UNIVERSITY FOUNDATION PROGRAMME

BIOLOGY SPECIFICATION

PREPARING STUDENTS FOR UNIVERSITY SUCCESS

FOR TEACHING FROM 2021

August 2021

CATS UFP

CATS UFP is a Level 3 course, specifically designed to help international students move successfully from secondary education to a UK University.

The CATS UFP is delivered over 420 directed hours of teaching and learning, over 3 subjects, and utilises a rigorous style of study, within a pastorally supportive and culturally stimulating environment that enables students' learning to develop and progress successfully. Students are able to access a variety of assessment methods that are common in UK Universities, such as portfolios, presentations academic posters, and examinations combined with content specifically designed to build on prior learning from courses around the world.

English for Academic purposes is an essential part of CATS UFP, and all students will take an English course that supports their learning and prepares them for university life, as well as having access to many extracurricular activities that further reinforce their use of English. Assessment design within each subject carefully focuses on subject knowledge and skills, rather than the ability to cope with English as a second language.

CATS Colleges provide a stimulating intellectual and diverse environment with small classes; thus, enabling the best learning to happen. With CATS UFP, all learning happens with teachers who have excellent subject knowledge and are expert in creating a positive learning environment for students from a wide range of backgrounds.

CATS UFP has a successful record of accomplishment and is highly respected by UK universities. With this qualification, students with 12 years of schooling from their own country can make the progression that they want, to a wide range of UK universities, including those ranked most highly for both research and teaching. CATS UFP has strong advocates in its alumni, who display what a CATS UFP qualification can give them. Graduates report that they feel very well prepared for university study; often, better prepared than students from other Level 3 programmes. Universities have confirmed this, through testimonials and through extensive consultation with university based External Examiners it has gained excellent credibility with UK universities.

WHY CHOOSE UFP BIOLOGY

Dynamic and Engaging Content

CATS College has a long history and proven track record of providing high quality, successful Biology UFP qualifications that we have continued to improve through teacher and student feedback, operational experience and by working closely with universities and the wider academic community.

The course teaches students theories and experimental techniques to support analysis of functions of living organisms and environments to provide a dynamic specification.

Our content is designed to engage students through topics and issues that are relevant in society.

Real Life Skills

Students will develop the knowledge and skills needed to analyse data, think critically about issues and make informed decisions – all skills that are needed for further study and employment.

Assessment Success

Biology UFP involves a blended learning approach to assessing students that enables them to access content and demonstrate a wide range of skills and abilities. There are 2 methods of assessment- coursework and examination papers.

Our coursework uses a variety of assessment styles including group and individual presentations, reflection, citing sources and essays. Topics are contemporary, engaging and developed specifically for international students.

Our examination papers use a variety of assessment styles including multiple choice, short answer, extended answer, data response, essay and case studies so that students feel more confident and engage with the questions.

Real life case studies will be used wherever possible to make it easier for students to relate to and apply their knowledge and skills developed throughout the course.

Sensitivity towards international students

The Biology UFP course has been designed to address the challenges that international students will face when studying a British qualification. Coursework and examination assessments are tailor made to ensure students can access, understand, progress and achieve to the best of their abilities.

AIMS OF THE COURSE

Enable students

CATS College wants to enable students to:

- Develop their interest in, and enthusiasm for biology, including developing an interest in further study and careers in biology.
- Appreciate how society makes decisions about scientific issues and how the sciences contribute to the success of the economy and society.
- Develop and demonstrate a deeper appreciation of the skills, knowledge and understanding of how science works.
- Develop essential knowledge and understanding of different areas of biology and how they relate to each other.

HARNESS KEY SKILLS

Students taking this course will be encouraged to develop into independent learners with the ability to think critically, understand the key importance of research and presentational skills. The course covers these key skills in the following ways:

Reasoning and Critical Thinking:

- Use problem-solving skills to interpret and consider situations where more than one approach is possible.
- Select, organise and communicate relevant information in a variety of forms.
- Use mathematical techniques in a multitude of situations applicable to the real world.
- Analyse, explain and evaluate their own and others' experimental and investigative results in a variety of ways.

Independent Learning:

- Organise a student's own learning through management of time and material.
- Work on own initiative to prioritise tasks.
- Work independently to support understanding of material.
- Carry out self-directed learning tasks.

Research Skills:

- Research an area of interest and find data suitable to analyse, statistically if necessary.
- Ensure all research is referenced and not plagiarised.
- Use ICT to develop information literacy skills, to communicate and collaborate with others.

Presentational Skills:

- Systematic documentation of findings and analysis.
- Use of word processing and other forms of ICT for communication.
- Organise information clearly and coherently, using specialist vocabulary where appropriate.

PRIOR KNOWLEDGE

Suggested Prior Subject Specific Topic Knowledge

For most students some previous exposure to formal Biology education would be necessary. Specific topic details are not expected, but students who have studied an equivalent national science qualification (for example a Level 1 or 2 qualification, such as GCSE) would be well prepared for UFP Biology.

However, experience shows that students will be able to study UFP Biology successfully with no background in, or previous knowledge of, Biology - in this case their approach to learning will be significant in their need to meet the requirements and pace of the course.

Suggested Prior Mathematical Knowledge

In order to access all aspects of the Biology UFP course, students need to have acquired competence in the appropriate areas of Mathematics. The required skills are:

- Arithmetic and numerical computations.
- Making use of appropriate units in calculations, expressing answers in decimal and standard form.
- Using ratios, percentage and fractions.
- Handling data by using the correct number of significant figures.
- Finding means and constructing frequency tables, bar charts and histograms.
- Using calculators to find exponential, power and logarithmic functions.
- Order of magnitude calculations.
- Changing the subject of an equation and solving equations.
- Determining slope (gradient) and intercept of a graph.
- In addition, the calculation of area and circumference of circles and volumes and areas of spheres, rectangular block and cylinders should be known.

