Cambridge Assessment International Education

Comparison guide for Cambridge Pre-U Biology 9790

Cambridge Pre-U Biology 9790
Cambridge International AS & A Level Biology 9700
OCR AS/A Level GCE Biology H420

Introduction

Cambridge International has mapped the assessment objectives, methodology of assessment and topics of Cambridge Pre-U Biology 9790 to Cambridge International AS & A Level Biology 9700 and OCR AS/A Level GCE Biology H420 for examination in 2022. When comparing the topics, the expressions below have been used to give an indication of overlap between the syllabuses:

- Topic coverage is **identical** to the Cambridge Pre-U syllabus.
- Topic coverage is **almost identical**. Slight differences are stated.
- Topic coverage is **similar**. Differences are stated.
- This topic is **not covered** in this syllabus.

Brief summary

All three syllabuses aim to

- develop learners' knowledge and understanding of Biology
- develop an understanding of the scientific method and practical, analytical and problem-solving skills
- relate the study of Biology to the needs of society

Assessment objectives

Cambridge Pre-U	Cambridge International AS & A Level	OCR AS/A Level GCE
Assessment objectives (AOs)		
AO1 Knowledge with understanding • scientific phenomena, facts, laws, definitions, quantities and principles • concepts and theories, and the relationships and models used to explain them • scientific vocabulary, terminology and conventions (including symbols, quantities and units) • scientific instruments, apparatus and methods, and their uses • scientific developments and the methodology used to develop knowledge.	**AO1 Knowledge and understanding** • scientific phenomena, facts, laws and definitions, • concepts and theories • scientific vocabulary, terminology and conventions (including symbols, quantities and units) • scientific instruments and apparatus, including techniques of operation and aspects of safety • scientific quantities and their determination • scientific and technological applications with their social, economic and environmental implications.	**AO1 Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures.**
AO2 Application of knowledge and problem solving • select, organise, interpret and present scientific information • translate information from one form to another (including manipulating numerical and other data) • analyse scientific information by identifying and explaining patterns and trends • drawing inferences and conclusions, and constructing arguments • evaluate scientific information in terms of validity, accuracy and precision • apply and synthesise scientific skills, knowledge and understanding to solve problems and explain phenomena.	**AO2 Handling, applying and evaluating information** • locate, select, organise and present information from a variety of sources • translate information from one form to another • manipulate numerical and other data • use information to identify patterns, report trends and draw conclusions • give reasoned explanations for phenomena, patterns and relationships • make predictions and construct arguments to support hypotheses • apply knowledge, including principles, to new situations • evaluate information and hypotheses • demonstrate an awareness of the limitations of biological theories and models • solve problems.	**AO2 Apply knowledge and understanding of scientific ideas, processes, techniques and procedures:** • in a theoretical context • in a practical context • when handling qualitative data • when handling quantitative data.
AO3 Experimental and investigative skills • plan scientific investigations (including constructing and testing hypotheses and predictions)	**AO3 Experimental skills and investigations** • plan experiments and investigations • collect, record and present observations, measurements and estimates	**AO3 Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to:** • make judgements and reach conclusions

Cambridge Pre-U	Cambridge International AS & A Level	OCR AS/A Level GCE
Assessment objectives (AOs)		
• use scientific apparatus, methods and techniques skilfully and safely • make, record and communicate observations, measurements and methods methodically with appropriate clarity, precision and accuracy • manipulate, present and analyse raw data from scientific experiments and investigations • report findings and conclusions, supported by evidence • evaluate experimental methods, techniques, raw data and conclusions, identify limitations and suggest improvements.	• analyse and interpret experimental data to reach conclusions • evaluate methods and quality of experimental data and suggest possible improvements to experiments.	• develop and refine practical design and procedures.

