**OCR A - AS Biology Checklist**

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| Unit |  |  |
| **Module 1: Development of Practical Skills in Biology** |
| 1 | Can you design experiments? |  |
|  | Can you solve problems set in a practical context? |  |
|  | Can you identify variables that must be controlled? |  |
|  | Can you evaluate an experimental method and assess whether it is appropriate to meet expected outcomes? |  |
|  | Can you use a wide range of practical apparatus and techniques correctly? |  |
|  | Can you use appropriate units for measurements? |  |
|  | Can you present observations and data in an appropriate format? |  |
|  | Can you process, analyse, and interpret qualitative and quantitative experimental results? |  |
|  | Can you use appropriate mathematical skills for analysis of quantitative data? |  |
|  | Can you use significant figures appropriately? |  |
|  | Can you plot and interpret graphs from experimental results? |  |
|  | Can you select and label axes with appropriate scales, quantities, and units? |  |
|  | Can you measure gradients and intercepts? |  |
|  | Can you evaluate results and draw conclusions? |  |
|  | Can you identify anomalies in experimental measurements? |  |
|  | Can you explain the limitations in experimental procedures? |  |
|  | Can you give precise and accurate measurements and data? |  |
|  | Can you refine experimental design by suggesting improvements to the procedures and apparatus? |  |
| **Module 2: Foundations in Biology** |
| 2 | Can you use microscopy to observe and investigate different types of cell and cell structure in a range of eukaryotic organisms? |  |
|  | Can you prepare and examine microscope slides for use in light microscopy? |  |
|  | Can you use staining in light microscopy? |  |
|  | Can you draw and annotate diagrams of whole cells or cells in sections of tissue? |  |
|  | Can you use and manipulate the magnification formula? |  |
|  | Can you explain the difference between magnification and resolution? |  |
|  | Can you describe the ultrastructure of eukaryotic cells and the functions of the different cellular components? |  |
|  | Can you analyse photomicrographs of cellular components in a range of eukaryotic cells? |  |
|  | Can you describe the interrelationship between the organelles involved in the production and secretion of proteins? |  |
|  | Can you explain the importance of the cytoskeleton? |  |
|  | Can you describe the similarities and differences in the structure and ultrastructure of prokaryotic and eukaryotic cells? |  |
| 3 | Can you describe how hydrogen bonding occurs between water molecules?  |  |
|  | Can you relate hydrogen bonding, and other properties of water, to the roles of water in living organisms? |  |
|  | Can you explain the concept of monomers and polymers? |  |
|  | Can you explain the importance of condensation and hydrolysis reactions in a range of biological molecules? |  |
|  | Can you list the chemical elements that make up biological molecules? |  |
|  | Can you describe the ring structure and properties of glucose as an example of a hexose monosaccharide? |  |
|  | Can you describe the structure of ribose as an example of a pentose monosaccharide? |  |
|  | Can you describe the synthesis and breakdown of a disaccharide and polysaccharide by the formation and breakage of glycosidic bonds? |  |
|  | Can you describe the structure of starch (amylose and amylopectin), glycogen, and cellulose molecules? |  |
|  | Can you explain how the structures and properties of glucose, starch, glycogen, and cellulose molecules relate to their functions in living organisms? |  |
|  | Can you describe the structure of a triglyceride and a phospholipid as examples of macromolecules? |  |
|  | Can you explain the synthesis and breakdown of triglycerides by the formation (esterification) and breakage of ester bonds between fatty acids and glycerol? |  |
|  | Can you describe how the properties of triglyceride, phospholipid, and cholesterol molecules relate to their functions in living organisms? |  |
|  | Can you describe the general structure of an amino acid? |  |
|  | Can you describe the synthesis and breakdown of dipeptides and polypeptides, by the formation and breakage of peptide bonds? |  |
|  | Can you explain the levels of protein structure? |  |
|  | Can you describe the structure and function of globular proteins including a conjugated protein? |  |
|  | Can you list the properties and functions of fibrous proteins? |  |
|  | Can you list the key inorganic ions that are involved in biological processes? |  |
|  | Can you describe how to carry out and interpret the results of the following chemical tests:• biuret test for proteins• Benedict’s test for reducing and non- reducing sugars• reagent test strips for reducing sugars• iodine test for starch• emulsion test for lipids? |  |