SUBJECT CONTENT

Examinable Content Overview
The topics in the table below will be assessed through the final examinations.

There is also one self-study topic where students are expected to study the topic themselves with little teacher guidance (an expectation on university courses) – it is highlighted in the syllabus and below in yellow.

There are 6 Modules.

Module 1 – Cell Biology	
1.1 Cells	• Use of microscopes • Difference between magnification and resolution • Structure of cells
1.2 Cell membranes	• Membrane structures • Movement of molecules and water across membranes • Practical investigations
1.3 Cell cycle	• Regulation of the cell cycle • Mitosis • Meiosis • Stem cells

Module 2 – Molecular Biology	
2.1 Biochemistry	• The role of water for living organisms • Chemical elements of biomedical molecules • Macromolecules
2.2 Nucleic acids	• The structure of Deoxyribonucleic acid (DNA) • The genetic code
2.3 Enzymes	• Metabolism at cellular and whole organism level • Classification of particles • The effects of inhibitors

Module 3 – Exchange & Transport	
3.1 Gas exchange	• The need for specialized exchange surfaces • The gas exchange system in mammals
3.2 Transport systems in animals	• Transportation system in multicellular animals • Circulatory systems • Cardiac cycle
3.3 Transport Systems in Plants (self-study)	• Structure and function • Transpiration • Xerophytes

Module 4 - Disease	
4.1 Disease	• Different types of pathogen • Immune responses • Use and risk of antibiotics • Immunisation programs

Module 5 – Energy and Coordination	
5.1 Respiration	• Cellular respiration • Anaerobic respiration
5.2 Homeostasis	• The principles of homeostasis • Physiological and behavioural responses • Structure and function of liver and kidney • Control of water potential in blood
5.3 Nerves & hormones	• Structure and function of neurons • Nerve impulses • The use of hormones

Module 6 – Genetics & Evolution	
6.1 Genetics and evolution	• Evolution • Adaptation • Natural selection
6.2 Genetic problems	• Use of genetic terminology • Use of genetic diagrams • Use of chi-squared test
6.3 Genetic manipulation	• Recombinant DNA • Gene sequencing • Genetic engineering

CONTENT DETAILS (SYLLABUS)

Mathematics will account for 10 – 15% of the available marks in the examination- **specific mathematics is highlighted in the syllabus with an asterisk (*) and mentioned in the "prior knowledge" section of the specification.**

Required investigations are highlighted in the syllabus and are required to be completed successfully in order to be awarded with a "Practically Confident" commendation at the end of the course.

Learners should be able to demonstrate and apply their knowledge and understanding of:

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Module 1 – Cell Biology

1.1 Cells		
Spec ID	**Assessment statement**	**Additional Guidance**
1.1.1	**Use microscopy to observe and investigate different types of cell and to identify the cell structure in a range of eukaryotic organisms.**	Students should be able to conduct careful observation using microscopes to view the structure.
1.1.2	**REQUIRED PRACTICAL:** **Preparation and examination of microscope slides for use in light microscopy preparation of slides of onion and/or cheek cells (with use of micrometre & graticule).**	Knowledge and importance of: Using (and staining) in light microscope. Using electron microscopes (SEM & TEM). The knowledge of how an image is formed is not required.
1.1.3	**Cell structure as seen under the light microscope using drawings and annotated diagrams of whole cells or cells in sections of tissue**	Magnification could be stated (for example, ×250) or indicated by means of a scale bar, for example.
1.1.4*	**Calculating Magnification, Image size and actual size using appropriate formulae.**	Students need to know and use the equation $\mathrm{M} = \frac{\mathrm{I}}{\mathrm{A}}$
1.1.5	**Definitions of magnification and resolution**	

Spec ID	Assessment statement	Additional Guidance
1.1.6	**The organelles, their ultrastructure and the other functions of the different cellular components. (This includes ultrastructure).**	Students should be able to produce drawings of eukaryotic cells showing a plasma membrane enclosing cytoplasm that contains 80S ribosomes and a nucleus, mitochondria and other membrane-bound organelles are present in the cytoplasm. Remember students that some eukaryotic cells have a cell wall.
1.1.7	**Deciphering photomicrographs of organelles and other cellular components in a range of cells.**	
1.1.8	**The organelles involved in protein synthesis and its secretion.**	From Nucleus to Membrane. (no detail of transcription and translation at this stage).
1.1.9	**The importance of microtubules and microfilaments in cell structure and transport.**	
1.1.10	**The similarities and differences in the structure and ultrastructure of prokaryotic and eukaryotic cells**	DNA storage, plasmids and associations with proteins. Mitochondria (and other membrane bound organelles). 70S versus 80S ribosomes

1.2 Cell Membranes		
Spec ID	**Assessment statement**	**Additional Guidance**
1.2.1	**The fluid mosaic model of membrane structure and the roles of its components**	
1.2.2	**Factors affecting membrane structure and permeability**	Explain and describe the movement across membranes by: simple diffusion. facilitated diffusion. osmosis. active transport. ex- and endo- cytosis as a form of bulk transport and how vesicles move materials.
1.2.3	**REQUIRED PRACTICAL:** **Practical investigations into factors affecting membrane structure and permeability - effect of temp on membrane permeability using colorimetry (eg beetroot discs)**	
1.2.4	**The movement of molecules across membranes**	Explain and describe the movement across membranes by: simple diffusion. facilitated diffusion. osmosis. active transport.
1.2.5	**Be able to design practical investigations into the factors affecting diffusion rates in model cells.**	
1.2.6	**The movement of water across membranes by osmosis and the effects that solutions of different water potential can have on plant and animal cells**	Deduce that Osmosis experiments are a useful opportunity for accurate mass

		and volume measurements in scientific experiments.
1.2.7	**REQUIRED PRACTICAL:** **Practical investigations into the effects of water potential on plant cells (eg potato cylinders)**	
1.2.8*	**Be able to calculate % increase and / or decrease.**	

