Biology: AQA

Year 1
Revision Checklist

Created by STEMpathy | September 2025

Welcome to your revision checklist 👋

This resource brings together the biology content you need to know for your exam board, broken down into a full, detailed checklist of points.

On the next page, you'll find a **master checklist** of the main topics – tick these off once you've completed the full set of checklist points for that topic.

The PDF is **fully interactive**, so you can jump between sections easily. Tap or click the boxes to add a ☑. To help you keep track of your progress, we've also added a simple scoring system:

Master Checklist

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Biological Molecules

Monomers and Polymers

Learning Outcome			
The variety of life, both past and present, is extensive, but the biochemical basis of life is similar for all living things	☐	☐	☐
Monomers are the smaller units from which larger molecules are made	☐	☐	☐
Polymers are molecules made from a large number of monomers joined together	☐	☐	☐
Monosaccharides, amino acids and nucleotides are examples of monomers	☐	☐	☐
A condensation reaction joins two molecules together with the formation of a chemical bond and involves the elimination of a molecule of water	☐	☐	☐
A hydrolysis reaction breaks a chemical bond between two molecules and involves the use of a water molecule	☐	☐	☐

Carbohydrates

Learning Outcome			
Monosaccharides are the monomers from which larger carbohydrates are made. Glucose, galactose and fructose are common monosaccharides	☐	☐	☐
A condensation reaction between two monosaccharides forms a glycosidic bond	☐	☐	☐
Disaccharides are formed by the condensation of two monosaccharides	☐	☐	☐
Maltose is a disaccharide formed by condensation of two glucose molecules	☐	☐	☐
Sucrose is a disaccharide formed by condensation of a glucose molecule and a fructose molecule	☐	☐	☐
Lactose is a disaccharide formed by condensation of a glucose molecule and a galactose molecule	☐	☐	☐
Glucose has two isomers, α-glucose and β-glucose, know the structure of each	☐	☐	☐
Polysaccharides are formed by the condensation of many glucose units	☐	☐	☐
Glycogen and starch are formed by the condensation of α-glucose	☐	☐	☐
Cellulose is formed by the condensation of β-glucose	☐	☐	☐
The basic structure and functions of glycogen, starch and cellulose. The relationship of structure to function of these substances in animal cells and plant cells	☐	☐	☐
Biochemical tests using Benedict's solution for reducing sugars and non-reducing sugars and iodine/potassium iodide for starch	☐	☐	☐

Lipids			
Learning Outcome			
Triglycerides and phospholipids are two groups of lipid	☐	☐	☐
Triglycerides are formed by the condensation of one molecule of glycerol and three molecules of fatty acid	☐	☐	☐
A condensation reaction between glycerol and a fatty acid (RCOOH) forms an ester bond	☐	☐	☐
The R-group of a fatty acid may be saturated or unsaturated	☐	☐	☐
In phospholipids, one of the fatty acids of a triglyceride is substituted by a phosphate-containing group	☐	☐	☐
The different properties of triglycerides and phospholipids related to their different structures	☐	☐	☐
The emulsion test for lipids	☐	☐	☐
Recognise, from diagrams, saturated & unsaturated fatty acids	☐	☐	☐
Be able to explain the different properties of triglycerides and phospholipids	☐	☐	☐

Proteins

General properties of proteins

Learning Outcome			
Amino acids are the monomers from which proteins are made.	☐	☐	☐
Know the general structure of an amino acid. Where NH_2 represents an amine group, COOH represents a carboxyl group and R represents a side chain. The twenty amino acids that are common in all organisms differ only in their side group	☐	☐	☐
A condensation reaction between two amino acids forms a peptide bond	☐	☐	☐
Dipeptides are formed by the condensation of two amino acids	☐	☐	☐
Polypeptides are formed by the condensation of many amino acids	☐	☐	☐
A functional protein may contain one or more polypeptides	☐	☐	☐
The role of hydrogen bonds, ionic bonds and disulfide bridges in the structure of proteins	☐	☐	☐
Proteins have a variety of functions within all living organisms. The relationship between primary, secondary, tertiary and quaternary structure, and protein function	☐	☐	☐
Know the Biuret test for proteins	☐	☐	☐
Students should be able to relate the structure of proteins to properties of proteins named throughout the specification	☐	☐	☐