Methodology of assessment

Cambridge Pre-U	Cambridge International AS & A Level	OCR AS/A Level GCE
Assessment		
• Paper 1 – 2 hours 30 minutes • Paper 2 – 1 hour 15 minutes • Paper 3 – 1 hour 45 minutes • Paper 4 – 2 hours 30 minutes (practical) All components are externally assessed	**AS Level** • Paper 1 – 1 hour • Paper 2 – 1 hour 15 minutes • Paper 3 – 2 hours (practical) **A Level** • Paper 1 – 1 hour • Paper 2 – 1 hour 15 minutes • Paper 3 – 2 hours (practical) • Paper 4 – 2 hours • Paper 5 – 1 hour 15 minutes All components are externally assessed	**AS Level** • Component 1 – 1 hour 30 minutes • Component 2 – 1 hour 30 minutes **A Level** • Component 1 – 2 hours 15 minutes • Component 2 – 2 hours 15 minutes • Component 3 – 1 hour 30 minutes • Component 4 – non-exam internal assessment All other components externally assessed

Topics

Cambridge Pre-U	Cambridge International AS & A Level	OCR AS/A Level GCE (Biology A)
Topics		
1.1 Eukaryotic cell structure • microscopy • cell membranes • organelles: structure and function	Topic coverage of microscopy is almost identical but this syllabus does not require discussion of the relative advantages of light and electron microscopes. Topic coverage is identical with respect to the roles and structure of cell membranes. Coverage of the theory of how and why molecules move across cell membranes is identical, but this syllabus does not require practical investigation of active transport, estimation of plant cell solute potential, the effects of temperature and solvents on cell membrane permeability, endocytosis or intracellular digestion in a protoctist. This syllabus lists additional practical activities on surface area to volume ratios and diffusion in agar blocks but this topic is covered in section 3.1 of the Cambridge Pre-U syllabus. Topic coverage is almost identical on the structure and function of organelles. Slight differences are that this syllabus does not list secretory vesicles, flagella and proteasomes but does list microtubules, microvilli and plasmodesmata. Practical outcomes on this syllabus focus on plant and animal cells, while 9790 makes reference to recognising organelles in cells from all four eukaryotic kingdoms.	Topic coverage of microscopy is almost identical but this syllabus covers in addition the laser scanning confocal microscope and places an emphasis on differential staining. Topic coverage is identical with respect to the roles and structure of cell membranes. Coverage of the theory of how and why molecules move across cell membranes is identical, but this syllabus does not require practical investigation of active transport, estimation of plant cell water potential and solute potential, endocytosis or intracellular digestion in a protoctist. Topic coverage is almost identical on the structure and function of organelles. Slight differences are that this syllabus does not list secretory vesicles, proteasomes or vacuoles. This syllabus has an additional learning outcome on the importance of the cytoskeleton.
1.2 Prokaryotic cells • structure of prokaryotic cells • pathogenic bacteria • antibiotics • reproduction	Approximately 40% of the Cambridge Pre-U syllabus is covered. Topic coverage is identical for the key structural features of a prokaryotic cell, how penicillin acts on bacteria and why antibiotics do not affect viruses, but this syllabus does not cover the structure of the cell walls of Gram-positive and Gram-negative bacteria (and the significance of the structure for the use of antibiotics), or the mode of transmission and	Identical coverage is limited compared to the content of Cambridge Pre-U syllabus. This syllabus has one learning outcome, on differences between eukaryotic and prokaryotic cells, which would be expected to cover the structure of prokaryotic cells. This syllabus does not cover how penicillin acts on bacteria, why antibiotics do not affect viruses, the structure of the cell walls of Gram-positive and Gram-