1.3 Cell Cycle		
Spec ID	**Assessment statement**	**Additional Guidance**
1.3.1	**The cell cycle**	Outline the stages in the cell cycle, including interphase (G1, S, G2), mitosis and cytokinesis.
1.3.2	**How the cell cycle is regulated**	Explain, using micrographs also, the stages of the cell cycle. Describe, G1, G2, S, interphase, cytokinesis and G0 phases of the cell cycle.
1.3.3	**Describe the stages that occur in mitosis (prophase, metaphase, anaphase and telophase).**	
1.3.4	**Look and describe prepared slides sections of plant tissue showing stages of mitosis (Root tip squash)**	
1.3.5	**The significance of mitosis in life cycles**	Explain how mitosis produces two genetically identical nuclei. State that growth, embryonic development, tissue repair and asexual reproduction involve mitosis.
1.3.6	**The significance of meiosis in life cycles**	State that one diploid nucleus divides by meiosis to produce four haploid nuclei.

		Describe that the halving of the chromosome number allows a sexual life cycle with fusion of gametes. Explain how DNA is replicated before meiosis so that all chromosomes consist of two sister chromatids.
1.3.7	**Describe the main stages of meiosis**	
1.3.8	**Describe the organisation of cells into tissues, organs and organ systems**	Explain, with the aid of diagrams and photographs, how cells are organised into tissues, using squamous and ciliated epithelia, xylem and phloem as examples. Discuss the importance of cooperation between cells, tissues, organs and organ systems.
1.3.9	**State that stem cells can differentiate.**	State that stem cells retain the capacity to divide and can differentiate along different pathways.
1.3.10	**State that erythrocytes and neutrophils are derived from stem cells in bone marrow and analyse blood cells under the microscope.**	
1.3.11	**Evaluate the potential uses of stem cells in research and medicine**	Describe the capacity of stem cells to divide and differentiate along different pathways. Explain that this is necessary in embryonic development and makes stem cells suitable for therapeutic uses.

Module 2 – Molecular Biology

2.1 Biochemistry		
Spec ID	**Assessment statement**	**Additional Guidance**
2.1.1	**Explain the bonding in water and the relation of this bonding to all the properties and roles water has in organisms.**	Include the following points: Water molecules are polar and hydrogen bonds form between them. Hydrogen bonding and dipolarity Explain the cohesive, adhesive, thermal and solvent properties of water. Distinguish between hydrophilic or hydrophobic properties of substances Outline the thermal, cohesive and solvent properties of water. Explain the relationship between the properties of water and its uses in living organisms as a coolant, medium for metabolic reactions and transport medium.
2.1.2	**Discuss and use the following terms appropriately:** **monomers and polymers** **condensation and hydrolysis**	State that proteins, carbohydrates and lipids are three of the key groups of macromolecules essential for life. Outline the role of condensation and hydrolysis in the relationships between monosaccharides, disaccharides and polysaccharides; between fatty acids, glycerol and triglycerides; and between amino acids and polypeptides.

2.1.3	**Label protein, carbohydrate and lipid molecules appropriately.**	
2.1.4	**Describe structure and properties of glucose (as a ring structure) and the structure of ribose.**	Describe and label the structure of alpha-glucose and beta-glucose.
2.1.5	**Understand and explain the breakdown and building of disaccharides and polysaccharides.**	Knowledge limited to: Disaccharide (maltose). Polysaccharide (amylose).
2.1.6	**Describe the structure of starch (amylose and amylopectin), glycogen and cellulose molecules**	
2.1.7	**The structures and properties of:** **Glucose, starch (amylose and amylopectin), glycogen and cellulose molecules.**	Relate these molecules to their functions in living organisms.
2.1.8	**The structures and properties of:** **triglycerides and a phospholipid as examples of macromolecules**	Including the structures of a triglyceride and a phospholipid.
2.1.9	**Explain the synthesis and breakdown of triglycerides by the formation (esterification) and breakage of ester bonds between fatty acids and glycerol**	
2.1.10	**Describe how the properties of triglyceride, phospholipid and cholesterol molecules relate to their functions in living organisms**	
2.1.11	**State and define the general structure of an amino acid.** **Conduct a practical investigation to identify amino acids using paper chromatography**	
2.1.12	**Understand and explain the breakdown and building of dipeptides and polypeptides, by the formation and breakage of peptide bonds**	
2.1.13	**State the levels of protein structure**	

2.1.14	**Compare and contrast the structure and function of globular proteins including a conjugated protein**	Include the structure and function of haemoglobin (as an example of a globular protein) and collagen (as an example of a fibrous protein)
2.1.15	**State the properties and functions of fibrous proteins**	
2.1.16	**Practical demonstrations of the following chemical tests: biuret test for proteins, Benedict's test for reducing and test for starch and lipids, non-reducing sugars, reagent test strips for reducing sugars, iodine test for starch, emulsion test for lipids.**	
2.1.17*	**Practical investigations to identify solutes in solution using paper chromatography to work out the retention factor (eg amino acids).**	

