

## (Science/KS5 Applied Science) Long-Term Plan

**Long-term planning (LTPs)** - Planning how the key concepts, knowledge, skills identified in the Progression map will be delivered termly per year group

Ensuring that end points & NC/spec are covered

Identifying what assessments are planned and when

Ensuring whole school intent priorities to be planned for

<b>(Year 12 Applied Science)</b>						
	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
<b>Unit title:</b>	Chemical Structures of elements and compounds Reactions in chemical and biological systems Types of hazard that may be encountered in a laboratory	Reactions in chemical and biological systems Cell Organisation and structures Health and safety procedures to minimise risk presented by hazard in a laboratory Design a safe functioning laboratory to manage the risk presented by hazards	Cell Organisation and structures Principles of Carbon chemistry Design a safe functioning laboratory to manage the risk presented by hazards	Importance of inorganic Chemistry in living systems Structures, properties and uses of materials Importance of health and safety and quality systems to industry	Separate, identify and quantify the amount of substances present in a mixture  Structures, properties and uses of materials	Determine the concentration of an acid or base using titration Examine and record features of biological samples
<b>Unit length:</b>	Chemical Structures of elements and compounds- 12 Lessons Reactions in chemical and biological systems- 2 Lessons	Reactions in chemical and biological systems- 10 Lessons Cell Organisation and structures-8 Lessons Health and safety procedures to minimise risk presented by hazard in a laboratory- 12 Lessons Design a safe functioning laboratory to manage the risk presented by hazards- 4 Lessons	Cell Organisation and structures- 6 Lessons Principles of Carbon chemistry- 7 Lessons Design a safe functioning laboratory to manage the risk presented by hazards- 6 Lessons	Importance of inorganic Chemistry in living systems-5 Lessons Structures, properties and uses of materials- 8 Lessons Importance of health and safety and quality systems to industry- 8 Lessons	Structures, properties and uses of materials- 6 Lessons Unit 1 Revision- 14 Lessons  Separate, identify and quantify the amount of substances present in a mixture- 12 Lessons	Determine the concentration of an acid or base using titration- 14 Lessons Examine and record features of biological samples-14 Lessons