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Topics		
	infection of *Agrobacterium tumefaciens* or the mechanism of asexual reproduction by binary fission. It also does not list any practical outcomes.	negative bacteria, the mode of transmission and infection of *Agrobacterium tumefaciens* or the mechanism of asexual reproduction by binary fission. This syllabus does cover additional material on the use of microorganisms in biotechnological processes, the advantages and disadvantages of using microorganisms to make food for human consumption, how to culture microorganisms effectively, the standard growth curve of a microorganism in a closed culture and the use of aseptic techniques, plus associated practical work.
1.3 Cell replication • DNA replication • mitosis • meiosis	Topic coverage of DNA replication is almost identical but this syllabus gives more detail in describing the prescribed learning outcomes. Coverage of mitosis and meiosis are effectively identical. This syllabus does not cover the control of the cell cycle, although this syllabus does mention that uncontrolled cell division can result in the formation of a tumour (a topic that is covered in more detail in section 1.6 for the Cambridge Pre-U syllabus).	Topic coverage of DNA replication is identical. Topic coverage of mitosis and meiosis is almost identical. This syllabus covers control of the cell cycle in less detail than the Cambridge Pre-U syllabus (it requires an outline of checkpoints but not extracellular growth factors) but does not cover telomeres, telomere shortening and telomerase reverse transcriptase. This syllabus has additional material on how cells of multicellular organisms are specialised for particular functions and organised into tissues, organs and systems. A list of examples is provided, most of which (and the principles of specialisation and organisation) would be expected to be covered at other points within the Cambridge Pre-U syllabus, although not as separate learning outcomes.
1.4 Enzymes • structure and function of enzymes • enzyme kinetics • commercial uses of enzymes	Topic coverage is almost identical, both for theoretical knowledge and practical outcomes, but this syllabus does not specifically cover end product inhibition, allosteric regulation, phenylketonuria or the production of lactose-free milk. This syllabus does differ in making explicit mention of using a colorimeter and the use of the Michaelis-Menten constant.	Topic coverage is almost identical, both for theoretical knowledge and practical outcomes, but this syllabus does not specifically cover allosteric regulation or phenylketonuria. This syllabus lists five examples of commercial uses of immobilised enzymes, including the examples given on the Cambridge Pre-U syllabus (the production of lactose-free milk). This syllabus does not cover the principles of operation of dipsticks but does refer to some examples of these in section 5.1.2

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Topics		
		(f). This syllabus has additional coverage of the temperature coefficient, coenzymes, cofactors and prosthetic groups, reference to metabolic poisons and medicinal drugs (that act as enzyme inhibitors) and inactive precursors in metabolic pathways.
1.5 Respiration • ATP • chemiosmosis • glycolysis • anaerobic respiration in mammals, yeast and plants • reactions within mitochondria	Topic coverage is almost identical in terms of eventual learning outcomes. This syllabus does not cover chemiosmosis in prokaryotes. Slight differences are that this syllabus covers the additional topics of RQ (respiratory quotient) and adaptations of rice to grow with its roots submerged in water. Energy values of carbohydrates, lipids and proteins are covered in this section on this syllabus but in the chemicals of life section (2.2) of the Cambridge Pre-U syllabus.	Topic coverage is almost identical in terms of eventual learning outcomes. This syllabus does not cover chemiosmosis in prokaryotes. Slight differences are that this syllabus covers the additional topics of RQ (respiratory quotient) and places emphasis on the roles of coenzymes. Energy values of carbohydrates, lipids and proteins are covered in this section on this syllabus but in the chemicals of life section (2.2) of the Cambridge Pre-U syllabus.
1.6 Genes and protein synthesis • the gene and genetic code • protein synthesis • control of gene expression • inheritance and Mendelian genetics • mutations • genetic conditions	Topic coverage of the gene and genetic code is similar. One difference is that this syllabus specifies a single simple definition of a gene whereas the Cambridge Pre-U syllabus requires discussion of the limitations of definitions of the gene. This syllabus confines itself to describing the principle of the universal genetic code whereas 9790 asks for discussion of the extent to which it is true that the code is universal to all organisms. Topic coverage of protein synthesis and the removal of introns from mRNA is almost identical, but this syllabus does not require knowledge of proteomics. Topic coverage of the control of gene expression in prokaryotes is similar but this syllabus also specifies knowledge of transcription factors in eukaryotes and the mechanism by which gibberellin activates genes by causing the breakdown of DELLA protein repressors. The	Topic coverage of the genetic code is similar but this syllabus does not attempt to define the gene. This syllabus confines itself to describing the nature of the genetic code whereas 9790 asks for discussion of the extent to which it is true that the code is universal to all organisms. Topic coverage of protein synthesis and the removal of introns from mRNA is almost identical, but this syllabus does not require knowledge of proteomics. It deals with post-transcriptional modification of mRNA under control of gene expression, and also considers control at the post-translational level. This syllabus has additional material not found on the Cambridge Pre-U syllabus, covering homeobox genes.

