Science Department – Year 12 Biology

A level Biology is a stepping stone to future study. We have chosen a course that allows students to develop the skills that they will need in future studies. The course allows us to support and inspire our students to nurture a passion for Biology and lay the groundwork for further study in courses like biological sciences, medicine and other science related courses.
AQA Biology A-level gives students the skills to make connections and associations with all living things around us. Being such a broad topic, it aims to encourage students to find a specific area of interest, plus it opens the door to a fantastic range of interesting careers.

Shirley High Curriculum Map	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:	Theme/Topic/Skill:
	Teacher A(4 lessons a fortnight). **Section 2- Cells** • Topic 3- Cell structure • 3.1-3.8 **Teacher B(6 lessons a fortnight.** **Section 1- Biological molecules** • Topic 1. Biological molecules 1.1-1.6	**Teacher A(4 lessons a fortnight)** **Section 2-Cells** • Practical 2: Preparing stained squashes of root cells to observe mitosis **Section 2** • Topic 4. Transport 4.1-4.3 • Core practical 4. Effect of a named variable on the permeability of cell -surface membrane. **Teacher B(6 lessons a fortnight.** **Section 1. Biological molecules 1.6-1.9** • Core Pract.1. Investigation into the effect of a named variable on enzyme-controlled reaction. • Topic 2- Nucleic acid • 2.1- structure of RNA.	**Teacher A(4 lessons a fortnight)** **Section 2-Cells** • Topic 4. Transport across cell membranes. 4.4-4.5 • Core Practical 3: Practical 3 Dilution series to find water potential of plant tissues • Topic 5. Cell recognition and immune system, 5.1-5.3 **Teacher B(6 lessons a fortnight.** **Section 1- Biological molecules.** • Topic 2- Nucleic acid 2.2-2.4. **Section 3 – Organisms exchange substances with their environment** • Topic 6 Exchange • 6.1-6.4	**Teacher A(4 lessons a fortnight).** **Section 2- Cells** • Topic 5. Cell recognition and immune system, 5.4-5.7. • Section 4; genetic information, variation and relationship. • Topic 8. Genetic information, variation and Relationships between organisms 8.1-8.2. **Teacher B(6 lessons a fortnight.** **Section 3 – Organisms exchange substances with their environment** • Topic 6 Exchange • 6.5-6.9 • Topic 7: Mass Transport. • 7.1-7.2	**Teacher A(4 lessons a fortnight).** **Section 4; genetic information, variation and relationship.** • Topic 8. Genetic information • 8.3-8.5 • Topic 9 . Genetic diversity • 9.1-9.2 **Teacher B(6 lessons a fortnight.** **Section 3 – Organisms exchange substances with their environment** • Topic 7: Mass Transport. 7.3- 7.9 • Core Practical 5: Dissection of animal or plant gas exchange or mass transport system or of organ within such a system **Section 4; genetic information, variation and relationship.** • Topic 10 : Diversity 10.1	**Teacher A(4 lessons a fortnight).** **Section 4; genetic information, variation and relationship.** • Topic 9 . Genetic diversity • 9.3-9.4 • Practical catch up • Practical 6: Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth . **Teacher B(6 lessons a fortnight.** **Section 4; genetic information, variation and relationship.** • Topic 10 : Diversity • 10.2-10.5 • Practical catch up
Why Now?	Section 1 Biological molecules. We begin the course by looking at biological molecules- the building blocks of all living things. This is important because all living cells are made up of only a few groups of molecules that react chemically with each other in similar ways. More importantly these molecules are all based on carbon. We also study water because of its role in all living things. It is the most important component of cells and all life as we know it relies on this simple molecule. Section 2 Cell structure. Alongside Biological molecules, we build on the GCSE knowledge of cells, to develop more in depth understanding of cell structure. The cell is the fundamental unit of life. All organisms whatever their type or size are composed of cells. All new cells are derived from existing ones by one of the following the process of binary fission, mitosis and meiosis. Cells contain the genetic material of an organism and metabolic processes take place within them.	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Section 3 Organisms exchange substances with their environment. WE build on the knowledge of the cell structure in section 2 by learning about how cells and all living things exchange materials between themselves and their environment. WE look at how substances enter or leave a cell through the plasma membrane.WE also look at the effect of size on how efficient substances are exchanged and the various adaptations organisms have to ensure efficient exchange of materials. Section 4 Genetic Information, variation, and relationships between organisms WE move on to study the variety of life around us. The diversity of life which is brought about primarily by the genes. We also look at the role the environment plays in modifying the characteristics determined by genes. WE the DNA and how mutations in the DNA may lead to different characteristics. WE develop this idea to look at how individuals in a population may have adaptations which help them survive. 