Biddulph High School Curriculum Intent

To deliver a broad and enriching curriculum through engaging and challenging lessons that provide a wide range of opportunities for all students to achieve their potential.
Students will all be prepared to take their next steps in a diverse and ever changing future ready to make a positive contribution to society.
Through a broad programme of extracurricular activities students will have the opportunities to showcase their talents and experience new challenges.
We value individuals and all that they can offer as well as supporting each other with kindness and empathy.

Curriculum Intent for Biology:

The lessons in the Science department provoke students' curiosity through exciting lessons; creating an environment where students will need to critically think and provide logical reasoning using various methods of investigation, such as observation, comparison, experimentation, and mathematical manipulation of data.

All teachers will follow the schemes of work and resources provided by the department. This will ensure that all students receive the same high-quality provision. All units of work will provide a clear outline of the knowledge and skills required and assessments will ensure that this knowledge has been retained and that skills can be evidenced.

Teachers will ensure that gaps are closed through regular monitoring within the classroom. DINT activities will allow for interleaving and recap of previous learning. Misconceptions will be identified through effective questioning and the regular inspection of student work.

Biology Long Term Overview						
Year Group	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
9	**Cell Structures. Animal and plant cells, cell division. culturing microorganisms**	**Osmosis, diffusion, active transport.**	**Microscopy and maths skills. The human digestive system.**	**The heart and blood vessels. Cardiovascular issues and how to treat cardiovascular disease.**	**Non-communicable disease, Health issues, The effect of lifestyle on some non-communicable diseases, cancer.**	**Plant organ systems, Transpiration. The root, stem and leaves. The xylem and the phloem vessels.**
10	**communicable diseases viral diseases Bacterial diseases fungal diseases human defence systems vaccination Producing monoclonal Discovery and development of drugs antibodies (HT only)**	**Plant disease (biology only) Plant defence responses Photosynthesis Rate of photosynthesis required practical activity 6 light intensity uses of glucose from photosynthesis aerobic respiration**	**Response to exercise Homeostasis uses of glucose from photosynthesis tests to identify starch, glucose and proteins (qualitative reagents) Hormones to treat fertility (HT only) Homeostasis he human nervous system structure and function**	**The brain (biology only) The eye (biology only) Ray diagrams and lenses Control of body temperature (biology only) Hormonal coordination in humans**	**Hormones in human reproduction Contraception The use of hormones to treat infertility (HT only) Negative feedback (HT only) Revision for mocks 28/04/25 - 02/05/25**	**Plant hormones (biology only) Required practical activity 8: tropism on seedlings Use of plant hormones (HT only) Revision for mocks**
11	**Natural selection Evidence for evolution Evolution theories**	**Sampling part 1 Sampling part 2 Biodiversity Maintaining biodiversity Monitoring biodiversity**	**Food security Feeding the world Selective breeding Genetic engineering Use of biotechnology in farming**	**Health and disease Preventing disease Monoclonal antibodies Plant disease and defences. Bloo and the body defence mechanism**	**Smoking and alcohol Exercise and diet Treating CVD New medicines Examinations**	**Revision for GCSE examinations**

				vaccinations		
12	**Basic components of Living systems. Biological molecules. Enzymes.**	**Plasma membranes. Cell division.**	**Exchanges surfaces and breathing transport in animals.**	**Transport in plants. Classification and evolution.**	**Biodiversity . Communicable diseases.**	**Neuronal communication. Hormonal communication.**
13	**Neuronal communication. Hormonal communication. Homeostasis.**	**Plant responses. Energy for biological processes. Respiration**	**Genetics of living systems. Patterns of inheritance and variation.**	**Manipulating genomes. Cloning and biotechnology.**	**Ecosystems. Populations and sustainability.**	**Preparation for A level examinations**