<p><b>Key concepts:</b></p>	<p>nucleus contains protons and neutrons surrounded by electrons relative masses and charges nuclear and atomic diameters nucleon number, proton number and isotopes proton number defines the type of atom nuclear notation attractive and repulsive forces within the nucleus organisation of elements within the table groups periods atomic number atomic mass atomic radius The types of hazardous agents that may be encountered in the Laboratory and the risks they pose The principles of disease causing organisms How some viruses (bacteriophage) can infect bacterial cells</p>	<p>ionic bonding covalent bonding prokaryotic cells eukaryotic cells</p> <ul style="list-style-type: none"> <li>cell wall</li> <li>plasma membrane</li> <li>cytoplasm</li> <li>mitochondria</li> <li>chloroplasts</li> <li>Golgi apparatus</li> <li>lysosome</li> <li>endoplasmic reticulum (rough and smooth)</li> <li>ribosomes</li> <li>nucleus</li> </ul> <p>nuclear membrane chromatin material, chromosomes</p> <ul style="list-style-type: none"> <li>DNA and RNA</li> <li>oxidation and reduction</li> <li>addition</li> <li>substitution</li> <li>polymerisation</li> <li>radical reactions</li> <li>displacement</li> </ul> <p>Hazards in the laboratory (disease</p>	<p>prokaryotic cells eukaryotic cells</p> <p>Tissues: Connective, Muscle, Bone, Nerve, ovary and testis</p> <ul style="list-style-type: none"> <li>alkanes, alkenes, alkynes</li> <li>aldehydes and ketones (for ketones only first two required)</li> <li>alcohols</li> <li>carboxylic acids</li> </ul> <p>C<sub>4</sub>H<sub>8</sub>O esters polymers</p> <ul style="list-style-type: none"> <li>polyethene,</li> <li>polypropene,</li> <li>polylactate,</li> <li>polystyrene,</li> </ul> <p>polyvinyl chloride (PVC) isomer</p> <ul style="list-style-type: none"> <li>structural isomers</li> <li>geometric isomers</li> <li>complex carbohydrates (starch,</li> </ul>	<ul style="list-style-type: none"> <li>oxides eg CO<sub>2</sub>, NO<sub>x</sub>, MgO</li> <li>metal ions, peroxide, nitrates, phosphates,</li> <li>Pt<sup>2+</sup> treatment in chemotherapy</li> <li>Li<sup>+</sup>: treatment of hypertension, bipolar disorder</li> <li>Mn<sup>2+</sup> oxidase, structural, photosynthesis</li> <li>Ca<sup>2+</sup>: structural, charge carrier</li> <li>Na<sup>+</sup>, K<sup>+</sup>: osmotic balance, charge carrier</li> <li>Fe<sup>2+</sup>, Fe<sup>3+</sup>, Cu<sup>2+</sup>: oxygen transport and storage, electron transfer</li> <li>Ni<sup>2+</sup>: hydrogenase, hydrolase</li> </ul> <p>bioinorganic - biological functions of metal ions</p> <ul style="list-style-type: none"> <li>mechanical properties, i.e.: <ul style="list-style-type: none"> <li>strength (compression and tension)</li> <li>stiffness</li> <li>malleability</li> <li>ductility</li> </ul> </li> </ul>	<p>paper chromatography to separate mixtures of coloured and colourless components e.g. pen dye, plant pigments</p> <ul style="list-style-type: none"> <li>thin-layer chromatography (TLC) to separate mixtures of coloured and colourless components e.g. plant pigments, pharmaceuticals</li> <li>stationary and mobile phases in chromatography</li> </ul> <p>calculate R<sub>f</sub> values and make comparisons (standards, literature values) retention times when using gas chromatography (GC) and high performance liquid chromatography (HPLC) positive identification of the components of a mixture when a chromatograph is linked to a mass</p>	<ul style="list-style-type: none"> <li>choice of appropriate measuring equipment (burette; one-mark pipette; balance)</li> <li>choice of appropriate indicators i.e. <ul style="list-style-type: none"> <li>strong acid / strong base, i.e. bromothymol blue</li> <li>strong acid / weak base, i.e. methyl orange</li> <li>weak acid / strong base, i.e. phenolphthalein</li> </ul> </li> <li>calculation of mass required to make a solution of a given concentration</li> <li>calculation of concentration in mol dm<sup>-3</sup> given the concentration of one solution</li> <li>pH meter</li> </ul>
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		<p>risk and hazards) • Risk assessment • biohazard symbol • COSHH regulations • RIDDOR</p> <p>Regulations • safety of instrumentation including electrical equipment • Use of standard operating procedure</p> <p>Initial planning</p> <p>Resources</p> <p>Procedures</p> <p>Legislation</p> <p>Design specifications</p>	<p>glycogen, cellulose)</p> <ul style="list-style-type: none"> <li>lipids from fatty acids, glycerol and phosphorus compounds</li> <li>protein synthesis (transcription, translation) RNA, messenger, ribosomal and transfer</li> </ul> <p>Initial planning</p> <p>Resources</p> <p>Procedures</p> <p>Legislation</p> <p>Design specifications</p>	<ul style="list-style-type: none"> <li>○ brittleness</li> <li>○ hardness</li> <li>○ density</li> <li>○ electrical properties, charge flow (in conductors, semiconductors and insulators)</li> <li>○ current</li> <li>○ internal resistance and combined resistances</li> <li>○ electromotive force (e.m.f) and potential difference (voltage)</li> <li>○ number of charge carriers per unit</li> <li>○ volume of conductors and insulatorsele ctrical energy and power</li> <li>• the choice of measuring equipment and the importance of calibration</li> </ul>	<p>spectrometer (GC-MS and HPLC-MS)</p>	<p>auto-titration</p> <p>visual observation (including the use of a hand lens / magnifying glass) - recording the main features, making measurements of distances and lengths, and using reference samples to interpret the image use of the light microscope, its benefits (observation of living specimens, use of incident light for surface features) and limitations</p> <p>accurate recording of observations; calculating magnification and scale; use of a graticule</p> <ul style="list-style-type: none"> <li>electron microscopy gives higher magnification and greater resolution X-ray analysis is used to reveal 'hidden' structures, e.g. the skeleton</li> </ul> <p>ultrasound is used to examine structures that are</p>
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				<ul style="list-style-type: none"> <li>○ the assessment and management of risk (risk assessments; safety precautions/minimising risk)</li> <li>○ the use of appropriate sampling techniques (the whole sample, representative sample, random sample), labelling and recording samples, storing and transporting samples</li> </ul>		difficult to access, e.g. pregnancy observations
<b>Knowledge/ Skills:</b>	Calculation of subatomic particles Identify hazards in a laboratory	Knowledge of COSHH regulations • RIDDOR				

