

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 | | | | | | |
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| Year Group | Autumn 1 | Autumn 2 | Spring 1 | Spring 2 | Summer 1 | Summer 2 |
| 9 | Microscopes Cell structures Specialised cells Nutrition and excretion | Aerobic and anaerobic respiration in animal, plant and fungi Synthesis & breakdown of carbs, protein and fats Structure of a leaf Photosynthesis Testing for starch The effects of stimuli on a leaf | Pondweed practical The history of DNA Genetic information Extracting DNA Protein synthesis | Biological polymers Enzyme theory Enzyme practical's | Active transport Mitosis Cell differentiation Stem cells Exchange surfaces and practical Osmosis Types of exchange surfaces | Heart dissection and circulatory system Heart theory Blood vessels and blood Transport in a plant Factors affecting transpiration |
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| Biology Medium Term Overview | | | |
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| Year 9 | Autumn Term 1 | Unit Title: Cell level systems | No of Lessons: 9 |
| 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): Students will be able to answer the following questions: What is the difference between eukaryotic and prokaryotic cells? What is the function of different subcellular structures found in a eukaryotic cell? What are some examples of different prokaryotes? What are the different components of a light microscope? How do you use a light microscope to observe a specimen? How do you carry out staining to highlight cell features? 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 cell | | Essential Skills (what must students be able to demonstrate): Practical skills: Investigation of a range of cells using pictures, light micrographs and diagrams. Measure the size and magnification of the cells. Preparation of cheek cell slides. Use of light microscopes to view plant and animal cells. Production of 3D model plant and animal cells to illustrate their differences. How to use a light microscope. How to carry out staining techniques of specimens. How to prepare cheek cell slides. Maths skills required: Demonstrate an understanding of number, size and scale and the quantitative relationship between units. Use estimations and explain when they should be used. Calculate with numbers written in standard form | Lessons to cover <ol style="list-style-type: none"> 1. KS3 living organisms what are cells? 2. KS3 specialised cells 3. Microscopes lesson 1 4. Microscopes lesson 2 5. Cell structures lesson 1 6. Cell structures lesson 2 7. KS3 Nutrition 8. KS3 Excretion 9. B1.1 test 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. Microscopy is used to examine cells and sub-cellular structures. |

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| <p>Prokaryotic cell Mitochondria Nucleus Chloroplast Cell wall Subcellular Magnification Specimen resolution</p> <p>Examination technique: understanding key command words within examination style questions to build confidence in student responses</p> | <p>Students will be able to:</p> <ul style="list-style-type: none"> • Describe how light microscopes and staining can be used to view cells • explain how the main sub-cellular structures of eukaryotic cells (plants and animals) and prokaryotic cells are related to their functions • State the features of a prokaryotic cell • Name examples of prokaryotes • State the difference between eukaryotic and prokaryotic cells • Explain what is needed for a balanced diet • Describe the process of digestion and excretion • explain how electron microscopy has increased our understanding of sub-cellular structures • Identify the components of a light microscope | <p>Specification points to consider: b1.1.1, b1.1.2, b1.1.3</p> |
| <p><u>Careers Link</u></p> <p>Some of the major jobs or careers that are known for their frequent use of the microscope are: Forensic scientists, Jewellers, Gemologists, Botanists, Microbiologists.</p> <p>An example of a career emphasis that would predominantly use microscopes are researchers for science and public health.</p> | <p><u>Enrichment</u></p> <p>Access to specialist equipment that they would not be able to access at home especially PP.</p> <p>Microscopes Staffordshire University workshops. Period 1-5 October.</p> | <p><u>MY PB</u></p> <p>Social Me- active listening, speaking effectively, working with others Practical work will require resilience and responsibility.</p> <p>Thinking Me – evaluating & creativity Evaluation will be utilised when comparing different methods of microscopy</p> <p>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</p> |