Many proteins are enzymes			
Learning Outcome			
Each enzyme lowers the activation energy of the reaction it catalyses	☐	☐	☐
The induced-fit model of enzyme action	☐	☐	☐
The properties of an enzyme relate to the tertiary structure of its active site and its ability to combine with complementary substrate(s) to form an enzyme-substrate complex	☐	☐	☐
The specificity of enzymes	☐	☐	☐
The effects of the following factors on the rate of enzyme controlled reactions - enzyme concentration, substrate concentration, concentration of competitive and of noncompetitive inhibitors, pH and temperature	☐	☐	☐
Appreciate how models of enzyme action have changed over time	☐	☐	☐
Be able to appreciate that enzymes catalyse a wide range of intracellular and extracellular reactions that determine structures and functions from cellular to whole-organism level	☐	☐	☐
Required practical 1: Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction	☐	☐	☐

Nucleic Acids are Important Information-Carrying Molecules

Structure of DNA and RNA

Learning Outcome			
Deoxyribonucleic acid (DNA) and ribonucleic acid (RNA) are important information-carrying molecules. In all living cells, DNA holds genetic information and RNA transfers genetic information from DNA to the ribosomes	☐	☐	☐
Ribosomes are formed from RNA and proteins	☐	☐	☐
Both DNA and RNA are polymers of nucleotides. Each nucleotide is formed from a pentose, a nitrogen-containing organic base and a phosphate group	☐	☐	☐
The components of a DNA nucleotide are deoxyribose, a phosphate group and one of the organic bases adenine, cytosine, guanine or thymine	☐	☐	☐
The components of an RNA nucleotide are ribose, a phosphate group and one of the organic bases adenine, cytosine, guanine or uracil	☐	☐	☐
A condensation reaction between two nucleotides forms a phosphodiester bond	☐	☐	☐
A DNA molecule is a double helix with two polynucleotide chains held together by hydrogen bonds between specific complementary base pairs	☐	☐	☐
An RNA molecule is a relatively short polynucleotide chain	☐	☐	☐
Be able to appreciate that the relative simplicity of DNA led many scientists to doubt that it carried the genetic code	☐	☐	☐

DNA replication			
Learning Outcome			
The semi-conservative replication of DNA ensures genetic continuity between generations of cells	☐	☐	☐
The process of semi-conservative replication of DNA in terms of the unwinding of the double helix	☐	☐	☐
The process of semi-conservative replication of DNA in terms of the breakage of hydrogen bonds between complementary bases in the polynucleotide strands	☐	☐	☐
The process of semi-conservative replication of DNA in terms of the role of DNA helicase in unwinding DNA and breaking its hydrogen bonds	☐	☐	☐
The process of semi-conservative replication of DNA in terms of the attraction of new DNA nucleotides to exposed bases on template strands and base pairing	☐	☐	☐
The process of semi-conservative replication of DNA in terms of the role of DNA polymerase in the condensation reaction that joins adjacent nucleotides	☐	☐	☐
Be able to evaluate the work of scientists in validating the Watson–Crick model of DNA replication	☐	☐	☐

ATP			
Learning Outcome			
A single molecule of adenosine triphosphate (ATP) is a nucleotide derivative and is formed from a molecule of ribose, a molecule of adenine and three phosphate groups	☐	☐	☐
Hydrolysis of ATP to adenosine diphosphate (ADP) and an inorganic phosphate group (P_i) is catalysed by the enzyme ATP hydrolase	☐	☐	☐
The hydrolysis of ATP can be coupled to energy-requiring reactions within cells	☐	☐	☐
The inorganic phosphate released during the hydrolysis of ATP can be used to phosphorylate other compounds, often making them more reactive	☐	☐	☐
ATP is resynthesised by the condensation of ADP and P_i . This reaction is catalysed by the enzyme ATP synthase during photosynthesis, or during respiration	☐	☐	☐

