **Responding to internal and external environments** ● Stimuli and responses ● Nervous control ● Homeostasis
Spring 1		● Use of stem cells ● Diffusion	● Anaerobic respiration	**Ecology** ● Relationships between organisms	**Exchange and transport**	

Spring 2			• Factors affecting diffusion • Osmosis • Active transport • Comparing processes **Organisation** • Specialised cells • Tissues, organs and systems • Enzymes • Enzymes in digestion	• Exercise and respiration • Metabolism **Homeostasis** • The importance of hormones • Control systems • The nervous system • Endocrine system	• Adaptations • Studying ecosystems • Recycling materials • Feeding relationships • Biodiversity • Pollution • Overexploitation • Conservation biodiversity	• Gas exchange • Digestion • Cardiovascular system • Mass transport in plants including transpiration and translocation **Genetic information,m variation and relationships** • Structure, function and replication of DNA • Protein synthesis • Genetic diversity and adaptations • Classification	**Genetics, populations and evolution** • Genetic diagrams • Variation, selection and speciation • Succession • Conservation **Control of gene expression** • Mutations • Stem cells • Gene expression • Genome projects and technologies
Summer 1 Summer 2			• Bile and digestion • Blood • Blood vessels • The heart • Gaseous exchange • Health and disease • Risk factors • Diseases of the heart • Cancer • Plant tissues • Water transport • Translocation	• Control of blood glucose • The sex hormones • Control of the menstrual cycles • Reducing fertility • Increasing fertility			

Chemistry

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Autumn 1	**See KS3 Science**		**Atoms** ● Atoms elements and compounds ● Equations ● Separating mixtures ● Scientific models of the atom ● Subatomic particles ● Isotopes and ions ● Electronic configuration	**Energy and Chemical Change** ● Oxidation and reduction ● The reactivity series ● Displacement reactions ● Extraction of metals ● Losing and gaining electrons ● The pH scale	**Chemical analysis** ● Pure and impure substances ● Formulations ● Chromatography ● Gas tests	**Atomic structure** ● The atom ● Atomic models ● Relative mass ● The mass spectrometer ● Using mass spectra ● Electronic structure ● Ionising energies **Amount of substances** ● The mole	**Electrode potentials and cell** ● Electrode potentials ● Standard electrode potentials ● Electrochemical series ● Electrochemical cells **Acids, Bases and pH** ● Acids bases and Kw ● pH calculations

Autumn 2		• The development of the periodic table • Group 0 • Group 7 • Group 1	• Neutralisation of Acids • Soluble salts and insoluble bases • Strong and weak acids • Electrolysis • Oxidation and reduction • Extraction of metals • Electrolysis of aqueous solutions		• Gases and the mole • Chemical equations • Titrations • Formulas • Chemical yield • Atom economy	• The acid dissociation constant • Titration d pH curves • Titration calculations • Buffer action • Calculating the pH of Buffers **Period 3 element s** • Period 3 elements • Period 3 oxides
				Atmosphere • **T**he earths atmosphere • The atmosphere today • Increase of oxygen levels • Decrease of carbon dioxide levels • Greenhouse gases • The impact of human activity • Global climate change • Carbon footprints	**Bonding** • Ionic Bonding • Covalent Bonding • Chare clouds • Shapes of molecules • Polarisation • Intermolecular forces • Metallic bonding • Properties of metals Energetics • Enthalpy • Bond Enthalpies • Measuring Enthalpy changes • Hess' Law	**Transition Metals** • Transition metals • Complex ions • Isomerism in complex ions • Formation of coloured compounds • Ligand substitution reactions • Variable oxidation states • Transition metals titrations • Metal aqua ions **Isomers and carbonyl compounds** • Optical isomerism • Aldehydes ad Ketones • Hydroxynitriles • Carbocyclic acids and esters • Reaction's and uses of esters

						● Acyl chlorides ● Acid anhydrides ● Purifying organic compounds **Aromatic compounds and amines** ● Aromatic compounds ● Reactions of aromatics ● Amines and amides ● Reactions of amines
Spring 1		**Bonding** ● The three states of matter ● Changing states ● Identifying states of a substance ● State symbols ● Chemical bonds ● Ionic bonding ● Properties of ionic compounds ● Covalent bonding ● Small molecules ● Giant covalent structures ● Graphene ● Fullerenes ● Polymers ● Metallic bonding ● Properties of metals ● alloys	**Rates** ● Calculating the rate of reaction ● Collision theory ● Plotting the reaction rates ● Catalysts ● Reversible reactions ● Closed systems ● Changing reaction conditions	**Using resources** ● Sustainable development ● Drinking water ● Waste water treatment ● Alternative methods of extracting metals ● Life cycle assessment s ● Reducing the use of resources	**Kinetics** ● Reaction rates ● Catalysts ● Measuring reaction rates **Equilibria and redox reactions** ● Reversible reactions ● Industrial processes ● The equilibrium constant ● Factors effecting the equilibrium constant ● Redox reactions ● Redox equations	**Polymers** ● Condensation polymerisation ● Monomers and repeating units ● Disposing of polymers **Amino acids, proteins and DNA** ● **Amino acids** ● **Proteins** ● **Enzymes DNA** ● **Cisplatin**
Spring 2					**Periodicity** ● The periodic table ● Periodicity **Group 2 and group 7 elements** ● Group 2	**Further synthesis and Analysis** ● Organic synthesis ● NMR spectroscopy ● C NMR ● H NMR ● Chromatography

