سلطنة عمان
وزارة التربية والتعليم
المديرية العامة للمدارس الخاصة
دائرة برامج ومناهج المدارس الخاصة

نظام إدارة الجودة
Quality Management System

رؤية عمان 2040
نمضي بثقة
Moving Forward with Confidence

Syllabus	الإطار المنهجي
Biology	مادة الأحياء
Bilingual Program	برنامج ثنائي اللغة
Grades 9-10	الصفوف (٩–١٠)
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Contents

Introduction

Science plays a major role in the evolution of knowledge. It empowers us to use creative and independent approaches to problem solving. It arouses our natural curiosity and enables us to meet diverse and ever expanding challenges. It enhances our ability to inquire, seek answers, research and interpret data. These skills lead to the construction of theories and laws that help us to explain natural phenomena and exercise control over our environment. Science is, thus, an integral component of a balanced education.

This syllabus focus on the content essential for preparing students to be engaged and productive citizens. A good foundation in the sciences will help citizens to respond to the challenges of a rapidly changing world using the scientific approach. It addresses, in addition to a specific knowledge base, the development of related skills and attitudes. Critical thinking, enquiry and reasoning are emphasized to ensure that students develop the ability to work creatively, think analytically and solve problems. The syllabus also ensure that students become aware of their moral, social, and ethical responsibilities, as well as, the benefits intrinsic to the practical application of scientific knowledge to careers in the scientific field. Teaching these standards requires teaching methods that are varied and experiential. Effective lessons will concert and incorporate with: Practical work and the science standards, the place of information and communications technology in the science standards, teaching about science, technology and society, the mathematical requirements of the science standards.

The overall aims of science standards are that students should:

1. develop and sustain an interest in science and its applications.
2. have a sound and systematic knowledge of important scientific facts, concepts and principles, and possess the skills needed to apply these in new and changing situations in a range of personal, domestic, industrial and environmental contexts.
3. recognize the importance of the application of scientific knowledge in the modern world and be aware of the moral, ethical, social and environmental implications.
4. develop relevant attitudes, such as a concern for accuracy and precision, objectivity, integrity, enquiry, initiative and inventiveness.
5. develop an understanding of the scientific skills essential for both further study and everyday life.
6. plan, design and perform experiments to test theories and hypotheses.
7. be proficient in the use of a range of scientific methods and techniques and in handling apparatus.
8. develop the ability to work independently and collaboratively with others when necessary.
9. integrate Information and Communication Technology (ICT) tools and skills.

Important Skills

- Scientific enquiry skills: Scientific enquiry, which ensures the development of scientific skills, intellectual and practical, should be integrated in the learning of the scientific content across all the science branches. Scientific enquiry skills include the following:

1. Carry out the practical experiments to developed the practical skills which will be mentioned in details below.
2. Find secondary information sources such as the resources available in the public libraries and on the Internet and use these after validation and making sure of the suitability of the subject.
3. Apply Scientific knowledge and procedures to the situations of the reality Life.
4. Recognizes the importance of cooperative teamwork, put work plans, distributes responsibilities and regulates and sets specific targets for work.

- Know how scientists are working:

1. Realize that with science we can bring great benefits to humanity also if it is abused can cause serious damage to the environment.
2. know how scientists are carrying out their work, such as environmental monitoring and control of industrial processes.
3. Know how scientists publish and present their ideas and results in order to encourage debate and development.
4. know that science could lead to the emergence of ethical considerations, and discuss them.
5. know that there are many questions and considerations that cannot be answered by Science.
6. trace the historical development of some key scientific models and knows what contributions Scientists presented in this development.

- Processing and delivery of information

1. present qualitative and quantitative data using a variety of methods, such as descriptive texts, graphics, images, tables, and maps with the use of technology methods and computer when it is appropriate, then analyse and explain these date to extract conclusions from them.
2. use mathematical relationships routinely to calculate the quantities.
3. do calculations based on data taken from the graphs, and distinguishes between Independent and dependent variables.
4. handle data and writes reports about the results.
5. use symbolic equations to represent chemical reactions and simple physical relationships.
6. use the appropriate methods to deliver scientific information.

- ICT application:

This syllabus provides students with a wide range of opportunities to use ICT in their study of science in order to play a full part in modern society, students need to be confident and effective users of ICT. Opportunities for ICT include:

1. gathering information from the internet, DVDs and CD-ROMs.
2. using spreadsheets and other software to process data.
3. using animations and simulations to visualize scientific ideas.
4. using software to present ideas and information on paper and on screen.

Skills and abilities to be assessed:

The skills students are expected to develop on completion of this syllabus, have been grouped under three main headings:

1. knowledge and understanding.
2. application of knowledge and understanding, analysis and evaluation of information.
3. scientific enquiry skills and procedures.

1. Knowledge and understanding

Assessment Objectives	Skills: The ability to
Knowledge	• identify, remember and grasp the meaning of basic facts, concepts and principles.
Understanding	• select appropriate ideas, match, compare and cite examples of facts, concepts and principles in familiar situations; • explain familiar phenomena in terms of theories, models, laws and principles.

Questions testing these skills will often begin with one of the following words: define, state, describe, explain.

2. Application of knowledge and understanding, analysis and evaluation of information

Assessment Objectives	Skills: The ability to
Application	• use facts, concepts, principles and procedures in unfamiliar situations. • transform data accurately and appropriately • use common characteristics as a basis for classification • use information to identify patterns, report trends and draw inferences. • use formulae accurately
Analysis and Interpretation	• identify and recognize the component parts of a whole and interpret the relationships between those parts; • identify causal factors and show how they interact with each other; • infer, predict and draw conclusions; • make necessary and accurate calculations and recognize the limitations and assumptions of data. • present reasoned explanations for phenomena, patterns and relationships
Synthesis	• combine component parts to form a new meaningful whole; • make predictions and solve problems. • locate, select, organize and present information from a variety of sources.
Evaluation	• make reasoned judgments and recommendations based on the value of ideas and information and their implications.

Questions testing these skills will often begin with one of the following words: predict, suggest, calculate or determine.