Water			
Learning Outcome			
Know that water is a major component of cells. It has several properties that are important in biology	☐	☐	☐
Water is a metabolite in many metabolic reactions, including condensation and hydrolysis reactions	☐	☐	☐
Water is an important solvent in which metabolic reactions occur	☐	☐	☐
Water has a relatively high heat capacity, buffering changes in temperature	☐	☐	☐
Water has a relatively large latent heat of vaporisation, providing a cooling effect with little loss of water through evaporation	☐	☐	☐
Water has strong cohesion between water molecules; this supports columns of water in the tube-like transport cells of plants and produces surface tension where water meets air	☐	☐	☐

Inorganic Ions			
Learning Outcome			
Inorganic ions occur in solution in the cytoplasm and body fluids of organisms, some in high concentrations and others in very low concentrations	☐	☐	☐
Each type of ion has a specific role, depending on its properties	☐	☐	☐
Students should be able to recognise the role of ions in the following topics: hydrogen ions and pH; iron ions as a component of haemoglobin; sodium ions in the co-transport of glucose and amino acids; and phosphate ions as components of DNA and of ATP	☐	☐	☐

Cells

Cell Structure

Structure of eukaryotic cells

Learning Outcome			
The structure of eukaryotic cells, restricted to the structure and function of the cell-surface membrane, nucleus, mitochondria, chloroplasts, Golgi apparatus, Golgi vesicles, ribosomes, rough endoplasmic reticulum, smooth endoplasmic reticulum, cell wall, lysosomes and cell vacuole	☐	☐	☐
Know that the nucleus contains chromosomes, consisting of protein-bound, linear DNA, and one or more nucleoli	☐	☐	☐
Know that plants and algae contain chloroplasts (in plants and algae)	☐	☐	☐
Know that plants, algae and fungi have a cell wall	☐	☐	☐
Know that lysosomes are membrane-bound organelles that releases hydrolytic enzymes	☐	☐	☐
Know that plant cells contain a vacuole	☐	☐	☐
In complex multicellular organisms, eukaryotic cells become specialised for specific functions. Specialised cells are organised into tissues, tissues into organs and organs into systems	☐	☐	☐
Be able to apply knowledge of these features in explaining adaptations of eukaryotic cells	☐	☐	☐

Structure of prokaryotic cells and of viruses

Learning Outcome			
Prokaryotic cells are much smaller than eukaryotic cells. They also differ from eukaryotic cells in having a cytoplasm that lacks membrane-bound organelles, smaller ribosomes, no nucleus, one or more plasmids, a capsule surrounding the cell and one of more flagella (details of these structural differences is not required)	☐	☐	☐
Know that the prokaryotes have a single circular DNA molecule that is free in the cytoplasm and is not associated with proteins	☐	☐	☐
Know that the prokaryotic cell wall that contains murein, a glycoprotein	☐	☐	☐
Viruses are acellular and non-living. The structure of virus particles to include genetic material, capsid and attachment protein	☐	☐	☐

Methods of studying cells			
Learning Outcome			
The principles and limitations of optical microscopes, transmission electron microscopes and scanning electron microscopes	☐	☐	☐
Measuring the size of an object viewed with an optical microscope. The difference between magnification and resolution	☐	☐	☐
Use of the formula: magnification = size of image / size of real object	☐	☐	☐
Principles of cell fractionation and ultracentrifugation as used to separate cell components	☐	☐	☐
Be able to appreciate that there was a considerable period of time during which the scientific community distinguished between artefacts and cell organelles	☐	☐	☐

All Cells Arise from Other Cells

Learning Outcome			
Within multicellular organisms, not all cells retain the ability to divide	☐	☐	☐
Eukaryotic cells that do retain the ability to divide show a cell cycle	☐	☐	☐
DNA replication occurs during the interphase of the cell cycle	☐	☐	☐
Mitosis is the part of the cell cycle in which a eukaryotic cell divides to produce two daughter cells, each with the identical copies of DNA produced by the parent cell during DNA replication	☐	☐	☐
The behaviour of chromosomes during interphase, prophase, metaphase, anaphase and telophase of mitosis. The role of spindle fibres attached to centromeres in the separation of chromatids	☐	☐	☐
Division of the cytoplasm (cytokinesis) usually occurs, producing two new cells	☐	☐	☐
Be able to recognise the stages of the cell cycle: interphase, prophase, metaphase, anaphase and telophase (including cytokinesis)	☐	☐	☐
Be able to explain the appearance of cells in each stage of mitosis	☐	☐	☐
Mitosis is a controlled process. Uncontrolled cell division can lead to the formation of tumours and of cancers. Many cancer treatments are directed at controlling the rate of cell division	☐	☐	☐
Binary fission in prokaryotic cells involves replication of the circular DNA and of plasmids and that the division of the cytoplasm produces two daughter cells, each with a single copy of the circular DNA and a variable number of copies of plasmids	☐	☐	☐
Being non-living, viruses do not undergo cell division. Following injection of their nucleic acid, the infected host cell replicates the virus particles	☐	☐	☐
Required practical 2: Preparation of stained squashes of cells from plant root tips; set-up and use of an optical microscope to identify the stages of mitosis in these stained squashes and calculation of a mitotic index. Students should measure the apparent size of cells in the root tip and calculate their actual size using the formula: actual size = size of image / magnification	☐	☐	☐