| Biology Medium Term Overview | | | |
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| Year 9 | Autumn Term 2 | Unit Title: Respiration and metabolic processes | No of Lessons:10 |
| Overview | Metabolic processes such as respiration are controlled by enzymes. Organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life. Life processes depend on photosynthesis. Green plants and algae trap light from the Sun to fix carbon dioxide with hydrogen from water making organic compounds. | | |
| Assessment | Students will be assessed through a series of small tests to identify any misconceptions and the correct use of key scientific terminology. | | |
| <u>Essential Knowledge (what must students know):</u> Students will be able to answer the following questions: What is meant by metabolic rate? What are the components of carbohydrates, proteins and lipids? How are carbohydrates, proteins and lipids synthesised and broken down? What is the word equation for respiration? What happens during the process of respiration? What is the equation for anaerobic respiration? What is the difference between anaerobic and aerobic respiration? What is the word equation for photosynthesis? Where does photosynthesis occur? How do you test a leaf for starch? Which factors affect the rate of photosynthesis? <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: | | <u>Essential Skills (what must students be able to demonstrate):</u> Practical skills: Practically research into whether plants respire Investigation of fermentation in fungi Qualitative testing of biological molecules Using iodine solution to test a leaf for starch Experiments to show the consequences of light exclusion on photosynthesising plants (e.g. testing geraniums for starch). Planning a method, collecting reliable data, evaluating the data and its merits/drawbacks How to use chemicals safely in a lab Students will be able to: <ul style="list-style-type: none"> Describe cellular respiration as a universal chemical process, continuously occurring that supplies ATP in all living cells | Lessons to cover <ol style="list-style-type: none"> 1. Respiration 2. Aerobic respiration and anaerobic respiration 3. Respiration in plants, animals and fungi 4. Synthesis and breakdown of carbohydrates, proteins and fats 5. KS3 structure of a leaf 6. KS3 what are the organs of a plant 7. Photosynthesis 8. Photosynthesis practical (testing a leaf for starch) 9. The effects of temperature, light and carbon dioxide on a leaf 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 |

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| <p>Respiration Aerobic respiration Anaerobic respiration Metabolic rate Lipids Amino Acids ATP Exothermic Sugar molecules Glucose Sucrose Lactose Synthesise Monomer Polymer</p> <p>Synoptic links: Mitochondria are subcellular components. Energy and chemical reactions (chemistry)</p> | <ul style="list-style-type: none"> • Describe cellular respiration as an exothermic reaction • Compare the processes of aerobic respiration and anaerobic respiration • Explain the importance of sugars in the synthesis and breakdown of carbohydrates • Explain the importance of amino acids in the synthesis and breakdown of proteins • Explain the importance of fatty acids and glycerol in the synthesis and breakdown of lipids • Describe the process of photosynthesis • Describe experiments to investigate how factors affect photosynthesis | <p>equation for respiration and photosynthesis alongside how we can practically investigate both processes.</p> |
| <p><u>Careers Link</u></p> <p>Registered Respiratory Therapist, RRT Adult Critical Care Specialty, ACCS.</p> <p>Neonatal/Pediatric Respiratory Care Specialist, NPS.</p> <p>Sleep Disorders Testing and Therapeutic Intervention Respiratory Care Specialist, SDS.</p> | <p><u>Enrichment</u></p> <p>Understanding respiration and the links can link to healthier lifestyle choices that could impact on future health choices.</p> | <p><u>MY PB</u></p> <p>Social Me- active listening, speaking effectively, working with others Practical work will require aspects of the social me strand</p> <p>Thinking Me – evaluating & creativity Evaluation will be utilised when assessing data from the practical work</p> <p>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</p> |

| Biology Medium Term Overview | | | |
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| Year 9 | Spring Term 1 | Unit Title: What happens in cells (and what do cells need?) | No of Lessons:9 |
| Overview | 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. | | |
| Assessment | 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 | | |
| <u>Essential Knowledge (what must students know):</u> Students will be able to answer the following questions: What are the limiting factors of photosynthesis? How do limiting factors interact? What is the role of DNA in the body? What is the structure of DNA? What is meant by complimentary base pairing? What is protein synthesis? What is the difference between mRNA and DNA? How does the process of transcription occur? What does the process of translation entail? Key terms: Light intensity Volume DNA Chromosome Gene complementary base nucleotide polymer mRNA Transcription Translation Synthesis | | <u>Essential Skills (what must students be able to demonstrate):</u> Practical skills: Planning a method, collecting reliable data, evaluating the data and its merits/drawbacks Investigation of photosynthesis in algae using alginate beads to immobilize the algae. Investigation of DNA extraction from a living organism. 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. | Lessons to cover <ol style="list-style-type: none"> 1. Pondweed photosynthesis prac. 2. Summary test 3. Intervention lesson 4. The history and discovery of DNA 5. Genetic information 6. Extracting DNA 7. Protein synthesis 1 8. Protein synthesis 2 9. Exam questions Homework Seneca: Topics set will test the understanding of the double helix model of DNA. The discovery of DNA and ow protein synthesis occurs |