3. Scientific enquiry skills and investigations.

Assessment Objectives	Skills: The ability to
Planning and designing a practical procedure	• identify problems, make predictions, and design a practical procedure to answer a question, solve a problem or test a hypothesis. • select and use suitable apparatus for carrying out experiments accurately and safely. • take into account possible sources of errors and danger in the design of an experiment; • evaluating experimental procedures and identifying weaknesses and develop realistic strategies for improvement • Work in a way that is committed to ethical and moral standards such as honesty and authenticity of his results and writing of the used references.
Control	• use experimental controls where appropriate; • Appreciate that, unless certain variables are controlled, experimental results may not be valid • Recognize the need to choose appropriate sample sizes, and study control groups where necessary.
Risk assessment	• Identify possible hazards in practical situations, the risks associated with these hazards, and methods of minimizing the risks.
Manipulation and measurement	• follow a detailed set or sequence of instructions; • make measurements with due regard for precision and accuracy; • handle chemicals and living organisms with care; • cut, stain and mount sections and make temporary mounts; • set up light microscope for optimum use both under low power and high power; • use the stage micrometer and eyepiece graticule for accurate measuring; • assemble and use simple apparatus and measuring instruments.
Observation, recording and reporting	• select observations relevant to the particular activity; • make accurate observations and minimise experimental errors • record observations, measurements, methods and techniques with due regard for precision, accuracy and units; • record and report unexpected results; • select and use appropriate models of recording data or observations, for example, graphs, tables, diagrams and drawings;

Assessment Objectives	Skills: The ability to
	• organize and present information, ideas, descriptions and arguments clearly and logically in a complete report, using spelling, punctuation, grammar and scientific terminology with an acceptable degree of accuracy;
Analyzing and interpreting data	• Appreciate when it is appropriate to calculate a mean, calculate a mean from a set of at least three results and recognize when it is appropriate to ignore anomalous results in calculating a mean. • Recognize patterns in data, form hypotheses and deduce relationships. • Use and interpret tabular and graphical representations of data. • Evaluate data, considering its repeatability, reproducibility and validity in presenting and justifying conclusions.
Making conclusions	• Draw conclusions that are consistent with the evidence obtained and support them with scientific explanations
Drawing	• make clear, accurate line representations of specimens, with no shading or unnecessary details; and with clean continuous lines. • label drawings accurately and use label lines which do not cross each other or carry arrowheads or dots • make drawings which are large enough to display specific details • calculate the magnification of the drawings.

Biology Syllabus

The study of biology subject leads to an understanding and appreciation of the concept of life at all levels and, hence, to a greater respect and reverence for life. Students of Biology should recognize the enormous responsibility they must undertake to ensure the continuity of life in all its forms. It is incumbent on them to use this knowledge to protect, sustain, conserve and improve the variety of life in the ecosphere. Additionally, the study of Biology prepares students for careers in biological, agricultural, environmental, medical, paramedical and applied science.

Aims: Biology syllabus enables students to:

1. acquire a body of knowledge and develop an understanding of biological concepts and principles.
2. develop the ability to apply biological knowledge and skills essential for both further studies as well as in everyday life situations.
3. recognize the dynamic nature of the interrelationships between organisms and their environment.
4. develop a natural curiosity about living organisms and a respect for all living things and the environment.
5. understand how new information results in reformulation or rejection of earlier models and concepts.
6. recognize the scope of Biology from the molecular level to that of entire ecosystems.
7. develop an ability to communicate biological information in a variety of acceptable ways.
8. acquire an understanding of the scientific method and be able to apply it to solving problems, both in academic and non-academic settings.
9. appreciate the impact of biological knowledge on society and its relevance to ethical, economic, environmental and technological issues.
10. acquire training in the practical skills and thought processes associated with the study of science.

How to use this syllabus

This syllabus is arranged according to the following manner:

Outcomes:

Indicate the scope of the content, including practical work which will be examined as well. However, practical work should not necessarily be limited to these objectives.

1- The numbering key :[Unit – Topic –Learning outcome]
   e.g. 7.4.2 : Unit 7(Human influences on ecosystems); Topic 4 (conservation) and 2 is the second learning outcome(Justify the need to conserve non-renewable resources, limited to fossil fuels).
2- (S) skill objective.

Practical experiments and activities:

Show some examples of active Learning activities and do not represent Full -scale activities can be done. It is recommended that approximately 70 % of suggested laboratory-related activities, such as conducting experiments, making field trips and viewing audio-visual materials, must be done. Take into account the sufficient time to carry out practical experiments in the student text book and the wok book and training students in practical skills related to them. The teachers should get benefit from the work book and laboratory practical book that are recommended by MOE in the approved books list.

Skills

Some Proposed exercises are referred whenever possible to Specific skills.

Grade 9 (Bilingual) Biology - Learning outcomes
Semester 1

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
1. Characteristics and classification of living organisms					
1.1 Characteristics of living organisms	1.1.1 Describe the characteristics of living organisms.	1			
1.2 Concept and use of a classification system	1.2.1 State the definition and importance of classification. 1.2.2 Construct a chart for classifying by using a classification key. 1.2.3 Name the five kingdoms. 1.2.4 Explain the hierarchy of classification. 1.2.5 Define *species.* 1.2.6 Describe the *binomial system* of nomenclature.	2	2-5	1. Practicing classification using the key 2. Present some samples, models and photographs to show examples of organisms from the five kingdoms.	Critical thinking and Organization

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
1.3 Features of organisms	1.3.1 List the features in the cells of all living organisms limited to cytoplasm, cell membrane and nucleus (containing DNA). 1.3.2 Evaluate the main features used to place animals and plants into the appropriate kingdoms. 1.3.3 Compare the main features used to place organisms into groups within the animal kingdom, limited to: I. The groups of vertebrates: mammals, birds, reptiles, amphibians, fish. II. The groups of invertebrates: annelids, nematodes, molluscs and arthropods. III. The main classes of arthropods: myriapods, insects, arachnids, crustaceans. 1.3.4 List the main features used to place organisms into groups within the plant kingdom, limited to flowering plants (dicotyledons and monocotyledons). 1.3.5 Describe the features of bacteria, viruses and fungi limited to: I. Structure. II. Requirements for growth and reproduction. III. Importance and impact on humans.	6	6 -14	1. Observing samples and photographs of vertebrates and invertebrates (Focus on local examples) 2. Observing samples and photographs of monocotyledons and dicotyledons (Focus on local examples)	Observation, problem solving and critical thinking
1.4 Dichotomous keys	1.4.1 Construct and use simple dichotomous keys based on easily identifiable features. (s)	21	15-16	Practicing using the key	Organization analyzing and research

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
2. Organisation of the organism					
2.1 Cell structure and organisation	2.1.1 Compare the structure of a plant cell with an animal cell, as seen under the microscope, limited to cell wall, nucleus, cytoplasm, chloroplasts, vacuoles and location of the cell membrane. 2.1.2 Make drawings of typical animal and plant cells as seen under the light microscope.(s) 2.1.3 State the functions of the structures in plant and animal cells. 2.1.4 State that the cytoplasm of all cells contains structures, limited to ribosomes and vesicles. 2.1.5 State that aerobic respiration occurs in mitochondria.	24	18-24	1. Prepare slides of plant cells (e g. onion bulb leaf, *Rhoeo discolor* leaves, rhubarb skin) and animals cells (e. g. cheek cells) 2. Using of the microscope to observe the structure of plant and animal cells 3. Show models of plant and animal cells.	Scientific enquiry, team work and Communication
2.2 Levels of organisation	2.2.1 Relate the structure of the following specialized cells to their functions: i. ciliated cells – movement of mucus in the trachea and bronchi. ii. root hair cells – absorption. iii. xylem vessels – conduction and support. iv. palisade mesophyll cells - photosynthesis. v. nerve cells – conduction of impulses. vi. red blood cells – transport of oxygen. vii. sperm and egg cells – reproduction. 2.2.2 Define *tissue, organ and organ system.* 2.2.3 State examples of tissues, organs and organ systems 2.2.4 Identify the different levels of organisation in drawings, diagrams and images. (s)	29	25-26	Using the microscope to observe the structure of different types of specialized cells (Permanent slides) OR examine photomicrographs for some specialized cells	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
2.3 Size of specimens	2.2.1 Calculate magnification and size of biological specimens using millimetres as units.	33	23	Practicing Calculations	Problem solving
3. Movement of substances into and out of cells					
3.1 Diffusion	3.1.1 Define *diffusion.* 3.1.2 Investigate the process of diffusion. (s) 3.1.3 Describe the importance of diffusion of gases and solutes. 3.1.4 State the role of semipermeable cell membrane in diffusion of substances into and out of cells. 3.1.5 Explain the factors that affect the rate of movement of substances into and out of cells.	36	28-29	Use the ink OR liquid colors in the water and smoke or perfume in the class room air to represent diffusion	Scientific enquiry and creativity.

