Erindale College

UNIT OUTLINE

MATHEMATICS, SCIENCE AND IT ACADEMY
SEMESTER 1 2018

Course Title	**Biology** Integrating Australian Curriculum (T)	**Course Code**	2427
Semester Unit Title	**Unit 3: Heredity & Continuity of Life**	**Semester Unit Code & Unit Value**	23238 (1.0)
Term 3	**Unit 3a Heredity & Continuity of Life**	**Term Unit Code & Unit Value**	23239 (0.5)
Term 4	**Unit 3b Heredity & Continuity of Life**	**Term Unit Code & Unit Value**	23240 (0.5)

Unit Description

Heredity is an important biological principle as it explains why offspring (cells or organisms) resemble their parent cell or organism. Organisms require cellular division and differentiation for growth, development, repair and sexual reproduction. In this unit, students investigate the biochemical and cellular systems and processes involved in the transmission of genetic material to the next generation of cells and to offspring. They consider different patterns of inheritance by analysing the possible genotypes and phenotypes of offspring. Students link their observations to explanatory models that describe patterns of inheritance, and explore how the use of predictive models of inheritance enables decision making.

Students investigate the genetic basis for the theory of evolution by natural selection through constructing, using and evaluating explanatory and predictive models for gene pool diversity of populations. They explore genetic variation in gene pools, selection pressures and isolation effects in order to explain speciation and extinction events and to make predictions about future changes to populations.

Through the investigation of appropriate contexts, students explore the ways in which models and theories related to heredity and population genetics, and associated technologies, have developed over time and through interactions with social, cultural, economic and ethical considerations. They investigate the ways in which science contributes to contemporary debate about local, regional and international issues, including evaluation of risk and action for sustainability, and recognise the limitations of science to provide definitive answers in different contexts.

Students use science inquiry skills to design and conduct investigations into how different factors affect cellular processes and gene pools; they construct and use models to analyse the data gathered; and they continue to develop their skills in constructing plausible predictions and valid, reliable conclusions.

Specific Unit Goals

The specific goals of this unit are for students to:

• understand the cellular processes and mechanisms that ensure the continuity of life, and how these processes contribute to unity and diversity within a species
• understand the processes and mechanisms that explain how life on Earth has persisted, changed and diversified over the last 3.5 billion years
• understand how models and theories have developed over time; and the ways in which biological knowledge interacts with social, economic, cultural and ethical considerations in a range of contexts
• use science inquiry skills to design, conduct, evaluate and communicate investigations into heredity, gene technology applications, and population gene pool changes
• evaluate with reference to empirical evidence, claims about heredity processes, gene technology, and population gene pool processes, and justify evaluations
• communicate biological understanding using qualitative and quantitative representations in appropriate modes and genres

CONTENT SUMMARY

DNA, genes and the continuity of life

Continuity of life requires the replication of genetic material and its transfer to the next generation through processes including binary fission, mitosis, meiosis and fertilisation (ACSBL075)

DNA is a helical double-stranded molecule that occurs bound to proteins in chromosomes in the nucleus, and as unbound circular DNA in the cytosol of prokaryotes and in the mitochondria and chloroplasts of eukaryotic cells (ACSBL076)

The structural properties of the DNA molecule, including nucleotide composition and pairing and the weak bonds between strands of DNA, allow for replication (ACSBL077)

Genes include 'coding' and 'non-coding' DNA, and many genes contain information for protein production (ACSBL078)

Protein synthesis involves transcription of a gene into messenger RNA in the nucleus, and translation into an amino acid sequence at the ribosome (ACSBL079)

Proteins, including enzymes, are essential to cell structure and functioning (ACSBL080)

The phenotypic expression of genes depends on factors controlling transcription and translation during protein synthesis, the products of other genes, and the environment (ACSBL081)

Mutations in genes and chromosomes can result from errors in DNA replication or cell division, or from damage by physical or chemical factors in the environment (ACSBL082)

Differential gene expression controls cell differentiation for tissue formation, as well as the structural changes that occur during growth (ACSBL083)

Variations in the genotype of offspring arise as a result of the processes of meiosis and fertilisation, as well as a result of mutations (ACSBL084)

Frequencies of genotypes and phenotypes of offspring can be predicted using probability models, including Punnett squares, and by taking into consideration patterns of inheritance, including the effects of dominant, autosomal and sex-linked alleles and multiple alleles, and polygenic inheritance (ACSBL085)

DNA sequencing enables mapping of species genomes; DNA profiling identifies the unique genetic makeup of individuals (ACSBL086)