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Fundamental Concepts	**Section 1. Biological molecules** All life on Earth shares a common chemistry. This provides indirect evidence for evolution. Despite their great variety, the cells of all living organisms contain only a few groups of carbon-based compounds that interact in similar ways. Carbohydrates are commonly used by cells as respiratory substrates. They also form structural components in plasma membranes and cell walls. Lipids have many uses, including the bilayer of plasma membranes, certain hormones and as respiratory substrates. Proteins form many cell structures. They are also important as enzymes, chemical messengers and components of the blood.	**Section 2- Cells** **Section 1- Biological molecules.** All life on Earth exists as cells. These have basic features in common. Differences between cells are due to the addition of extra features. This provides indirect evidence for evolution. All cells arise from other cells, by binary fission in prokaryotic cells and by mitosis and meiosis in eukaryotic cells. All cells have a cell-surface membrane and, in addition, eukaryotic cells have internal membranes. The basic structure of these plasma membranes is the same and enables control of the passage of substances across exchange surfaces by passive or active transport.	**Section 2- Cells** **Section 1- Biological molecules.**	**Section 3- Organisms exchange substances with their environment** The internal environment of a cell or organism is different from its external environment. The exchange of substances between the internal and external environments takes place at exchange surfaces. To truly enter or leave an organism, most substances must cross cell plasma membranes. In large multicellular organisms, the immediate environment of cells is some form of tissue fluid. Most cells are too far away from exchange surfaces, and from each other, for simple diffusion alone to maintain the composition of tissue fluid within a suitable metabolic range. In large organisms, exchange surfaces	**Section 4 Genetic information, variation and relationships between organisms** Biological diversity – biodiversity – is reflected in the vast number of species of organisms, in the variation of individual characteristics within a single species and in the variation of cell types within a single multicellular organism. Differences between species reflect genetic differences. Differences between individuals within a species could be the result of genetic factors, of environmental factors, or a combination of both. A gene is a section of DNA located at a particular site on a DNA molecule, called its locus. The base sequence of each gene carries the coded genetic information that	**Section 3- Organisms exchange substances with their environment** **Section 4** **Genetic information, variation and relationships between organisms**

		Cell-surface membranes contain embedded proteins. Some of these are involved in cell signalling – communication between cells. Others act as antigens, allowing recognition of 'self' and 'foreign' cells by the immune system. Interactions between different types of cell are involved in disease, recovery from disease and prevention of symptoms occurring at a later date if exposed to the same antigen, or antigen-bearing pathogen		are associated with mass transport systems that carry substances between the exchange surfaces and the rest of the body and between parts of the body. Mass transport maintains the final diffusion gradients that bring substances to and from the cell membranes of individual cells. It also helps to maintain the relatively stable environment that is tissue	determines the sequence of amino acids during protein synthesis. The genetic code used is the same in all organisms, providing evidence for evolution. Genetic diversity within a species can be caused by gene mutation, chromosome mutation or random factors associated with meiosis and fertilisation. This genetic diversity is acted upon by natural selection, resulting in species becoming better adapted to their environment. Variation within a species can be measured using differences in the base sequence of DNA or in the amino acid sequence of proteins. Biodiversity within a community can be measured using species richness and an index of diversity	