|  | Can you use quantitative methods to determine the concentration of a chemical substance in a solution? |  |
|  | Can you describe the principles and uses of paper and thin layer chromatography to separate biological molecules / compounds? |  |
|  | Can you carry out practical investigations to analyse biological solutions using paper or thin layer chromatography? |  |
|  | Can you describe the structure of a nucleotide as the monomer from which nucleic acids are made? |  |
|  | Can you explain the synthesis and breakdown of polynucleotides by the formation and breakage of phosphodiester bonds? |  |
|  | Can you describe the structure of ADP and ATP as phosphorylated nucleotides? |  |
|  | Can you describe the structure of DNA (deoxyribonucleic acid)? |  |
|  | Can you carry out practical investigations into the purification of DNA by precipitation? |  |
|  | Can you explain semi-conservative DNA replication? |  |
|  | Can you describe the nature of the genetic code? |  |
|  | Can you describe the transcription and translation of genes resulting in the synthesis of polypeptides? |  |
| 4 | Can you explain the role of enzymes in catalysing reactions that affect metabolism at a cellular and whole organism level? |  |
|  | Can you explain the role of enzymes in catalysing both intracellular and extracellular reactions? |  |
|  | Can you describe the mechanism of enzyme action? |  |
|  | Can you describe the effects of pH, temperature, enzyme concentration, and substrate concentration on enzyme activity? |  |
|  | Can you carry out practical investigations into the effects of pH, temperature, enzyme concentration, and substrate concentration on enzyme activity? |  |
|  | Can you explain the need for coenzymes, cofactors, and prosthetic groups in some enzyme-controlled reactions? |  |
|  | Can you describe the effects of inhibitors on the rate of enzyme-controlled reactions? |  |
| 5 | Can you explain the roles of membranes within cells and at the surface of cells? |  |
|  | Can you describe the fluid mosaic model of membrane structure and the roles of its components? |  |
|  | Can you list the factors affecting membrane structure and permeability? |  |
|  | Can you carry out practical investigations into factors affecting membrane structure and permeability? |  |
|  | Can you describe the movement of molecules across membranes? |  |
|  | Can you carry out practical investigations into the factors affecting diffusion rates in model cells? |  |
|  | Can you describe the movement of water across membranes by osmosis and the effects that solutions of different water potential can have on plant and animal cells? |  |
|  | Can you carry out practical investigations into the effects of solutions of different water potential on plant and animal cells? |  |
| 6 | Can you describe the cell cycle? |  |
|  | Can you explain how the cell cycle is regulated? |  |
|  | Can you list the main stages of mitosis? |  |
|  | Can you draw sections of plant tissue showing the cell cycle and stages of mitosis? |  |
|  | Can you explain the significance of mitosis in life cycles? |  |
|  | Can you explain the significance of meiosis in life cycles? |  |
|  | Can you list the main stages of meiosis? |  |
|  | Can you explain how cells of multicellular organisms are specialised for particular functions? |  |
|  | Can you explain the organisation of cells into tissues, organs, and organ systems? |  |
|  | Can you describe the features and differentiation of stem cells? |  |
|  | Can you explain the production of erythrocytes and neutrophils derived from stem cells in bone marrow? |  |
|  | Can you describe the production of xylem vessels and phloem sieve tubes from meristems? |  |
|  | Can you list the potential uses of stem cells in research and medicine? |  |
| **Module 3: Exchange and Transport** |
| 7 | Can you explain the need for specialised exchange surfaces? |  |
|  | Can you list the features of an efficient exchange surface? |  |
|  | Can you describe the structures and functions of the components of the mammalian gaseous exchange system? |  |
|  | Can you explain the mechanism of ventilation in mammals? |  |
|  | Can you describe the relationship between vital capacity, tidal volume, breathing rate, and oxygen uptake? |  |
|  | Can you describe the mechanisms of ventilation and gas exchange in bony fish and insects? |  |
|  | Can you dissect, examine and draw the gaseous exchange system of a bony fish and/or insect trachea? |  |
|  | Can you examine microscope slides to show the histology of exchange surfaces? |  |
| 8 | Can you explain the need for transport systems in multicellular animals? |  |
|  | Can you list the different types of circulatory systems? |  |
|  | Can you describe the structure and functions of arteries, arterioles, capillaries, venules, and veins? |  |
|  | Can you describe the formation of tissue fluid from plasma? |  |
|  | Can you describe the external and internal structure of the mammalian heart? |  |