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Topics		
	Pre-U syllabus partially covers this idea in section 4.4 (a). Topic coverage of inheritance and Mendelian genetics is almost identical but this syllabus does not require practical investigation of genetic crosses and patterns of variation. Topic coverage of mutations is similar, but this syllabus does not require knowledge of the effects of ionising radiation on living cells, or mutations that can lead to cancer. This syllabus gives albinism, sickle cell anaemia, haemophilia and Huntington's diseases as examples of genetic conditions while the Cambridge Pre-U syllabus gives sickle cell anaemia and cystic fibrosis.	Topic coverage of inheritance and Mendelian genetics is almost identical but this syllabus mentions intraspecific and interspecific variation and does not require definitions of terms used in genetics. This syllabus does not require practical investigation of genetic crosses and patterns of variation. Topic coverage of mutation and genetic conditions is limited, as this syllabus does not require knowledge of the effects of ionising radiation on living cells, or mutations that can lead to cancer. This syllabus refers to beneficial, neutral or harmful effects of mutations but does not give any examples of genetic conditions. This syllabus has an additional learning outcome about the importance of mitosis and apoptosis as mechanisms controlling the development of body form.
1.7 Applications of cell biology • principles of genetic engineering • isolating genes • cloning DNA • vectors and insertion into host cells • identifying and cloning transformed cells • gene therapy and genetic profiling (DNA fingerprinting) • gene sequencing – methods and applications • stem cells – isolation and uses • ethical issues surrounding genetic engineering and the use of stem cells	Approximately 60% of the Cambridge Pre-U syllabus is covered, including the principles of genetic engineering, isolating genes, cloning DNA, gene therapy and ethical issues surrounding genetic engineering. This syllabus does not stipulate methods of inserting genes into plant cells (*Agrobacterium tumefaciens* and microprojectiles) how genes ae inserted into target cells in gene therapy (liposomes and viral vectors), the processes used in genetic profiling (DNA fingerprinting) or the methods of DNA sequencing and its uses.	Approximately 80% of the Cambridge Pre-U syllabus is covered, including the principles of genetic engineering, isolating genes, cloning DNA, gene therapy and ethical issues surrounding genetic engineering. This syllabus does not stipulate methods of inserting genes into plant cells (*Agrobacterium tumefaciens* and microprojectiles) or how genes ae inserted into target cells in gene therapy (liposomes and viral vectors). This syllabus does cover the processes used in genetic profiling (DNA fingerprinting) and methods of DNA sequencing and its uses, but places emphasis on the development of new DNA sequencing techniques (as opposed to knowledge of the chain-termination and dye-terminator methods on the pre-U syllabus) and the latest applications such as in genome-wide comparisons (e.g. epidemiology as opposed to