Students will…	**Teacher B(6 lessons a fortnight)** **Biological molecules** 1.1- Introductions • Describe what a mole is, and what is meant by a molar solution • Explain bonding and the formation of molecules • Describe polymerisation and state what macromolecules are • Describe condensation and hydrolysis • Describe metabolism 1.2 – monosaccharides. • Describe how carbohydrates are constructed • Describe the structure of monosaccharides • Describe how to carry out the Benedict's test for reducing and non-reducing sugars 1.3 Disaccharides • Explain how monosaccharides are linked together to form disaccharides • Describe how α-glucose molecules are linked to form starch • Describe the test for non-reducing sugars. • Describe the test for starch. 1.4- starch, glycogen and cellulose. • Explain how α-glucose monomers are arranged to form the polymers of starch and glycogen • Explain how β-glucose monomers are arranged to form the polymer cellulose • Explain how the molecular structures of starch, glycogen and cellulose relate to their functions. 1.5 Lipids • Describe the structure of triglycerides and how this relates to their function • Describe the roles of lipids. • Describe the structure • of a phospholipids and how this relates to their function • Describe the test for a lipid.	**Teacher B(6 lessons a fortnight)** **Biological Molecules** 1.6 Proteins • Explain how amino acids are linked to form polypeptides – the primary structure of proteins • Explain how polypeptides are arranged to form the secondary structure and then the tertiary structure of a protein • Explain how the quaternary structure of a protein is formed • Describe the test for proteins 1.7 Enzymes action. • Explain how enzymes speed up chemical reactions • Describe how the structure of enzyme molecules relates to their function • Explain the lock and key model of enzyme action. • Explain the induced-fit model of enzyme action. 1.8 Factors affecting enzyme action • Describe how the rate of an enzyme-controlled reaction is measured • Explain how temperature affects the rate of an enzyme-controlled reaction • Explain how pH affects the rate of an enzyme-controlled reaction • Explain how substrate and enzyme concentration affect the rate of reaction 1.9- Enzyme inhibition. • Describe the nature of enzyme inhibition • Explain how competitive inhibitors and non-competitive inhibitors affect the active site • Core Pract. 1. Investigation into the effect of a named variable on enzyme-controlled reaction.	**Teacher B(6 lessons a fortnight)** **Topic 2- Nucleic acid** 2.2 DNA replication • Describe the events which take place during DNA replication • Describe the formation of a new polynucleotide strand. • Explain the semi-conservative process of DNA replication 2.3 Energy and ATP • Define what energy is and why organisms need it • Explain how ATP stores energy • Describe how ATP is synthesised • Describe the role of ATP in biological processes 2.4. water and its functions. • Describe the structure of the water molecule • State the properties of the water molecule • Explain the importance of the water molecule to living organisms. • Describe inorganic ions and their roles **6. Exchange** **6.1 Exchange between organisms and their environment** • Explain how the size of an organism and its structure relate to its surface area to volume ratio • Describe how larger organisms increase their surface area to volume ratio Explain how surfaces are specially adapted to facilitate exchange. **6.2 Gas exchange in single-celled organisms and insects** • Describe how single-celled organisms exchange gases • Explain how terrestrial insects balance the need to exchange gases with the need to conserve water Explain how insects exchange gases **6.3 Gas exchange in fish** • Describe the structure of fish gills • Describe how water is passed along fish gills • Explain the difference between parallel flow and countercurrent flow Explain how countercurrent flow increases the rate of gas exchange **6.4 Gas exchange in the leaf of a plant.** • Describe how plants exchange gases • Describe the structure of a dicotyledonous plant leaf Explain the adaptations of leaves for efficient gas exchange	**Teacher B(6 lessons a fortnight)** **Section 3** **Organisms exchange substances with their environment.