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
3.2 Osmosis	3.2.1 Investigate that water diffuses through partially permeable membranes by osmosis. 3.2.2 Define *osmosis.* 3.2.3 Demonstrate osmosis using potatoes. (s) 3.2.4 Investigate the effects on plant tissues of immersing them in solutions of different concentrations. (s) 3.2.5 Investigate the process of plasmolysis in the epidermal cells of the onion. (s) 3.2.6 Explain the effects on plant tissues of immersing them in solutions of different concentrations by using the terms *turgid*, *turgor pressure*, *plasmolysis* and *flaccid.* 3.2.7 Explain the effects on animal cells of immersing them in solutions of different concentrations. 3.2.8 Explain the importance of osmosis in the uptake of water by plants. 3.2.9 Explain the importance of osmosis on animal cells and tissues. 3.2.10 Differentiate between diffusion and osmosis.	40	30-34	1. Experiment of Osmosis and water flow using of osmometer OR dialysis tube. 2. Investigate the effect of sugar solutions on potato tissue 3. Use the microscope to show the behavior of plant cells (*Rhoeo discolor)* in isotonic, hypotonic and hypertonic solutions	Scientific enquiry and team work
3.3 Active transport	3.3.1 Define *active transport.* 3.3.2 State the importance of active transport.	48	35-37	Show video about active transport	ICT application

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
4. Biological molecules					
4.1 Biological molecules.	4.1.1 State the definition and function of biological (organic) molecules. 4.1.2 Describe the chemical elements that make up: carbohydrates, fats and proteins 4.1.3 Identify macromolecules based on some chemical reactions by the use of: (s) I. iodine solution to test for starch. II. Benedict's solution to test for reducing Sugars. III. Biuret test for proteins. IV. ethanol emulsion test for lipids (fats and oils). 4.1.4 Relate the shape and structure of protein molecules to their function. 4.1.5 Describe the structure of DNA. 4.1.6 Describe the roles of water as a solvent in organisms with respect to digestion, excretion and transport.	51	40-47	1. Construct simple models for some macromolecules (carbohydrates, fats, proteins and DNA). 2. Testing presence of carbohydrates, proteins and fats by using chemical tests.	Scientific enquiry, problem solving and team work

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
5. Enzymes					
5.1 Enzymes	5.1.1 Define the term *catalyst and* enzyme. 5.1.2 Explain why enzymes are important in all living organisms. 5.1.3 Describe enzyme action with reference to the complementary shape of an enzyme and its substrate and the formation of a product. 5.1.4 Explain the specificity of enzymes in terms of the complementary shape and fit of the active site with the substrate. 5.1.5 Analyse graphs which shows the effect of changes in pH and temperature on the enzyme activity. 5.1.6 Explain the effect of changes in pH and temperature on the enzyme activity in terms of shape and fit and denaturation. 5.1.7 Discuss the use of enzymes in industry, medicine and food production.	59	49-54	1. Show videos about action and specificity of enzymes. 2. Construct a model for the specificity of enzymes. 3. Give a presentation about the use of enzymes in industry OR medicine OR food production.	ICT application, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
6. Diseases and immunity					
6.1 Diseases and immunity	6.1.1 Define *pathogen.* 6.1.2 Define *transmissible disease.*= 6.1.3 State that the pathogen for a transmissible disease may be transmitted either through direct contact, or indirectly. 6.1.4 Explain the following defences of human body: I. mechanical barriers, limited to skin and hairs in the nose. II. chemical barriers, limited to mucus and stomach acid. III. cells, limited to phagocytosis and antibody production by white blood cells. 6.1.5 Compare active immunity and passive immunity. 6.1.6 Explain the process of vaccination and its importance. 6.1.7 Discuss the importance of hygienic food preparation, good personal hygiene, waste disposal and sewage treatment in controlling the spread of disease.	142	127-131	1. Collect data about the number of students that got any of the transmissible diseases and present these data according to the type of the microorganisms OR way of transmission using graphs and tables showing distribution of these transmitted diseases in the class. 2. Write a report about any of the recent transmitted diseases in Oman (e.g. Crimean–Congo haemorrhagic fever) 3. Show a video about the types of body defences 4. Give a presentation about some topics (e.g. vaccination and controlling the spread of diseases) 5. Arrange a Visit a to the health center and collect information about a range of available vaccinations.	Processing and delivery of information , observation, ICT application, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
7. Plant Nutrition					
7.1 Photosynthesis	7.1.1 Define *photosynthesis.* 7.1.2 State the word and balanced chemical equations for photosynthesis. 7.1.3 Investigate the necessity for chlorophyll, light and carbon dioxide for photosynthesis, using appropriate controls. (s) 7.1.4 Discuss the concept of limiting factors in photosynthesis. 7.1.5 Explain the limiting factors of photosynthesis in different environmental conditions.	66	58-59	Experiments to investigate Photosynthesis: 1. Testing leaves for starch. 2. Is light necessary for photosynthesis? 3. Is Oxygen produced during photosynthesis? 4. The effect of changing light intensity and CO_2 conc. on the rate of photosynthesis.	Scientific enquiry, problem solving and team work
7.2 Leaf structure	7.2.1 Identify chloroplasts, cuticle, guard cells and stomata, upper and lower epidermis, palisade mesophyll, spongy mesophyll, vascular bundles, xylem and phloem in leaves of a dicotyledonous plant. 7.2.2 Explain how the internal structure of a leaf is adapted for photosynthesis. 7.2.3 Draw the cellular and tissue structure of a dicotyledonous leaf (to show the distribution of tissues within an organ), as seen in a cross-section under the light microscope. (s)	77	60-61	Using the microscope to observe the internal leaf structure (prepared slides of a transverse section of a dicotyledonous leaf)	Scientific enquiry
7.3 Mineral requirements	7.3. 1 Describe the importance of nitrate ions and magnesium ions. 7.3.2 Explain the effects of nitrate ions and magnesium ions deficiency on growth of plants.	81	64	1. Show a video about the effect of minerals deficiency on the plants' growth and problems with fertilizers. 2. Investigate the effect minerals in the growth of a plant.	Scientific enquiry