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| <p>Common misconceptions: Learners commonly hold the misconception that DNA is made of protein or sugar.</p> <p>Examination technique: understanding key command words within examination style questions to build confidence in student responses</p> | <p>Students will be able to:</p> <ul style="list-style-type: none"> • Explain the interaction of temperature, light intensity and carbon dioxide concentration in limiting the rate of photosynthesis • describe DNA as a polymer • describe DNA as being made up of two strands forming a double helix • describe that DNA is made from four different nucleotides; each nucleotide consisting of a common sugar and phosphate group with one of four different bases attached to the sugar • recall a simple description of protein synthesis • explain simply how the structure of DNA affects the proteins made in protein synthesis | |
| <p><u>Careers Link</u> Horticulturist. Soil technician. Crime scene technician. DNA analyst. Examiner. Archeologist. Endangered species biologist. Food technologist.</p> | <p><u>Enrichment</u> The Big Biology quiz, national competition at Birmingham University</p> | <p><u>MY PB</u> 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 practical 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</p> |

| Biology Medium Term Overview | | | |
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| Year 9 | Spring Term 2 | Unit Title: Enzymes and their effects | No of Lessons: 7 |
| Overview | Enzymes are important proteins in biology. Underlying knowledge and understanding Learners should have a simple understanding of the double helix model of DNA. Enzymes are biological catalysts at the heart of metabolic processes. | | |
| Assessment | 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 | | |
| <u>Essential Knowledge (what must students know):</u> Students will be able to answer the following questions: What are enzymes? What is the structure of an enzyme? What is meant by enzyme specificity? What factors affect enzyme-controlled reaction? How do enzymes become denatured? How do different factors affect the rate of an enzyme controlled reaction? Key terms: Enzyme Substrate Molecule Active site Optimum conditions Common misconceptions: Learners commonly hold the misconception that DNA is made of protein or sugar. Learners also think that all enzymes have an optimum temperature of 37°C (human body temperature). The range of optimum temperatures of enzymes should be introduced through the teaching of this topic and | | <u>Essential Skills (what must students be able to demonstrate):</u> Practical skills: Investigations of enzyme activity, including numerical analysis of data and graphical representation of results. Investigation into the effect of amylase on a baby rice paste. Investigation of enzyme controlled reactions. Maths skills: Work out rate equations using simple algebraic equations. understand and use simple compound measures such as the rate of a reaction carry out rate calculations for chemical reactions Calculating the gradient of a graph. Students will be able to: <ul style="list-style-type: none"> Describe experiments that can be used to investigate enzymatic reactions Explain the mechanism of enzyme action | Lessons to cover <ol style="list-style-type: none"> 1. Biological polymers 2. Enzyme practical 1 3. Enzyme theory 4. Enzyme review 5. Enzyme practical 2 6. Module test 7. Intervention lesson Homework Seneca: Students will be set homework fortnightly on the following topics: what are enzymes and how can they be affected. Why do enzymes denature and what are their optimum conditions? |

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| <p>further addressed when considering homeostatic mechanisms for controlling temperature.</p> <p>Examination technique: understanding key command words within examination style questions to build confidence in student responses</p> | <ul style="list-style-type: none"> • Carry out investigations of enzyme activity, including numerical analysis of data and graphical representation of results. • Carry out and explain an Investigation of enzyme controlled reactions. • Define enzyme related keyterms | |
| <p><u>Careers Link:</u></p> <p>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 identify industrial uses for them.</p> | <p><u>Enrichment</u></p> <p>The Big Bang Fayre - Range of practical activities to develop practical skills and engage kinaesthetic learners.</p> | <p><u>MY PB</u></p> <p>Social Me- active listening, speaking effectively, working with others Practical work will require aspects of the social me strand</p> <p>Thinking Me – evaluating & creativity Evaluation will be utilised when assessing data from the enzyme rate of reaction practical lessons</p> <p>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</p> |

| Biology Medium Term Overview | | | |
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| Year 9 | Summer Term 1 | Unit Title: Scaling up | No of Lessons:9 |
| Overview | Cells transport many substances across their membranes by diffusion, osmosis and active transport. Stem cells are found in both plants and animals. These stem cells can divide, differentiate and become specialised to form tissues, organs and organ systems. | | |
| Assessment | 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 module | | |
| <p>Essential Knowledge (what must students know): Students will be able to answer the following questions:</p> <p>Key terms:</p> <p>Common misconceptions: Learners commonly show some confusion regarding surface area: volume ratio, particularly how larger animals have a smaller surface area: volume ratio. They also show some confusion as to stem cells: where they are found and their roles. Care should be taken to give clear definitions when covering this content.</p> <p>Examination technique: understanding key command words within examination style questions to build confidence in student responses</p> | <p>Essential Skills (what must students be able to demonstrate):</p> <p>Practical skills: planning a method, collecting reliable data, evaluating the data and its merits/drawbacks</p> <p>Maths skills:</p> <ul style="list-style-type: none"> Use percentiles and calculate percentage gain and loss of mass <p>Students will be able to:</p> <ul style="list-style-type: none"> Explain how substances are transported into and out of cells through diffusion, osmosis and active transport. Describe the process of mitosis in growth, including the cell cycle. Explain the importance of cell differentiation. Recall that stem cells are present in embryonic and adult animals, and meristems in plants. Describe the functions of stem cells in embryonic and adult animals, and meristems in plants. Describe the difference between embryonic and adult stem cells in animals. | <p>Lessons to cover</p> <ol style="list-style-type: none"> B1.2 test Active transport Mitosis 1 Mitosis 2 Cell differentiation Stem cells Exchange surfaces and practical Osmosis and practical Types of exchange surfaces <p>Homework</p> <p>Seneca topic based homework to be set every fortnight. The topics will assess:</p> | |

