Science

Building Curiosity One Atom at a Time

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.

Group	Autumn		Spring		Summer	
B	Photosynthesis	Evolution	Genetics	Cells	Natural defence	Enzymes
C	Periodic tables	Astronomy	Microbes	Fundamentals Separation techniques	Changes of state Atomic structure	Bonding & structures (Ionic, covalent, metals)
P	Magnetism	Heating and cooling	Fuel bills and appliances	Energy	Energy	Forces and pressure

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
Photosynthesis	• 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 • 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. • The adaptations of leaves for photosynthesis.
Evolution	• The variation between species and individuals of the same species means some organisms compete more successfully which can drive natural selection • Changes in the environment may lead to individuals within a species and entire species less well adapted to compete successfully and reproduce which in turn leads to extinction • The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material
Genetics	• Heredity as the process by which genetic information is transmitted from one generation to the next. • A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model. • Differences between species • Variation between individuals within a species being continuous or discontinuous to include measurement and graphical representation
Cells	• Plant and animal cells (parts and functions) • Bacterial cells • Specialised cells • Cell division (mitosis) • Microscopy and magnification • Culturing microorganisms (BIOL ONLY)
Natural defence	• Infectious diseases • Viral, bacterial, fungal, protist disease • Human defence system • Vaccination • Antibiotics and painkillers • Antibodies (HIGHER) • Plant disease (BIOL ONLY) • Plant defence response

Enzymes	• Types of enzymes • Lock and key theory • Factors affecting rate of enzymes
Periodic tables	• The varying physical and chemical properties of different elements. • The Periodic Table periods and groups: metals and non-metals. • The properties of metals and non-metals. • The principles underpinning the Mendeleev Periodic Table. • How patterns in reactions can be predicted with reference to the Periodic Table.
Astronomy	• Our Sun as a star, other stars in our galaxy, other galaxies. • The seasons and the Earth's tilt, day length at different times of year, in different hemispheres. • Gravity force, weight – mass x gravitational field strength (g), on Earth g=10N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). • The light year as a unit of astronomical distance.
Microbes	• The importance of bacteria in the human digestive system. • Micro-organisms. • Fermentation. • The process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration.
Fundamentals	• Elements, mixtures & compounds • Word equations, chemical symbols and formula, balanced symbol equations
Separation techniques	• Mixtures • Techniques to include filtration, crystallisation, simple distillation, fractional distillation, chromatography
Changes of State	• State symbols • States and particle models • Changes of state in terms of energy and forces • Predict state of a substance from data
Atomic structure	• Subatomic particles, charges and mass • Calculating subatomic particles • Electron arrangements • Size of atoms • Development of atomic theory (Dalton, Thomson, Rutherford, Bohr, Chadwick) • Details of plum pudding model and alpha scattering experiment
Bonding & 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

Magnetism	• Non-contact forces; gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity. • Magnetic poles, attraction and repulsion. • Magnetic fields by plotting with compass, representation by field lines. • Earth's magnetism, compass and navigation. • The magnetic effect of a current, electromagnets, D.C.
Heating and cooling	• Heating and thermal equilibrium: temperature difference between two objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference: use of insulators. • Changes with temperature. • Internal energy stored in materials.
Fuel bills and appliances	• Comparing power ratings of appliances in watts (W, kW). • Comparing amounts of energy transferred (J, kJ, KW hour). • Domestic fuel bills, fuel use and costs.
Energy	• Energy when systems change • Work done by forces • Work done when current flows • Calculating kinetic energy • Calculating elastic potential energy • Calculating gravitational potential energy • Calculating thermal energy changes • Specific heat capacity • Power • Energy transfers • Wasted energy • Reducing wasted energy • Thermal conductivity • Energy efficiency • Energy resources • Renewable and non-renewable energy
Forces and pressure	• Vector quantities • Contact and non-contact forces • Gravity and weight • Resultant forces • Work done • Forces and elasticity • Moments (Physics) • Levers and gears • Pressure in fluids • Pressure in fluids (different depths) • Atmospheric pressure • Particle motion • Pressure in gases (Physics) • Increasing pressure (Physics)