

**\*\*\*H420 Module 1-Development of practical skills in Biology**  
**will be integrated within other modules of the specification \*\*\***

	Big Question/ Theme	Small Questions	Assessment Opportunities and Criteria. Teacher feedback point (TFP)	Homework
<b>Module 2</b> <b>Foundations in Biology</b>  <i>Chapter 2</i> <i>Basic components of</i> <i>living organisms</i>	What are living organisms made up of?	<b>2.1 Microscopy</b> What is the history of the microscope? How did cell theory develop? How do you use a light microscope? How do you prepare a slide to view using a light microscope? Why do we use stains?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking. Practical assessments (PAGs) Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>2.2 Magnification and calibration</b> What is the difference between magnification and resolution? How do we calculate magnification? How do you convert units of measurement? How do you use a graticule to calibrate a light microscope?		
		<b>2.3 More microscopy</b> How do electron microscopes work? What are the 2 types of electron microscopes? How do light and electron microscopes compare? How are specimens prepared to view under an electron microscope? What does a laser scanning confocal microscope do?		
		<b>2.4 Eukaryotic cell structure</b> What is the ultrastructure and function of eukaryotic cellular components? Why is the cytoskeleton important? What is the relationship between the organelles involved in the production and secretion of proteins?		
		<b>2.5 The ultrastructure of plant cells</b> What is the ultrastructure and function of eukaryotic (plant) cellular components?		
		<b>2.6 Prokaryotic and eukaryotic cells</b> What is the ultrastructure and function of prokaryotic cells? How does the structure of prokaryotic and eukaryotic cells compare?		
	Big Question/	Small Questions	Assessment	Homework

	Theme		Opportunities and Criteria. Teacher feedback point (TFP)	
<b>Module 2</b> <b>Foundations in Biology</b>  <i>Chapter 3</i> <i>Biological Molecules</i>	Why are the biological molecules essential for life?	<b>3.1 Biological elements</b> What chemical elements make up biological molecules? What is an ion? What are the key organic ions involved in biological processes? What are the bonding rules? What is the difference between a monomer and a polymer?	MCQ Topic tests are available from OCR and these test student misconceptions within each topic area.  Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>3.2 Water</b> How does hydrogen bonding occur between water molecules? How does the properties of water relate to its roles in living organisms?		
		<b>3.3 Carbohydrates</b> What is the ring structure and properties of glucose? What is the structural difference between an $\alpha$ - and a $\beta$ -glucose molecule? What is the difference between a hexose and a pentose monosaccharide? How are glycosidic bonds formed in the synthesis and breakdown of a disaccharide and polysaccharide? What is the structure of starch (amylose and amylopectin), glycogen and cellulose molecules? How the structures and properties of glucose, starch, glycogen and cellulose molecules relate to their functions in living organisms?		
		<b>3.4 Testing for carbohydrates</b> How do you carry out and interpret the results of the following: Benedict's test; reagent test strips; iodine test? What quantitative methods are there that determine the concentration of a chemical substance in a solution?		
		<b>3.5 Lipids</b> What is the structure of a triglyceride and a phospholipid? How are triglycerides synthesised and broken down? What are the properties of triglyceride, phospholipid and cholesterol molecules? How do we carry out and interpret the results of an emulsion tests for lipids?		
		<b>3.6 Structure of proteins</b>		

		<p>What is the general structure of an amino acid?</p> <p>What are the levels of protein structure?</p> <p>What happens in the synthesis and breakdown of dipeptides and polypeptides?</p> <p>How do you carry out and interpret the results of the biuret test for proteins?</p> <p>What are the principles for paper chromatography?</p>		
		<p><b>3.7 Types of proteins</b></p> <p>What is the structure and function of globular proteins including conjugated protein?</p> <p>What are the properties of fibrous proteins?</p>		
		<p><b>3.8 Nucleic acids</b></p> <p>What is the structure of a nucleotide?</p> <p>What happens in the synthesis and breakdown of polynucleotides?</p> <p>What is the structure of DNA?</p> <p>How can we extract DNA?</p>		
		<p><b>3.9 DNA replication and the genetic code</b></p> <p>How does DNA replicate?</p> <p>What is the difference between continuous and discontinuous replication?</p> <p>What is meant by and the nature of the genetic code?</p>		
		<p><b>3.10 Protein synthesis</b></p> <p>How are polypeptides synthesised?</p> <p>What happens in transcription?</p> <p>What happens in translation?</p>		
		<p><b>3.11 ATP</b></p> <p>What is the structure of ADP and ATP?</p> <p>What happens in the hydrolysis and condensation reactions involving ATP and ADP?</p>		