2.2 Nucleic Acids		
Spec ID	**Assessment statement**	**Additional Guidance**
2.2.1	**Understand and explain the breakdown and building of polynucleotides.**	Explain how a DNA double helix is formed using complementary base pairing and hydrogen bonds.
2.2.2	**Describe the structure of DNA (deoxyribonucleic acid)**	Draw and label a simple diagram of the molecular structure of DNA.
2.2.3	**Explain the purification of DNA by precipitation (extraction of DNA from kiwi/strawberry)**	
2.2.4	**Describe semi-conservative DNA replication**	Outline, with the aid of diagrams, how DNA replicates semi-conservatively, with reference to the role of DNA polymerase;
2.2.5	**Analyse the nature of the genetic code and triplet code.**	
2.2.6	**Describe the transcription and translation of genes, resulting in the synthesis of polypeptides**	

2.3 Enzymes		
Spec ID	**Assessment statement**	**Additional Guidance**
2.3.1	**Explain the role of enzymes in catalysing both intracellular and extracellular reactions**	
2.3.2	**Describe the mechanism of enzyme action**	Including the induced fit and the lock and key models.
2.3.3	**Investigate the effects of pH, temperature, enzyme concentration and substrate concentration on enzyme activity**	

Spec ID	Assessment statement	Additional Guidance
2.3.4	**REQUIRED PRACTICAL:** **Practical investigations into the effects of enzyme concentration and/or substrate concentration on enzyme activity (NOT Q10)**	Students should be able to produce tangent lines to work out the gradient and therefore the rate of breakdown.
2.3.5	**Discuss the effects of inhibitors and co-factors on enzymic reactions**	Including: Competitive and non-competitive inhibitors. Reversible and non-reversible inhibitors. Cofactors and coenzymes.

Module 3 – Transport in Organisms

3.1 Gas Exchange		
Spec ID	**Assessment statement**	**Additional Guidance**
3.1.1	**Exchange surfaces characteristics:** **Large SA: Vol Ratio**	Understand terms: ventilation, gas exchange and cell respiration. Why single-celled organisms do not require specialised exchange surfaces.
3.1.2*	**State and define the features of an efficient exchange surface.**	Use of Fick's Law and calculate the SA:Vol ratio.
3.1.3	**Analyse the structures and functions of the components of the mammalian gaseous exchange system**	Draw and label a diagram of the ventilation system, including trachea, lungs, bronchi, bronchioles and alveoli.
3.1.4	**Explain the mechanism of ventilation in mammals using terms pressure and volume.**	

3.2 Transport Systems in Animals		
Spec ID	**Assessment statement**	**Additional Guidance**
3.2.1	**Explain why transport systems are required in multicellular animals.**	
3.2.2	**Use the terms:** **single circulatory system and double circulatory systems** **open circulatory system and closed circulatory system**	Examples included (but not limited to): Mammals. Fish. Insects.
3.2.3	**Describe the structure and functions of arteries, arterioles, capillaries, venules and veins.**	

3.2.4	**Identify how tissue fluid is formed from plasma and its constituents.**	Also, describe the function and location of haemoglobin.
3.2.5	**Comment and compare the external and internal structure of the mammalian heart**	Describe and draw the external and internal structure of the mammalian heart. Explain, with the aid of diagrams, the differences in the thickness of the walls of the different chambers of the heart in terms of their functions. Explain the cardiac cycle, with reference to the action of the valves in the heart.
3.2.6	**REQUIRED PRACTICAL:** **Dissect and examine the structure of the mammalian heart**	
3.2.7	**Describe the events that are coordinated in the cardiac cycle.**	Including: Valves Contractions of Walls. SAN and AVN Purkyne Tissue.

3.2 Transport Systems in Plants (Self Study Topic)		
Spec ID	**Assessment statement**	**Additional Guidance**
3.3.1	**Describe xylem & phloem structure and function.**	
3.3.2	**Label and draw (using micrographs) the structure of the vascular system in root, stems and leaves of dicot plants.**	
3.3.3	**Explain process of transpiration and the factors that affect the rate of water loss.**	

3.3.4	**The transport of water in roots (symplast and apoplast only), through the stem and through stomata.**	
3.3.5	**Describe and explain the main adaptations of xerophytes to reduce transpiration.**	

Module 4 – Disease

4.1 Disease		
Spec ID	**Assessment statement**	**Additional Guidance**
4.1.1	**Understand term "communicable pathogen"**	
4.1.2	**Define the primary non-specific defences against pathogens in animals - barriers to pathogen entry (chemical and physical), inflammation response**	Explain the primary defences against pathogens and parasites (including skin and mucus membranes) and outline their importance. (No details of skin structure are required)
4.1.3	**Understand the process of phagocytosis and identify the cells in blood smears.**	
4.1.4	**Explain and compare the specific immune response – structure – including the action of B and T lymphocytes and their signalling to each other.**	
4.1.5	**Analyse the structure and general functions of antibodies**	Describe, with the aid of diagrams, the structure of antibodies. Outline the mode of action of antibodies, with reference to the neutralisation and agglutination of pathogens;
4.1.6	**Describe the primary and secondary immune responses - differences between first and second exposure to a pathogen**	
4.1.7	**Compare and contrast the differences between active and passive immunity, and between natural and artificial immunity**	
4.1.8	**Evaluate the use of antibiotics to treat bacterial infections.**	MRSA knowledge and evolution included.
4.1.9	**Compare and contrast the uses of antibiotics, problems of antibiotic resistance.**	

4.1.10	**REQUIRED PRACTICAL:** **Practical investigation of the effect of antibiotics on bacteria using aseptic technique.**	
4.1.11*	**Understand the principles of dilution and be able to carry out a serial dilution and work out concentrations of solutions.**	
4.1.12	**Determine the principles of vaccination and the role of vaccination programmes in the prevention of epidemics**	Explain how vaccination can control disease