** **6.5 Limiting water loss** Explain how terrestrial plants and insects balance the need for gas-exchange and the need to conserve water **6.6 Structure of the human gas-exchange system** • Describe how the human gas exchange system is arranged Explain the functions of the human gas-exchange system **6.7 The mechanism of breathing** • Explain how and why air is moved into the lungs when breathing in • Explain how air is moved out of the lungs when breathing out Explain what is meant by pulmonary ventilation and how it is calculated **6.8 Exchange of gases in the lungs** • Describe the essential features of exchange surfaces Explain how gases are exchanged in the alveoli of humans. **6.9 Enzymes and digestion** • Describe the structure and function of the major parts of the digestive system • Explain how the digestive system breaks down food both physically and chemically Explain the role of enzymes in digestion of carbohydrates, lipids and proteins **6.10 Absorption of the products of digestion** • Describe the structure of the ileum • Explain how the ileum is adapted for the function of absorption • Explain how monosaccharides and amino acids are absorbed Explain how triglycerides are absorbed. **Chapter 7 Mass transport** **7.1 Haemoglobin** • Describe the structure and function of haemoglobins • Explain the differences between haemoglobins in different organisms and the reasons for these differences Explain what is meant by loading and unloading of oxygen **7.2 Transport of oxygen by haemoglobin**	**Teacher B(6 lessons a fortnight)** **7.3 circulatory system of a mammal.** • Explain why large organisms move substances around their bodies. • Describe the features of the transport systems of large organisms. • Describe the circulatory system of insects. • Describe the circulatory system of fish. • Describe the circulatory system of mammals. • Explain the relative efficiency of different circulatory systems. **7.4 The structure of the heart** • Describe the appearance of the heart and its associated blood vessels • Explain why the heart is made up of two adjacent pumps • Core Practical 5: Dissection of animal or plant gas exchange or mass transport system or of organ within such a system Explain how the structure of the heart is related to its functions **7.5 The cardiac cycle** • Describe the stages of the cardiac cycle • Explain how valves control the flow of blood through the heart Explain the volume and pressure changes which take place in the heart during the cardiac cycle **7.6 Blood vessels and their functions** • Describe the structures of arteries, arterioles and veins • Explain how the structure of each of the above vessels is related to its function Explain the structure of capillaries and how it is related to their function **7.7 Transport of water in the xylem** • Define what transpiration is • Explain how water moves through the leaf • Explain how water moves up the xylem Explain the cohesion–tension theory of water transport	**Teacher B(6 lessons a fortnight)** **Chapter 10 Biodiversity** **10.2 Diversity within a community** • Describe what we understand by species diversity Explain how a diversity index is used as a measure of species diversity **10.3 Species diversity and human activity** • Describe the impact of agriculture on species diversity Explain the balance between conservation and farming **10.4 Investigating diversity** • Explain the use of the following techniques in comparing genetic diversity within, and between, species: • observable characteristics • base sequence of DNA • base sequence of mRNA • amino acid sequence of proteins Explain how immunological comparisons are used to investigate variations in proteins **10.5 Quantitative investigations of variation** • Describe how variation is measured • Explain what sampling is and why it is used • Describe the types of variation and their causes Explain what is meant by the mean and standard variation Catch up practical **Teacher A(4 Lessons a fortnight)** **9.3 Genetic diversity and adaptation** • Explain why organisms are different from one another • Describe what factors influence genetic diversity • Explain how reproductive success affects allele frequency within a gene pool Explain how genetic diversity enables natural selection. **9.4 Types of selection** • Describe what selection is • Describe the environmental factors which exert selection pressure Explain what stabilising and directional selection are Practical 6: Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth yr 12

	1.6 Proteins ● Explain how amino acids are linked to form polypeptides – the primary structure of proteins ● Explain how polypeptides are arranged to form the secondary structure and then the tertiary structure of a protein ● Explain how the quaternary structure of a protein is formed ● Describe the test for proteins **Teacher A (4 Lessons a fortnight).** **Cells** **3.1 Methods of studying cells.