BIOLOGY (BIO315124)

External Assessment Specifications

External Assessment Specifications inform the development of external assessments. The primary audience for this document is the course Setting Examiner and Exam Critics. It may also be of use to teachers and students.

These specifications must be read in conjunction with the current course document, available on the TASC Courses webpage.

FORMAT AND STRUCTURE

The external assessment for this course consists of a **written exam**.

The written exam is **THREE hours**.

The written exam includes **FIVE sections**.

Students will have an additional 15-minute preparation time during which students can take notes on the note paper provided and highlight any key words in the exam booklet during the allocated time. Students will not be permitted to start their exam until advised by the Exam Supervisor.

There will be FIVE booklets with ONE booklet per criterion.

CRITERIA TO BE ASSESSED

The criteria to be externally assessed are:

- Criterion 3: undertake biological inquiry to generate and evaluate data
- Criterion 5: analyse the processes and mechanisms by which biological systems are regulated
- Criterion 6: analyse homeostatic concepts, processes and interrelationships
- Criterion 7: analyse concepts, processes and interrelationships as organisms respond to pathogens
- Criterion 8: analyse cell division, genetics and evolution to explain biological persistence and diversity.

All elements of all criteria listed above will be assessed, except where indicated otherwise for C3.

SPECIFIC MATERIALS AND EQUIPMENT APPROVED FOR USE BY STUDENTS

- Current TASC BIO315124 Biology Information Sheet.
- A TASC approved calculator.

ASSESSMENT

All criteria are assessed numerically with marks out of 36.

A set of solutions or a marking tool will be developed by the Setting Examiner, reviewed by the Marking Coordinator and provided to markers at the marking meeting that follows the external written exam. The solutions or marking tool will be available from TASC in the following year.

The external assessment must include questions that, separately or together, give opportunities to demonstrate the standards from rating C to rating A.

Final results will be awarded as a rating of A, B, C, t or z in the above criteria. These ratings are used in determining the final award according to the algorithm in the course document.

NUMERICAL MARK ALLOCATION

Exam papers are designed so that the number of marks allocated to a section, part or question corresponds to the recommended time allocation for it. This is so that a student knows when answering a 5-mark question that the question has been designed for students to spend approximately 5 minutes reading, thinking and then answering the question. Students may find that they spend less or more time on certain questions throughout the exam.

SECTION A

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between FOUR and SIX questions. All questions are compulsory.
- Questions will be mostly broken into items, which will be arranged in order of difficulty.

This section addresses the following course content:

- Develop, interpret and evaluate biological experiments by:
  - consideration of research ethics
  - formulating a hypothesis (3 marks)
  - designing a controlled experiment
  - evaluating method and suggesting improvements.

  Questions based on practical work may be included.
- Develop, interpret and evaluate biological experiments related only to:
  - regulation of biological systems
  - homeostatic control
  - response to pathogens
  - biological persistence and diversity.

Assessed Criterion

- Criterion 3: undertake biological inquiry to generate and evaluate data (not including the laboratory safety aspects of E1).

SECTION B

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between FOUR and SIX questions. All questions are compulsory.
- Questions will be mostly broken into items, which will be arranged in order of difficulty.

This section addresses the following course content:

- Enzyme structure and function
- Biochemical Pathways – respiration and photosynthesis
- DNA Structure and Replication
- Gene expression and regulation
- Causes and impacts of mutation.

Assessed Criterion

- Criterion 5: analyse the processes and mechanisms by which biological systems are regulated.

SECTION C

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between FOUR and SIX questions. All questions are compulsory.
- Questions will be mostly broken into items, which will be arranged in order of difficulty.

This section addresses the following course content:

- Nerve impulses, transmission and hormone function
- Homeostatic Pathways
- Glucose regulation in animals
- Thermoregulation in animals
- Osmoregulation in animals and plants.

Assessed Criterion

- Criterion 6: analyse homeostatic concepts, processes and interrelationships.

SECTION D

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between FOUR and SIX questions. All questions are compulsory.
- Questions will be mostly broken into items, which will be arranged in order of difficulty.