Grade 9 (Bilingual) Biology - Learning outcomes
Semester 2

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
8. Human Nutrition					
8.1 Diet	8.1.1 Define nutrition. 8.1.2 State what is meant by the term balanced diet for humans. 8.1.3 Explain how age, gender and activity affect the dietary needs of humans including during pregnancy and whilst breast-feeding. 8.1.4 Discuss the effects of malnutrition in relation to starvation, constipation, coronary heart disease, obesity and scurvy. 8.1.5 List the principal sources of, and describe the dietary importance of: i. carbohydrates ii. fats iii. proteins iv. vitamins, limited to C and D v. mineral salts, limited to calcium and iron vi. fibre (roughage) vii. water 8.1.6 Analyse the causes and effects of vitamin D and iron deficiencies. 8.1.7 Explain the causes and effects of protein-energy malnutrition, e.g. kwashiorkor and marasmus.	86	73-77	1. Nutrients tests 2. Put tables to show the diet that fits groups of individuals according to their age and their work. 3. Show a video about the effect of nutrients' deficiency on humans. 4. Give a presentation about national statistics on obesity, coronary heart disease and diabetes and discuss actions of the health institutions to deal with the obesity.	ICT application, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
8.2 Alimentary canal	8.2.1 Define the following terms; ingestion, mechanical digestion, chemical digestion, absorption, assimilation, and egestion. 8.2.2 Identify the main regions of the alimentary canal and associated organs, limited to mouth, salivary glands, oesophagus, stomach, small intestine (duodenum and ileum), pancreas, liver, gall bladder and large intestine (colon, rectum, anus). 8.2.3 Describe the functions of the regions of the alimentary canal listed above, in relation to ingestion, digestion, absorption, assimilation and egestion of food.	95	78-87	Identifying the different parts of sheep's digestive system	Observation and communication
8.3 Mechanical digestion	8.3.1 Identify the types of human teeth. (s) 8.3.2 Describe the structure of human teeth, limited to enamel, dentine, pulp, nerves and cement, as well as the gums. 8.3.3 Explain the functions of the types of human teeth in mechanical digestion of food. 8.3.4 Discuss the causes of dental decay. 8.3.5 Discuss the proper care of teeth in terms of diet and regular brushing.	98	78-87	1. Constructing a teeth model 2. Show a video about structure and types of human teeth	Creativity, Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
8.4 Chemical digestion	8.4.1 Explain the significance of chemical digestion in the alimentary canal in producing small, soluble molecules that can be absorbed. 8.4.2 State where, in the alimentary canal, amylase, protease and lipase are secreted. 8.4.3 State the functions of digestive enzymes limited to amylase, protease and lipase. 8.4.4 Explain the functions of the hydrochloric acid in gastric juice. 8.4.5 Compare pepsin and trypsin as two protease enzymes that function in different parts of the alimentary canal. 8.4.6 Outline the role of bile. 8.4.7 Explain the process of egestion.	100	85	1. Show a video about the chemical digestion 2. Experiments to investigate chemical digestion: a) The action of salivary amylase on starch b) The action of pepsin on egg-white protein c) The action of lipase on lipids.	Observation and communication
8.5 Absorption	8.5.1 Explain how the small intestine is adapted to the function of absorption of digested food. 8.5.2 Explain the significance of villi and microvilli in the small intestinal wall. 8.5.3 Describe the structure of a villus. 8.5.4 Describe the roles of capillaries and lacteals in villi. 8.5.5 Discuss that water is absorbed in both the small intestine and the colon.	103	84-85	1. Identifying the structure of villus using a model. 2. Show a video about Absorption	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
9. Transport in plants					
9.1 Transport in plants and water Uptake	9.1.1 Identify root hair cells, as seen under the light microscope, and state their functions. 9.1.2 Explain the processes by which water and minerals are absorbed by roots. 9.1.3 Compare the functions of xylem and phloem. 9.1.4 Identify the position of xylem and phloem as seen in sections of roots, stems and leaves, limited to non-woody dicotyledonous plants. (s) 9.1.5 State the pathway taken by water through root, stem and leaf . 9.1.6 Investigate; using a suitable stain, the pathway of water through the above ground parts of a plant. (s)	110	93-97	1. Using the microscope to examine the root hair cells 2. Using the microscope to observe the xylem and phloem (permanent slides) 3. Investigate water transport in plants (Tracing xylem).	Scientific enquiry, observation and team work
9.2 Transpiration	9.2.1 Define *transpiration.* 9.2.2 Investigate the effects of variation of temperature and humidity on transpiration rate. (s) 9.2.3 Explain how water vapour loss is related to the large surface area of cell surfaces, interconnecting air spaces and stomata. 9.2.4 Explain the mechanism by which water moves upwards in the xylem.	116	97-100	Investigate the effect of temperature and humidity on rates of water uptake by using the potometer.	Scientific enquiry, observation and team work
9.3 Translocation	9.3.1 Define *translocation.* 9.3.2 Identify the parts of the plant that may act as a source and a sink.	121	102		

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
10. Transport in Animals					
10.1 Transport in Animals	10.1.1 Describe the circulatory system as a system of blood vessels with a pump and valves to ensure one-way flow of blood. 10.1.2 Describe the single circulation of a fish 10.1.3 Discuss the double circulation of a mammal. 10.1.4 Compare the advantages of a double circulation.	124	106-107	Show a video about the two types of blood circulation and the first scientists to describe theses circulations	ICT application and communication
10.2 Heart	10.2.1 Identify the structures of the mammalian heart, limited to the muscular wall, the septum, the left and right ventricles and atria, one-way valves and coronary arteries. 10.2.2 Explain the relative thickness. i. of the muscle wall of the left and right ventricles. ii. of the muscle wall of the atria compared to that of the ventricles. 10.2.3 Illustrate the functioning of the heart in terms of the contraction of muscles of the atria and ventricles and the action of the valves. 10.2.4 Investigate the effect of physical activity on the pulse rate. (s) 10.2.5 Describe coronary heart disease in terms of the blockage of coronary arteries and state the possible risk factors 10.2.6 Discuss the roles of diet and exercise in the prevention of coronary heart disease.	125	108-117	1. Identify the structures of the mammalian heart using sheep's Heart 2. Investigate the effect of physical activity on the pulse rate (use excel to present data)	Scientific enquiry, ICT application and team work