Biology **Medium Term Overview**			
Year 12	***Autumn Term***	**Unit Title: Cell level systems**	**No of Lessons: 48**
Overview	All living organisms have similarities in cellular structure, biochemistry and function. An understanding of these similarities is fundamental to the study of the subject. This module gives learners the opportunity to use microscopy to study the cell structure of a variety of organisms. Biologically important molecules such as carbohydrates, proteins, water and nucleic acids are studied with respect to their structure and function. The structure and mode of action of enzymes in catalysing biochemical reactions is studied. Membranes form barriers within, and at the surface of, cells. This module also considers the way in which the structure of membranes relates to the different methods by which molecules enter and leave cells and organelles. The division and subsequent specialisation of cells is studied, together with the potential for the therapeutic use of stem cells. Learners are expected to apply knowledge, understanding and other skills developed in this module to new situations and/or to solve related problems.		
Assessment	**Students will be assessed through a series of small tests to identify any misconceptions and the correct use of key scientific terminology.**		

Essential Knowledge (what must students know):	**Essential Skills (what must students be able to demonstrate):**	**Lessons to cover**
Biology is the study of living organisms. Every living organism is made up of one or more cells, therefore understanding the structure and function of the cell is a fundamental concept in the study of biology. Since Robert Hooke coined the phrase ‘cells’ in 1665, careful observation using microscopes has revealed details of cell structure and ultrastructure and provided evidence to support hypotheses regarding the roles of cells and their organelles.	**Learners should be able to demonstrate and apply their knowledge and understanding of:** • the use of microscopy to observe and investigatedifferent types of cell and cell structure in a rangeof eukaryotic organisms • the preparation and examination of microscopeslides for use in light microscopy	2.1 Microscopy PAG 1.1 light microscopes to study mitosis 2.2 Magnification and Calibration 2.3 More microscopy 2.4 Eukaryotic cell structure 2.5 The ultrastructure of plant cells 2.6 Prokaryotic and eukaryotic cells 3.1 Biological elements 3.2 Water 3.3 Carbohydrates 3.4 Testing for carbohydrates

The cells of all living organisms are composed of biological molecules. Proteins, carbohydrates and lipids are three of the key groups of biological macromolecules that are essential for life. A study of the structure of these macromolecules allows a better understanding of their functions in living organisms. Nucleic acids are essential to heredity in living organisms. Understanding the structure of nucleotides and nucleic acids allows an understanding of their roles in the storage and use of genetic information and cell metabolism. Metabolism in living organisms relies upon enzyme-controlled reactions. Knowledge of how enzymes function and the factors that affect enzyme action has improved our understanding of biological processes and increased our use of enzymes in industry. Membranes are fundamental to the cell theory. The structure of the plasma membrane allows cells to communicate with each other. Understanding this ability to communicate is important as scientists increasingly make use of membrane-bound receptors as sites for the action of medicinal drugs. Understanding how different substances enter cells is also crucial to the development of mechanisms for the administration of drugs.	• the use of staining in light microscopy • the representation of cell structure as seen under the light microscope using drawings andannotated diagrams of whole cells or cells in sections of tissue • the use and manipulation of the magnificationformula • the difference between magnification and resolution • the ultrastructure of eukaryotic cells and the functions of the different cellular components • photomicrographs of cellular components in arange of eukaryotic cells • the interrelationship between the organelles involved in the production and secretion of proteins • the importance of the cytoskeleton • the similarities and differences in the structure and ultrastructure of prokaryotic and eukaryoticcells. • how hydrogen bonding occurs between water molecules, and relate this, and other propertiesof water, to the roles of water for living organisms • the concept of monomers and polymers and the importance of condensation and hydrolysisreactions in a range of biological molecules • the chemical elements that make up biologicalmolecules	3.5 Lipids 3.6 Structure of proteins 3.7 types of proteins 3.8 nucleic acids 3.9 DNA replication and the genetic code 3.10 Protein synthesis 3.11 ATP 4.1 Enzymes 4.2 Factors affecting enzyme activity 4.3 Enzyme inhibitors 4.4 Cofactors, coenzymes and prosthetic groups 5.1 The structure and function of membranes 5.2 Factors affecting membrane structure 5.3 Diffusion 5.4 active transport 5.5 Osmosis 6.1 The cell cycle 6.2 Mitosis 6.3 Meiosis 6.4 The organisation and specialisation of cells 6.5 stem cells 9.1 Transport systems in dicotyledonous plants 9.2 Water transport in multicellular plants 9.3 Transpiration 9.4 Translocation 9.5 Plant adaptations to water availability **Synoptic links:** - biological membranes - cell division - organelles to greater detail elsewhere (e.g. respiration, photosynthesis, gene expression)