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<b>Module 2</b> <b>Foundations in Biology</b>  <i>Chapter 4</i> Enzymes	Why are enzymes vital for biological processes?	<b>4.1 Enzyme Action</b> What are enzymes? What is the mechanism of enzyme action? What is the role of enzymes in catalysing intracellular and extracellular reactions?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>4.2 Factors affecting enzyme activity</b> What are the effects of pH on enzyme activity? What are the effects of temperature on enzyme activity? What are the effects of substrate concentration on enzyme activity? What are the effects of enzyme concentration on enzyme activity?		
		<b>4.3 Enzyme inhibitors</b> What are the effects of inhibitors on the rate of enzyme-controlled reactions? What is the difference between competitive, non-competitive inhibition and end-product inhibition?		
		<b>4.4 Cofactors, coenzymes and prosthetic groups</b> What is the difference between co-factors and co-enzymes? What is the need of prosthetic groups in some enzyme-controlled reactions? What is the role of inactive precursors?		

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<b>Module 2</b> <b>Foundations in Biology</b>  <i>Chapter 5</i> Plasma membranes	How do substances move into and out of cells?	<b>5.1 The structure and function of membranes</b> What is meant by the term compartmentalisation? What is the structure of the membrane? What is the function of the different components of the membrane? What is the cell membrane theory?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>5.2 Factors affecting membrane structure</b> What factors affect membrane structure and permeability? How can we investigate membrane structure and permeability?		
		<b>5.3 Diffusion</b> What is diffusion? What is facilitated diffusion? What factors affect diffusion rates? How can we investigate the factors affecting diffusion rates?		
		<b>5.4 Active transport</b> What is active transport? How does active transport take place? What is bulk transport? What happens in endocytosis? What happens in exocytosis? What is the importance of active transport?		
		<b>5.5 Osmosis</b> What is osmosis? What do we mean by the term water potential? What are the effects of osmosis on plant and animal cells? How can we investigate osmosis in animal and plant cells?		

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<b>Module 2</b> <b>Foundations in Biology</b>  <i>Chapter 6</i> Cell division	How and why do cells divide?	<b>6.1 Cell cycle</b> What is the cell cycle? What are the phases of the cell cycle? How is the cell cycle regulated?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>6.2 Mitosis</b> What is the significance of mitosis in life cycles? What happens in the main stages of mitosis? What do the phases of mitosis look like for plant and animal cells under a microscope?		
		<b>6.3 Meiosis</b> What is the significance of meiosis in life cycles? What is reduction division? What happens in the main stages of meiosis? What do the phases of mitosis look like for cells under a microscope?		
		<b>6.4 The organisation and specialisation of cells</b> What are the levels of organisation in multicellular organisms? How do cells of multicellular organisms become specialised? What examples of specialised animal and plant cells can you describe? What examples of specialised animal and plant tissues can you describe? What is the relationship between an organ system and the organs which form that system?		
		<b>6.5 Stem cells</b> What are stem cells? What is the difference between totipotent, pluripotent and multipotent stem cells? What are the sources of animal and plant stem cells? What are some of the uses of stem cells in medicine? What are the ethical issues regarding the use of stem cells in therapies and research?		

