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. Blood 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 9	***Autumn Term***	**Unit Title: Cell structures**	**No of Lessons: 14**
Overview	**Learners should be familiar with cells as the fundamental unit of living organisms, and with the use of light microscopes to view cells. They should also be familiar with some sub-cellular structures, and the similarities and differences between plant and animal cells.**		
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**
Cells are the basic unit of all forms of life. In this section we explore how structural differences between types of cells enables them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. In mature animals, cell division is mainly restricted to repair and replacement. As a cell differentiates it acquires different sub-cellular structures to enable it to carry out a certain function. It has become a specialised cell.	**Practical skills**: • Required practical activity 1: use a light microscope to observe, draw and label a selection of plant and animal cells. A magnification scale must be included. • Required practical activity 2: investigate the effect of antiseptics or antibiotics on bacterial growth using agar plates and measuring zones of inhibition. • Required practical activity 3: investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue. **Students will be able to:** • Students should be able to explain how the main sub-cellular structures, including the nucleus, cell membranes, mitochondria, chloroplasts in plant cells	1.1 Cell structure 1.1.2 Animals and plant cells 1.1.3 cell specialisation 1.1.4 cell differentiation 1.1.5 microscopy Required practical 1- Microscopy 1.1.6 culturing microorganisms Required practical 2 Investigate the effect of antiseptics (zone of inhibition) 1.2.1 chromosomes 1.2 mitosis and the cell cycle 1.2.3 stem vcells 1.3.1 diffusion 1.3.2 osmosis Required practical 3 osmosis **Homework** Seneca topic based homework to be set every fortnight. Seneca: Topics will be set to allow students to understand that cells are the fundamental units of living organisms. Cells contain many subcellular structures that are essential for the functioning of the cell as a whole.

(Biology only) Bacteria multiply by simple cell division (binary fission) as often as once every 20 minutes if they have enough nutrients and a suitable temperature. Bacteria can be grown in a nutrient broth solution or as colonies on an agar gel plate. Uncontaminated cultures of microorganisms are required for investigating the action of disinfectants and antibiotics. The nucleus of a cell contains chromosomes made of DNA molecules. Each chromosome carries a large number of genes. In body cells the chromosomes are normally found in pairs. A stem cell is an undifferentiated cell of an organism which is capable of giving rise to many more cells of the same type, and from which certain other cells can arise from differentiation. The use of stem cells has potential risks such as transfer of viral infection, and some people have ethical or religious objections. Diffusion is the spreading out of the particles of any substance in solution, or particles of a gas, resulting in a net movement from an area of higher concentration to an area of lower concentration. In multicellular organisms, surfaces and organ systems are specialised for exchanging materials. This is to allow sufficient molecules to be	and plasmids in bacterial cells are related to their functions. • Students should be able to, when provided with appropriate information, explain how the structure of different types of cell relate to their function in a tissue, an organ or organ system, or the whole organism. • Students should be able to explain the importance of cell differentiation. • understand how microscopy techniques have developed over time explain how electron microscopy has increased understanding of sub-cellular structures. • Students should be able to describe how to prepare an uncontaminated culture using aseptic technique. • Students should be able to describe the stages of the cell cycle, including mitosis. • Students should be able to describe the function of stem cells in embryos, in adult animals and in the meristems in plants. • Students should be able to calculate and compare surface area to volume ratios. • Students should be able to calculate and compare surface area to volume ratios. • Students should be able to explain the need for exchange surfaces and a	Microscopy is used to examine cells and sub-cellular structures. **Specification points to consider: B1.1 to B3.2**

transported into and out of cells for the organism's needs. **Common misconceptions:** Learners commonly have difficulty understanding the concept of a cell as a 3D structure, so this should be addressed during the teaching of this topic. **Key terms**: Eukaryotic ell Prokaryotic cell Mitochondria Nucleus Chloroplast Cell wall Subcellular Magnification Specimen Resolution **Maths skills required:** • Calculate with numbers written in standard form. • Make order of magnitude calculations • Use prefixes, centi, milli, micro and nano. • Be able to calculate magnification. Calculate cross-sectional areas of colonies or clear areas around colonies using πr^2. • Students should be able to plot, draw and interpret appropriate graphs.	transport system in multicellular organisms in terms of surface area to volume ratio. • Students should be able to explain how the small intestine and lungs in mammals, gills in fish, and the roots and leaves in plants, are adapted for exchanging materials. • Students should be able to use simple compound measures of rate of water uptake use percentages calculate percentage gain and loss of mass of plant tissue. • Students should be able to describe how substances are transported into and out of cells by diffusion, osmosis and active transport explain the differences between the three processes.	