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
10.3 Blood vessels and Lymphatic vessels	10.3.1 Compare the structure and functions of arteries, veins and capillaries. 10.3.2 Name the main blood vessels connected to the: i. heart, limited to vena cava, aorta, pulmonary artery and pulmonary vein. ii. lungs, limited to the pulmonary artery and pulmonary vein. iii. kidney, limited to the renal artery and renal vein. 10.3.3 Outline the lymphatic system in terms of lymphatic vessels and lymph nodes. 10.3.4 Discuss the function of the lymphatic system in the circulation of body fluids and the protection of the body from infection.	132	117-123	Using of microscope to examine the structure of blood vessels (Prepared slides)	Observation and communication
10.4 Blood	10.4.1 Demonstrate the components of blood. 10.4.2 Identify red and white blood cells, as seen under the light microscope, on prepared slides and/or in diagrams and photomicrographs. (s) 10.4.3 State the functions of the components of blood. 10.4.4 Identify lymphocyte and phagocyte white blood cells, as seen under the light microscope, on prepared slides and/or in diagrams and photomicrographs. (s) 10.4.5 Compare the functions of lymphocytes and phagocytes. 10.4.6 Describe the process of clotting.	136	117-118	Using of microscope to identify the blood cells (Prepared slides)	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
11. Gas Exchange in Humans					
11.1 Gas Exchange in Humans	11.1.1 List the features of gas exchange surfaces in humans. 11.1.2 Name and identify the following on a diagram of the respiratory system: the lungs, diaphragm, ribs, intercostal muscles, larynx, trachea, bronchi, bronchioles, alveoli and associated capillaries. 11.1.3 Discuss the role of the ribs, the internal and external intercostal muscles and the diaphragm in the ventilation of the lungs. 11.1.4 Explain the role of goblet cells, mucus and ciliated cells in protecting the gas exchange system 11.1.5 Explain the differences in composition between inspired and expired air, limited to oxygen, carbon dioxide and water vapour. 11.1.6 Investigate and explain the effects of physical activity on rate and depth of breathing. (s). 11.1.7 Explain the effect of some factors on breathing rate limited to smoking, anxiety, environmental (CO2, temperature and humidity), altitude, weight.	156	140-149	1. Construct a model to explain the mechanism of breathing 2. Using limewater as a test for carbon dioxide in exhaled air. 3. Effects of physical activity on rate and depth of breathing	Scientific enquiry, creativity, ICT application, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
12. Respiration					
12.1 Aerobic respiration	12.1.1 Discuss the uses of energy in the body of humans. 12.1.2 Define *aerobic respiration* 12.1.3 State the word and balanced chemical equation for aerobic respiration 12.1.4 Investigate the uptake of oxygen by respiring organisms, such as arthropods and germinating seeds. (s) 12.1.5 Investigate the aerobic respiration by carrying out experiments to show the production of carbon dioxide and heat. (s)	165	141	1. Measurement of oxygen consumption using a respirometer. 2. Measurement of carbon dioxide and heat release.	Scientific enquiry, ICT application, team work and communication
12.2 Anaerobic respiration	12.2.1 Define *anaerobic respiration.* 12.2.2 State the word and balanced chemical equations for anaerobic respiration in muscles during vigorous exercise and in the microorganism (yeast). 12.2.3 Investigate the anaerobic respiration in yeast by carrying out experiment to show the production of carbon dioxide, ethanol and heat. (s) 12.2.4 Discuss the cause of oxygen debt. 12.2.5 Outline how the oxygen debt is removed during recovery. 12.2.6 Compare aerobic and anaerobic respiration.	169	143	1. Experiment to investigate release of carbon dioxide, ethanol and heat during anaerobic respiration in yeast cells. 2. Write a report using resources from the library about the uses of fermentation in the manufacture of products.	Scientific enquiry, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
13. Excretion					
13.1 Excretion	13.1.1 Define excretion. 13.1.2 State human waste products and organs involved in their excretion. 13.1.3 Identify on drawings, diagrams and images, the kidneys, ureters, bladder and urethra. 13.1.4 Explain that the volume and concentration of urine produced is affected by water intake, temperature and exercise. 13.1.5 Outline the structure of the kidney, limited to the cortex, medulla and ureter. 13.1.6 Outline the structure and functioning of a kidney tubule. 13.1.7 Explain dialysis in terms of salt balance, the maintenance of glucose concentration and the removal of urea. 13.1.8 Evaluate the advantages and disadvantages of treating organ failure by mechanical devices or transplant.	174	153-158	1. Examine the structure of the sheep's kidney 2. Show a video about the structure and functioning of kidney tubule 3. Give a presentation about kidney transplant and dialysis machines.	Observation, ICT application, communication and team work

Grade 10 (Bilingual) Biology - Learning outcomes
Semester 1

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
1. Coordination and response					
1.1 Nervous control in humans	1.1.1 Describe a nerve impulse. 1.1.2 Describe the human nervous system in terms of: i. the central nervous system. ii. the peripheral nervous system iii. coordination and regulation of body functions 1.1.3 Distinguish between voluntary and involuntary actions. 1.1.4 Identify motor (effector), relay (connector) and sensory neurones from diagrams. 1.1.5 Describe a simple reflex arc in terms of receptor, sensory neurone, relay neurone, motor neurones and effector. 1.1.6 Describe a reflex action. 1.1.7 Define a *synapse*. 1.1.8 Describe the structure of a synapse, including its components. 1.1.9 Explain how the impulses are transmitted through synapses. 1.1.10 Describe the action of the antagonistic muscles giving the example of biceps and triceps muscles.	181	161-165	1. Show a video about the human nervous system OR reflex arc OR synapses. 2. Test the speed of the students' response in some examples of reflex actions (e.g. pick up a pen during the fall between their fingers).	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
1.2 Sense organs	1.2.1 Define sense organs. 1.2.2 Identify the structures of the eye, limited to cornea, iris, pupil, lens, retina, optic nerve and blind spot. 1.2.3 Describe the function of each part of the eye. 1.2.4 Draw and label the eye.(S) 1.2.5 Explain the pupil reflex in terms of light intensity and pupil diameter. 1.2.6 Explain accommodation to view near and distant objects in terms of the contraction and relaxation of the ciliary muscles, tension in the suspensory ligaments, shape of the lens and refraction of light. 1.2.7 State the distribution of rods and cones in the retina of a human 1.2.8 Outline the function of rods and cones. 1.2.9 Identify the position of the fovea.	186	165-171	1. Identify the structures of the human eye by using the eye model/sheep's eye 2. Examine the pupil's size under a bright light and in the dark.	Observation and communication
1.3 Hormones in humans	1.3.1 Define the term hormone. 1.3.2 Identify specific endocrine glands and their secretions, limited to adrenal glands and adrenaline, pancreas and insulin, testes and testosterone and ovaries and oestrogen. 1.3.3 Illustrate the function and effects of adrenaline. 1.3.4 Give examples of situations in which adrenaline secretion increases. 1.3.5 Demonstrate the functions of insulin, oestrogen and testosterone. 1.3.6 Compare nervous and the hormonal control systems in terms of speed of action, nature of message and duration of response. 1.3.7 Describe the importance of hormones in food industry.	190	170-171	1. Show video about some situations in which adrenaline secretion is increased. 2. Study specific cases of the body's responses and discuss the evidence of whether these responses are from the nervous system or the hormonal system. 3. Arrange a trip to one of beef, poultry and dairy industries and discuss the use of hormones.	Observation, evaluation, communication and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
1.4 Homeostasis	1.4.1 Define homeostasis. 1.4.2 Explain that homeostasis is the control of internal conditions within set limits. 1.4.3 Explain the concept of control by negative feedback. 1.4.4 Demonstrate the structure of the skin using a diagram. 1.4.5 Explain the maintenance of a constant internal body temperature in humans in terms of insulation, sweating, shivering and the role of the brain (limited to blood temperature receptors and coordination). 1.4.6 Describe the maintenance of a constant internal body temperature in humans in terms of vasodilation and vasoconstriction of arterioles supplying skin surface capillaries. 1.4.7 Describe the control of the glucose concentration of the blood by certain hormones. 1.4.8 Outline the symptoms and treatment of diabetes.	192	178-185	1. Use a blood glucose meter to measure the level of blood glucose before and after eating sugar (under the supervision of the teacher). 2. Record changes in body temperature across the full day, in places with different air temperatures and explain the results.	Observation, evaluation, communication and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
1.5 Tropic responses	1.5.1 Define *gravitropism and phototropism.* 1.5.2 Investigate gravitropism and phototropism in shoots and roots. (S) 1.5.3 Explain the role of auxin in controlling shoot growth, limited to: i. auxin made in shoot tip (only). ii. auxin spreads through the plant from the shoot tip. iii. auxin is unequally distributed in response to light and gravity. iv. auxin stimulates cell elongation. 1.5.4 Discuss some commercial uses of plant hormones limited to i. Synchronised fruiting. ii. Production of seedless fruits.	197	172-173	1. Experiments provide clues about phototropism and gravitropism . 2. Give a presentation about the commercial uses of plant hormones.	Scientific enquiry, team work, communication and ethics (safety, health and environment)
2. Drugs					
2.1 Drugs	2.1.1 Define a *drug* as any substance taken into the body that modifies or affects chemical reactions in the body. 2.1.2 Differentiate between medicines and social drugs. 2.1.3 List the main types of drugs according to their effects.	205	188-189	Arrange for a small exhibition in which the students can present some posters and models about the dangers of abusing drugs (alcohol, tobacco, heroin, al afdhal, and other new types of social drugs)	Problem solving, creativity, team work, communication and ethics (safety, health and environment)
2.2 Medicinal drugs	2.2.1 Describe the use of antibiotics. 2.2.2 Discuss that some bacteria are resistant to antibiotics which reduces the effectiveness of antibiotics. 2.2.3 State that antibiotics kill bacteria but do not affect viruses.	205			