Module 5 – Energy and Coordination

5.1 Respiration		
Spec ID	**Assessment statement**	**Additional Guidance**
5.1.1	**Label the structure of ADP and ATP as phosphorylated nucleotides.**	Including the nature of ATP as a universal energy currency.
5.1.2	**Outline the need for cellular respiration**	Including processes requiring ATP.
5.1.3	**Describe the structure of the mitochondrion**	Explain using diagrams and electron micrographs, how the structure of mitochondria enables them to carry out their functions.
5.1.4	**Outline the process and site of glycolysis**	State that glycolysis takes place in the cytoplasm; Outline the process of glycolysis beginning with the phosphorylation of glucose to hexose bisphosphate, splitting of hexose bisphosphate into two triose phosphate molecules and further oxidation to pyruvate, producing a small yield of ATP and reduced NAD.
5.1.5	**Explain and describe the process of the link reaction.**	Use terms decarboxylation and reduction.
5.1.6	**Describe the process and site of the Krebs cycle**	Use the terms decarboxylation, dehydrogenation, reduction and substrate level phosphorylation.
5.1.7	**Understand the importance of coenzymes in cellular respiration**	Including coenzyme A.
5.1.8	**Define the process and site of oxidative phosphorylation**	
5.1.9	**Explain chemiosmotic theory**	

5.1.10	**Deduce the effects of:** **temperature, substrate concentration & different respiratory substrates** **On the rate of respiration in yeast.**	
5.1.11	**Outline the process of anaerobic respiration in eukaryotes**	

5.2 Homeostasis		
Spec ID	**Assessment statement**	**Additional Guidance**
5.2.1	**Describe the need for communication systems in multicellular organisms**	
5.2.2	**Define the communication between cells by cell signalling through both neuronal and hormonal means.**	
5.2.3	**Explain the principles of homeostasis using the terms:** **Negative & positive feedback - highlighting the importance of receptors and effectors.**	
5.2.4	**Compare and contrast the physiological and behavioural responses and coordination involved in temperature control in ectotherms and endotherms**	
5.2.5	**Describe the term excretion and its importance in maintaining metabolism and homeostasis including:** **carbon dioxide and nitrogenous waste.**	
5.2.6	**Explain the structure and functions of the mammalian liver.**	Use diagrams and photographs, to describe the histology and gross structure of the liver. Explain the formation of urea in the liver, including an outline of the ornithine cycle. Describe the roles of the liver in detoxification.

5.2.7	**Understand the structure and workings of the mammalian kidney**	Be able to label diagrams and describe the key stages of ultrafiltration, selective reabsorption and controlling salinity in the medulla using the counter-current multiplier in the loop of Henle.
5.2.8	**Discuss carrying out a safe dissection and be able to draw the structure of the kidney.**	
5.2.9	**Explain the control of the water potential of the blood using the terms:** **Water potential, osmoreceptor, posterior pituitary gland and hypothalamus.**	

5.3 Nerves and Hormones		
Spec ID	**Assessment statement**	**Additional Guidance**
5.3.1	**Understand the roles of mammalian sensory receptors in converting different types of stimuli into nerve impulses**	
5.3.2	**Describe the structure and functions of sensory, relay and motor neurones**	
5.3.3	**Explain and describe the generation and transmission of nerve impulses in mammals including:** **a resting potential** **Depolarisation** **Action potential** **Salutatory Conduction.**	Understand graphs showing membrane potentials in axons. Understand how the frequency of action potentials shows larger stimuli.
5.3.4	**Compare and contrast the structure and roles of synapses in neurotransmission**	Include the structure and function of myelinated and non-myelinated neurones; Using the aid of diagrams, describe the structure of a cholinergic synapse.

5.3.5	**Describe endocrine and exocrine communication by hormones**	Explain the meaning of the terms first messenger and second messenger, with reference to adrenaline and cyclic AMP (cAMP);
5.3.6	**Describe the histology of the pancreas to show Islets of Langerhans.**	Use the aid of diagrams and micrographs, to describe the histology of the pancreas, and outline its role as an endocrine and exocrine gland.
5.3.7	**Comment on how blood glucose concentration is regulated**	Refer to insulin, glucagon and the liver. Describe how insulin is secreted from Beta cells.

Module 5 – Genetics and Evolution

6.1 Genetics and Evolution		
Spec ID	**Assessment statement**	**Additional Guidance**
6.1.1	**State the different types of variation in evolution - continuous/discontinuous and their influencers.**	
6.1.2	**Compare and contrast the different types of adaptations of organisms to their environment- anatomical, physiological, behavioural.**	
6.1.3	**Analyse the mechanism of natural selection, using the terms:** **Selective pressures and reproductive isolation.** **Genetic Drift and stabilisation.**	
6.1.4	**Describe and discuss how evolution (in theory) occurs. Discuss its links with antibiotic resistance and pesticide resistance.**	
6.1.5	**Discuss the evidence for the theory of evolution including:** **fossil evidence and relevant molecular analysis of DNA and cytochrome C.**	

6.2 Genetic Problems		
Spec ID	**Assessment statement**	**Additional Guidance**
6.2.1	**Use the key terms:** **allele, locus, phenotype, genotype, dominant, codominant and recessive** **to explain inheritance.**	
6.2.2	**Define the terms linkage and crossing over.**	
6.2.3	**Use genetic diagrams (Punnet Squares) to solve problems involving monohybrid, dihybrid, sex linkage and codominance.**	Be able to use the example of human blood groups.

6.2.4*	**Use the chi-squared (χ2) test to test the significance of the difference between observed and expected results. (The formula for the chi-squared test will be provided).**	State that a human female can be homozygous or heterozygous with respect to sex-linked genes. Explain that female carriers are heterozygous for X-linked recessive alleles. Predict the genotypic and phenotypic ratios of offspring of monohybrid crosses involving any of the above patterns of inheritance.