Biotechnology can involve the use of bacterial enzymes, plasmids as vectors, and techniques including gel electrophoresis, bacterial transformations and PCR (ACSBL087)

Continuity of life on Earth

Life has existed on Earth for approximately 3.5 billion years and has changed and diversified over time (ACSBL088)

Comparative genomics provides evidence for the theory of evolution (ACSBL089)

Natural selection occurs when selection pressures in the environment confer a selective advantage on a specific phenotype to enhance its survival and reproduction; this results in changes in allele frequency in the gene pool of a population (ACSBL090)

In additional to environmental selection pressures, mutation, gene flow and genetic drift can contribute to changes in allele frequency in a population gene pool and results in micro-evolutionary change (ACSBL091)

Mutation is the ultimate source of genetic variation as it introduces new alleles into a population (ACSBL092)

Speciation and macro-evolutionary changes result from an accumulation of micro-evolutionary changes over time (ACSBL093)

Differing selection pressures between geographically isolated populations may lead to allopatric speciation (ACSBL094)

Populations with reduced genetic diversity face increased risk of extinction (ACSBL095)

Pre-requisite: Unit 2 Cells and Organisms

Specific Entry & Exit Requirements for Term Units

It is possible to enter this course at Term 2. This is a Semester Unit.

Assessment Schedule

TASK	DUE DATE	WEIGHTING
Assignment	Week 8	25%
Unit 3a Exam	Week 8	25%
Practical Investigation Report	Week 16	25%
Unit 3b Exam	Week 18	25%

Science Unit Grade Descriptors for T courses

	A student who achieves an **A** grade typically	A student who achieves a **B** grade typically	A student who achieves a **C** grade typically	A student who achieves a **D** grade typically	A student who achieves an **E** grade typically
Knowledge and Understanding	• demonstrates thorough and extensive knowledge and understanding of scientific concepts • justifies and applies knowledge to familiar and unfamiliar contexts and across different concept areas and experiences, displays originality and lateral thinking in problem solving	• demonstrates broad and in-depth knowledge and understanding of scientific concepts • applies knowledge to familiar and unfamiliar contexts and across different concept areas and experiences, displaying originality and effective thinking in problem solving	• demonstrates broad and general knowledge and understanding of scientific concepts • is able to apply knowledge in a variety of contexts and different concept areas to solve problems	• demonstrates general and basic knowledge and understanding of scientific concepts • is able to use knowledge in different areas to solve problems	• demonstrates a limited knowledge of scientific concepts • displays emerging awareness of strategies to solve problems
Critical Thinking	• evaluates, synthesises and analyses patterns and trends in data, observations and investigations and makes valid and perceptive inferences • applies highly effective analytical and evaluative skills, makes perceptive connections between scientific concepts, draws accurate conclusions and proposes appropriate improvements	• analyses and synthesises patterns and trends in data, observations and investigations and makes valid inferences • applies effective analytical skills, makes insightful connections between scientific concepts, draws mostly accurate conclusions and proposes appropriate improvements	• describes and explains patterns and trends in data, observations and investigations and makes general inferences • describes and explains general connections between scientific concepts, draws conclusions and proposes improvements	• identifies and describes patterns in data, observations and investigations and makes simple inferences • describes connections between scientific concepts, draws conclusions and proposes improvements	• identifies patterns in data, observations and investigations • identifies connections between scientific concepts
Investigative Skills	• demonstrates logical and coherent investigations, acknowledges information using referencing conventions and operates equipment highly effectively and safely	• demonstrates well considered investigations, acknowledges information using referencing conventions and operates equipment effectively and safely	• demonstrates considered investigations, acknowledges information using referencing conventions and operates equipment safely with some general effectiveness	• outlines investigations, inconsistently acknowledges information using referencing conventions and mostly operates equipment effectively and safely	• displays emerging skills in investigations, attempts to acknowledge information and operates equipment with limited awareness of safety procedures
Communication	• presents highly complex concepts accurately and coherently in a wide range of written and non written formats using appropriate terminology with flair	• presents concepts clearly and logically in a range of written and non written formats using appropriate terminology with confidence	• presents general concepts clearly in a range of written and non written formats using appropriate terminology generally using terminology appropriately	• presents basic concepts in a narrow range of written and non written formats using terminology inconsistently	• presents some basic concepts in a limited range of written & non written formats using minimal terminology
Work practices	• organises time and resources to work in a highly productive and safe manner both independently and in a team • evaluates and analyses risks, acts highly appropriately in all investigations	• organises time and resources to work in a productive and safe manner both independently and in a team • analyses and explains risks and acts appropriately in all investigations	• organises time and resources to work in a generally productive and safe manner both independently and in a team • identifies and describes risks and acts appropriately in all investigations	• demonstrates inconsistent organisation of time & resources, works with occasional productivity & some awareness of safety independently or in a group • identifies risks and acts mostly appropriately in investigations	• demonstrates limited organisation of time & resources to work with an emerging awareness of safety • demonstrates an emerging awareness of risks, developing approaches to investigations