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
2.3 Misused drugs	2.3.1 Demonstrate the effects of excessive alcohol consumption and abuse of heroin, limited to: i. powerful depressant drugs. ii. effect on reaction times and self-control. iii. addiction and withdrawal symptoms. iv. negative social implications, e.g. crime. v. Getting infectious diseases, eg. AIDS vi. Liver damage. 2.3.2 Discuss the effect of tobacco on health. 2.3.3 Describe the effects of tobacco smoke and its major toxic components on the gas exchange system limited to carbon monoxide, nicotine and tar. 2.3.4 State that the liver is the site of breakdown of alcohol and other toxins.	207	190-195		
3. Reproduction					
3.1 Asexual reproduction	3.1.1 Define *asexual reproduction.* 3.1.2 Identify examples of asexual reproduction. 3.1.3 Discuss the advantages and disadvantages of asexual reproduction: i. to a population of a species in the wild. ii. to crop production.	213	197-198	1) Show some diagrams and photos about the asexual reproduction 2) Practice some methods of the asexual reproduction in plants.	Observation and communication
3.2 Sexual reproduction	3.2.1 Illustrate the sexual reproduction discussing all related terms. 3.2.2 Define *fertilisation.* 3.2.3 State that the nuclei of gametes are haploid and that the nucleus of a zygote is diploid. 3.2.4 Discuss the advantages and disadvantages of sexual reproduction: I. to a population of a species in the wild. II. to crop production.	219	198-200		Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
3.3 Sexual reproduction in plants	3.3.1 Identify (using a hand lens if necessary) and draw the sepals, petals, stamens, filaments and anthers, carpels, style, stigma, ovary and ovules, of an insect-pollinated flower.(s) 3.3.2 State the functions of the sepals, petals, anthers, stigmas and ovaries 3.3.3 Define *pollination.* 3.3.4 Compare self-pollination and cross-pollination with examples for each of them. 3.3.5 Discuss the implications to a species of self-pollination and cross-pollination in terms of variation, capacity to respond to changes in the environment and reliance on pollinators. 3.3.6 Distinguish, using a hand lens if necessary, between the structural adaptations of insect-pollinated and wind-pollinated flowers. (s) 3.3.7 Describe the growth of pollen tube and its entry into the ovule followed by fertilization. 3.3.8 Define the terms: fertilisation, seeds, fruits, dispersal and seed germination. 3.3.9 Describe how seeds and fruits are adapted for dispersal limited to the examples mentioned in the book. 3.3.10 Investigate and state the environmental conditions that affect germination of seeds, limited to the requirement for water, oxygen and a suitable temperature.(s)	221	200-206	1. Examine the structure of a flower and identify the male and female parts. 2. Examine a range of floral structures in order to differences between wind pollinated and insect pollinated flowers. 3. Visit to appropriate plant Propagation Stations . 4. Investigate the requirement of water, oxygen and suitable temperature for seed germination.	Scientific enquiry, problem solving, team work and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
3.4 Sexual reproduction in humans	3.4.1 Identify and name on diagrams the parts of the male and female reproductive systems. 3.4.2 Describe the functions of each part of the male and female reproductive systems. 3.4.3 State the adaptive features of sperm, limited to flagellum and the presence of enzymes. 3.4.4 State the adaptive features of egg cells, limited to energy stores and a jelly coating that changes after fertilisation. 3.4.5 Compare male and female gametes in terms of size, structure, motility and numbers. 3.4.6 Describe fertilization. 3.4.7 State that in early development, the zygote forms an embryo. 3.4.8 State the functions of the umbilical cord, placenta, amniotic sac and amniotic fluid. 3.4.9 Outline the growth and development of the fetus in terms of increasing complexity in the early stages and increasing size towards the end of pregnancy. 3.4.10 Describe the ante-natal care of pregnant women, limited to special dietary needs and the harm from smoking and alcohol consumption 3.4.11 State that some toxins, e.g. nicotine, and pathogens, e.g. rubella virus, can pass across the placenta and affect the fetus. 3.4.12 Discuss the advantages and disadvantages of breast-feeding compared with bottle-feeding using formula milk.	232	212-217	1. Show a video about the development of embryo. 2. Give a presentation (talk OR poster) about ante-natal care of pregnant women.	Team work, ICT application, communication and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridg		
3.5 Sex hormones in humans	3.5.1 Describe the roles of testosterone and oestrogen in the development and regulation of secondary sexual characteristics during puberty. 3.5.2 Describe the sites of production of oestrogen and progesterone in the menstrual cycle and in pregnancy. 3.5.3 Describe the menstrual cycle in terms of changes in the ovaries and in the lining of the uterus. 3.5.4 Explain the role of hormones in controlling the menstrual cycle and pregnancy, limited to FSH, LH, progesterone and oestrogen.	241	221		Observation and communication
3.6 Sexually transmitted infections (STIs)	3.6.1 Define *sexually transmitted infection (STI).* 3.6.2 State that human immunodeficiency virus (HIV) is an example of an STI. 3.6.3 Explain how the spread of STIs is controlled. 3.6.4 Describe the methods of transmission of HIV. 3.6.5 State that HIV infection may lead to AIDS. 3.6.6 Outline how HIV affects the immune system, limited to decreased lymphocyte numbers and reduced ability to produce antibodies.	245	225-226	Give a presentation (talk OR poster) about AIDS OR other sexually transmitted diseases	Team work, ICT application, communication and ethics (safety, health and environment)