This section addresses the following course content:

- Nature and transmission of pathogens
- Innate immune responses
- Adaptive immune responses
- Types of immunity.

Assessed Criterion

- Criterion 7: analyse concepts, processes and interrelationships as organisms respond to pathogens.

SECTION E

Structure

- This section will take approximately 36 minutes and be allocated 36 marks.
- This section will include between FOUR and SIX questions. All questions are compulsory.
- Questions will be mostly broken into items, which will be arranged in order of difficulty.

This section addresses the following course content

- Processes of reproduction
- Processes of cell division
- Patterns of inheritance
- Pedigree analysis
- Mechanisms of evolution.

Assessed Criterion

- Criterion 8: analyse cell division, genetics and evolution to explain biological persistence and diversity.

MARKING

The marking tool will be developed by the Setting Examiner, reviewed by the Marking Coordinator, ratified at the initial marking meeting and adopted by all markers.

All criteria are assessed numerically with marks out of 36.

Final results for each criterion will be recorded as A, B, C, t or z. These ratings are used in determining the final award according to the algorithm in the course document.

Appendix 1: Nature of questions and responses

Nature of questions (All Sections)

- Includes analytical and interpretive questions involving:
  - tables
  - graphs
  - biological diagrams
  - diagrams
  - schematic diagram / model.
- Some extended questions should be non-routine.
- Some scenarios of questions are real-world scenarios.
- A balance of questions ranging from short to extended.
- Responses range from closed to open-ended.
- The language used for the instruction of the question should come from the Course Content and Glossary.

Routine context: These questions require rehearsed responses and/or rehearsed skills in the application of biological concepts and principles, interpretation and evaluation, and in familiar contexts.

Non-routine context: These questions require procedures not previously encountered in expected prior learning activities. These require the combination, and sometimes the selection, of a set of skills in unfamiliar contexts.

Real-world scenarios: These questions relate concepts of biology to phenomena in the real world.

Data analysis: These questions require analysis of the mean, confidence intervals should not be examined.

Nature of responses (All Sections)

Short response format: These questions are composed of a brief prompt that demands a response to some stimulus material that varies from a single response to a few written points. This sort of question is suited to assessing the student's ability to:

- recall specific information and methods related to key content
- apply rehearsed methods to familiar situations
- demonstrate understanding of key concepts in previously unseen stimulus material.

Extended response format: These questions involve lengthy or multi-stage responses of increasing complexity. Greater complexity may be due to one or more of, but not limited to, the following:

- a greater cognitive demand of biological concepts
- the necessity to select appropriate information
- justification of a response via a logical line of reasoning
- questions up to a maximum of six (6) marks.

Closed-ended response: These are questions for which there is a single ‘correct’ or ‘best’ response.

Open-ended response: These are questions for which there may be multiple correct responses OR in which the quality of the argument and/or the expression is being assessed.

Appendix 2: Content mapping

Criterion	Topics	Inclusions in BIO315124	Exclusions
C5	Enzymes	**Structure and function** • globular protein, active site, denaturation. **Factors affecting rate of reaction** • temp, pH, enzyme concentration, substrate concentration, inhibitors, coenzymes and cofactors. **Inhibitors** • competitive and non-competitive.	Only general understanding of coenzymes and cofactors – not specific examples
	Photosynthesis	**Role of chloroplasts** • thylakoids, grana and stroma. Light dependent stage and light independent stage: • general understanding of photolysis, oxygen release, and reduction of carbon dioxide to produce glucose • ATP is a limiting factor produced in light dependent stage. **Inputs and outputs** • balanced net chemical equation. **Factors affecting rate of reaction** • temperature, carbon dioxide concentration and light intensity.	Not photosystem I or II No enzyme knowledge required No coenzyme action
	Cellular respiration	**Role of mitochondria** • inner folds increase surface area for chemical	Individual enzyme driven pathways not required No NAD+ and no FAD+