6.3 Genetic Manipulation		
Spec ID	**Assessment statement**	**Additional Guidance**
6.3.1	**Define the term recombinant DNA.**	
Spec ID	**Assessment statement**	**Additional Guidance**
6.3.2	**Understand and interpret data to show genetic comparisons, for example in forensics, paternity testing, disease comparisons, phylogeny.**	
6.3.3	**Describe how the polymerase chain reaction (PCR) can be used to make multiple copies of DNA fragments. Analyse the principles of the polymerase chain reaction (PCR) and its application in DNA**	Explain that genetic engineering involves the extraction of genes from one organism, or the manufacture of genes, in order to place them in another organism (often of a different species) such that the receiving organism expresses the gene product
6.3.4	**Understand the process of how DNA fragments are produced and separated by size using electrophoresis.**	Describe the principles and uses of electrophoresis for separating nucleic acid fragments or proteins
6.3.5	**Explain (for example, with human insulin production in bacteria) the potential of genetic engineering.**	

6.3.6	**Evaluate the ethical issues (both positive and negative) relating to the genetic manipulation of animals including humans, plants and microorganisms**	Describe the advantage to microorganisms of the capacity to take up plasmid DNA from the environment; Outline how genetic markers in plasmids can be used to identify the bacteria that have taken up a recombinant plasmid
6.3.7	**Understand the potential of and use the terms: somatic cell gene therapy and germ line cell gene therapy.**	

COURSE ASSESSMENT

ASSESSMENT OBJECTIVES

Assessment objectives (AOs) are the same across all Level 3 Science specifications and all exam boards. The Biology UFP will also place a stronger emphasis on the use of biology in an international context compared to other Level 3 qualifications.

Objective	Objective Detail	Overall Course Weighting
AO1	Demonstrate knowledge and understanding of scientific ideas, processes, techniques and procedures • scientific evidences and concepts • scientific methods and systems • scientific terminology • logical presentation of scientific information	20 – 25%
AO2	Apply knowledge and understanding and use: • scientific evidences and concepts • scientific methods and systems • scientific terminology to transfer information efficiently • suitable logical steps are evident to present scientific information	30- 35%
AO3	Analyse, interpret and evaluate scientific information, ideas and evidence, including in relation to issues, to: • aim, research questions and predictions • scientific methods and systems • scientific explanations of concepts, projects and investigations	25 - 30%
AO4	Demonstrate the appropriate research, experimental skills, and personal skills necessary to carry out insightful and ethical investigations and presentations: • develop and apply 21st century communication skills • become critically aware, as global citizen, of the ethical implications of using science and technology • carry out practicals in groups effectively	15 – 20%

ASSESSMENT OBJECTIVE WEIGHTING PER COURSE ELEMENT

Course Element Information			Assessment Objective Weighting			
Type of Assessment	**Name of Assessment**	**Overall Course %**	**AO1**	**AO2**	**AO3**	**AO4**
MCQ Exam	**Basics of Science**	7	30 – 40%	40 – 50%	20 – 30%	
MCQ Exam	**Beyond Basics**	13				
Exam	**Written Exam**	40				
Coursework	**Poster**	15			45 – 55%	45 – 55%
Coursework	**Presentation**	10		40 – 50%	30 – 40%	30 – 40%
Controlled Assessment	**Practical Write Up**	15		40 – 50%	30 – 40%	30 – 40%
Practical Skills	**Practically Confident**	n/a				
Totals (Considering Weighting)		**100**	**20 – 25%**	**30 – 35%**	**25 – 30%**	**15 – 20%**

N.B. In the Examinations Mathematics will account for 10 – 15% of the available marks.

ASSESSMENT STRUCTURE OVERVIEW

Biology UFP involves five methods of assessment:

- A scientific research poster – relating a subject matter from Biology to another subject.
- A presentation – Presenting a selected Biology subject.
- 3 examination papers – 2 Multiple Choice Papers and one written exam.
- A controlled assessment - a practical write up of a practical given to you.
- A "Practically Confident" teacher assessment of your practical skills throughout the course.

Assessment Name	% Weighting	Marks Available	Additional Information
Coursework 1 - Poster	15	36	Relating a subject matter from Biology to another subject
Coursework 2 - Presentation	10	24	Presenting a selected Biology subject.
Controlled Assessment – Practical Writeup	15	36	A practical write up of a practical provided to you.
Practically Confident	n/a	n/a	Required practicals assessed by your teacher throughout the course.
Exam Paper 1 – Basics of Biology	7	20	Multiple Choice Paper on Modules 1 & 2 only. 30 minutes.
Exam Paper 2 – Beyond the Basics of Biology.	13	30	Multiple Choice Paper on all topics. 45 minutes.
Exam Paper 3 – Written Paper	40	90	Long and short answer questions on all topics (including practical applications mentioned in the syllabus and self-study topic) 2 hour 15 minutes.

An overall grade in Biology is given at the end of the course.

ASSESSMENTS

Coursework 1 - Poster

The Poster topics must be different for each science and based on the science under study, however, the assessment requirements are the same for biology, chemistry and physics.

The poster is worth 15% of the course and consists of the following stages:

- Students pick an appropriate subject (in the form of a specific question) that relates a topic from the science being studied to a cross curricular issue, some examples are:

Chemistry - Why is chemistry required for XXXXXX?	Business / Economics - How has XXXXXX shaped the economy?
Physics - Why does physics provide answers to XXXXXX?	Maths - How maths and XXXXXX aim to find solutions.
Biology - How can Biology help XXXXXX?	History - What in history has shaped XXXXXX?
General Science - How has working together helped solve XXXXXX?	Law - How does law shape XXXXX?