Examination technique: understanding key command words within examination style questions to build confidence in student responses		
Careers Link Some of the major jobs or careers that are known for their frequent use of the microscope are: Forensic scientists, Jewellers, Gemologists, Botanists, Microbiologists. An example of a career emphasis that would predominantly use microscopes are researchers for science and public health.	**Enrichment** Access to specialist equipment that they would not be able to access at home especially PP. Microscopes Staffordshire university workshops. Period 1-5 October.	**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 9	***Spring***	**Unit Title: Organisation**	**No of Lessons:16**
Overview **Assessment**	In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by the circulatory system. Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary heart disease, many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that they need for photosynthesis. **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**
Cells are the basic building blocks of all living organisms. A tissue is a group of cells with a similar structure and function. Organs are aggregations of tissues performing specific functions. Organs are organised into organ systems, which work together to form organisms. This section assumes knowledge of the digestive system studied in Key Stage 3 science. The digestive system is an example of an organ system in which several organs work together to digest and absorb food. Digestive enzymes convert food into small soluble molecules that can be absorbed into the bloodstream. Carbohydrases break down carbohydrates to simple sugars. Amylase is a carbohydrase which breaks down starch. Proteases break down proteins to amino acids. Lipases break down lipids (fats) to glycerol and fatty acids. The products of digestion are used to build new carbohydrates, lipids and proteins. Some glucose is used in respiration. The heart is an organ that pumps blood around the body in a double circulatory system. The right ventricle pumps blood to the lungs where gas exchange takes place. The left ventricle pumps blood around the rest of the body. Knowledge of the blood vessels associated with the heart is limited to the aorta, vena cava, pulmonary artery, pulmonary	**Practical skills**: Required practical activity 4: use qualitative reagents to test for a range of carbohydrates, lipids and proteins. Required practical activity 5: investigate the effect of pH on the rate of reaction of amylase enzyme. Observing and drawing blood cells seen under a microscope. **Students will be able to:** • Students should be able to relate knowledge of enzymes to Metabolism. • Students should be able to describe the nature of enzyme molecules and relate their activity to temperature and pH changes. • Students should be able to carry out rate calculations for chemical reactions. • Students should be able to use the 'lock and key theory' as a simplified model to explain enzyme action. • Students should be able to recall the sites of production and the action of amylase, proteases and lipases	Intervention Intervention b1 summary test Intervention 2.1 Principles of organisation 2.2 the human digestive system Required practical 4: Qualitative reagents Required practical 5: Investigate the effects of pH on amylase enzyme 2.2.2 The heart and blood vessels 2.2.2 dissection of the heart 2..2.3 blood 2.2.4 coronary heart disease 2.2.5 Health issues 2.2.6 The effects of lifesytle 2.2.7 cancer 2.3.1 plant tissues 2.3.1 observation and drawing of a transverse section of a leaf. Assessment for DD2 intervention intervention 2.3.2 plant organ system Measure the rate of transpiration by the uptake of water b2 summary test B2 intervention **Maths skills required:** • Calculate with numbers written in standard form. • Students should understand the principles of sampling as applied to scientific data, including epidemiological data. • Students should be able to plot, draw and interpret appropriate graphs. • Interpret data about risk factors for specified diseases.

vein and coronary arteries. Knowledge of the names of the heart valves is not required. In some people heart valves may become faulty, preventing the valve from opening fully, or the heart valve might develop a leak. Students should understand the consequences of faulty valves. Faulty heart valves can be replaced using biological or mechanical valves. Diseases, both communicable and non-communicable, are major causes of ill health. Other factors including diet, stress and life situations may have a profound effect on both physical and mental health. Blood is a tissue consisting of plasma, in which the red blood cells, white blood cells and platelets are suspended. In coronary heart disease layers of fatty material build up inside the coronary arteries, narrowing them. This reduces the flow of blood through the coronary arteries, resulting in a lack of oxygen for the heart muscle. Stents are used to keep the coronary arteries open. Statins are widely used to reduce blood cholesterol levels which slows down the rate of fatty material deposit. The leaf is a plant organ. Knowledge limited to epidermis, palisade and spongy mesophyll, xylem and phloem, and guard cells surrounding stomata.	• Students should be able to understand simple word equations but no chemical symbol equations are required. • Students should be able to explain how the structure of these vessels relates to their functions. • Students should be able to use the 'lock and key theory' as a simplified model to explain enzyme action. • Students should be able to recall the sites of production and the action of amylase, proteases and lipases. • Students should be able to explain how the structure of these vessels relates to their functions. • Students should be able to use simple compound measures such as rate and carry out rate calculations for blood flow. • Students should be able to recognise different types of blood cells in a photograph or diagram, and explain how they are adapted to their functions. • Students should be able to evaluate the advantages and disadvantages of treating cardiovascular diseases by drugs, mechanical devices or transplant. • Students should be able to describe the relationship between health and disease and the interactions between different types of disease.	• Students should be able to use a scatter diagram to identify a correlation between two variables in terms of risk factors. • Students should be able to translate information between graphical and numerical forms; and extract and interpret information from charts, graphs and tables in terms of risk factors. • Students should be able to translate disease incidence information between graphical and numerical forms, construct and interpret frequency tables and diagrams, bar charts and histograms, and use a scatter diagram to identify a correlation between two variables. **Homework** Seneca topic based homework to be set every fortnight. Seneca: Topics will be set to allow students to underpin knowledge of respiration. This will include that respiration involves the breakdown of organic molecules to enable all the other chemical processes necessary for life. Learners will be asked to recall the word equation for respiration and photosynthesis alongside how we can practically investigate both processes.

