

Subject: Science

Year group: Year 10

Department Curriculum Vision:

The KS4 Science Curriculum is designed to provide students with a comprehensive understanding of key scientific concepts and principles, develop their scientific skills and knowledge, and develop a mindset necessary for further study or careers in science-related fields. As well as an appreciation of science in developing the world around them.

	Autumn Term 1	Autumn Term 2
Content: (Know what...)	<u>Bonding, structure, and the properties of matter</u> - Chemical bonds - Ionic bonding - Ionic compounds - Covalent bonding - Metallic bonding - The three states of matter - State symbols - Properties of ionic compounds - Properties of small molecules - Polymers - Giant covalent structures - Properties of metals and alloys - Metals as conductors - Diamond - Graphite - Graphene and fullerenes - Sizes of particles and their properties (Chemistry Only) - Uses of nanoparticles (Chemistry Only) <u>Energy</u> - Energy stores and systems - Changes in energy - Energy changes in systems - Power - Energy transfers in a system - Efficiency	<u>Organisation</u> - Principles of organisation - The human digestive system - The heart and blood vessels - Blood - Coronary heart disease: a non-communicable disease - Health issues - The effect of lifestyle on some non-communicable diseases - Cancer - Plant tissues - Plant organ system <u>Electricity</u> - Standard circuit diagram symbols - Electrical charge and current - Current, resistance and potential difference - Resistors - Series and parallel circuits - Direct and alternating potential difference - Mains electricity - Power - Energy transfers in everyday appliances - The National Grid - Static charge (physics only) - Electric fields (physics only) <u>Particle Model</u>

	- National and global energy resources	- Density of materials - Changes of state - Internal energy - Temperature changes in a system and specific heat capacity - Changes of state and specific latent heat - Particle motion in gases - Pressure in gases (physics only) - Increasing the pressure of a gas (physics only) (HT only)
Skills: (know how...)	<u>Energy Practical Skill</u> - Investigation to determine the specific heat capacity of one or more materials. The investigation will involve linking the decrease of one energy store (or work done) to the increase in temperature and subsequent increase in thermal energy stored. - Investigate the effectiveness of different materials as thermal insulators and the factors that may affect the thermal insulation properties of a material. AT skills covered by this practical activity: AT 1 and 5. (physic only)	<u>Electricity Practical Skill</u> - Use circuit diagrams to set up and check appropriate circuits to investigate the factors affecting the resistance of electrical circuits. This should include: - the length of a wire at a constant temperature - combinations of resistors in series and parallel. - use circuit diagrams to construct appropriate circuits to investigate the I-V characteristics of a variety of circuit elements, including a filament lamp, a diode and a resistor at constant temperature. <u>Particle Model of Matter Practical Skill</u> - use appropriate apparatus to make and record the measurements needed to determine the densities of regular and irregular solid objects and liquids. Volume should be determined from the dimensions of regularly shaped objects, and by a displacement technique for irregularly shaped objects. Dimensions to be measured using appropriate apparatus such as a ruler, micrometer or Vernier callipers

Key vocabulary	<u>Chemical Bonding</u> - Ions - Elections - Dot and cross diagram - Intermolecular forces - Giant lattice <u>Energy</u> - Kinetic energy - Gravitational potential energy - Insulation - Conservation of energy - Renewable - Non-renewable energy.	<u>Organisation</u> - Specialised cells - Enzymes - Cardiovascular disease - Transpiration - Translocation <u>Electricity</u> - Series circuit - Parallel circuit - Current - Voltage - Resistance - Ohm's law
Mid Term Assessment	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.
End Term Assessment	All topics will be followed by an EUA.	All topics will be followed by an EUA.
	Spring 1	Spring 2

Content:**(Know what...)****Infections and Response**

- Communicable (infectious) diseases
- Viral diseases
- Bacterial diseases
- Fungal diseases
- Protist diseases
- Human defence systems
- Vaccination
- Antibiotics and painkillers
- Discovery and development of drugs
- Producing monoclonal antibodies (biology only)
- Uses of monoclonal antibodies (biology only)
- Detection and identification of plant diseases (biology only)
- Plant defence responses (biology only)

Quantitative Chemistry

- Conservation of mass and balanced chemical equations
- Relative formula mass
- Mass changes when a reactant or product is a gas
- Chemical measurements
- Moles (HT only)
- Amounts of substances in equations (HT only)
- Using moles to balance equations (HT only)
- Limiting reactants (HT only)
- Concentration of solutions
- Percentage yield (chemistry only)
- Atom economy
- Using concentrations of solutions in mol/dm³ (chemistry only)
- Use of amount of substance in relation to volumes of gases (chemistry only)

Chemical Changes

- Metal oxides
- The reactivity series
- Extraction of metals and reduction
- Oxidation and reduction in terms of electrons (HT only)
- Reactions of acids with metals
- Neutralisation of acids and salt production
- Soluble salts
- The pH scale and neutralisation
- Titrations (chemistry only)
- Strong and weak acids (HT only)
- 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 (HT only)