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<b>Module 3</b> <b>Exchange and transport</b>  <i>Chapter 7</i> Exchange surfaces and breathing	What is the need for specialised exchange surfaces?	<p><b>7.1 Specialised exchange surfaces</b>            What are the features of a specialised exchange surface?            How can we use surface area to volume ratio to model an organism?</p> <p><b>7.2 Mammalian gaseous exchange system</b>            What is the gross structure of the mammalian gaseous exchange system?            How are the components of the mammalian gaseous exchange system adapted for its function?            What is the mechanism of ventilation in the lungs?</p> <p><b>7.3 Measuring the process</b>            How do we measure the capacity of the lungs?            What are the components of lung volume?            What is the relationship between vital capacity, tidal volume, breathing rate and oxygen uptake?</p> <p><b>7.4 Ventilation and gas exchange in other organisms</b>            What is the mechanism of ventilation and gas exchange in insects?            What is the mechanism of ventilation and gas exchange in bony fish?            How do we dissect and draw bony fish and insect trachea?            What does the histology of exchange surfaces look like under the microscope?</p>	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.

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<b>Module 3</b> <b>Exchange and transport</b>  <i>Chapter 8</i> <i>Transport in animals</i>	Why are transport systems essential?	<b>8.1 Transport systems in multicellular animals</b> What are the different types of circulatory systems found in multicellular animals? What are the advantages and disadvantages of open and closed circulatory systems?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>8.2 The blood vessels</b> What is the structure and function of arteries, arterioles, capillaries venules and veins? What do sections of the blood vessels look like under the microscope?		
		<b>8.3 Blood, tissue and lymph</b> What are the differences in the composition of the blood, tissue fluid and lymph? How is tissue fluid formed from plasma?		
		<b>8.4 Transport of oxygen and carbon dioxide in the blood</b> What is the role of haemoglobin in transporting oxygen and carbon dioxide around the body? What is an oxygen dissociation curve and what information does it provide? What is the Bhor shift?		
		<b>8.5 the heart</b> What is the internal and external structure of the heart? How is heart action initiated and coordinated? How can we use and interpret electrocardiogram (ECG) traces?		



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<b>Module 3</b> <b>Exchange and transport</b>  <i>Chapter 9</i> <i>Transport in plants</i>	Why are transport systems essential?	<b>9.1 Transport systems in dicotyledonous</b> What are dicots? What is the structure and function of the vascular system in the roots, stems and leaves of herbaceous dicotyledonous plants? What do transverse sections of stained plant tissue look like under the microscope?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>9.2 Water transport in multicellular plants</b> Why must water be transported in plants? What are the mechanisms of water movements into and through plants? What evidence is there for the role of active transport in root pressure?		
		<b>9.3 Transpiration</b> What is transpiration? What is the mechanism for transpiration? What factors affect transpiration rates? How can we investigate the factors that affect transpiration rates? What evidence is there for the cohesion-tension theory?		
		<b>9.4 Translocation</b> What is translocation? What is the mechanism for translocation? What evidence is there to support the mechanism for translocation?		
		<b>9.5 Plant adaptations to water availability</b> What are xerophytes? What are hydrophytes? What are the adaptations of plants to the availability of water in their environments?		

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<b>Module 4</b> <b>Biodiversity and evolution</b>  <i>Chapter 10</i> <i>Classification and evolution</i>	How are organisms classified?	<b>10.1 Classification</b> How do scientists classify organisms? How are organisms classified in the taxonomic hierarchy of species? What is the binomial system of naming species? What are the advantages of the binomial system?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>10.2 The five kingdoms</b> What features are used to classify organisms into the 5 kingdoms? What recent evidence has been used to clarify relationships in the 3 domains of life?		
		<b>10.3 Phylogeny</b> What is phylogeny? What is the relationship between classification and phylogeny? What are the advantages of phylogenetic classification?		
		<b>10.4 Evidence for evolution</b> What was the contribution of Darwin and Wallace in forming the theory of evolution? What evidence is there for the theory of evolution?		
		<b>10.5 Types of variation</b> What is variation? What is the difference between interspecific and intraspecific variation? What causes variation?		
		<b>10.6 Representing variation graphically</b> What is the difference between continuous and discontinuous variation? What is the normal distribution? How do we calculate standard deviation? How do we calculate the student's t-test? How do we interpret the correlation coefficient?		