					● Group 2 compounds ● Group 7 ● Halide ions ● Tests for ions **Introduction to organic chemistry** ● Formulas ● Functional groups ● Nomenclature ● Mechanisms] ● Isomers ● E/Z isomers	● Gas chromatography
Summer 1		**Quantitate** ● Conservation of mass ● Relative formula mass ● Apparent change in mass ● Amount of substances ● Calculating the amount of substances ● Balanced equations ● Limiting reactions ● Concentrations of solutions			**Alkanes and Halogenalkanes** ● /alkanes and petroleum ● Alkanes as fuels ● Synthesis of chloroalkanes ● Halogenalkanes ● Nucleophilic substitution ● Elimination reactions ● Alkenes and alcohols ● Alkenes ● Reactions of alkenes ● Additional polymers ● Alcohols ● Dehydration of alcohols ● Ethanol production	

Summer 2					• Oxidation of alcohols • **Organic Analysis** • Tests for functional groups • Mass spectrometry • Infrared spectroscopy	
			Organics • Crude oils and hydrocarbons • Fractional distillation • Alkanes • Burning fuels • Cracking hydrocarbons • Bromine water		**Thermodynamics** • Enthalpy changes • Born Haber cycles • Enthalpies of solution • Entropy • Free energy change **Rate equation and Kp** • Monitoring reactions • Reaction rates and graphs • Rate equations • The initial rate methods • Clock reactions • Rate and concentration graph • The rate determining step • The Arrhenius equation • Gas equilibria • Changing gas equilibria	

Physics

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Autumn 1	**See KS3 science**		**Particles** ● States of matter ● Density ● Specific Latent Heat ● Specific heat Capacity ● Particle motion ● Pressure	**Atomic Structure** ● The structure of the atom ● Isotopes ● The plum pudding model ● Rutherford, Giger and Marsden	**Waves** ● Transverse and longitudinal waves ● Properties of waves ● Wave speed ● Electromagnetic waves ● Refraction	**Materials** ● Density ● Fluids, viscosity and Stoke's law ● Hookes Law Young Modulus **Wave and Particle Nature of light**	**Further Mechanics** ● Impulse ● Collisions in 2 dimensions ● Circular motion and centripetal force **Gravitational Fields**

Autumn 2		**Energy** ● Energy Stores and systems ● Calculating Energy Change ● Specific and	● Further Developments ● Nuclear Decay ● Alpha, Beta and Gamma Decay ● Radioactive contamination ● Half life Nuclear equations	● Ray Diagrams ● Uses and appliances of EM waves ● Radio Signals ● Hazards of EM waves **Magnetism** ● Magnetic poles and fields ● Plotting fields ● Electromagnetism and solenoids ● Electromagnetic devices ● Flemings left hand rule ● Electric motors	● Wave equation ● Interference and superposition ● Standing waves ● Radiation intensity and energy transfer ● Refraction, lenses and Snell's law ● Diffraction and Huygen's construction ● Photoelectric effect and quantum behaviour ● Energy levels in atoms ● Spectra and photons ● De Broglie wavelength for electrons	● Newton's gravitational law ● Field strength and potential ● Objects in orbit **Electric and Magnetic Fields** ● Force fields ● Radial fields and potential ● Capacitors and exponential decay/growth ● Magnetic forces on charges and wires ● Electromagnetic induction – Faraday's law ● AC electricity
Spring 1		● internal energy	**Forces**	**Space (separates only)**	**Mechanics**	

Spring 2		• Energy Transfers • National and global energy resources **Electricity** • Standard circuit Symbols • Electric Charge and Current Resistance and Potential difference	• Scalar and Vector Quantities • Contact and non-contact forces • Gravity • Resultant Forces • Vector Diagrams • Work done and energy transfer • Forces and Elasticity • Distance and Displacement • Speed • Velocity • Newton's First Law • Distance Time Graphs	• Our solar system • The formation of our solar system • Life Cycle of a star • Creating new Elements • Orbital Motion • Red Shift • The big bang Theory	• SUVAT equations • Projectiles • Momentum conservation • Potential and kinetic energy in motion • Power and work **Electric circuits** • Current and charge • Power and resistance • Resistivity • Potential dividers • Sensors and components • EMF and internal resistance	**Nuclear and Particle Physics** • Models of the atom • Particle accelerators • Creation and annihilation • The standard model, baryons and leptons **Nuclear Radiation** • Binding energy • Gamma absorption and half thickness • Exponential decay **Oscillation** • Simple harmonic motion • Pendula and springs • Resonance and damping **Space** • Radiation intensity and luminosity • Parallax • The HR diagram • Life cycle of stars • Doppler effect, red shift and Hubble's law
Summer 1		• Circuits and other components • Series and Parallel circuits • Power in circuits	• Acceleration • Velocity time graphs • Newton's second law • Terminal velocity • Newton's third law			

Summer2		● Direct and alternating current ● Mains electricity ● Danger of Mains electricity ● Power and efficiency ● Energy transfer in appliances ● The National Grid	● Momentum ● Conservation of momentum ● Stopping distances ● Reaction times ● Factors effecting breaking distances			