- A short-written article of why the topic was chosen by the student and why it is important to others.
- A written report of 1500 words that allows you to discuss research in more detail (not including references).
- An abstract (a summary of the key points of your research) of 250 words.
- Production of a digital A1 sized poster using the information from your essay and including appropriate referencing of sources and an abstract that summarises your research.
- Your written reflections regarding - on your production of the poster; the sources used and the extending the ideas of your research.

The mark scheme, documents that need to be provided and additional information for the poster is in the Assessment Guidance document.

Coursework 2 – Presentation
The Presentation is worth 10% of the course and consists of the following stages:

- Students will be given a pathogenic disease to research by their subject teacher, some examples are:

    - Tuberculosis
    - HIV
    - Influenza
    - Malaria
    - Tobacco Mosaic Virus
    - Blight
    - Bacterial soft rot
    - Creutzfeldt-Jakob Disease

- An 8 – 12-minute presentation should be produced and given that answers the following:
    - What sort of pathogen is involved?
    - What does the pathogen's lifecycle look like?
    - Who is most at risk of infection?
    - How can the disease be treated?
    - What impact does the disease have across the world?
    - What can be done to reduce the spread of the disease?

- Your reflections on your production of the presentation, the used sources and the general ideas of your presentation will take place verbally after your presentation has been given.

The mark scheme, documents that need to be provided and additional information for the presentation is in the Assessment Guidance document.

Controlled Assessment – Practical Writeup
A practical will be viewed by students in their own time.

Raw data will be provided.

Students will have 1 week to complete the task independently and it consists of the following stages:

- Writing a method.
- Carrying out a risk assessment.
- Drawing an appropriate table.
- Drawing an appropriate graph.
- Writing a conclusion.
- Evaluating the method.

The mark scheme, documents that need to be provided and additional information for the practical writeup is in the Assessment Guidance document.

Practically Confident

Students will achieve a "Practically Confident" grade upon successful completion of the required practical procedures and analysis during the course.

Students will be awarded with a "Practically Confident Shown" grade if they meet the requirements of the required practicals as judged by their subject teacher – please see "required Investigations" section for more details.

The requirements for each practical to be deemed as "Confidence Shown" shall be that the practical has been:

- Carried out effectively (either in a group or individually) – Teacher judgment based on raw data.
- Analysed correctly – Teacher judgement based upon viewing appropriate presentation of data in tabular and/or graph form (where appropriate).
- Evaluated appropriately – Teacher judgment based upon written evaluation of procedure after carrying out the investigation.

Teachers will be given a spreadsheet to record the date of when the 3 criteria above for each practical have been reached.

This will then be monitored by your teacher so as the "practically confident" grade is given or not stated.

Required Practicals

Biology is the study of life. Biologists attempt to understand the living world at all levels using many different methods and procedures. Students are expected to gain an understanding of how a scientific investigation is carried out.

The following practicals are a requirement of the course.

Students must complete all the below practicals successfully throughout the course in order to be awarded with the "Practically Confident Shown" grade to be awarded.

Students who miss or do not reach the requirements mentioned in the section for the "Practically Confident" material are responsible for arranging another suitable time with their teacher to show they have reached the criteria.

The required practicals

- Preparation of a slide -Onion cells/cheek cells (with use of micrometre & graticule).
- Effect of temp on membranes (eg in beetroot) – with use of a colorimeter.
- Effects of water potential on plant cells.
- Effects of enzyme concentration and/or substrate concentration on enzyme activity.
- Dissect and examine the structure of the mammalian heart safely.
- Effect of antibiotics on bacteria using aseptic technique.

Exam Papers

Exam Paper 1 – Basics of Biology

This paper is a multiple-choice paper and will mostly consist of AO1 questions.

It will be under controlled conditions, worth 20 marks and last for 30 minutes.

It will assess only:

1.1 Cells
1.2 Cell membranes
1.3 Cell cycle
2.1 Biochemistry
2.2 Nucleic acids
2.3 Enzymes

Exam Paper 2 – Beyond the Basics of Biology

This paper is a multiple-choice paper and will mostly consist of AO1& AO2 questions.

It will be under controlled conditions, worth 30 marks and last for 45 minutes.

It will assess all areas of the course (including practical applications mentioned in the syllabus and self-study topic).

Exam Paper 3 – Written Paper

This paper is a long and short answer questions paper and will mostly consist of AO2 & AO3 questions.

It will be under controlled conditions, worth 90 marks and last for 2 hours 15 minutes.

It will assess all areas of the course (including practical applications mentioned in the syllabus and self-study topic).

PLANNING
Suggested Teaching Plan

Spec ID	Topic	Recommended Hours	Recommended Teaching Month (September Start)	Recommended Teaching Month (Fast Track)
1.1	**Cells**	11	September	January
1.2	**Cell membranes**	10	September	January
1.3	**Cell cycle**	11	September / October	January / February
2.1	**Biochemistry**	11	October / November	February
2.2	**Nucleic acids**	8	November	February
2.3	**Enzymes**	6	November / December	February
Review & Prepare for Exam Paper 1 – Basics of Biology		(5)	December / January Exam Paper 1	March / April Exam Paper 1
3.1	**Gas exchange**	6	December / January	February / March
3.2	**Transport system in animals**	9	January	March
3.3	**Transport system in plants**	(5 hours self-study topic)	n/a	n/a
4.1	**Disease**	11	January / February	March
5.1	**Respiration**	8	February	March
5.2	**Homeostasis**	9	March	March / April
5.3	**Nerves and hormones**	11	March	April
6.1	**Genetics and evolution**	6	March / April	April / May
6.2	**Genetic problems**	7	April	May
6.3	**Genetic manipulation**	6	April / May	May
Review & Prepare for Exam Papers 2 & 3		(5)	May Exam Papers 2 & 3	May Exam Papers 2 & 3

Total = 140 Hours teacher contact time minimum.