<p><b>End points covered:</b></p>	<p>To understand the chemical structures of elements and compounds</p> <p>To understand reactions in chemical and biological systems</p> <p>To understand the types of hazard that may be encountered in a laboratory</p>	<p>To understand reactions in chemical and biological systems</p> <p>To understand cell organisation and structures</p> <p>To be able to use health and safety procedures to minimise the risk presented by hazards in a laboratory</p> <p>Be able to design a safe functioning laboratory to manage the risk presented by hazards</p>	<p>To understand cell organisation and structures</p> <p>To understand the principles of carbon chemistry</p> <p>To understand the structures, properties and uses of materials</p>	<p>To understand the importance of inorganic chemistry in living systems</p> <p>To understand the importance of health and safety and quality systems to industry</p>	<p>To be able to separate, identify and quantify the amount of substances present in a mixture</p>	<p>To be able to determine the concentration of an acid or base using titration</p> <p>To be able to examine and record features of biological samples</p>
<p><b>NC/Spec coverage:</b></p>	<p>Unit 1 LO1: Chemical Structures of elements and compounds</p> <p>1.1 The atom is the basic structure; it is made up of subatomic particles</p> <p>1.2 Elements are based on atomic structure and can be classified by the Periodic Table</p>	<p>Unit 1 LO2: Reactions in chemical and biological systems</p> <p>2.2 Chemical reactions</p> <p>2.3 Rate of reaction can be affected by factors</p> <p>Unit 1 LO3: Cell Organisation and structures</p> <p>3.1 Types of cells</p>	<p>Unit 1 LO3: Cell Organisation and structures</p> <p>3.2 Components of the cell and their role in the cell</p> <p>3.3 Understand how tissues types are related to their function</p> <p>Unit 1 LO4: Principles of Carbon chemistry</p>	<p>Unit 1 LO5: Importance of inorganic Chemistry in living systems</p> <p>5.1 Inorganic Chemistry is the study of elements and compounds which do not include carbon-hydrogen bonds</p> <p>Unit 1 LO6: Structures, properties and uses of materials</p>	<p>Unit 2 LO2: Separate, identify and quantify the amount of substances present in a mixture</p> <p>2.1 Techniques to separate and identify substances present in a mixture</p> <p>Unit 1 LO6: Structures, properties and uses of materials</p> <p>6.1 The properties of a material determine its uses,</p>	<p><b>Unit 2 LO3: Determine the concentration of acid or base using titration</b></p> <p>3.1 Techniques to determine the concentration of an acid or base using titration</p> <p>3.2 Alternative techniques offering enhanced accuracy and sensitivity</p> <p><b>Unit 2 LO4: Examine and record features of biological samples</b></p>

	<p>Unit 1 LO2: Reactions in chemical and biological systems</p> <p>2.1 Chemicals interact and react with each other</p> <p>Unit 6 LO1: Types of hazard that may be encountered in a laboratory</p> <p>1.1 The types of hazardous agents that may be encountered in the Laboratory and the risks they pose</p> <p>1.2 The principles of disease causing organisms</p> <p>1.3 How some viruses (bacteriophage) can infect bacterial cells</p>	<p>Unit 6 LO2: Health and safety procedures to minimise risk presented by hazard in a laboratory</p> <p>2.1 Safe working practices in the laboratory when working with bio hazardous substances</p> <p>Unit 6 LO3: Design a safe functioning laboratory to manage the risk presented by hazards</p> <p>3.1 Design of the area of work</p>	<p>4.1 Carbon forms a vast number of different types of compounds with other elements due to the nature of the carbon atom</p> <p>4.2 Carbon compounds can be represented using empirical and structural formulae</p> <p>4.3 Carbon compounds form different types of optical isomers</p> <p>4.4 Carbon compounds can form large complex molecules</p> <p>Unit 6 LO3: Design a safe functioning laboratory to manage the risk presented by hazards</p> <p>3.1 Design of the area of work</p>	<p>6.1 The properties of a material determine its uses, and can be explained by its chemistry</p> <p>Unit 2 LO1: Importance of health and safety and quality systems to industry</p> <p>1.1 To use aspects of good laboratory practice throughout all practicals</p>	<p>and can be explained by its chemistry</p>	<p>4.1 Techniques to examine and record features of biological samples</p> <p>4.2 Alternative techniques offering enhanced visual examination of microscopic features and features hidden from view or difficult to access</p>
<b>Cross-curricular links:</b>	Literacy Skills	Literacy Skills	Literacy Skills	Maths skills	Maths skills	<b>Maths skills</b>