Grade 10 (Bilingual) Biology - Learning outcomes
Semester 2

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
4. Inheritance					
4.1 Inheritance	4.1 Define inheritance	250	230		
4.2 Chromosomes, genes and proteins	4.2.1 Define *chromosome*, gene and allele. 4.2.2 Describe the inheritance of sex in humans with reference to XX and XY chromosomes. 4.2.3 Explain that the sequence of bases in a gene is the genetic code for putting together amino acids in the correct order to make a specific protein (knowledge of the details of nucleotide structure is not required). 4.2.4 Explain that DNA controls cell function by controlling the production of proteins (some of which are enzymes), antibodies and receptors for neurotransmitters. 4.2.5 Explain that all body cells in an organism contain the same genes, but many genes in a particular cell are not expressed because the cell only makes the specific proteins it needs. 4.2.6 Explain what is meant by a *haploid nucleus* and a diploid nucleus. 4.2.7 State that in a diploid cell, there is a pair of each type of chromosome and in a human diploid cell there are 23 pairs. 4.2.8 construct a model to follow the bases sequence in the DNA and determines relationship with the amino acids code (DNA) change one of these sequences and try to define their relationship with the amino acids	250	231	1. construct a model using the colored beads to represent the alleles (dominant and recessive) in the genes of the parents to illustrate how these alleles are transmitted to the gametes and then to the offspring . 2. construct a model using the colored beads to represent how the sequence of bases in a gene determines the sequence of the amino acids in the polypeptide. 3. Show a photo of male and female Karyotypes (Somatic cells and gametes)	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
4.3 Mitosis	4.3.1 Define *mitosis.* 4.3.2 Discuss the role of mitosis in growth, repair of damaged tissues, replacement of cells and asexual reproduction. 4.3.3 Describe with the aid of diagrams, the processes involved in mitosis (details of stages of mitosis are not required). 4.3.4 State that the exact duplication of chromosomes occurs before mitosis 4.3.5 State that during mitosis, the copies of chromosomes separate, maintaining the chromosome number. 4.3.6 Construct models to simulate chromosome behaviour in mitosis. (s) 4.3.7 Draw phases of mitosis from prepared slides. (s) 4.3.8 Describe stem cells as unspecialised cells that divide by mitosis to produce daughter cells that can become specialised for specific functions.	254	232	1. Using of microscope to examine stages of mitosis (Prepared slides) 2. Simulate chromosomal behaviour in mitosis using coloured strings OR plastic wires.	Team work, creativity, observation and communication
4.4 Meiosis	4.4.1 Define meiosis . 4.4.2 State the role of meiosis in production of haploid gametes. 4.4.3 Describe with the aid of diagrams, the processes involved in meiosis (details of stages of meiosis are not required). 4.4.4 Construct models to simulate chromosome behaviour in meiosis. (s) 4.4.5 Justify the importance of reduction of the chromosomes number in meiosis. 4.4.6 Describe how meiosis contributes to heritable variation (details are not required). 4.4.7 Compare the major features of meiosis and mitosis.	255	233	1. Using of microscope to examine stages of meiosis (Prepared slides) 2. Simulate chromosomal behaviour in meiosis using coloured strings OR plastic wires.	Team work, observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
4.5 Monohybrid inheritance	4.5.1 Define these terms; genotype, phenotype, dominant alleles, recessive alleles heterozygous and homozygous. 4.5.2 Deduce that two identical homozygous individuals that breed together will be pure-breeding and that a heterozygous individual will not be pure-breeding. 4.5.3 Interpret pedigree diagrams for the inheritance of a given characteristic. 4.5.4 Construct genetic diagrams to predict the results of monohybrid crosses and calculate phenotypic ratios, limited to 1:1 and 3:1 ratios.(s) 4.5.5 Design Punnett squares in crosses which result in more than one genotype to work out and show the possible different genotypes. (s) 4.5.6 Explain how to use a test cross to identify an unknown genotype. 4.5.7 Explain co-dominance by reference to the inheritance of ABO blood groups. 4.5.8 Explain the pattern of inheritance of sex-linked genes. 4.5.9 Describe colour blindness as an example of sex linkage. 4.5.10 Design genetic diagrams to predict the results of monohybrid crosses involving co-dominance or sex linkage and calculate phenotypic ratios. (s)	259	235-239	1. Practicing using of Punnett square. 2. Practicing solving pedigrees. 3. Collect and interpret statistical information about some common inherited diseases in Oman.	Problem solving, critical thinking and team work

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
4.6 Genetic engineering	4.6.1 Define genetic engineering. 4.6.2 State examples of genetic engineering: – the insertion of human genes into bacteria to produce human insulin – the insertion of genes into crop plants to confer resistance to herbicides and insect pests. 4.6.3. Discuss the advantages and disadvantages of genetically modified crops, such as soya, maize and rice.	310		Give a presentation about genetically modified crops.	
5. Variation and selection					
5.1 Variation	5.1.1 Define variation. 5.1.2 Discuss that phenotypic variation is caused by both genetic and environmental factors. 5.1.3 Distinguish between continuous and discontinuous variation limited to that: i. continuous variation: - caused by several genes acting together or from both genes and environment - results in a range of phenotypes between two extremes, e.g. height in humans. ii. discontinuous variation: - caused by genes alone, e.g. A, B, AB and O blood groups in humans. - results in a limited number of phenotypes with no intermediates, e.g. tongue rolling. 5.1.4 Record and present the results of investigations into continuous and discontinuous variation. (s) 5.1.5 State definition and causes of mutation. 5.1.6 Distinguish between chromosome and gene mutations with an example for each of them. 5.1.7 Justify that mutation is the way in which new alleles are formed. 5.1.8 State that ionising radiation and some chemicals increase the rate of mutation.	270	247-249	1. Investigations into continuous and discontinuous variation in the class (statistical work). 2. Write instruction set to carry out a task, then change one of the instructions and then try to do the mission. 3. Collect and interpret statistical information about Down's syndrome and sickle cell anemia in Oman. 4. Arrange for a scientific debate between students distributing to them specific roles on evidence available that agree about the effects of radiation and chemicals on mutation rates.	ICT application, team work and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
5.2 Adaptive features	5.2.1 Define *adaptive feature in term of* inherited feature and inherited functional features . 5.2.2 Interpret images or other information about a species to describe its adaptive features. 5.2.3 Define *fitness.* 5.2.4 Explain the adaptive features of hydrophytes and xerophytes to their environments.	274	250-251	1. Present images and samples about a species to describe its adaptive features. 2. Record observations for various types of Omani plants (including shrubs and trees) that live in the desert and describe their adaptive features.	Observation and communication
6. Organisms and their environment					
6.1 Energy flow	1.1.1 Discuss that the Sun is the principal source of energy input to biological systems. 1.1.2 Describe the flow of energy through living organisms.	284	266	Designing charts	Team work