During the cell cycle, genetic information is copied and passed to daughter cells. Microscopes can be used to view the different stages of the cycle. In multicellular organisms, stem cells are modified to produce many different types of specialised cell. Understanding how stem cells can be modified has huge potential in medicine. To understand how a whole organism functions, it is essential to appreciate the importance of cooperation between cells, tissues, organs and organ systems. As plants become larger and more complex, transport systems become essential to supply nutrients to, and remove waste from, individual cells. **Practical skills**: • Preparation of microscope slides • Use of differential staining to identify different cellular components and cell types • Use of light microscope to enable examinations of slides • Use of an eye piece graticule • Use of a stage micrometer	• the ring structure and properties of glucose as an example of a hexose monosaccharide and thestructure of ribose as an example of a pentose monosaccharide • the synthesis and breakdown of a disaccharideand polysaccharide by the formation and breakage of glycosidic bonds • the structure of starch (amylose and amylopectin), glycogen and cellulose molecules • how the structures and properties of glucose, starch, glycogen and cellulose molecules relate totheir functions in living organisms • the structure of a triglyceride and a phospholipidas examples of macromolecules • the synthesis and breakdown of triglycerides by the formation and breakage of ester bondsbetween fatty acids and glycerol • how the properties of triglyceride, phospholipidand cholesterol molecules relate to their functions in living organisms • the general structure of an amino acid • the synthesis and breakdown of dipeptides andpolypeptides, by the formation and breakage ofpeptide bonds • the levels of protein structure • the structure and function of globular proteinsincluding a conjugated protein • the properties and functions of fibrous proteins	- Pathogen types **Synoptic links:** - enzymes - qualitative testing that allows us to track hydrolysis reactions - link to diagnosis using excretory products - Photosynthetic pigments **Synoptic links:** - DNA sequencing and genetic engineering - Enzymes - Function of eukaryotic organelles **Homework** Seneca topic based homework to be set every fortnight. Seneca: Topics will be set to allow students to understand communicable and non-communicable disease including plant diseases. **Examination technique:** understanding key command words within examination style questions to build confidence in student responses

• Use of photomicrograph for the production of scientific drawings with annotations • Interpret photomicrographs and use them to practice drawing skills. • Extraction of strawberry DNA • Effect of pH on amylase activity - Alternative • Effect of concentration on the activity of trypsin • PAG5 OCR suggested activities – Effect of temperature on membrane permeability • the principles and uses of paper and thin layer chromatography to separate biologicalmolecules / compounds • practical investigations to analyse biologicalsolutions using paper or thin layer chromatography • quantitative methods to determine the concentration of a chemical substance in a solution • practical investigations into the purification of DNA by precipitation	• the key inorganic ions that are involved in biological processes • the structure of a nucleotide as the monomerfrom which nucleic acids are made • the synthesis and breakdown of polynucleotides by the formation and breakage of phosphodiesterbonds • the structure of ADP and ATP as phosphorylatednucleotides • the structure of DNA (deoxyribonucleic acid) • semi-conservative DNA replication • the nature of the genetic code • transcription and translation of genes resulting inthe synthesis of polypeptides • the role of enzymes in catalysing reactions that affect metabolism at a cellular and wholeorganism level • the mechanism of enzyme action • the effects of pH, temperature, enzyme concentration and substrate concentrationon enzyme activity • the need for coenzymes and cofactors in someenzyme-controlled reactions • the roles of membranes within cells and at the surface of cells • the fluid mosaic model of membrane structureand the roles of its components • factors affecting membrane structure and permeability • the movement of molecules across membranes • the movement of water across membranes	