**10.7 Adaptions**

What are adaptations?

What examples are there of anatomical, behavioural and physiological adaptations?

Why do organisms from different taxonomic groups show similar anatomical adaptations?

**10.8 Changing population characteristics**

What are selection pressures?

What is the mechanism by which natural selection can affect the characteristics of a population over time?

How has the evolution in some species had an impact on human populations?

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<b>Module 4</b> <b>Biodiversity and</b> <b>evolution</b>  <i>Chapter 11 Biodiversity</i>	What is the importance of maintaining biodiversity?	<b>11.1 Biodiversity</b> What is biodiversity? What is the importance of biodiversity? What are the different levels of biodiversity that are studied?	Topic tests these are from OCR and include short answer questions that test student misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>11.2 Sampling</b> What is sampling and why is it important? How is sampling used to measure diversity? What is the difference between random and non-random sampling? How can reliability of sampling be improved?		
		<b>11.3 Sampling techniques</b> How do we sample animals? How do we sample plants? How do we measure abiotic factors? What is species richness and evenness and how are these measured?		
		<b>11.4 Calculating biodiversity</b> How do we calculate biodiversity? What does high and low biodiversity tell us about habitats?		
		<b>11.5 Calculating genetic biodiversity</b> What is the importance of genetic biodiversity? What factors affect genetic biodiversity?		
		<b>11.6 Factors affecting biodiversity</b> What is human influence on biodiversity?		
		<b>11.7 Reasons for maintaining biodiversity</b> What are the reasons for maintaining biodiversity? What positive impacts does human activity have on biodiversity?		
		<b>11.8 Methods for maintaining biodiversity</b> What is conservation? What are the <i>in situ</i> and <i>ex situ</i> methods of maintaining biodiversity? What international and local conservation agreements have been made to protect species and habitats?		

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<b>Module 4 Biodiversity and evolution</b>  <i>Chapter 12 Communicable diseases</i>	How do plants and animals defend themselves against pathogens?	<b>12.1 Animal and plant pathogens</b> What is a communicable disease? What are the different types of pathogens? What is a vector? What are the modes of action different pathogens?	Topic tests these are from OCR and include short answer questions that test student  misconceptions in the topic area. Teacher will mark exam questions and provide a class feedback sheet. Students will NTG by responding to marking.  Practical assessments (PAGs)  Optional: Zig Zag end of topic tests are available to use	Homework: Revision of the topic's knowledge organiser.  Students will be quizzed weekly /10 Student results will be recorded on a tracking sheet.  Students to make Cornell notes of sections covered in class and complete summary questions in the text book. Students complete any extra exam questions set by the teacher.
		<b>12.2 Animal and plant diseases</b> What pathogens cause various diseases in plants and animals? What are the symptoms of these diseases? How are pathogens identified?		
		<b>12.3 The transmission of communicable diseases</b> What are the mechanisms of direct transmission? What are the mechanisms of indirect transmission? What factors affect the transmission of communicable diseases in plants and animals?		
		<b>12.4 Plant defences against pathogens</b> How do plants recognise an attack from a pathogen? What physical defences do plants have against pathogens? What chemical defences do plants have against pathogens?		
		<b>12.5 Non-specific animal defences against pathogens</b> What are the primary non-specific defences against pathogens in animals? What is the structure and mode of action of phagocytes? How do we examine and draw cells observed in blood smears?		
		<b>12.6 The specific immune system</b> What are antibodies and how do they defend the body? What is the mode of action of B and T lymphocytes in the specific immune response? What are the actions of opsonin, agglutinins and anti-toxins? What is the difference between the primary and secondary immune response?		

		What is an autoimmune disease?		
		<b>12.7 Preventing and treating disease</b> What is the difference between active and passive immunity? What is the difference between natural and artificial immunity? What are the principles and roles of vaccination programmes? What are the benefits and risks of using antibiotics to manage bacterial infections? What are the possible sources of new medicines?		