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| <u>Careers Link:</u> Biomedical research assistant. Biomedical technician. Pharmaceutical sciences manager. Biologist. Cancer research scientist. Biomedical engineer. Clinical trials administrator | <u>Enrichment</u> Potential medical mavericks-careers in the NHS workshops. | <u>MY PB</u> 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 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 |
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| Biology Medium Term Overview | | | |
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| Year 9 | Summer Term 2 | Unit Title: Scaling up | No of Lessons:9 |
| Overview | Cells transport many substances across their membranes by diffusion, osmosis and active transport. Stem cells are found in both plants and animals. These stem cells can divide, differentiate and become specialised to form tissues, organs and organ systems. | | |
| Assessment | 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 module | | |
| <u>Essential Knowledge (what must students know):</u> Students will be able to answer the following questions: What is the circulatory system? What is the difference between oxygenated and de-oxygenated blood? What are blood vessels? What is inside your heart? What is in the blood? | <u>Essential Skills (what must students be able to demonstrate):</u> Practical skills: planning a method, collecting reliable data, evaluating the data and its merits/drawbacks Maths skills: <ul style="list-style-type: none"> calculate surface area: volume ratios use simple compound measures such as rate | Lessons to cover 1. Heart dissection and circulatory system 2. Heart theory 3. Blood vessels and blood 4. Transport in a plant 5. Movement of water through a plant 6. Movement of water through a plant 2 7. Factors affecting transpiration 8. Module 2 OCR assessment | |

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| <p>How does a plant transport materials? What is the structure of the phloem? How do the vascular bundles provide support? What is transpiration? Why do plants wilt? How is water lost from the leaves?</p> <p>Key terms: Capillaries, arteries, veins, semi-permeable, circulatory, ventricles, platelets, plasma, xylem, phloem, transpiration, vascular bundles, stomata, potometer</p> <p>Common misconceptions:</p> <p>Learners have a view that the slow flow of blood in capillaries is due to the narrow diameter, when in fact it is a function of the total cross-sectional area of the capillaries (1000 times greater than the aorta). When explaining the importance of the slow flow of blood in allowing time for exchange by diffusion, this misunderstanding should be considered.</p> <p>Examination technique: understanding key command words within examination style questions to build confidence in student responses</p> | <ul style="list-style-type: none"> • carry out rate calculations • plot, draw and interpret appropriate graphs <p>Students will be able to:</p> <ul style="list-style-type: none"> • State the function of the circulatory system • Describe the structure of the double circulatory system • Explain the structure and function of blood vessels • Identify the main structures in the heart • Describe the flow of blood through the heart • State the function of blood components • State the function of the xylem and phloem tissue • Describe the structure of xylem tissue • Describe the structure of the phloem tissue • State what is meant by transpiration • Describe the transpiration stream • Explain how stomata control water loss from leaves • State the factors which affect transpiration • Describe how to use a photometer • Explain how environmental factors affect the rate of transpiration | <p>9. B2 exam question practice</p> <p>Homework</p> <p>Seneca topic based homework to be set every fortnight.</p> |
| <p>Careers Link: EKG technician. Exercise physiologist. Cardiovascular technician. Respiratory therapist.</p> | <p>Enrichment</p> <p>Potential medical mavericks-careers in the NHS workshops.</p> | <p>MY PB</p> <p>Social Me- active listening, speaking effectively, working with others Practical work will require aspects of the social me strand</p> <p>Thinking Me – evaluating & creativity</p> |

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| Medical sonographer. Cardiology consultant. Cardiac nurse. Cardiology physician. | | <p>Evaluation will be utilised when assessing data from the</p> <p>This is Me – Resilience, responsibility, self-motivation, integrity, self-management</p> <p>Students will need to demonstrate resilience and self- management when looking at the assessed points across the lessons</p> |
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