Transport Across Cell Membranes

Learning Outcome			
The basic structure of all cell membranes, including cell-surface membranes and the membranes around the cell organelles of eukaryotes, is the same	☐	☐	☐
The arrangement and any movement of phospholipids, proteins, glycoproteins and glycolipids in the fluid-mosaic model of membrane structure. Cholesterol may also be present in cell membranes where it restricts the movement of other molecules making up the membrane	☐	☐	☐
Movement across membranes by simple diffusion (involving limitations imposed by the nature of the phospholipid bilayer)	☐	☐	☐
Movement across membranes by facilitated diffusion (involving the roles of carrier proteins and channel proteins)	☐	☐	☐
Movement across membranes by osmosis (explained in terms of water potential)	☐	☐	☐
Movement across membranes by active transport (involving the role of carrier proteins and the importance of the hydrolysis of ATP)	☐	☐	☐
Movement across membranes by co-transport (illustrated by the absorption of sodium ions and glucose by cells lining the mammalian ileum)	☐	☐	☐
Cells may be adapted for rapid transport across their internal or external membranes by an increase in surface area of, or by an increase in the number of protein channels and carrier molecules in, their membranes	☐	☐	☐
Be able to explain the adaptations of specialised cells in relation to the rate of transport across their internal and external membranes	☐	☐	☐
Be able to explain how surface area, number of channel or carrier proteins and differences in gradients of concentration or water potential affect the rate of movement across cell membranes	☐	☐	☐
Required practical 3: Production of a dilution series of a solute to produce a calibration curve with which to identify the water potential of plant tissue	☐	☐	☐
Required practical 4: Investigation into the effect of a named variable on the permeability of cell-surface membranes	☐	☐	☐

Cell Recognition and the Immune System

Learning Outcome			
Each type of cell has specific molecules on its surface that identify it. These molecules include proteins and enable the immune system to identify pathogens, cells from other organisms of the same species, abnormal body cells and toxins	☐	☐	☐
Definition of antigen. The effect of antigen variability on disease and disease prevention	☐	☐	☐
Phagocytosis of pathogens. The subsequent destruction of ingested pathogens by lysozymes	☐	☐	☐
The response of T lymphocytes to a foreign antigen (the cellular response). The role of antigen-presenting cells in the cellular response. The role of helper T cells (T_H cells) in stimulating cytotoxic T cells (T_C cells), B cells and phagocytes. The role of other T cells is not required	☐	☐	☐
The response of B lymphocytes to a foreign antigen, clonal selection and the release of monoclonal antibodies (the humoral response)	☐	☐	☐
Definition of antibody	☐	☐	☐
Antibody structure	☐	☐	☐
The formation of an antigen-antibody complex, leading to the destruction of the antigen, limited to agglutination and phagocytosis of bacterial cells	☐	☐	☐
The roles of plasma cells and of memory cells in producing primary and secondary immune responses	☐	☐	☐
The use of vaccines to provide protection for individuals and populations against disease. The concept of herd immunity	☐	☐	☐
The differences between active and passive immunity	☐	☐	☐
Structure of the human immunodeficiency virus (HIV) and its replication in helper T cells	☐	☐	☐
How HIV causes the symptoms of AIDS. Why antibiotics are ineffective against viruses	☐	☐	☐
The use of monoclonal antibodies in targeting medication to specific cell types by attaching a therapeutic drug to an antibody and medical diagnosis. Details of the commercial or scientific production of monoclonal antibodies are not required	☐	☐	☐
Ethical issues associated with the use of vaccines and monoclonal antibodies	☐	☐	☐
The use of antibodies in the ELISA test	☐	☐	☐
Be able to discuss ethical issues associated with the use of vaccines and monoclonal antibodies	☐	☐	☐
Be able to evaluate methodology, evidence and data relating to the use of vaccines and monoclonal antibodies	☐	☐	☐