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Topics		
		the Cambridge Pre-U syllabus focus on clinical diagnosis) and in the development of synthetic biology. It does not stipulate any examples of gene therapy but does cover the difference between somatic cell gene therapy and germline cell gene therapy, plus electroporation as a technique in genetic engineering.
	This syllabus also does not cover how stem cells are obtained for research and the current and potential uses of stem cells.	This syllabus does cover stem cells and goes into additional detail about their features and differentiation, with examples from animals and plants. There are differences between this syllabus and the Cambridge Pre-U syllabus in the examples given of potential uses of stem cells.
	This syllabus does not stipulate practical activities (electrophoresis, transformation of bacteria and investigating the *lac* operon).	This syllabus does not stipulate transformation of bacteria and investigating the *lac* operon as practical activities but encourages practical use of electrophoresis.
	This syllabus does cover material not found on the Cambridge Pre-U syllabus: chemical synthesis of genes, why a promoter may have to be transferred into an organism as well as the desired gene, gene editing, microarrays and the benefits of using databases that provide information about nucleotide sequences of genes and genomes. This syllabus goes into more detail than the Cambridge Pre-U syllabus about using recombinant human proteins to treat disease and the advantages of genetic screening. It also stipulates three specific examples of genetically modified organisms in agriculture.	This syllabus covers a small amount of material not found on the Cambridge Pre-U syllabus, including pharming and issues related to patents and technology transfer (with respect to genetic engineering). It stipulates one specific example of a genetically modified organism in agriculture.
2.1 The origins of life • origin of complex organic molecules • origin of prokaryotic and eukaryotic cells • advantages of multicellularity	These topics are not covered in this syllabus.	These topics are not covered in this syllabus.

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Topics		
2.2 The chemicals of life • water • lipids • carbohydrates • proteins • nucleic acids	Topic coverage of water is identical to the Cambridge Pre-U syllabus though this syllabus describes the learning outcomes in more detail but does not require practical investigation of the key physical and chemical properties of water. Topic coverage of lipids is identical to the Cambridge Pre-U syllabus. Topic coverage of carbohydrates is almost identical to the Cambridge Pre-U syllabus, though this syllabus does not mention ribose or maltose. Topic coverage of proteins is identical to the Cambridge Pre-U syllabus. Topic coverage of nucleic acids is identical to the Cambridge Pre-U syllabus. This syllabus does not require practical investigation of the energy content of carbohydrates, lipids and proteins (by calorimetry) but energy content is covered under respiration (12.2) on this syllabus.	Topic coverage of water is identical to the Cambridge Pre-U syllabus though this syllabus does not require practical investigation of the key physical and chemical properties of water. Topic coverage of lipids is identical to the Cambridge Pre-U syllabus, though this syllabus provides more preliminary guidance on very basic ideas like the elements in molecules and the principles of condensation and hydrolysis. Cambridge Pre-U syllabus coverage assumes this knowledge is incorporated within other learning outcomes. Topic coverage of carbohydrates is almost identical to the Cambridge Pre-U syllabus, though this syllabus also mentions lactose. Topic coverage of proteins is almost identical to the Cambridge Pre-U syllabus, but this syllabus specifies additional proteins to be studied: a named enzyme, insulin, keratin and elastin. Topic coverage of nucleic acids is almost identical to the Cambridge Pre-U syllabus. RNA nucleotides are referred to but not the structure of RNA. This syllabus does not require practical investigation of the energy content of carbohydrates, lipids and proteins (by calorimetry) but energy content is covered under respiration (5.2.2) on this syllabus. This syllabus specifies quantitative methods including colorimetry and the use of biosensors. It also specifies using chromatography to separate proteins,

