Science

Inspiring young scientists of the futures, atom by atom

Science surrounds us. It is everywhere in our daily lives - all day, every day! We want Science to inspire students to explore the world around them and recognise and understand this. We aim to excite and enrich with the practical applications of the subject, teaching students that doing science develops our ability to ask questions, collect information, organise and test our ideas, problem-solve and apply what we learn.

Science is a platform for building confidence, developing communication skills, and making sense of the world around us.

	Autumn		Spring		Summer	
B	B3 Infection and response B4 Bioenergetics (Respiration)	B4 Bioenergetics (Photosynthesis)	B5 Homeostasis (Nervous System)	B5 Homeostasis (Hormones)	B6 Inheritance	B6 Variation and Evolution
C	C2 Structure and Properties	C3 Quantitative Chemistry	C4 Chemical Changes	C4 Electrolysis	C5 Energy Changes	C6 Rates of Reactions
P	P3 Particle Model	P4 Atomic Structure	P5 Forces	P5 Forces and Motion	P6 Waves and Properties	P6 Electromagnetic Waves

Science homework is an integral part of each students learning journey. Therefore the Science department will issue regular homework.
The homework set is designed to:

- Consolidate learning
- Allow further research on subjects
- Develop and practise essential scientific skills
- Provide extra challenge and support for students

Students will be set two pieces of homework per week. One piece will be based on the current learning and the second homework will be a piece of recall work to consolidate previous topic and aid revision. Students studying separate sciences will receive three pieces of homework per week but of a shorter duration.

Homework is not expected to be completed in isolation and we actively encourage parents or any other person to help and support students while completing the tasks set. If a student is having difficulty completing homework they must bring this to the attention of their class teacher who will arrange a time suitable to go over any problem areas.

Unit	Learning Objectives/Outcomes
Infection and response	• The importance of bacteria in the human digestive system. • Micro-organisms. • The process of anaerobic respiration in humans and micro- organisms, including fermentation, and a word summary for anaerobic respiration. • Infectious diseases • Viral, bacterial, fungal, protist disease • Human defence system • Vaccination / Antibiotics and painkillers • Antibodies (HIGHER) • Plant disease (BIOL ONLY) • Plant defence response
Bioenergetics	• The structure and functions of the gas exchange system in humans, including adaptation to function. • Plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots. • The reactants in, and products of, photosynthesis, and a word summary for photosynthesis. • The role of leaf stomata in gas exchange in plants / adaptations of the leaf • The dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere. • Aerobic and anaerobic respiration • Response to exercise • Metabolism
Homeostasis	• Regulation of the internal conditions of a cell or organism. • Automatic control systems • explain how the structure of the nervous system is adapted to its functions. • Information from receptors passes along cells (neurones) as electrical impulses to the central nervous system (CNS). • Reflex actions are automatic and rapid; they do not involve the conscious part of the brain. • The brain (Biology only) • The eye (Biology only)

	• Control of body temperature (Biology only) • Human endocrine system • Control of blood glucose concentration • Maintaining water and nitrogen balance in the body (biology only) • Hormones in human reproduction • Contraception • Negative feedback (HT) • Plant hormones (Biology only)
Inheritance	• Reproduction – sexual and asexual • Advantages and disadvantages of sexual and asexual reproduction • DNA • Structure of DNA • Protein synthesis • Genetic inheritance • Inherited disorders • Sex determination • Mendel and genetics
Evolution	• Describe evolution • Natural selection • Variation • Speciation (Biology only) • Selective breeding • Genetic engineering • Cloning (Biology only) • Theory of evolution (Biology only) • Understanding of genetics (Biology only) • Evidence for evolution • Fossils • Extinction • Resistant bacteria • Classification of living organisms
Bonding and structures (Ionic, covalent, metals)	• Why bonding occurs, ion formation, ionic bonding, properties of ionic substances • Covalent bonding, dot and cross diagrams, properties of simple covalent molecules • Metallic bonding, properties of metals • Properties of diamond, graphite, silicon dioxide and graphene • Properties of metals and alloys • Properties of polymers

Quantitative chemistry	• Reactivity of metals • Oxidation and reduction • Oxidation and reduction in terms of electrons (HIGHER) • Reactivity series • Displacement • Extracting metals
Chemical changes- metals and reactions, acids, bases and salts	• pH scale, neutralisation • reactions of acids with metals, bases, alkalis • Salt formation • Soluble salts • Neutralisation equation • Titrations • Strong and weak acids
Electrolysis/energy changes	• Electrolysis theory • Electrolysis of molten ionic compounds • Half equations • Electrolysis of aqueous substances • Electrolysis to extract aluminium • Exothermic and endothermic reaction theory • Uses of exothermic/endothermic reactions • Reaction profiles • Calculating energy changes (HIGHER) • Chemical cells and fuel cells
Rates of reactions	• Relative mass • Conservation of mass • Moles (HIGHER) • Reacting masses (HIGHER) • Limiting reactants (HIGHER) • Concentration • Percentage yield and atom economy • Titration calculations • Gas volumes
Particle model	• Solids, liquids, gases • Changes of state

Atomic structure	• Atoms, elements, compounds, mixtures • The development of the atom • Relative electrical charges of subatomic particles • Size and mass of atoms • Relative atomic mass • Electron structure
Forces	• Scalar and vector quantities • Contact and non-contact forces • Gravity • Resultant forces • Work done and energy transfers • Forces and elasticity • Moments, lever and gears (Physics only) • Pressure and pressure differences in fluids
Forces and motion	• Describing motion along a line • Speed • Velocity • Distance time relationship • Acceleration • Newton's first law • Newton's second law • Newton's third law • Stopping distances • Reaction times • Braking distances
Waves	• Transverse and longitudinal waves • Wave diagrams • Calculating wave frequency • Wave speed • Measuring speed of waves • Reflection of waves and ray diagrams (Physics) • Sound waves (Physics) • Hearing • Ultrasound and uses (Physics) • Electromagnetic waves and spectrum • Refraction • Properties of EM waves • Uses of EM waves • Lenses (Physics) • Convex and concave lenses (Physics) • Lenses and ray diagrams (Physics)

	• Magnification (Physics) • Colours and filters • Emission and absorption of infrared radiation • Radiation and temperature