<b>Assessments:</b>	End of topic tests	End of topic tests	End of topic tests	End of topic tests	End of topic tests	<b>End of topic tests</b>
<b>Other school intent priorities</b>						
<b>New experiences</b> – broadening horizons	Potential visit to a laboratory		Potential visit to a laboratory		Potential visit to an industry	
<b>Developing character</b> – <i>Kind, Hard Working, Successful</i>						
<b>Context specific need</b> – diversity, inclusion; reading, literacy; mental health						
<b>Curriculum Careers</b> - Gatsby 4	Allied healthcare	Laboratory technician	Laboratory technician			Allied healthcare

**(Year 13 Applied Science)**

	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
<b>Unit title:</b>	Unit 8: Physiology of Human Body Systems Learning Aim A Unit 3: Science Investigation Skills: Topic A-C Unit 3: Science Investigation Skills: Topic D: ENZYMES IN ACTION Unit 3: Science Investigation Skills: Topic E DIFUSION OF MOLECULES Unit 3: Science Investigation Skills: Topic F: PLANTS AND THEIR ENVIRONMENT	Unit 8: Physiology of Human Body Systems Learning Aim A Unit 3: Science Investigation Skills: Topic F: PLANTS AND THEIR ENVIRONMENT Unit 3: Science Investigation Skills: Topic G ENERGY CONTENT Unit 3: Science Investigation Skills: Topic H ELECTRICAL CIRCUIT	Unit 8: Physiology of Human Body Systems Learning Aim B Unit 8: Physiology of Human Body Systems Learning Aim C  Revision Unit 3	Unit 8: Physiology of Human Body Systems Learning Aim B Unit 8: Physiology of Human Body Systems Learning Aim C	Unit 8: Physiology of Human Body Systems Learning Aim B Unit 8: Physiology of Human Body Systems Learning Aim C	N/A
<b>Unit length:</b>	Unit 8: Physiology of Human Body Systems Learning Aim A-14 Lessons Unit 3: Science Investigation Skills: Topic A-C- 6 Lessons Unit 3: Science Investigation Skills: Topic D: ENZYMES IN ACTION- 6 Lessons Unit 3: Science Investigation Skills: Topic E DIFUSION OF MOLECULES- 6 Lessons	Unit 8: Physiology of Human Body Systems Learning Aim A- 10 Lessons Unit 3: Science Investigation Skills: Topic F: PLANTS AND THEIR ENVIRONMENT Unit 3: Science Investigation Skills: Topic G ENERGY CONTENT- 9 Lessons Unit 3: Science Investigation Skills: Topic H ELECTRICAL CIRCUIT-6 Lessons	Unit 8: Physiology of Human Body Systems Learning Aim B- 4 Lessons Unit 8: Physiology of Human Body Systems Learning Aim C- 8 Lessons  Revision Unit 3	Unit 8: Physiology of Human Body Systems Learning Aim B- 14 Lessons Unit 8: Physiology of Human Body Systems Learning Aim C- 14 Lessons	Unit 8: Physiology of Human Body Systems Learning Aim B- 14 Lessons Unit 8: Physiology of Human Body Systems Learning Aim C- 14 Lessons	