Organisms Exchange Substances With Their Environment

Surface Area to Volume Ratio

Learning Outcome			
The relationship between the size of an organism or structure and its surface area to volume ratio	☐	☐	☐
Changes to body shape and the development of systems in larger organisms as adaptations that facilitate exchange as this ratio reduces	☐	☐	☐
Be able to appreciate the relationship between surface area to volume ratio and metabolic rate	☐	☐	☐

Gas Exchange

Learning Outcome			
Adaptations of gas exchange surfaces, shown by gas exchange across the body surface of a single-celled organism, in the tracheal system of an insect (tracheae, tracheoles and spiracles), across the gills of fish (gill lamellae and filaments including the counter-current principle), and by the leaves of dicotyledonous plants (mesophyll and stomata)	☐	☐	☐
Structural and functional compromises between the opposing needs for efficient gas exchange and the limitation of water loss shown by terrestrial insects and xerophytic plants	☐	☐	☐
The gross structure of the human gas exchange system limited to the alveoli, bronchioles, bronchi, trachea and lungs	☐	☐	☐
The essential features of the alveolar epithelium as a surface over which gas exchange takes place	☐	☐	☐
Ventilation and the exchange of gases in the lungs. The mechanism of breathing to include the role of the diaphragm and the antagonistic interaction between the external and internal intercostal muscles in bringing about pressure changes in the thoracic cavity	☐	☐	☐
Be able to interpret information relating to the effects of lung disease on gas exchange and/or ventilation	☐	☐	☐
Be able to interpret data relating to the effects of pollution and smoking on the incidence of lung disease	☐	☐	☐
Be able to analyse and interpret data associated with specific risk factors and the incidence of lung disease	☐	☐	☐
Be able to evaluate the way in which experimental data led to statutory restrictions on the sources of risk factors	☐	☐	☐
Be able to recognise correlations and causal relationships	☐	☐	☐

Digestion and Absorption			
Learning Outcome			
During digestion, large biological molecules are hydrolysed to smaller molecules that can be absorbed across cell membranes	☐	☐	☐
Digestion in mammals of carbohydrates by amylases and membrane-bound disaccharidases, lipids by lipase (including the action of bile salts), and of proteins by endopeptidases, exopeptidases and membrane bound dipeptidases	☐	☐	☐
Mechanisms for the absorption of the products of digestion by cells lining the ileum of mammals, to include co-transport mechanisms for the absorption of amino acids and of monosaccharides and the role of micelles in the absorption of lipids	☐	☐	☐

Mass Transport

Mass transport in animals

Learning Outcome			
The haemoglobins are a group of chemically similar molecules found in many different organisms. Haemoglobin is a protein with a quaternary structure	☐	☐	☐
The role of haemoglobin and red blood cells in the transport of oxygen. The loading, transport and unloading of oxygen in relation to the oxyhaemoglobin dissociation curve. The cooperative nature of oxygen binding to show that the change in shape of haemoglobin caused by binding of the first oxygens makes the binding of further oxygens easier. The effects of carbon dioxide concentration on the dissociation of oxyhaemoglobin (the Bohr effect)	☐	☐	☐
Many animals are adapted to their environment by possessing different types of haemoglobin with different oxygen transport properties	☐	☐	☐
The general pattern of blood circulation in a mammal. Names are required only of the coronary arteries and of the blood vessels entering and leaving the heart, lungs and kidneys	☐	☐	☐
The gross structure of the human heart. Pressure and volume changes and associated valve movements during the cardiac cycle that maintain a unidirectional flow of blood	☐	☐	☐
The structure of arteries, arterioles and veins in relation to their function	☐	☐	☐
The structure of capillaries and the importance of capillary beds as exchange surfaces. The formation of tissue fluid and its return to the circulatory system	☐	☐	☐
Be able to analyse and interpret data relating to pressure and volume changes during the cardiac cycle	☐	☐	☐
Be able to analyse and interpret data associated with specific risk factors and the incidence of cardiovascular disease	☐	☐	☐
Be able to evaluate conflicting evidence associated with risk factors affecting cardiovascular disease	☐	☐	☐
Be able to recognise correlations and causal relationships	☐	☐	☐
Required practical 5: Dissection of animal or plant gas exchange system or mass transport system or of an organ within such a system	☐	☐	☐