The roots, stem and leaves form a plant organ system for transport of substances around the plant. Students should be able to describe the process of transpiration and translocation, including the structure and function of the stomata. Students should be able to describe the process of transpiration and translocation, including the structure and function of the stomata. **<u>Common misconceptions</u>**: Learners commonly hold the misconception that ventilation is respiration. They can also get confused between the terms breakup and breakdown. Learners often think that plants do not respire. **Key terms**: Respiration Aerobic respiration Anaerobic respiration Metabolic rate Lipids Amino Acids ATP Exothermic Sugar molecules Glucose Sucrose Lactose Synthesise Monomer	• Students should be able to: discuss the human and financial cost of these non-communicable diseases to an individual, a local community, a nation or globally explain the effect of lifestyle factors including diet, alcohol and smoking on the incidence of non-communicable diseases at local, national and global levels. • Students should be able to explain how the structures of plant tissues are related to their functions. • Students should be able to explain how the structure of root hair cells, xylem and phloem are adapted to their functions. • Students should be able to explain the effect of changing temperature, humidity, air movement and light intensity on the rate of transpiration. •	

Polymer **Synoptic links:** Mitochondria are subcellular components. Energy and chemical reactions (chemistry)		
Careers Link Registered Respiratory Therapist, RRT Adult Critical Care Specialty, ACCS. Neonatal/Pediatric Respiratory Care Specialist, NPS. Sleep Disorders Testing and Therapeutic Intervention Respiratory Care Specialist, SDS.	**Enrichment** Understanding respiration and the links can link to healthier lifestyle choices that could impact on future health choices.	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require aspects of the social me strand **Thinking Me – evaluating & creativity** Evaluation will be utilised when assessing data from the practical work **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 9	***Summer term***	**Unit Title: What happens in cells (and what do cells need?)**	**No of Lessons:8**
Overview **Assessment**	Life processes depend on biological molecules whose structure is related to their function. Inside every cell is genetic material and this is used as a code to make proteins. Enzymes are important proteins in biology. **Students will be assessed through a series of small tests to identify any misconceptions and the correct use of key scientific terminology, as well as an assessment task at the end of the unit**		
Essential Knowledge (what must students know):	**Essential Skills (what must students be able to demonstrate):** **Practical skills**:	**Lessons to cover:** **Assessment for DD2 intervention intervention**	

Root hair cells are adapted for the efficient uptake of water by osmosis, and mineral ions by active transport. Xylem tissue transports water and mineral ions from the roots to the stems and leaves. It is composed of hollow tubes strengthened by lignin adapted for the transport of water in the transpiration stream. The role of stomata and guard cells are to control gas exchange and water loss. Phloem tissue transports dissolved sugars from the leaves to the rest of the plant for immediate use or storage. The movement of food molecules through phloem tissue is called translocation. Phloem is composed of tubes of elongated cells. Cell sap can move from one phloem cell to the next through pores in the end walls. Detailed structure of phloem tissue or the mechanism of transport is not required. **Key terms**: Transpiration Stomata Leaf Guard cells Specialised cells Transpiration stream	• Measure the rate of transpiration by the uptake of water. • Investigate the distribution of stomata and guard cells. • Process data from investigations involving stomata and transpiration rates to find arithmetic means, understand the principles of sampling and calculate surface areas and volumes. **Students will be able to:** Students should be able to: • translate information between graphical and numerical form plot and draw appropriate graphs, selecting appropriate scales for axes extract and interpret information from graphs, charts and tables. • Students should be able to describe the process of transpiration and translocation, including the structure and function of the stomata. • Students should be able to explain how the structure of root hair cells, xylem and phloem are adapted to their functions. • Students should be able to explain the effect of changing temperature, humidity, air movement and light intensity on the rate of transpiration.	**2.3.2 plant organ system** **Measure the rate of transpiration by the uptake of water** **b2 summary test** **B2 intervention** **Science Quizzes** **Maths skills:** • carry out rate calculations for chemical reactions • understand and use simple compound measures such as the rate of a reaction • understand and use inverse proportion – the inverse square law and light intensity in the context of factors affecting photosynthesis. • Plot and draw appropriate graphs, selecting appropriate scales and axes. • Translate information between graphical and numerical form. **Homework** Seneca: Topics set will test the understanding transpiration. **Common misconceptions**: Learners commonly hold the misconception that water will require energy to move the water up the plant to the top of the leaves. This is not the case and is a passive process. **Examination technique:** understanding key command words within examination style questions to build confidence in student responses

Mineral ions Surface area Photosynthesis Volume Osmosis Turgid		
Careers Link Horticulturist. Soil technician. DNA analyst. Examiner. Archeologist. Endangered species biologist. Food technologist.	**Enrichment** **The big Biology quiz, national competition at Birmingham university**	**MY PB** **Social Me- active listening, speaking effectively, working with others** Practical work will require aspects of the social me strand **Thinking Me – evaluating & creativity** Evaluation will be utilised when assessing data from the photosynthesis pondweed practiccal **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