** ● Explain the principles of magnification and resolution ● Describe what cell fractionation is Explain how ultracentrifugation works **3.2 The electron microscope** ● Explain how electron microscopes work ● Explain the differences between a transmission electron microscope and a scanning electron microscope Describe the limitations of the transmission and the scanning electron microscopes **3.3 Microscopic measurements and calculations** ● Explain how to calibrate an eyepiece graticule ● Explain how to measure cell size using an eyepiece graticule Learn how to calculate the size of a specimen and/or magnifications from drawings and photographs **3.4 Eukaryotic cell structure** ● Describe the structure and functions of the nucleus, mitochondria, chloroplasts, rough and smooth endoplasmic reticulum, Golgi apparatus, Golgi vesicles and lysosomes ● Describe the structure and function of the cell wall in plants, algae and fungi Describe the structure and function of the cell vacuole in plants **3.5 Cell specialisation and organisation** ● Discuss the advantages of cellular differentiation ● Describe how cells are arranged into tissues ● Describe how tissues are arranged into organs Describe how organs are arranged into organ systems 3.6 Prokaryotic cells and viruses ● Describe the structure of prokaryotic cells ● Distinguish prokaryotic cells from eukaryotic ones 3.7 Mitosis ● Describe what mitosis is ● State when DNA replication takes place ● Explain the importance of mitosis 3.8 The cell cycle ● Describe the three stages of the cell cycle	Topic 2- Nucleic acid 2.1. Structure of RNA and DNA ● Describe the structure of a nucleotide ● Describe the structure of RNA ● Describe the structure of DNA. **Teacher A (4 Lessons a fortnight).** ● Practical 2: Practical: Preparing stained squashes of root cells to observe mitosis **4. Transport across cell membrane.** 4.1 . Structure of the cell surface membrane. ● Describe the structure of the cell-surface membrane ● Describe the functions of the various components of the cell-surface membrane. ● Explain the fluid-mosaic model of cell membrane structure **4.2. Diffusion** ● Explain what diffusion is and how it occurs ● Explain what affects the rate of diffusion ● Distinguish between facilitated diffusion and diffusion. **4.3. Osmosis** ● Describe the nature of osmosis ● State the water potential of pure water ● Describe the effect of solutes on water potential ● Explain how water potential affects water movement. ● Explain what happens when animal cells and plant cells are placed into pure water ● Core practical 4. Effect of a named variable on the permeability of cell -surface membrane	**Teacher A (4 Lessons a fortnight).** **4.4 Active transport.** ● Explain the process of active transport ● Describe the conditions required for active transport. **4.5. Co transport and absorption of glucose in the ileum.** ● Describe the part villi and microvilli play in absorption. ● Explain how the products of carbohydrate digestion are absorbed in the ileum. ● Explain the roles of diffusion, active transport and co-transport in the process. **Practical 3 Dilution series to find water potential of plant tissues** **5.1 Defence mechanism** Describe the main defence mechanisms of the body. Explain how the body distinguishes between its own cells and foreign cells. **5.2 Defence mechanism** ● Describe the first line of defence against disease ● Explain the process of phagocytosis ● Describe the role of lysosomes in phagocytosis **5.3. T lymphocytes and cell** mediated immunity. ● State the definition of an antigen ● Describe the two main types of lymphocytes. ● Explain the role of T cells (T lymphocytes) in cell-mediated immunity	● Describe the nature of an oxygen dissociation curve ● Explain the effect of carbon dioxide concentration on the curve and the reasons why Explain how the properties of the haemoglobins in different organisms relate to the environment and way of life of the organism concerned **Teacher A (4 Lessons a fortnight).** 5.4. B lymphocytes and humoral immunity. ● Explain the role of B cells (B lymphocytes) in humoral immunity ● Explain the roles of plasma cells and antibodies in the primary immune response ● Explain the role of memory cells in the secondary immune response. ● Explain how antigenic variation affects the body's response to infection. 5.5. Antibiotics ● Describe the structure of an antibody ● Describe the functions of antibodies ● Describe the nature of a monoclonal antibody ● Explain how monoclonal antibodies are produced. ● Explain how monoclonal antibodies are used to target specific substances and cells. 5.6 Vaccination ● Describe the nature of vaccines ● Describe the features of an effective vaccination programme ● Explain why vaccination rarely eliminates a disease. ● Discuss the ethical issues associated with vaccination programmes 5.7. HIV ● Describe the structure of the human immunodeficiency virus ● Explain how the human immunodeficiency virus replicates ● Explain how the human immunodeficiency virus causes AIDS ● Describe the treatment and control of AIDS ● Explain how the ELISA test works. Explain why antibiotics are ineffective against viruses **Section 4** **Section 4: Genetic information, variation and relationships between organisms** **8. DNA, genes and protein synthesis.