Mass transport in plants			
Learning Outcome			
Xylem is the tissue that transports water in the stem and leaves of plants. The cohesion-tension theory of water transport in the xylem	☐	☐	☐
Phloem is the tissue that transports organic substances in plants. The mass flow hypothesis for the mechanism of translocation in plants. The use of tracers and ringing experiments to investigate transport in plants	☐	☐	☐
Be able to recognise correlations and causal relationships	☐	☐	☐
Be able to interpret evidence from tracer and ringing experiments and to evaluate the evidence for and against the mass flow hypothesis	☐	☐	☐

Genetic Information, Variation and Relationships Between Organisms

DNA, Genes and Chromosomes

Learning Outcome			
In prokaryotic cells, DNA molecules are short, circular and not associated with proteins	☐	☐	☐
In the nucleus of eukaryotic cells, DNA molecules are very long, linear and associated with proteins, called histones. Together a DNA molecule and its associated proteins form a chromosome	☐	☐	☐
The mitochondria and chloroplasts of eukaryotic cells also contain DNA which, like the DNA of prokaryotes, is short, circular and not associated with protein	☐	☐	☐
A gene is a base sequence of DNA that codes for the amino acid sequence of a polypeptide, and functional RNA (including ribosomal RNA and tRNAs)	☐	☐	☐
A gene occupies a fixed position, called a locus, on a particular DNA molecule	☐	☐	☐
A sequence of three DNA bases, called a triplet, codes for a specific amino acid. The genetic code is universal, non-overlapping and degenerate	☐	☐	☐
In eukaryotes, much of the nuclear DNA does not code for polypeptides. There are, for example, non-coding multiple repeats of base sequences between genes. Even within a gene only some sequences, called exons, code for amino acid sequences. Within the gene, these exons are separated by one or more non-coding sequences, called introns	☐	☐	☐

DNA and Protein Synthesis			
Learning Outcome			
The concept of the genome as the complete set of genes in a cell and of the proteome as the full range of proteins that a cell is able to produce	☐	☐	☐
The structure of molecules of messenger RNA (mRNA) and of transfer RNA (tRNA)	☐	☐	☐
Transcription as the production of mRNA from DNA. The role of RNA polymerase in joining mRNA nucleotides	☐	☐	☐
In prokaryotes, transcription results directly in the production of mRNA from DNA	☐	☐	☐
In eukaryotes, transcription results in the production of premRNA; this is then spliced to form mRNA	☐	☐	☐
Translation as the production of polypeptides from the sequence of codons carried by mRNA. The roles of ribosomes, tRNA and ATP	☐	☐	☐
Be able to relate the base sequence of nucleic acids to the amino acid sequence of polypeptides, when provided with suitable data about the genetic code	☐	☐	☐
Be able to interpret data from experimental work investigating the role of nucleic acids	☐	☐	☐
You are not be required to recall in written papers specific codons and the amino acids for which they code	☐	☐	☐

Genetic Diversity Can Arise as a Result of Mutation or During Meiosis

Learning Outcome			
Gene mutations involve a change in the base sequence of chromosomes. They can arise spontaneously during DNA replication and include base deletion and base substitution. Due to the degenerate nature of the genetic code, not all base substitutions cause a change in the sequence of encoded amino acids. Mutagenic agents can increase the rate of gene mutation	☐	☐	☐
Mutations in the number of chromosomes can arise spontaneously by chromosome non-disjunction during meiosis	☐	☐	☐
Meiosis produces daughter cells that are genetically different from each other	☐	☐	☐
The process of meiosis only in sufficient detail to show how two nuclear divisions result usually in the formation of four haploid daughter cells from a single diploid parent cell, how genetically different daughter cells result from the independent segregation of homologous chromosomes, and how crossing over between homologous chromosomes results in further genetic variation among daughter cells	☐	☐	☐
Be able to complete diagrams showing the chromosome content of cells after the first and second meiotic division, when given the chromosome content of the parent cell	☐	☐	☐
Be able to explain the different outcome of mitosis and meiosis	☐	☐	☐
Be able to recognise where meiosis occurs when given information about an unfamiliar life cycle	☐	☐	☐
Be able to explain how random fertilisation of haploid gametes further increases genetic variation within a species	☐	☐	☐