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		carbohydrates, vitamins or nucleic acids and the purification of DNA by precipitation. This syllabus has an additional learning outcome covering the key inorganic ions that are involved in biological processes. Most of these ions would be encountered under other learning outcomes on the Cambridge Pre-U syllabus.
2.3 The evolution of life • selection and changes in allele frequency • speciation • aspects of evolution	Approximately 70% of the Cambridge Pre-U syllabus is covered. This syllabus does not use the terms divergence and adaptive radiation, and does not stipulate a wide range of examples like Galapagos finches, ring species, African cichlids and banded snails. This syllabus also does not cover the effect of increased environmental stress, such as climate change, on the proportions of niches occupied, or the difference between background extinction and mass extinction. This syllabus covers additional material to the Cambridge Pre-U: genetic drift, the founder effect, genetic bottleneck, the Hardy-Weinberg principle and selective breeding, including examples of wheat, rice, maize and dairy cattle.	Approximately 70% of the Cambridge Pre-U syllabus is covered. This syllabus does not use the terms divergence and adaptive radiation, and does not stipulate a wide range of examples like Galapagos finches, ring species, African cichlids and banded snails. This syllabus also does not cover disruptive selection, the effect of increased environmental stress, such as climate change, on the proportions of niches occupied, or the difference between background extinction and mass extinction. This syllabus covers additional material to the Cambridge Pre-U: evolution of pesticide resistance in insects, fossil evidence for evolution, genetic drift, the founder effect, genetic bottleneck, the Hardy-Weinberg principle and selective breeding, including examples such as dog breeds and the importance of maintaining a resource of genetic material for use in selective breeding. This syllabus covers drug resistance in microorganisms which is broader than the Cambridge Pre-U syllabus focus on bacterial genetic resistance to antibiotics.
2.4 Classification • the species concept • classification systems	Topic coverage is similar. Differences are that this syllabus does not use the terms phylogenetic, cladistic or phenetic or consider why classification systems are used, the distinctions between different classification systems or the relative usefulness of the three domain and five kingdom systems. This syllabus does not require use of dichotomous keys to identify organisms or a learnt classification of	Topic coverage is similar. Differences are that this syllabus does not use the terms phylogenetic, cladistic or phenetic or consider the distinctions between different classification systems. This syllabus does not require use of dichotomous keys to identify organisms or a learnt classification of *Homo sapiens*. This syllabus requires knowledge of the evidence that has led

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Topics		
	Homo sapiens. This syllabus specifies some details about the differences between Archaea and Bacteria, and asks for knowledge of how viruses are classified.	to new classification systems, such as the three domains of life.
3.1 (Animal) Transport systems • structure and function of transport systems in multicellular animals • ventilation mechanisms • the mammalian circulatory system • oxygen transport in the blood	Approximately 75% of the Cambridge Pre-U syllabus is covered. Topic coverage of the structure of the lungs, gas exchange and ventilation mechanisms in mammals is identical to the Cambridge Pre-U syllabus, but this syllabus does not require knowledge of gas exchange structures and ventilation mechanisms of insects and fish, or the need for mass flow systems in animals. Surface area to volume ratio is covered in section 4.2. Topic coverage of the mammalian circulatory system and oxygen transport in the blood are similar to the Cambridge Pre-U syllabus, but this syllabus does not require knowledge of the nervous and hormonal control of heart rate. This syllabus does not cover comparison of open, single and double circulatory systems or the circulatory systems of fish and amphibians. This syllabus also does not cover LDL and HDL, atherosclerosis, the aetiology of coronary heart disease and the roles of warfarin, statins and surgery in the treatment of cardiovascular disease. This syllabus has additional material that makes specific mention of water as a component of blood and the functions and formation of tissue fluid.	Approximately 80% of the Cambridge Pre-U syllabus is covered. Topic coverage of surface area to volume ratio and gas exchange and ventilation mechanisms in mammals, fish and insects are identical to the Cambridge Pre-U syllabus. This syllabus has additional requirements for analysing data from a spirometer and understanding of measured quantities relating to lung function, and lists features of gas exchange surfaces. Topic coverage of the mammalian circulatory system and oxygen transport in the blood are similar to the Cambridge Pre-U syllabus, but this syllabus does not require knowledge of the nervous and hormonal control of heart rate (although in section 5.1.5 it asks for 'the effects of hormones and nervous mechanisms on heart rate'). This syllabus does not cover the circulatory system of amphibians. This syllabus also does not cover LDL and HDL, atherosclerosis, the aetiology of coronary heart disease and the roles of warfarin, statins and surgery in the treatment of cardiovascular disease. This syllabus has additional material that makes specific mention of the formation of tissue fluid from plasma and the use and interpretation of ECG traces.
3.2 Nutrition • modes of nutrition • mammalian alimentary canal and digestion.	These topics are not covered in this syllabus.	These topics are not covered in this syllabus.
3.3 Nerves, muscles and behaviour • the nervous system • nerves and synapses • the brain	Approximately 60% of the Cambridge Pre-U syllabus is covered. Coverage of the nervous system and striated muscle is similar but this syllabus does not require knowledge of the	Approximately 75% of the Cambridge Pre-U syllabus is covered. Coverage of the nervous system and striated muscle is almost identical but this syllabus does not require knowledge of as