• practical investigations into the effects of pH, temperature, enzyme concentration andsubstrate concentration on enzyme activity • practical investigations into factors affecting membrane structure and permeability • practical investigations into the factors affecting diffusion rates in model cells • practical investigations into the effects of solutions of different water potential on plant and animal cells. • the examination and drawing of stainedsections of plant tissue to show the distribution of xylem and phloem • the dissection of stems, both longitudinally and transversely, and their examination todemonstrate the position and structure of xylem vessels • practical investigations to estimate transpiration rates	• by osmosis and the effects that solutions of different water potential can have on plant and animal cells • the cell cycle • how the cell cycle is regulated • the main stages of mitosis • sections of plant tissue showing the cell cycle andstages of mitosis • the significance of mitosis in life cycles • the significance of meiosis in life cycles • the production of erythrocytes and neutrophilsas examples of distinct, differentiated cells derived from a common stem cell in bone marrow • the potential uses of stem cells in research and medicine • the need for transport systems in multicellularplants • the structure and function of the vascularsystem in the roots, stems and leaves of herbaceous dicotyledonous plants • the process of transpiration and theenvironmental factors that affect transpiration rate	

Examination technique: understanding key command words within examination style questions to build confidence in student responses		
Careers Link EKG technician. Exercise physiologist. Cardiovascular technician. Respiratory therapist. Medical sonographer. Cardiology consultant. Cardiac nurse. Cardiology physician.	**Maths skills required:** Maths opportunity for the calculation of *Rf* value. Maths opportunities for understanding and using the magnification formula as well as expression of decimal and standard form. Maths opportunity to calculate temperature coefficient, drawing and interpreting graphs, identify uncertainties, predict graph, represent linear relationship, calculate rates from graphs and measure the gradient on a curve. To include reference to the temperature coefficient(Q_{10}). $Q_{10} = \frac{R_2}{R_1}$	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require resilience and responsibility. **Thinking Me – evaluating & creativity** Evaluation will be utilised when comparing different methods of microscopy **This is Me – Resilience, responsibility, self-motivation, integrity, self-management** Students will need to demonstrate resilience and self-management when looking at the assessed points across the lessons

Biology **Medium Term Overview**			
Year 12	***Spring term***	**Module 3 exchange and transport**	**No of Lessons: 53**
Overview	In this module, learners study the structure and function of gas exchange and transport systems in a range of animals and in terrestrial plants. The significance of surface area to volume ratio in determining the need for ventilation, gas exchange and transport systems in multicellular organisms is emphasised. The examples of terrestrial green plants and a range of animal phyla are used to illustrate the principle. Learners are expected to apply knowledge, understanding and other skills developed in this module to new situations and/or to solve related problems.		
Assessment	**Students will be assessed through a series of small tests to identify any misconceptions and the correct use of key scientific terminology.**		

Essential Knowledge (what must students know)	**Essential Skills (what must students be able to demonstrate):**	**Lessons to cover**
As animals become larger and more active, ventilation and gas exchange systems become essential to supply oxygen to, and remove carbon dioxide from, their bodies. Ventilation and gas exchange systems in mammals, bony fish and insects are used as examples of the properties and functions of exchange surfaces in animals. As plants become larger and more complex, transport systems become essential to supply nutrients to, and remove waste from, individual cells. Organisms are surrounded by pathogens and have evolved defences against them. Medical intervention can be used to support these natural defences.	***Learners should be able to demonstrate and apply their knowledge and understanding of:*** • the need for transport systems in multicellular animals • the different types of circulatory systems • the structure and functions of arteries, arterioles, capillaries, venules and veins • the formation of tissue fluid from plasma • the external and internal structure of the mammalian heart • the dissection, examination and drawing of the external and internal structure of the mammalian heart • the cardiac cycle	7.1 Specialised exchange surfaces PAG 1.3 Light microscope to examine lung tissue 7.3 Measuring the process 7.4 Ventilation in other organisms Fish and locust dissection 8.1 Transport in multicellular animals 8.2 Blood vessels 8.3 Blood, tissue fluid and lymph 8.4 Transport of oxygen and co2 in the blood 8.5 the heart