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
6.2 Food chains and food webs	6.2.1 Define the following terms; food chain, food web, producer, consumer, herbivore, carnivore, omnivore, decomposer and the trophic level. 6.2.2 Construct simple food chains. (s) 6.2.3 State that consumers may be classed as primary, secondary and tertiary according to their position in a food chain. 6.2.4 Describe how energy is transferred between trophic levels. 6.2.5 Explain why the transfer of energy from one trophic level to another is inefficient. 6.2.6 Explain why food chains usually have fewer than five trophic levels. 6.2.7 Explain why there is a greater efficiency in supplying plants as human food, and that there is a relative inefficiency in feeding crop plants to livestock that will be used as food. 6.2.8 Interpret food chains and food webs in terms of identifying producers and consumers. (s) 6.2.9 Use food chains and food webs to describe the impacts humans have through over-harvesting of food species and through introducing foreign species to a habitat. (s) 6.2.10 Draw, describe and interpret pyramids of numbers and pyramids of biomass. (s) 6.2.11 Discuss the advantages of using a pyramid of biomass.	285	266	Drawing and interpreting food chains , food webs, pyramids of numbers and pyramids of mass.	Problem solving, critical thinking, and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
6.3 Nutrient cycles	6.3.1 Describe the carbon cycle, limited to photosynthesis, respiration, feeding, decomposition, fossilisation and combustion. 6.3.2 Discuss the effects of the combustion of fossil fuels and the cutting down of forests on the carbon dioxide concentrations in the atmosphere. 6.3.3 Describe the water cycle, limited to evaporation, transpiration, condensation and precipitation. 6.3.4 Describe the nitrogen cycle in terms of: i. decomposition of plant and animal protein to ammonium ions ii. nitrification. iii. nitrogen fixation by lightning and bacteria. iv. absorption of nitrate ions by plants. v. production of amino acids and proteins. vi. feeding and digestion of proteins. vii. deamination. viii. denitrification. 6.3.5 State the roles of microorganisms in the nitrogen cycle, limited to decomposition, nitrification, nitrogen fixation and denitrification (generic names of individual bacteria, e.g. Rhizobium, are not required).	292	270-272	Practicing interpret nutrient cycles.	Critical thinking, and ethics (safety, health and environment)

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
6.4 Population size	6.4.1 Define *population.* 6.4.2 Identify and state the factors affecting the rate of population growth for a population of an organism, limited to biotic factors such as food supply, predation and disease. 6.4.3 Identify the lag, exponential (log), stationary and death phases in the sigmoid population growth curve for a population growing in an environment with limited resources.	296	272-273		Observation and communication
7. Human influences on ecosystems					
7.1 Food supply	7.1.1 State how modern technology has resulted in increased food production in terms of: i. agricultural machinery to use larger areas of land and improve efficiency ii. chemical fertilisers to improve yields. iii. insecticides to improve quality and yield. iv. herbicides to reduce competition with weeds. v. selective breeding to improve production by crop plants and livestock, e.g. cattle, fish and poultry. 7.1.2 Illustrate the negative impacts to an ecosystem of large-scale monocultures of crop plants. 7.1.3 Illustrate the negative impacts to an ecosystem of intensive livestock production.	316	293	Arrange for a scientific debate between students distributing to them specific roles on evidences available that agree or disagree about the negative impacts of large-scale monocultures of crop plants on an ecosystem	Critical thinking and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
7.2 Habitat destruction	7.2.1 Explain the reasons for habitat destruction, limited to: i. increased area for food crop growth, livestock production and housing. ii. extraction of natural resources. iii. marine pollution. 7.2.2 Explain the undesirable effects of deforestation as an example of habitat destruction, to include extinction, loss of soil, flooding and increase of carbon dioxide in the atmosphere.	320	292-293	Show a video about the undesirable effects of deforestation on the environment	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
7.3 Pollution	7.3.1 State the sources and effects of pollution of land and water, e.g. rivers, lakes and the sea, by insecticides, herbicides and by nuclear fall-out 7.3.2 Explain the process of eutrophication of water in terms of: i. increased availability of nitrate and other ions. ii. increased growth of producers. iii. increased decomposition after death of Producers. iv. increased aerobic respiration by decomposers. v. reduction in dissolved oxygen. vi. death of organisms requiring dissolved oxygen in water. 7.3.3 Discuss the effects of non-biodegradable plastics in the environment, in both aquatic and terrestrial ecosystems. 7.3.4 Discuss the causes and effects on the environment of acid rain. 7.3.5 Explain how increases in carbon dioxide and methane concentrations in the atmosphere cause an enhanced greenhouse effect that leads to climate change. 7.3.6 Discuss possible remedies and solutions that are taken to reduce the impact of the above types of pollution on environment.	324	299	1. Show a video about pollution (causes, effects and possible remedies) 2. A visit to one of the institutions that are in charge with the environment in Oman and write a report about their rules and regulations in order to reduce pollution.	Observation and communication

Subtopics	Learning Outcomes	Pages		Suggested teaching and learning activities + Practical work	Skills
		Hodder	Cambridge		
7.4 Conservation	7.4.1 Define a *sustainable resource.* 7.4.2 Explain the need to conserve non-renewable resources, limited to fossil fuels. 7.4.3 State the products that can be recycled and benefits of recycling. 7.4.4 Discuss the functions and importance of sewage treatment. 7.4.5 Explain how forests and fish stocks can be sustained using education, legal quotas and restocking. 7.4.6 Explain reasons for conservation programs.	334	307	Show videos about conservation of fossil fuels , sewage treatment and recycling	Observation and communication

Yearly plan

	Grade 9 – semester one	Grade 9 – semester two	Grade 10 – semester one	Grade 10 – semester two
1	Characteristics of living organisms and classification	Human nutrition	Coordination and response	Inheritance
2	Organization of the organisms	Transport in plants	Drugs	Variation and selection
3	Movement in and out of cells.	Transport in animals	Reproduction	Organisms and their environment
4	Biological molecules	Gas exchange		Human influence on ecosystem
5	Enzymes	Respiration		
6	Diseases and immunity	Excretion		
7	Plant nutrition			

Resources for teachers to upgrade their knowledge and skills

Teacher support	http://www.cie.org.uk/teaching-and-learning/
How to teach	https://www.international.heacademy.ac.uk/
Past paper resource	http://papers.xtremepapers.com/CIE/Cambridge%20IGCSE/
Teaching strategies	http://www.teachthought.com/pedagogy/instructional-strategies/50-teaching-strategies-to-jumpstart-your-teacher-brain/

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نهاية الإطار المنهجي

End of Biology Syllabus