Criterion	Topics	Inclusions in BIO315124	Exclusions
		reaction to take place. **Aerobic respiration** **Glycolysis** • glucose is broken down to pyruvate in the cytoplasm – yield 2ATP net. **Kreb's cycle** • pyruvate converted in acetyl -Co A which enters Kreb's cycle where CO2 is emitted, and 2 ATP yielded – in mitochondria. ATP – majority generated from final stage (electron transport). Total ATP – 34-38 from total breakdown of one molecule of glucose. **Anaerobic respiration** • pyruvate converted into lactic acid in animals or ethanol and carbon dioxide in plants and yeast **Inputs and outputs** • balanced net chemical equations required for both anaerobic and aerobic respiration. **Factors affecting rate of reaction** • temperature, glucose concentration, oxygen concentration and pH.	
	DNA	**Structure** • double helix • nucleotide composition	Purines and pyrimidines

Criterion	Topics	Inclusions in BIO315124	Exclusions
		• complementary base pairing **Replication** • basic function of helicase, primase, DNA polymerase and ligase • semi- conservative theory. **Enzymes used to manipulate DNA** • synthesis of DNA using polymerase, ligase to join DNA and endonucleases to cut DNA • investigate genome sequencing.	No other enzymes Not continuous and discontinuous replication No Okazaki fragments 5' to 3' not included Only general understanding of how endonucleases cut DNA – not including recombinant DNA technology, PCR testing, CRISPR (could be investigated through Criterion 4) Only general understanding of genome sequencing.
	Protein synthesis	**What are proteins?** • globular – example, enzymes as catalysts **Protein synthesis** • transcription of gene into mRNA in nucleus • introns and exons • translation mRNA (codons) into polypeptide chain at the ribosome – including tRNA and anticodons • reading genetic code.	
	Gene regulation	**Gene expression and regulation** **Factors controlling** • transcription and translation • prokaryotic cells only – specifically the lac operon and E.coli exposure to glucose or lactose. • Knowledge of function of Lac Z and Lac Y	Not eukaryotic gene regulation, no methylation.

Criterion	Topics	Inclusions in BIO315124	Exclusions
		genes and their products required. • cell differentiation for tissue formation. **Examples could include** • palisade mesophyll cell • guard cells • root hair cells • kidney tubule cells • neurons • Schwann cell • secretory cell • leukocytes (found in course document) • sperm and egg cells.	Knowledge of function of Lac A gene and products not required. Understanding of CAP and cAMP not required in the lac operon HOX genes and embryo development or epigenetics
	Genetic mutations	**Mutations** • DNA point mutations including: • substitutions, deletions, additions and inversions • general chromosomal mutations • mutagens: physical, UV radiation, heat and chemical change • impact of mutation on final protein.	
C6	Nervous system	**Neurons** • basic structure – dendrites, cell body, axon, axon terminal, myelin sheath, Schwann cells. **Action potential** • resting potential, stimulus, threshold, depolarisation, repolarisation,	Bipolar, unipolar, multipolar neurons, glial cells Nervous system parts – parasympathetic, sympathetic, autonomic and brain parts/spinal cord Reflex arc Reflex action

Criterion	Topics	Inclusions in BIO315124	Exclusions
		hyperpolarisation, sodium and potassium leak channels, voltage gated sodium and potassium ion channels, sodium potassium pump. **Synapses** • voltage gated calcium channels, basic understanding of neurotransmitters, vesicles, synaptic cleft, post synaptic receptors. • names of neurotransmitters.	Specific functions of individual neurotransmitters not required.
	Endocrine system	**Endocrine glands** • relevant to glucose regulation and osmoregulation in animals • pancreas, hypothalamus and pituitary glands • Hormones • bind to target receptors – transported in blood to target organs • insulin, glucagon and anti-diuretic hormone.	All other endocrine organs not included Lipid soluble and water-soluble hormones – specific names not required Hormone receptor complex and transcription initiation
	Negative feedback	**Feedback loops as self-regulating systems** • stimulus, receptor, control centre, effector and response.	
	Glucose regulation	**Negative feedback** • role of pancreas as receptor – Insulin and glucagon action • role of effectors – cells take up glucose, liver converts glucose to glycogen • general understanding of diabetes.	GLUT transporters Specific mention of beta and alpha islets of Langerhans not included