** **8.1 Genes and the triplet code** ● Describe the nature of a gene Explain how genes code for polypeptides. **8.2 DNA and chromosomes** ● Distinguish between the DNA in prokaryotic cells and the DNA in eukaryotic organisms ● Describe the structure of a chromosome ● Explain how genes are arranged on a DNA molecule ● Describe the nature of homologous chromosomes Explain what is meant by an allele	**7.8 Transport of organic molecules in the phloem** ● Describe the mass flow mechanism for the transport of organic substances in the phloem Summarise the evidence for and against the mass flow mechanism **7.9 Investigating transport in plants** ● Describe the use of ringing experiments to investigate transport in plants ● Describe the use of tracer experiments to investigate transport in plants Explain the evidence that translocation of organic molecules occurs in the phloem **Chapter 10 Biodiversity** **10.1 Species and taxonomy** ● Explain the concept of a species is ● Outline how species are named ● Explain how courtship is a precursor to mating ● Explain the principles of classification Explain how classification is related to evolution **Teacher A (4 Lessons a fortnight).** **8.3 The structure of ribonucleic acid** ● Describe what the genetic code is and its main features ● Describe the structure of ribonucleic acid (RNA) ● Describe the structure and the role of messenger RNA (mRNA) Describe the structure and the role of transfer RNA (tRNA) **8.4 Protein synthesis - transcription and splicing** ● Explain how pre-messenger RNA is produced from DNA in the process called transcription Describe how pre-messenger RNA is modified to form messenger RNA **8.5 Protein synthesis – translation** ● Explain how a polypeptide is synthesised during the process of translation Describe the roles of messenger RNA and transfer RNA in translation. **Chapter 9 Genetic diversity and adaptation** **9.1 Mutations** ● Describe gene mutations ● Explain how deletion and substitution of bases result in different amino acid sequences in polypeptides ● Explain why some mutations do not result in a changed amino acid sequence Describe what chromosome mutations are 9.2 Meiosis and genetic variation ● Describe why meiosis is necessary ● Describe the process of meiosis Explain how meiosis creates genetic variation	

	• Describe what happens during interphase • Explain how mitosis is controlled • Describe how cancer and its treatment relate to the cell cycle					
Language for Life (Key terms/Vocabulary)	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond	activation energy active immunity, active site ,active aerobic ,allele allergen allergy ,antibiotic ,anticodon antigen antioxidant apoplastic, artificial selection ,asthma ,atheroma ,ATP ,B cell ,B lymphocytes Benedict's test, biodiversity ,biomass period of time.Biuret testbody mass index (BMI) cancer a diseasecarcinogen cardiac cycle cardiac outputcarrier molecule (carrier protein, centrifugation cholesterol chromatid chromatin ,chromosome codon cohesion collagen fibrous cartilage and bone.community complementary DNA condensation continuous variation ,coronary arteries ,coronary heart disease (CHD, correlation co-transport counter current covalent bond
Extended writing Opportunities	The importance of proteins in the control of processes and responses in organisms. The uses of water in living organisms	1. Cells and organisms carry out exchanges with their external environment to maintain their internal environment. 2. How bacteria can affect the lives of humans and other organisms	1. The membranes of different types of cells are involved in many different functions. 3. The part played by the movement of substances across cell	1. How energy is transferred within and between organisms. The causes of disease in humans	2. Using DNA in science and technology	The part played by enzymes in the functioning of different cells, tissues
Maths Across the Curriculum	1 Recognise and make use of appropriate units in calculations. 2. Recognise and use expressions in decimal and standard form 3. Use ratios, fractions and percentages 4. Estimate results 5. Use calculators to find and use power, exponential and logarithmic function. 1.1 Use an appropriate number of significant figure .	1. Recognise and make use of appropriate units in calculations. 2. Recognise and use expressions in decimal and standard form 3. Use ratios, fractions and percentages 4. Estimate results 5. Use calculators to find and use power, exponential and logarithmic function. 1.1 Use an appropriate number of significant figure .	.2 Find arithmetic means 1.3 Construct and interpret frequency tables and diagrams, bar charts and histogram 1.4 understand simple probability MS 1.5 Understand the principles of sampling as applied to scientific data MS 1.6 Understand the terms mean, median and mode MS 1.7 Use a scatter diagram to identify a correlation between two variables MS1.8 Make order of magnitude calculations MS 1.9 Select and use a statistical test MS 1.8 Make order of magnitude calculations MS 1.9 Select and use a statistical test MS 1.10 Understand measures of dispersion, including standard deviation and range MS 1.11 Identify uncertainties in measurements.	