Atomic Structure

- The structure of an atom
- Mass number, atomic number and isotopes
- The development of the model of the atom (common content with chemistry)
- Radioactive decay and nuclear radiation
- Nuclear equations
- Half-lives and the random nature of radioactive decay
- Radioactive contamination
- Hazards and uses of radioactive emissions and of background radiation (physics only)
- Background radiation (physics only)
- Different half-lives of radioactive isotopes (physics only)
- Uses of nuclear radiation (physics only)
- Nuclear fission (physics only)
- Nuclear fusion (physics only)

Skills: (Know how...)	<u>Quantitative Chemistry Math and practical skills</u> - Recognise and use expressions in decimal form - Recognise and use expression in standard form - Change the subject of an equation - Use ratios, fractions and percentages - Use the relative formula mass of a substance to calculate the number of moles in a given mass. - Calculate the mass of solute in a given volume of solution - Calculate the percentage yield of a product from a given mass of reactant and the balance equation for the reaction. (chemistry only) - Calculate the atom economy of a reaction to form a desired product. (chemistry only)	<u>Chemical Changes Practical Skills</u> - preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate using a Bunsen burner to heat dilute acid and a water bath or electric heater to evaporate the solution. - determination of the reacting volumes of solutions of a strong acid and a strong alkali by titration (chemistry only) - investigate what happens when aqueous solutions are electrolysed using inert electrodes. This should be an investigation involving developing a hypothesis.
Key vocabulary	<u>Infection & Response</u> - Communicable disease - Pathogens - Antibodies - Antibiotics - Vaccines <u>Quantitative chemistry</u> - Conservation of mass - Relative formula mass - Moles - Concentration - Avogadro's number	<u>Chemical change</u> - Reactivity series - Displacement reaction - Neutralisation - Strong acid/weak acid - Electrolysis - Redox reactions <u>Atomic Structure</u> - Isotopes - Plum pudding model - Decay - Alpha radiation - Beta radiation - Gamma radiation - Radioactive - Contamination - Half-life

Mid Term Assessment	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.
End Term Assessment	All topics will be followed by an EUA.	All topics will be followed by an EUA.
	Summer 1	Summer 2
Content: (Know what...)	<u>Bioenergetics</u> - Photosynthetic reaction - Rate of photosynthesis - Uses of glucose from photosynthesis - Aerobic and anaerobic respiration - Response to exercise - Metabolism <u>Energy Change</u> - Energy transfer during exothermic and endothermic reactions - Reaction profiles - The energy change of reactions (HT only) - Cells and batteries (Chemistry Only) - Fuel cells (Chemistry Only)	<u>Chemical Analysis</u> - Pure substances - Formulations - Chromatography - Test for hydrogen - Test for oxygen - Test for carbon dioxide - Test for chlorine - Flame tests (Chemistry Only) - Metal hydroxides (Chemistry Only) - Carbonates - Halides - Sulfates - Instrumental methods - Flame emission spectroscopy
Skills: (Know how...)	<u>Bioenergetics Practical Skills</u> - Investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed. <u>Energy Change Practical Skills</u> - investigate the variables that affect temperature changes in reacting solutions such as, eg acid plus	<u>Chemical Analysis Practical Skills</u> - investigate how paper chromatography can be used to separate and tell the difference between coloured substances. Students should calculate R_f values. - use of chemical tests to identify the ions in unknown single ionic compounds covering the ions from sections Flame tests to Sulfates (chemistry only)

	metals, acid plus carbonates, neutralisations, displacement of metals -	
Key vocabulary	<u>Bioenergetics</u> - Photosynthesis - Limiting factors - Respiration - Aerobic respiration - Anaerobic respiration - Lactic acid - Metabolism <u>Energy Changes</u> - Exothermic - Endothermic - Reaction profiles - Catalysts - Activation energy - Bond energy	<u>Chemical analysis</u> - Purity - Impure - Formulation - Chromatography - Rf value - Mobile phase
Mid Term Assessment	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.	MUAs will be present in all topics. Some larger topics that stretch more than 3 weeks may have 2 MUAs to give students the best chance at understanding content before an EUA.
End Term Assessment	All topics will be followed by an EUA.	All topics will be followed by an EUA.
Additional information		

Homework	Follow the school policy of 1 hour per week per class. This will be double for triple science students. The homework set is down to the teacher as they will set homework that is suitable, achievable and beneficial to the class.
Extracurricular and enrichment opportunities	• Science Club • Science week • Science Careers
Useful links that will support learning	Seneca - https://senecalearning.com/en-GB/ BBC Bitesize - https://www.bbc.co.uk/bitesize/subjects/zng4d2p Sparx science - https://sparxscience.com/
How parents can support learning	We encourage parents/carers to engage in conversation with their child/children about their science lessons and homework. We also encourage parents to