ATTENDANCE AND PARTICIPATION

Students are expected to submit all assessment items and attend all classes, participate in a positive manner and seek support whenever it is required. Excursions, simulations and presentations by visitors (including lunchtime) may form part of class work. It is your responsibility to catch up on missed work when absent from class.

Any student whose attendance falls below the 90% of the scheduled classes/contact time and has not provided substantial documentary evidence to cover the absence will be awarded a V grade. This means that 4 unexplained absences in a term or 8 unexplained absences in a semester could mean that a V grade may be awarded. However, the Principal has the right to exercise discretion in special circumstances if satisfactory documentation is supplied.

LATE SUBMISSION OF WORK

Students are encouraged to submit work on time as it is a valuable organisational skill. Students are also encouraged to complete work even if it is late, as there are educational benefits in doing so.

Late work will receive a penalty of 5% (of possible marks) per calendar day late, unless an extension is granted by the class teacher prior to the deadline. This means that 5% is taken off the possible marks that could have been achieved eg. If a student achieved a score of 75/100, and the item is one day late, then five marks (5% of 100) would be taken from 75, which leaves the score as 70/100. 'Per calendar day late' means each day late whether it be a weekend or public holiday. Items due on any date must be submitted to the class teacher, faculty staff room, or front office at the college by 3.30pm on that day. After 3.30pm, the item will attract the late penalty. Submission of work on a weekend or public holiday is not acceptable. If you do not submit your work to your class teacher, make sure that it is signed and dated by either another member of staff in the faculty staffroom, or a member of the front office staff.

After 7 days, late work will be awarded the Notional Zero. Calculation of a Notional Zero is based on genuine scores, (items submitted on time or with an extension). The Notional Zero will be a score that lies between 0.1 of the standard deviation below the lowest genuine score for that item and zero. If the lowest genuine score is zero, then the notional score is zero.

No work will be accepted after marked work has been returned, or accepted after the unit has completed. Computer and/or printer failure will not be accepted as a valid reason for late work. Make sure you backup, keep hard copies and rough notes.

Unless prior approval is granted, any student who fails to submit assessment tasks worth in total 70% or more of the assessment for the unit will be considered to be unassessable and will receive a V grade. The Principal has the right to exercise discretion in the application of the late penalty in special circumstances where satisfactory documentation is supplied.

CHEATING AND DISHONEST PRACTICE

The integrity of the College's assessment system relies upon all involved acting in accordance with the highest standards of honesty and fairness. Any departure from such standards will be viewed very seriously. Accordingly:

- Plagiarism - claiming authorship of someone else's work (intentionally or otherwise) - is a serious misdemeanour, and attracts severe penalties.
- Students are required to acknowledge the source of all material that is incorporated into their own work.
- Students may not submit the same item for assessment in more than one unit, unless specific agreement has been reached with the class teacher.

MODERATION

Throughout the semester, moderation in the form of common marking schemes, cross marking and joint marking occurs across all units in the Moderation Group to ensure comparability of standards. Moderation is a process whereby student's work is compared so that student performance can be graded fairly and consistently. Moderation takes some time, and so students may not receive their work back until ACT wide moderation of grades across all colleges has occurred. Small Group Moderation is carried out in courses with small class sizes.

UNIT SCORES (only included for Tertiary Courses)

- Raw scores are calculated by adding Z scores according to the weightings in the assessment table.
- All raw unit scores are then combined into two rank order lists, one for each cohort Year 11 and 12. Each list is reviewed by the Executive Teachers concerned to identify any anomalies.
- Each of the rank order lists is then standardised for each semester using historical parameters or back scaling.

RIGHT TO APPEAL

You can appeal against your assessment if you feel that the result you obtained is not fair. You should first talk to your class teacher, and if you are not satisfied with the explanation you must discuss the situation with the Executive Teacher of the faculty concerned. If you still do not feel that your result is fair you should talk to the Deputy Principal Programs for further advice on the 'appeal process'.

Executive Teacher: Ruth Edge **Class Teacher: Sebastian Gray** **Date 13/02/2018**