Biodiversity refers to the variety and complexity of life. It is an important indicator in the study of habitats. Evolution has generated a very wide variety of organisms. The fact that all organisms share a common ancestry allows them to be classified. Classification is an attempt to impose a hierarchy on the complex and dynamic variety of life on Earth. **Practical skills:** • the examination of microscope slides to show the histology of exchange surfaces • the dissection, examination and drawing of the external and internal structure of the mammalian heart • the use and interpretation of electrocardiogram (ECG) traces • the examination and drawing of stained sections of plant tissue to show the distribution of xylem and phloem • the dissection of stems, both longitudinally and transversely, and their examination to demonstrate the position and structure of xylem vessels	• how heart action is initiated and coordinated • the role of haemoglobin in transporting oxygen and carbon dioxide • the oxygen dissociation curve for fetal and adult human haemoglobin. • the need for transport systems in multicellular plants • the structure and function of the vascular system in the roots, stems and leaves of herbaceous dicotyledonous plants • the examination and drawing of stained sections of plant tissue to show the distribution of xylem and phloem • the process of transpiration and the environmental factors that affect transpiration rate • the transport of water into the plant, through the plant and to the air surrounding the leaves • adaptations of plants to the availability of water in their environment • the mechanism of translocation • the different types of pathogen that can cause communicable diseases in plants and animals • the means of transmission of animal and plant communicable pathogens • plant defences against pathogens • the primary non-specific defences against pathogens in animals	PAG 2.1 Dissection of the heart 10.1 Classification 10.2 the five kingdoms 10.3 Phylogeny 10.4 Evidence for evolution 10.5 Types of variation 10.6 Representing variation graphically 10.7 Adaptations 10.8 Changing population characteristics 11.3 Sampling techniques 11.4 Calculating biodiversity 11.5 Calculating genetic biodiversity 11.6 Factors affecting biodiversity 11.7 Reasons for maintaining biodiversity 11.8 Methods for maintaining biodiversity 12.1 Animal and plant pathogens

• practical investigations to estimate transpiration rates • practical investigations collecting random and non-random samples in the field **Maths skills required:** • To include an appreciation of size, metabolic rate and surface area to volume ratio (SA:V). • Students should be able to translate information about reaction times between numerical and graphical forms. • The formula will be provided for diversity calculations where needed in assessments and does not need to be recalled AND the interpretation of both high and low values of Simpson's Index of Diversity (D) • how to measure species richness and species evenness in a habitat • the use and interpretation of Simpson's Index of Diversity (D) to calculate the biodiversity of a habitat • To include calculations of genetic diversity within isolated populations, for example the percentage of gene variants (alleles) in a genome. proportion of polymorphic gene	• the structure, different roles and modes of action of B and T lymphocytes in the specific immune response • the primary and secondary immune responses • an outline of the action of opsonins, agglutinins and anti-toxins • autoimmune diseases • the principles of vaccination and the role of vaccination programmes in the prevention of epidemics • the benefits and risks of using antibiotics to manage bacterial infection. • how biodiversity may be considered at different levels • how sampling is used in measuring the biodiversity of a habitat and the importance of sampling • how to measure species richness and species evenness in a habitat • the factors affecting biodiversity • the ecological, economic and aesthetic reasons for maintaining biodiversity • n situ and ex situ methods of maintaining biodiversity • international and local conservation agreements made to protect species and habitats • the biological classification of species • the binomial system of naming species and the advantage of such a system	12.2 Animal and plant diseases 12.3 The transmission of communicable diseases 12.4 Plant defences against pathogens 12.5 Non-specific animal defences against pathogens 12.6 The specific immune system 12.7 Preventing and treating disease PAG 7.1 Effects of antibiotics on microbial growth Synoptic links: - Exchange surfaces and adaptations - Respiration - Photosynthesis - Tissues and organs. Synoptic links: - Prokaryotic and eukaryotic cells. - Cell specialisation and level of organisation Proteins and enzymes Synoptic link: - Membranes Neuronal communication

loci = number of polymorphic gene loci total number of loci	• the features used to classify organisms into the five kingdoms: Prokaryotae, Protoctista, Fungi, Plantae, Animalia • the evidence that has led to new classification systems, such as the three domains of life, which clarifies relationships • the relationship between classification and phylogeny • the evidence for the theory of evolution by natural selection • the different types of variation • the different types of adaptations of organisms to their environment • the mechanism by which natural selection can affect the characteristics of a population over time • how evolution in some species has implications for human populations **Examination technique:** understanding key command words within examination style questions to build confidence in student responses.	**Common misconceptions:**. With regards to the menstrual cycle, research has shown that learners have problems relating the time of conception to the condition of the lining of the uterus. Learners often confuse type 1 and type 2 diabetes, and the effective treatments for each. The effect of ADH on the permeability of the kidney tubules is often confused.
Careers Link Biotechnologists create and improve products and processes for agriculture, medicine and conservation using biological organisms. They study the genetic, chemical and physical attributes of cells, tissues and organisms, and	**Homework** SENECA learning and examination style questions to support learning and improve skill. Work booklet for homework tasks.	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require resilience and responsibility. **Thinking Me – evaluating & creativity** Evaluation will be utilised when comparing different methods of microscopy