- Students are expected to supplement this contact time with revision, completion of homework and

extra reading around the subject.

- Any relevant information that demonstrates extended reading may be awarded credit in the exam if no other creditable information is provided.

COURSEWORK DEADLINES & SUGGESTED PLANNING

All assessment will be marked centrally and anonymously..

All coursework documents need to be submitted to your teacher digitally (MS Office) for checking on similarity detection software and for marking and moderation.

A first draft of your coursework **(not the controlled assessment)** can be handed to your teacher for feedback if received within the deadline.

Missing the deadline is not acceptable – if you miss the teacher feedback deadline the teacher reserves the right not give feedback before the final hand in date.

The final deadline is when work needs to be uploaded for moderation and marking, therefore, if this deadline is missed the teacher reserves the right to only award on what has been seen or award 0 marks.

Coursework	Task in Coursework	Deadline for September Start	Deadline for Fast Track	Notes
Coursework 1 – Poster	Selecting an appropriate Question.	Before October Half – Term	Before February Half – Term	This should be discussed with your teacher before moving onto other tasks.
Coursework 1 – Poster	First draft of Coursework completed so far (not including reflections).	Last Week in November	Last Week in February	Your Teacher will mark what is provided and give verbal or written feedback.
Coursework 1 – Poster	Coursework completed and digitally sent.	January – the week of exam paper 1.	March – the week of exam paper 1.	Requirements of documents to be provided are in the appendix of this document.
Coursework 1 – Poster	Reflections	End of the week of exam paper 1.	End of the week of exam paper 1.	To be completed after the poster hand in.
Coursework 2 – Presentation	Research topic given.	Before February Half – Term	After Paper 2 & 3.	This should be confirmed with your teacher before moving onto other tasks.
Coursework 2 – Presentation	First draft of Coursework	First week in March.	1 week after Paper 2 & 3.	Your Teacher will mark what is provided and

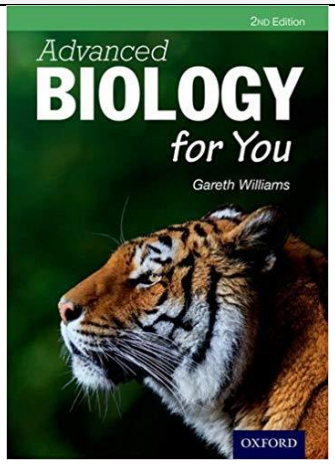
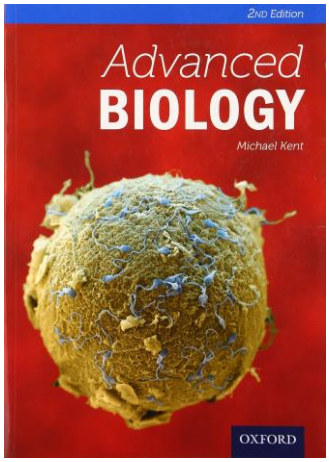
	completed so far (not including reflections).			give verbal or written feedback.
Coursework 2 – Presentation	Coursework completed, digitally sent and presented.	First week after Easter vacation.	2 weeks after Paper 2 & 3.	Requirements of documents to be provided are in the appendix of this document.
Controlled Assessment – Practical Writeup	Coursework Given to students	First week of May	First week of May	This will be sent to you to your e-mail address by the Chief Examiner.
Controlled Assessment – Practical Writeup	Coursework completed and digitally sent.	Second week of May	Second week of May	Requirements of documents to be provided are in the appendix of this document.

For these assessment elements of the course, marks for each element of the marking criteria will be awarded on a points system. Each "Seen Expansively" will be worth three points, each "seen clearly" will be worth two points, each "Seen, but vaguely" will be worth one point, and each "Not Seen" is not worthy of credit.

	Points awarded				
Marking Statement	**Not Seen**	**Seen, but vaguely**	**Seen clearly**	**Seen expansively**	**Comment as to why points were awarded**
	0	**1**	**2**	**3**	•

SUPPORT & INFORMATION

Suggested Reading Material

Textbook Name & Author	Front Cover	Publisher & Edition
Advanced Biology for you **KEITH JOHNSON**		OUP Oxford University Press 2nd Edition
A Level Biology for OCR A **CGP Books**		CGP Books 1st Editions
Advanced Biology (Advanced Sciences) **KENT**		Oxford University Press 2nd Edition

ACADEMIC HONESTY

All work should be your own and you may be required to declare that it is indeed all your own work.

All work will be checked by the similarity checker and therefore must be provided in a digital format.

If it is believed that the work is not your own due to it being different to other pieces of work and / or scores highly in the similarity checker, you may be asked to redo the work, attend a viva or be given zero marks for that particular area.

EAL (ENGLISH AS AN ADDITIONAL LANGUAGE)

Students can access the English support offered in their respective CATS College.

Lessons are taught using a Content and Language Integrated Learning (CLIL) approach, so that students can also develop their English language skills.

The course has been designed for international students and therefore, even though the course is conducted in the English language, opportunities to award skills have been considered and teachers are trained in teaching EAL students.

Most UFP students will be expected to attend an EAP programme as Universities will require a workable understanding of the English Language.

SEND (SPECIAL EDUCATIONAL NEED AND DISABILITIES)

Students can discuss any SEND concerns in their respective CATS College.

Support and extra time will be granted through the SEND coordinator at the respective CATS College in conjunction with the UFP board.

CONTACT US

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