Genetic Diversity and Adaptation			
Learning Outcome			
Genetic diversity as the number of different alleles of genes in a population	☐	☐	☐
Genetic diversity is a factor enabling natural selection to occur	☐	☐	☐
The principles of natural selection in the evolution of populations: Random mutation can result in new alleles of a gene, and that many mutations are harmful, but in certain environments the new allele of a gene might benefit its possessor, leading to increased reproductive success, and that the advantageous allele is inherited by members of the next generation. As a result, over many generations, the new allele increases in frequency in the population	☐	☐	☐
Directional selection, exemplified by antibiotic resistance in bacteria, and stabilising selection, exemplified by human birth weights	☐	☐	☐
Natural selection results in species that are better adapted to their environment. These adaptations may be anatomical, physiological or behavioural	☐	☐	☐
Be able to use unfamiliar information to explain how selection produces changes within a population of a species	☐	☐	☐
Be able to interpret data relating to the effect of selection in producing change within populations	☐	☐	☐
Be able to show an understanding that adaptation and selection are major factors in evolution and contribute to the diversity of living organisms	☐	☐	☐
Required practical 6: Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth	☐	☐	☐

Species and Taxonomy

Learning Outcome			
Two organisms belong to the same species if they are able to produce fertile offspring. Courtship behaviour as a necessary precursor to successful mating. The role of courtship in species recognition	☐	☐	☐
A phylogenetic classification system attempts to arrange species into groups based on their evolutionary origins and relationships. It uses a hierarchy in which smaller groups are placed within larger groups, with no overlap between groups. Each group is called a taxon (plural taxa)	☐	☐	☐
One hierarchy comprises the taxa: domain, kingdom, phylum, class, order, family, genus and species	☐	☐	☐
Each species is universally identified by a binomial consisting of the name of its genus and species, eg, Homo sapiens	☐	☐	☐
Recall of different taxonomic systems, such as the three domain or five kingdom systems, will not be required	☐	☐	☐
Be able to appreciate that advances in immunology and genome sequencing help to clarify evolutionary relationships between organisms	☐	☐	☐

Biodiversity Within a Community

Learning Outcome			
Biodiversity can relate to a range of habitats, from a small local habitat to the Earth	☐	☐	☐
Species richness is a measure of the number of different species in a community	☐	☐	☐
An index of diversity describes the relationship between the number of species in a community and the number of individuals in each species	☐	☐	☐
Calculation of an index of diversity (d) from the formula: $d = (N(N - 1)) / (\Sigma n(n - 1))$, where N = total number of organisms of all species, and n = total number of organisms of each species	☐	☐	☐
Farming techniques reduce biodiversity. The balance between conservation and farming	☐	☐	☐

Investigating Diversity

Learning Outcome			
Genetic diversity within, or between species, can be made by comparing the frequency of measurable or observable characteristics, the base sequence of DNA, the base sequence of mRNA, and the amino acid sequence of the proteins encoded by DNA and mRNA	☐	☐	☐
Be able to interpret data relating to similarities and differences in the base sequences of DNA and in the amino acid sequences of proteins to suggest relationships between different organisms within a species and between species	☐	☐	☐
Be able to appreciate that gene technology has caused a change in the methods of investigating genetic diversity; inferring DNA differences from measurable or observable characteristics has been replaced by direct investigation of DNA sequences. Knowledge of gene technologies will not be tested	☐	☐	☐
Quantitative investigations of variation within a species involve collecting data from random samples, calculating a mean value of the collected data and the standard deviation of that mean, and interpreting mean values and their standard deviations. You will not be required to calculate standard deviations in written papers	☐	☐	☐