	Unit 3: Science Investigation Skills: Topic F: PLANTS AND THEIR ENVIRONMENT-4-Lessons					
<b>Key concepts:</b>	<ul style="list-style-type: none"> <li>• <b>Protein structure</b> Active sites</li> </ul> Denaturation formulate a hypothesis or a null hypothesis based on relevant scientific ideas. Selection of appropriate equipment, techniques and standard procedures Health and safety associated with the investigation Variables in the investigation Method for data collection and analysis	Factors that may affect plant growth and distribution. Human effects, pH and aeration of soil, temperature, light intensity, amount of moisture and presence of mineral ions Products of combustion Types of fuels Electrical resistance Thermistor investigation Power and energy usage  Gross anatomy and function of the organs of the lymphatic system. composition and location of the spleen, thymus gland, tonsils, lymph glands, lymph vessels formation and transport of lymphocytes and lymph	Digestion Enzymes key nutrients for a balanced diet. Nutrient deficiency  Pathways and mechanisms by which the products of chemical digestion are absorbed Role of digestive enzymes in nutrient uptake Symptoms of nutritional deficiency resulting from dietary related disease a Gross anatomy and function of the organs of the lymphatic system. composition and location of the spleen, thymus gland, tonsils, lymph glands, lymph vessels formation and transport of lymphocytes and lymph	Digestion Enzymes key nutrients for a balanced diet. Nutrient deficiency  Pathways and mechanisms by which the products of chemical digestion are absorbed Role of digestive enzymes in nutrient uptake Symptoms of nutritional deficiency resulting from dietary related disease a Gross anatomy and function of the organs of the lymphatic system. composition and location of the spleen, thymus gland, tonsils, lymph glands, lymph vessels formation and transport of lymphocytes and lymph	Digestion Enzymes key nutrients for a balanced diet. Nutrient deficiency  Pathways and mechanisms by which the products of chemical digestion are absorbed Role of digestive enzymes in nutrient uptake Symptoms of nutritional deficiency resulting from dietary related disease a Gross anatomy and function of the organs of the lymphatic system. composition and location of the spleen, thymus gland, tonsils, lymph glands, lymph vessels formation and transport of lymphocytes and lymph	

<b>Knowledge/ Skills:</b>	formulate a hypothesis or a null hypothesis processing and evaluating data Importance of obtaining data accurately/reliably and to appropriate levels of precision.	<ul style="list-style-type: none"> <li>• Statistical analysis of data</li> <li>• standard deviation</li> <li>chi-squared test</li> </ul> use the t-test Plant population investigation Measuring heat energy released from a fuel Planning energy from foods practical Energy from foods practical investigation Calculating resistance and power	Food test			
<b>End points covered:</b>	<p><b>To be able to plan a scientific investigation</b></p> <p><b>To be able to collect data, process and interpret data</b></p> <p>To understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</p> <p>To understand factors that affect the rate of diffusion</p> <p>To understand factors that affect the</p>	<p>To understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</p> <p>To understand factors that affect the distribution of plants in their environment</p> <p>To understand how much energy is in fuels</p>	<p>To understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</p> <p>To be able to explore the physiology of the digestive system and the use of Corrective treatments for dietary related diseases.</p>	<p>To understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</p> <p>To be able to explore the physiology of the digestive system and the use of Corrective treatments for dietary related diseases.</p>	<p>To understand the impact of disorders of the musculoskeletal system and their associated corrective treatments</p> <p>To be able to explore the physiology of the digestive system and the use of Corrective treatments for dietary related diseases.</p>	

	distribution of plants in their environment					
<b>NC/Spec coverage:</b>	<p>Unit 1 LO1: Chemical Structures of elements and compounds</p> <p>1.2 The atom is the basic structure; it is made up of subatomic particles</p> <p><b>D1 Protein structure</b>  <b>D2 Enzymes as biological catalysts in chemical reactions</b>  <b>D3 Factors that can affect enzyme activity</b>  <b>E1 Factors affecting the rate of diffusion</b>  <b>E2 Arrangement and movement of Molecules</b>  <b>F1 Factors that can affect plant growth and/or distribution</b></p> <p><b>F2 Sampling techniques</b>  <b>F3 Sampling sizes</b>  Statistical analysis of data</p> <p>Explain the functional role of the</p>	<p><b>F1 Factors that can affect plant growth and/or distribution</b></p> <p><b>F2 Sampling techniques</b></p> <p><b>F3 Sampling sizes</b>  Statistical analysis of data</p> <p><b>G1 Fuels</b></p> <p><b>G2 Hazards associated with fuels</b></p> <p><b>G3 Units of energy</b></p> <p><b>H1 Use of electrical symbols to design circuits</b></p> <p><b>H2 Equations</b>  <b>H3 Energy usage</b></p>				

	musculoskeletal system in the human body					
<b>Cross-curricular links:</b>	Maths and literacy skills	Literacy and maths skills	Literacy skills	Literacy skills	Literacy skills	
<b>Assessments:</b>	End of topic tests	End of topic tests	End of topic tests	End of topic tests		
<b>Other school intent priorities</b>						
<b>New experiences –</b> broadening horizons						
<b>Developing character –</b> <i>Kind, Hard Working, Successful</i>						
<b>Context specific need –</b> diversity, inclusion; reading, literacy; mental health						
<b>Curriculum Careers -</b> Gatsby 4	Jobs in Allied Healthcare	Jobs in Allied Healthcare	Jobs in Allied Healthcare			