.2 Find arithmetic means 1.3 Construct and interpret frequency tables and diagrams, bar charts and histogram 1.4 understand simple probability MS 1.5 Understand the principles of sampling as applied to scientific data MS 1.6 Understand the terms mean, median and mode MS 1.7 Use a scatter diagram to identify a correlation between two variables MS1.8 Make order of magnitude calculations MS 1.9 Select and use a statistical test MS 1.8 Make order of magnitude calculations MS 1.9 Select and use a statistical test MS 1.10 Understand measures of dispersion, including standard deviation and range MS 1.11 Identify uncertainties in measurements.	MS 2.1 Understand and use the symbols: =, <>, >, ∝, . No exemplification required. MS 2.2 Change the subject of an equation MS 2.3 Substitute numerical values into algebraic MS 2.4 Solve algebraic equations MS 2.5 Use logarithms in relation to quantities that range over several orders of magnitude. MS 3.1 Translate information between graphical, numerical and algebraic forms MS 3.2 Plot two variables from experimental or other data MS 3.3 Understand that y = mx + c represents a linear relationship MS 3.4 Determine the intercept of a graph MS 3.5 Calculate rate of change from a graph showing a linear relationship MS 3.6 Draw and use the slope of a tangent to a curve as a measure of rate of change MS 4.1 Calculate the circumferences, surface areas and volume	MS 2.1 Understand and use the symbols: =, <>, >, ∝, . No exemplification required. MS 2.2 Change the subject of an equation MS 2.3 Substitute numerical values into algebraic MS 2.4 Solve algebraic equations MS 2.5 Use logarithms in relation to quantities that range over several orders of magnitude. MS 3.1 Translate information between graphical, numerical and algebraic forms MS 3.2 Plot two variables from experimental or other data MS 3.3 Understand that y = mx + c represents a linear relationship MS 3.4 Determine the intercept of a graph MS 3.5 Calculate rate of change from a graph showing a linear relationship MS 3.6 Draw and use the slope of a tangent to a curve as a measure of rate of change MS 4.1 Calculate the circumferences, surface areas and volume
Links to careers/ aspirations	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.	Aeronautical engineer, Botanist, conservationist, dietician, Equine Dentist, Forensic scientists, Geoscientist, Hydrotherapist, immunologist, journalist, kinesiologist, lab technician, marine Biologist, Neuro scientist, optician, paramedic, roboticist, sports scientists, urologist, Volcanologist, weather forecaster, Xray technician, yacht master, Zoologist.
Cultural Capital	Research work on proteins and the importance of proteins in medicine including in treating diseases. Example the sequencing of the genome of the coronavirus.	What are the causes of cardiovascular diseases? What are the Social and ethical issues related to genetic screening	Research work by Pharmaceutical companies developing immunosuppressant drugs. Possible methods of transporting drugs How the different vaccine for coronavirus works	The cause of cardiovascular diseases and how it is treated. Effect of mass transport in plants and the impact on farming and food production.	What is the role of genetics and the environment in determining characteristics?	What are the roles of zoos and seed banks in botanical gardens in the survival of species.
Practical Application of Skills	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of	At. a. use appropriate apparatus to record a range of quantitative measurements (to include mass, time, volume, temperature, length and pH). AT b use appropriate instrumentation to record quantitative measurements, such as a colorimeter or potometer. AT c use laboratory glassware apparatus for a variety of

	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data	experimental techniques to include serial dilutions. AT d use of light microscope at high power and low power, including use of a graticule AT e produce scientific drawing from observation with annotations. AT f use qualitative reagents to identify biological molecules. AT g separate biological compounds using thin layer/paper chromatography or electrophoresis AT h safely and ethically use organisms to measure: • plant or animal responses • physiological functions. AT i use microbiological aseptic techniques, including the use of agar plates and broth . AT j safely use instruments for dissection of an animal organ, or plant organ AT k use sampling techniques in fieldwork AT l use ICT such as computer modelling, or data logger to collect data, or use software to process data