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• muscles • innate and learned behaviour • social behaviour in primates.	histology of the spinal cord, the structure of the brain, the organisation of the nervous system, antagonistic and inhibitory neurotransmitters such as GABA or the effects of neurone diameter and body temperature on impulse speed. This syllabus does not cover the topic of behaviour, e.g. innate, learned and social behaviour, or associated practical activities such as choice chambers and T-mazes.	many areas of the brain, nor the effects of neurone diameter and body temperature on impulse speed. This syllabus places added weight on the role of sensory receptors and covers additional material: the somatic and autonomic nervous systems, reflexes, the 'fight or flight' response to environmental stimuli in mammals and comparison of skeletal, involuntary and cardiac muscle. This syllabus does not cover the topic of behaviour, e.g. innate, learned and social behaviour, or associated practical activities such as choice chambers and T-mazes.
3.4 Homeostasis and cell signalling • homeostasis • regulatory hormones • the role of the liver in homeostasis • the roles of the kidney and hypothalamus in homeostasis • cell signalling	Topic coverage is similar to the Cambridge Pre-U syllabus. Slight differences are that this syllabus does not require knowledge of transamination and detoxification in the liver, counter current multiplication in the kidney or type 1 and type 2 diabetes, or the role of the medulla oblongata in controlling the circulatory system.	Topic coverage is similar to the Cambridge Pre-U syllabus. Slight differences are that this syllabus does not require knowledge of transamination in the liver, counter current multiplication in the kidney or the role of the medulla oblongata in controlling the circulatory system. This syllabus covers cell signalling in section 5.1.5 but does not refer to G-protein receptors. This syllabus covers this additional material: temperature control in endotherms and ectotherms, the structure and function of the adrenal glands, the histology of the pancreas, the control of insulin secretion, carbon dioxide in the context of excretion and the effects of kidney failure and its potential treatments.
3.5 The immune system • structure, function and physiology of the mammalian immune system • monoclonal antibodies	Approximately 70% of the Cambridge Pre-U syllabus is covered. Coverage of the structure, function and physiology of the mammalian immune system is similar but this syllabus does not cover autoimmune diseases, the ABO blood group system or histocompatibility and acute transplant rejection. This syllabus provides more detail about expected knowledge of transmission of infectious disease with reference to specific examples.	Approximately 75% of the Cambridge Pre-U syllabus is covered. Coverage of the structure, function and physiology of the mammalian immune system is similar but this syllabus does not cover the ABO blood group system or histocompatibility and acute transplant rejection. This syllabus provides alternative examples of autoimmune diseases and more detail about expected knowledge of functions of different types of antibodies and the transmission of infectious disease with reference to specific examples. This