Criterion	Topics	Inclusions in BIO315124	Exclusions
	Thermoregulation	**Negative feedback** • mechanisms in the skin including vasodilation/vasoconstriction, piloerector muscles, sweat glands • role of hypothalamus as detector.	Role of the thyroid gland and TSH
	Osmoregulation animals	**Negative feedback** • role of the hypothalamus • basic understanding of kidney function for osmoregulation only • mechanism of ADH on collecting tubule in kidney • kidney structure and function including filtration and reabsorption components of urine.	
	Osmoregulation plants	• transpiration – mechanism and factors affecting rate • role of stomata	CAM and C4 plants
C7	Types of pathogens	Prions, viruses, bacteria, protists, fungi and parasites. General understanding of the most common infectious diseases caused by the pathogens.	How the actual disease causes illness
	Transmission	Water, food, body fluids, vector, air, direct contact. Life cycles of some parasites.	

Criterion	Topics	Inclusions in BIO315124	Exclusions
	Innate immune responses	1st Line of defence – barriers – chemical, structural and biological 2nd Line of defence • inflammatory response – including phagocytic cells: mast cells, neutrophils, macrophages, dendritic cells • Phagocytosis • Macrophages and dendritic cells as antigen presenting cells.	
	Adaptive immune responses	3rd Line of defence • humoral response – B lymphocytes, plasma B cells, B memory cells, antibodies, antigen binding site specific to pathogen • cell mediated response – T lymphocytes, helper T cells, cytotoxic T cells, memory T cells, repressor T cells	IgG, IgA, IgM, IgE, IgD Heavy and light chains of antibodies Allergic response Terms MHC 1 and MHC 2 not required
	Types of immunity	Actively acquired passive and active immunity and artificially acquired passive and active immunity. Understanding of vaccination and herd immunity.	
C8	Reproduction	Basic differences between asexual and sexual reproduction.	
	Cell division	**Cell cycle** • G1, S, G2, M and C phases **Sub-phases** • mitosis – PMAT • meiosis – PMAT I and II	

Criterion	Topics	Inclusions in BIO315124	Exclusions
		• significance of meiosis and genetic variation • role of independent assortment and crossing over of homologous chromosomes.	
	Patterns of inheritance	• monohybrid crosses • multiple alleles (ABO blood types only) • mendelian inheritance • X-linked dominant and recessive • codominance and Incomplete dominance.	Dihybrid crosses Linkage
	Pedigrees	• identify and justify likely pattern of inheritance (dominant/recessive, X-linked/autosomal) • identify and justify likely genotypes of individuals	
	Micro and macro evolution	**Mechanisms of evolution** • mutation, Natural Selection, gene flow and genetic drift • differing selection pressures in geographically isolated populations • microevolutionary changes over time • macroevolutionary changes leading to speciation	Terms sympatric and allopatric speciation

Appendix 3: Command terms

Recall and basic understanding	
Define	Give the precise meaning of a word
Identify	Select or recognise something from information given.
Label	Add labels to a diagram
List	Give a sequence of names (no explanation necessary)
State	Give a brief, concise answer (no explanation necessary)
Understanding and use	
Describe	Give a detailed account *for example trend on a graph*
Explain	Give a detailed account; show cause and effect and reasons
Outline	Give a brief account or summary (relate back to question)
Application and analysis	
Analyse	Break down information into parts; show relationships and patterns
Compare	Give an account of the similarities between two or more items
Contrast	Give an account of the differences between two or more items
Discuss	Offer a considered and balanced review that includes a range of arguments and factors.
Evaluate	Assess strengths and weaknesses; make a judgment with evidence.
Interpret	Use knowledge and understanding to recognise trends and draw conclusions from given information
Justify	Provide scientific reasoning to support a statement or choice.
Predict	Give an expected result, trend
Suggest	Propose a solution or other possible answer