identify industrial uses for them.	Completion of additional reading and research.	**This is Me – Resilience, responsibility, self-motivation, integrity, self-management** Students will need to demonstrate resilience and self-management when looking at the assessed points across the lessons

Biology **Medium Term Overview**			
Year 10	***Summer term***	**Title: Neuronal and Hormonal communication and year 12 mock revision**	**No of Lessons:24**
Overview **Assessment**	This term will be used to support year 12 students in revising for their mock examinations and identifying any curriculum gaps and how to close these curriculum gaps through bespoke revision techniques and revision lessons to support growth in learning in science. This term will also be used to summarise neuronal and hormonal communication. **Students will be assessed through a series of mock examinations and lesson time will be used to revise for, feedback and intervene where needed to support learning of exam techniques within Biology.**		
<u>Essential Knowledge (what must students know):</u> • The stimulation of sensory receptors leads to thegeneration of an action potential in a neurone.	**<u>Essential Skills (what must students be able to demonstrate):</u>** ***Learners should be able to demonstrate and apply their knowledge and understanding of:***	**Lessons to cover** Chapter 10 assessment Chapter 10 intervention Year 12 mock revision x4 Year 12 mocks x4	

• Transmission between neurones takes place at synapses. • The ways in which specific hormones bring about their effects are used to exemplify endocrine communication and control. • Type 1 diabetes is used as an example to demonstrate how medical technology is used to regulate the hormonal control systems **Examination technique:** understanding key command words within examination style questions to build confidence in student responses	• the roles of mammalian sensory receptors in converting different types of stimuli into nerve impulses • the structure and functions of sensory, relay and motor neurones • the generation and transmission of nerve impulses in mammals • the structure and roles of synapses in neurotransmission • endocrine communication by hormones • the structure and functions of the adrenal glands • the histology of the pancreas • how blood glucose concentration is regulated • the differences between Type 1 and Type 2 diabetes mellitus • the potential treatments for diabetes mellitus **Practical skills**: • PAG1 HSW4 • the examination and drawing of stained sections of the pancreas to show the histology of the endocrine tissues • the structure and functions of the adrenal glands • To include the action of insulin and glucagon as an example of negative feedback, and the role of the liver AND the control of insulin secretion, with	Mop up PAGs and mock intervention x4 13.1 Coordination 13.2 Neurones 13.3 Sensory receptors 13.4 Nervous transmission 13.5 Synapses 13.6 Organisation of the nervous system 13.7 Structure and function of the brain Brain dissection **Common misconceptions:**. Some students do not understand that plant hormones are still chemical messengers that provide a localised response. Students need to be clear that plant hormones are heavily linked to tropisms.

	reference to potassium channels and calcium channels in the beta cells of the pancreas. • PAG11 HSW4 • To include the role of hormones in leaf loss in deciduous plants, seed germination and stomatal closure. • Learners should be able to apply their knowledge and understanding to different experiments. Learners are not required to recall specific experiments. • Learners should be able to apply their knowledge and understanding to different experiments. Learners are not required to recall specific experiments.	
Careers Link Biomedical research assistant. Biomedical technician. Pharmaceutical sciences manager. Biologist. Cancer research scientist. Biomedical engineer. Clinical trials administrator	**Homework** SENECA learning and examination style questions to support learning and improve skill. Work booklet for homework tasks.	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require resilience and responsibility. **Thinking Me – evaluating & creativity** Evaluation will be utilised when comparing different methods of microscopy **This is Me – Resilience, responsibility, self-motivation, integrity, self-management** Students will need to demonstrate resilience and self-management when looking at the assessed points across the lessons