

Yr 12 (KS5)	Topic Area	Key knowledge/skills (what <u>has</u> to be learnt)	Examples of key compulsory practicals for students	Resources/support at home
Section 1 Biological molecules	1 Biological molecules	<p>Explain bonding and the formation of molecules.</p> <p>Describe how carbohydrates, lipids and proteins are constructed and how their structure relates to their functions.</p> <p>Describe how to carry out the tests for reducing sugars, non-reducing sugars, starch, lipids and proteins.</p> <p>Understand how the structure of enzymes relates to their function and how inhibitors affect the active site. Explain how different factors affect enzyme action.</p>	Required practical 1: Investigation into the effect of a named variable on the rate of an enzyme-controlled reaction.	Kerboodle Google classroom
	2 Nucleic acids	<p>Describe the structure of DNA and RNA and describe and explain DNA replication.</p> <p>The role of ATP in biological processes. The importance of the water molecule in living organisms.</p>	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.	Kerboodle Google classroom
Section 2 Cells	3 Cell structure	<p>Describe methods of studying cells.</p> <p>Explain the principles of magnification and resolution. Explain how electron microscopes</p>		Kerboodle Google classroom

		<p>work and the differences between a TEM and SEM.</p> <p>Learn how to calculate the size of a specimen from drawings and photographs.</p> <p>Describe the structure of eukaryotic cells, prokaryotic cells and viruses.</p> <p>Explain the importance of mitosis and the cell cycle.</p>		
	4 Transport across cell membranes	<p>Describe and explain the structure of the cell membrane and the functions of the various components.</p> <p>Explain the importance of diffusion, facilitated diffusion, osmosis and active transport.</p> <p>Explain the process of co-transport and absorption of glucose in the ileum.</p>	<p>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.</p> <p>Required practical 4: Investigation into the effect of a named variable on the permeability of cell-surface membranes.</p>	<p>Kerboodle Google classroom</p>
	5 Cell recognition and the immune system	<p>Describe the main defense mechanisms of the body. Learn the importance of phagocytosis, cell mediated immunity and humoral immunity.</p> <p>Describe the structure and function of antibodies and the use of monoclonal antibodies.</p> <p>Understand how vaccines work and the features of an effective vaccination programme. Discuss the ethical issues associated with vaccination programmes.</p>		<p>Kerboodle Google classroom</p>

		Describe the structure of HIV and how it replicates. Learn how to ELISA test works.		
Section 3 Organisms exchange materials with their environment	6 Exchange	<p>Explain how surfaces are adapted to facilitate exchange. Understand how gas exchange takes place in insects, fish and the leaf of a plant.</p> <p>Explain the function of the human gas exchange system, the mechanism of breathing and how gas exchange takes place in the lungs.</p> <p>Explain the role of digestive enzymes, and the absorption of the products of digestion.</p>		Kerboodle Google classroom
	7 Mass transport	<p>Describe the role of haemoglobin in the body and explain the reasons for the different types of haemoglobin in different organisms.</p> <p>Describe the nature of the oxygen dissociation curve and explain the effect of carbon dioxide on the curve.</p> <p>Understand the pattern of blood circulation in a mammal and describe the structure of the human heart and blood vessels.</p> <p>Analyse and interpret data relating to pressure and volume changes in the cardiac cycle.</p> <p>Analyse and interpret data associated with specific risk factors and the incidence of cardiovascular disease</p>	Required practical 5: Dissection of animal or plant gas exchange system or mass transport system or of organ within such a system.	Kerboodle Google classroom

		Understand the roles of the xylem and phloem in transporting substances around the plant.		
Section 4 Genetic information, variation and relationships	8 DNA, genes and protein synthesis	Describe the nature of a gene and explain how genes code for polypeptides. Describe the structure of molecules of messenger RNA (mRNA) and of transfer RNA (tRNA). Describe the processes of transcription and translation in protein synthesis.		Kerboodle Google classroom
	9 Genetic diversity and adaptation	Describe gene mutations. Explain why meiosis is necessary and how it creates genetic variation. Explain selection and the difference between stabilising and directional selection.	Required practical 6: Use of aseptic techniques to investigate the effect of antimicrobial substances on microbial growth.	Kerboodle Google classroom
	10 Biodiversity	Explain the principles of classification and how it is related to evolution. Know how to calculate an index of diversity. Describe the impact of agriculture on species diversity. Know different ways diversity is investigated. Know about how quantitative investigations of variation are carried out.		Kerboodle Google classroom
Section 5 Energy transfer in and	13 Energy and ecosystems	Explain energy transfer and productivity.		Kerboodle Google classroom

<p>between organisms</p>		<p>Calculate the net productivity of producers or consumers from given data and the efficiency of energy transfers within ecosystems</p> <p>Describe the features of the nitrogen cycle and phosphorus cycle and know the role of microorganisms in the processes.</p> <p>Know about the use of fertilisers and environmental issues involved.</p>		
<p>Section 7 Genetics, populations, evolution and ecosystems</p>	<p>19 Populations in ecosystems</p>	<p>Explain what is meant by the terms ecosystem, population, community and habitat.</p> <p>Describe the effect of abiotic factors on population size.</p> <p>Describe the interactions between organisms: interspecific and intraspecific competition and predation.</p> <p>Understand how the sustainability of natural resources is maintained.</p> <p>Evaluate evidence and data concerning issues relating to the conservation of species and habitats and consider conflicting evidence</p>	<p>Required practical 12: Investigation into the effect of a named environmental factor on the distribution of a given species.</p>	<p>Kerboodle Google classroom</p>