|  | Can you dissect, examine, and draw the external and internal structure of the mammalian heart? |  |
|  | Can you describe the cardiac cycle? |  |
|  | Can you explain how heart action is initiated and coordinated? |  |
|  | Can you explain the use and interpretation of electrocardiogram (ECG) traces? |  |
|  | Can you describe the role of haemoglobin in transporting oxygen and carbon dioxide? |  |
|  | Can you describe the oxygen dissociation curve for fetal and adult human haemoglobin? |  |
| 9 | Can you explain the need for transport systems in multicellular plants? |  |
|  | Can you describe the structure and function of the vascular system in the roots, stems, and leaves of herbaceous dicotyledonous plants? |  |
|  | Can you examine and draw stained sections of plant tissue to show the distribution of xylem and phloem? |  |
|  | Can you dissect stems, both longitudinally and transversely, and examine them to demonstrate the position and structure of xylem vessels? |  |
|  | Can you describe the process of transpiration and the environmental factors that affect transpiration rate? |  |
|  | Can you carry out practical investigations to estimate transpiration rates? |  |
|  | Can you describe the transport of water into the plant, through the plant and to the air surrounding the leaves? |  |
|  | Can you describe adaptations of plants to the availability of water in their environment? |  |
|  | Can you explain the mechanism of translocation? |  |
| **Module 4: Biodiversity, Evolution and Disease** |
| 10 | Can you explain the biological classification of species? |  |
|  | Can you explain the binomial system of naming species and the advantage of such a system? |  |
|  | Can you describe the features used to classify organisms into the five kingdoms: Prokaryotae, Protoctista, Fungi, Plantae, Animalia? |  |
|  | Can you describe the evidence that has led to new classification systems, such as the three domains of life, which clarifies relationships? |  |
|  | Can you describe the relationship between classification and phylogeny? |  |
|  | Can you explain the evidence for the theory of evolution by natural selection? |  |
|  | Can you list and describe the different types of variation? |  |
|  | Can you describe the different types of adaptations of organisms to their environment? |  |
|  | Can you describe the mechanism by which natural selection can affect the characteristics of a population over time? |  |
|  | Can you explain how evolution in some species has implications for human populations? |  |
| 11 | Can you explain how biodiversity may be considered at different levels? |  |
|  | Can you explain the importance of sampling and how it is used in measuring the biodiversity of a habitat? |  |
|  | Can you carry out practical investigations collecting random and non-random samples in the field? |  |
|  | Can you describe how to measure species richness and species evenness in a habitat? |  |
|  | Can you use and interpret the Simpson’s Index of Diversity (*D*) to calculate the biodiversity of a habitat? |  |
|  | Can you explain how genetic biodiversity may be assessed, including calculations? |  |
|  | Can you describe the factors affecting biodiversity? |  |
|  | Can you explain the ecological, economic, and aesthetic reasons for maintaining biodiversity? |  |
|  | Can you describe *in situ* and *ex situ* methods of maintaining biodiversity? |  |
|  | Can you describe some international and local conservation agreements made to protect species and habitats? |  |
| 12 | Can you describe the different types of pathogen that can cause communicable diseases in plants and animals? |  |
|  | Can you explain the means of transmission of animal and plant communicable pathogens? |  |
|  | Can you list and describe plant defences against pathogens? |  |
|  | Can you list and describe the primary non-specific defences against pathogens in animals? |  |
|  | Can you describe the structure and mode of action of phagocytes? |  |
|  | Can you examine and draw cells observed in blood smears? |  |
|  | Can you describe the structure, different roles, and modes of action of B and T lymphocytes in the specific immune response? |  |
|  | Can you describe the primary and secondary immune responses? |  |
|  | Can you describe the structure and general functions of antibodies? |  |
|  | Can you provide outline of the action of opsonins, agglutinins, and anti-toxins? |  |
|  | Can you describe the differences between active and passive immunity, and between natural and artificial immunity? |  |
|  | Can you explain autoimmune diseases? |  |
|  | Can you explain the principles of vaccination and the role of vaccination programmes in the prevention of epidemics? |  |
|  | Can you list and describe possible sources of medicines? |  |
|  | Can you explain the benefits and risks of using antibiotics to manage bacterial infection? |  |