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		syllabus also covers possible sources of medicines, personalised medicine and synthetic biology, and the transmission of and defence against plant diseases.
3.6 (Animal) Reproduction • human sexual reproduction • cloning	This topic is not covered in this syllabus.	Approximately 25% of the Cambridge Pre-U syllabus is covered in section 6.2.1 on animal cloning.
4.1 Transport in plants • transport of water in the xylem • transport of assimilates in the phloem • stomata – structure and function	Topic coverage for transport in the xylem and phloem is almost identical to the Cambridge Pre-U syllabus, though specified in greater detail on this syllabus. This syllabus covers the structure and function of guard cells and the mechanisms of opening and closing of stomata in a separate section, Homeostasis in Plants 14.2.	Topic coverage for transport in the xylem and phloem is almost identical to the Cambridge Pre-U syllabus, though practical use of the potometer is specified on this syllabus. This syllabus covers the structure and function of guard cells in section 2.1.6 (h) and refers to hormonal control of the opening and closing of stomata in section 5.1.5 (b).
4.2 Photosynthesis • light-dependent stage • light-independent stage • photorespiration	Approximately 80% of the Cambridge Pre-U syllabus is covered. Coverage of the light-dependent and light-independent stages is almost identical but this syllabus does not cover photorespiration and C4 plants. This syllabus does cover additional material on investigating limiting factors on the rate of photosynthesis.	Approximately 80% of the Cambridge Pre-U syllabus is covered. Coverage of the light-dependent and light-independent stages is almost identical but this syllabus does not cover photorespiration, C4 plants or the Hill reaction. This syllabus does cover additional material on investigating limiting factors on the rate of photosynthesis and the interrelationship between the process of photosynthesis and respiration.
4.3 (Plant) Reproduction • pollination • fertilisation • seeds and fruit	This topic is not covered in this syllabus.	This topic is not covered in this syllabus but this syllabus does have learning outcomes related to natural and artificial cloning of plants (asexual reproduction) in section 6.2.1.
4.4 Control of plant processes Genetic control of plant cell growth • role of membrane transporters in phototropism • mode of action of gibberellins and auxins	Topic coverage is similar to the Cambridge Pre-U syllabus. This syllabus does not cover the role of auxins in positive phototropism of stems and practical activities involving auxins and gibberellin. This syllabus covers additional material: the rapid response of the Venus flytrap and the role of gibberellin in the germination of barley.	Approximately 20% of the Cambridge Pre-U syllabus is covered. This syllabus does not cover the effect of plant hormones on transcription blocking factors that restrict plant cell growth. It also does not cover mutant alleles for gibberellin synthesis or synthesis of DELLA protein leading to dwarf rice and dwarf wheat, nor Mendel's tall and dwarf pea plants resulting from control by a pair of alleles. This syllabus has learning outcomes on the roles of plant hormones, the

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		experimental evidence for the role of gibberellin in the control of plant stem elongation and practical investigations into phototropism that do cover some of the Cambridge Pre-U syllabus. This syllabus covers additional material: the types of plant responses including chemical defences, geotropism, the role of plant hormones in leaf loss in deciduous plants and in seed germination, the experimental evidence for the role of auxins in the control of apical dominance and the commercial uses of plant hormones.
5.1 (Environmental studies) Adaptation • adaptation and the ecological niche	This syllabus covers less than 10% of the Cambridge Pre-U syllabus content, covering only adaptations of xerophytes in section 7.2 and the definition of niche in 18.2.	This syllabus covers approximately 20% of the Cambridge Pre-U syllabus content. In 4.4.2 (g) it considers physiological adaptation (with different examples) and in 3.1.3 (e) it covers xerophytes (again with different examples) and hydrophytes, though without specifying practical activities.
5.2 Measuring and conserving biodiversity • biodiversity • sampling techniques as ecological tools • principles of conserving biodiversity • the species-area concept • integrated management strategies	Topic coverage is similar to the Cambridge Pre-U syllabus with regard to biodiversity, sampling techniques and the principles of conserving biodiversity. This syllabus does not cover keystone species, the species-area concept, the danger of habitat fragmentation or the SLOSS debate. This syllabus does additionally cover specified conservation strategies such as the role of zoos, botanic gardens, conserved areas, seed banks, controlling invasive alien species, assisted reproduction, IUCN and CITES.	Topic coverage is similar to the Cambridge Pre-U syllabus with regard to biodiversity, sampling techniques and the principles of conserving biodiversity. This syllabus mentions keystone species but does not cover the species-area concept, the danger of habitat fragmentation or the SLOSS debate. This syllabus does additionally cover details of sampling techniques, species richness and species evenness, how genetic biodiversity may be assessed, *in situ* and *ex situ* methods of conserving biodiversity such as conserved areas, seed banks, botanic gardens and zoos, CITES, CBD and CSS. This syllabus has a significant amount of additional ecological content covering biomass transfer, recycling and succession in ecosystems and population dynamics, plus specified examples of conservation, preservation and sustainable management.