		Use given data to calculate the size of a population estimated using the mark-release-recapture method.		
Yr 13 (KS5)	Topic Area	Key knowledge/skills (what <u>has</u> to be learnt)	Examples of key compulsory practicals for students	Resources/support at home
Section 5 Energy transfer in and between organisms (continued)	11 photosynthesis	<p>Explain how the leaf is adapted to carry out photosynthesis.</p> <p>Describe the light-dependant reaction and the light-independent reaction and the roles of NADP and ATP.</p> <p>Identify environmental factors that limit the rate of photosynthesis.</p>	<p>Required practical 7: Use of chromatography to investigate the pigments isolated from leaves of different plants, eg, leaves from shade-tolerant and shade-intolerant plants or leaves of different colours.</p> <p>Required practical 8: Investigation into the effect of a named factor on the rate of dehydrogenase activity in extracts of chloroplasts.</p>	<p>Kerboodle</p> <p>Google classroom</p>
	12 Respiration	<p>Describe the main stages of glycolysis and its products. Explain what happens in the link reaction and Krebs cycle. Explain how ATP is synthesised during oxidative phosphorylation. Explain how anaerobic respiration works.</p>	<p>Required practical 9: Investigation into the effect of a named variable on the rate of respiration of cultures of single-celled organisms.</p>	<p>Kerboodle</p> <p>Google classroom</p>
Section 6 Organisms respond to changes in their environment	14 Response to stimuli	<p>Know that organisms increase their chance of survival by responding to changes in their environment.</p> <p>Understand the effect of different concentrations of indoleacetic acid (IAA) on</p>	<p>Required practical 10: Investigation into the effect of an environmental variable on the movement of an animal using either a choice chamber or a maze.</p>	<p>Kerboodle</p> <p>Google classroom</p>

		<p>flowering plants as an explanation of gravitropism and phototropism in flowering plants.</p> <p>Describe taxes and kineses as simple responses that can maintain a mobile organism in a favourable environment.</p> <p>Describe the protective effect of a simple reflex, exemplified by a three-neurone simple reflex.</p> <p>Understand how some receptors respond to stimuli.</p> <p>Explain how the autonomic nervous system controls heart rate.</p>		
	15 Nervous coordination and muscles	<p>Know the structure of a neurone. Describe how a resting potential is established. Describe how an action potential is generated.</p> <p>Describe the sequence of events involved in transmission across a cholinergic synapse. Know the process of muscle contraction.</p>		<p>Kerboodle</p> <p>Google classroom</p>
	16 Homeostasis	<p>Understand the importance of maintaining a stable core temperature and stable blood pH in relation to enzyme activity.</p> <p>Understand the importance of maintaining a stable blood glucose concentration in terms of availability of respiratory substrate and of the water potential of blood.</p>	<p>Required practical 11: Production of a dilution series of a glucose solution and use of colorimetric techniques to produce a calibration curve with which to identify the concentration of glucose in an unknown 'urine' sample.</p>	<p>Kerboodle</p> <p>Google classroom</p>

		<p>Know how negative feedback restores systems to their original level.</p> <p>Know the factors that influence blood glucose concentration, the role of the liver in glycogenesis, glycogenolysis and gluconeogenesis. Describe the action of insulin and glucagon and the role of adrenaline .</p> <p>Understand osmoregulation as control of the water potential of the blood. Describe the structure of the nephron.</p>		
Section 7 Genetics, populations, evolution, and ecosystems (continued)	17 Inherited change	<p>Understand the terms genotype and phenotypes.</p> <p>Be able to use fully labelled genetic diagrams to interpret or predict the results of different crosses.</p> <p>Understand the use of the chi-squared test to compare the goodness of fit of observed phenotypic ratios with expected ratios.</p>		Kerboodle Google classroom
	18 Populations and evolution	<p>Understand the term population and the concepts of gene pool and allele frequency. Calculate allele, genotype and phenotype frequencies from appropriate data using the Hardy–Weinberg equation.</p> <p>Understand the effects of stabilising, directional and disruptive selection.</p> <p>Understand evolution as a change in the allele frequencies in a population.</p>	Required practical 12: Investigation into the effect of a named environmental factor on the distribution of a given species.	Kerboodle Google classroom

		<p>Explain the importance of genetic drift in causing changes in allele frequency in small populations.</p>		
<p>Section 8 The control of gene expression</p>	<p>20 Gene expression</p>	<p>Be able to relate the nature of a gene mutation to its effect on the encoded polypeptide.</p> <p>Be able to evaluate the use of stem cells in treating human disorders.</p> <p>Know that epigenetics involves heritable changes in gene function,</p> <p>Describe the main characteristics of benign and malignant tumours. Understand how tumours develop.</p>		<p>Kerboodle Google classroom</p>
	<p>21 Recombinant DNA technology</p>	<p>Know that sequencing projects have read the genomes of a wide range of organisms, including humans.</p> <p>Know about recombinant DNA technology involves the transfer of fragments of DNA from one organism, or species, to another.</p> <p>Know about the use of labelled DNA probes and DNA hybridisation to locate specific alleles of genes.</p> <p>Explain the biological principles that underpin genetic fingerprinting techniques.</p>		<p>Kerboodle Google classroom</p>

