Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE COURSE OUTLINE

BIOLOGY
GENERAL YEAR 12

Sample course outline

Biology – General Year 12

Unit 3 – Reproduction and inheritance

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan, select and use appropriate investigation methods, including laboratory experimentation, real or virtual dissections and microscopy techniques, to collect reliable data; assess risk and address ethical issues associated with these methods
- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error; and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- use appropriate representations, including DNA models, diagrams, flow charts and graphs to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a particular purpose using appropriate scientific language, conventions and representations

Semester 1

Week	Key teaching points
1–2	**Reproduction** Living things use a variety of methods to reproduce and support their offspring. • there are a number of asexual methods of reproduction in plants and animals, including: ▪ binary fission ▪ budding ▪ vegetative propagation ▪ cuttings ▪ bulbs and tubers ▪ spores ▪ parthenogenesis • plan, select and use appropriate investigation methods, including laboratory experimentation, real or virtual dissections and microscopy techniques, to collect reliable data; assess risk and address ethical issues associated with these methods **Task 1: Practical – Asexual reproduction in plants**. Grow plants using different methods of asexual reproduction; present results in the form of a written report, poster or photographic display accompanied by notes.
3	• cell division has a critical role in reproduction and growth: ▪ mitosis (description of the main events) ▪ meiosis (description of the main events) ▪ comparison of mitosis and meiosis, including: ○ haploid and diploid cells ○ number of divisions

Week	Key teaching points
	○ variability of daughter cells produced ○ number of daughter cells produced • sexual reproduction involves the production and union of gametes: ▪ types of gametes (haploid) ▪ fertilisation (restoring the diploid number)
4–6	• flowering plants differ in their methods of reproduction: ▪ main reproductive structures and their functions ▪ mechanisms of pollination ▪ seed dispersal ▪ requirements for germination • since the discovery that smoke promotes germination of many native Australian plants, smoke-water is now widely used in nursery production, bushland management and mine-site restoration • apiarists facilitate pollination of native plants through the movement of beehives • plants have a range of life cycles: ▪ flowering plants • banksias, eucalypts and many other Australian plants are adapted to regular burning of their habitat for seed dispersal and recolonisation **Task 2: Science inquiry – Reproduction in flowering plants**. Compare pollen grains from flowers with different mechanisms of pollination; conduct the investigation in class and complete Part 4 under test conditions.
7–8	• animals differ in their methods of reproduction: ▪ reproductive structures for external and internal fertilisation ▪ timing of reproduction ▪ strategies for the survival of offspring, including parental care and number of offspring • animals have a range of life cycles: ▪ insects or amphibians ▪ Australian marsupials • knowledge of the life cycles of organisms is important in the control of pests; for example, dung beetles to control flies, spraying wet areas to interrupt mosquitoes' life cycle **Task 3: Test – Reproduction**
9–11	Variation is the result of genetics and the environment. Genetic information is transferred to offspring by DNA to produce specific traits. • the DNA of an organism determines its characteristics: ▪ structure and function of DNA (double helix, nucleotides, complementary base pairing) ▪ genes (sequence of bases that codes for traits) • the external environment influences observable traits of an organism; for example, fur colour in Himalayan rabbits, flower colour in hydrangeas • sex determination is influenced by genetics and environmental conditions; for example, temperature, day length **Task 4: Practical – Model of DNA**. Build a model of DNA and respond to questions on DNA structure and function.
12–14	• variations in the genotype of offspring arise as a result of the processes of meiosis, sexual reproduction and mutations • mutations, the ultimate source of genetic variation, introduce new alleles into a population: ▪ gene

Week	Key teaching points
	▪ chromosome (structure and number) • natural selection occurs when selection pressures in the environment confer a selective advantage on a specific phenotype to enhance its survival and reproduction **Task 5: Externally set task** – A task set by the Authority based on the following content from Unit 3 – <teacher to insert information provided by the Authority> **Task 6: Extended response – Natural selection in action**. Read or view one or more case studies on natural selection in action; share understandings in a class discussion. Respond to questions and apply knowledge to other situations. Examples: http://theconversation.com/natural-selection-in-action-hurricanes-irma-and-maria-affected-island-lizards-100371) http://www.msn.com/en-au/news/techandscience/new-crocodile-species-found-hiding-in-plain-sight/ar-BBOR2RT?ocid=ientp https://news.harvard.edu/gazette/story/2017/08/research-explores-natural-selection-in-action/
15	• selective breeding is used in animal husbandry; for example, agriculture, horticulture and domestic pets **Task 7: Test – Inheritance and change**

Unit 4 – Ecosystems and eco-issues

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan, select and use appropriate investigation methods, including using ecosystem surveying techniques, to collect reliable data in a long term study; assess risk and address ethical issues associated with these methods
- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error; and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- use appropriate representations, including models, flowcharts, tables and graphs to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations

Semester 2

Week	Key teaching points
1	**Local ecosystem study** Citizen science includes community and students in data collecting, ecological monitoring, and being involved in scientific research. A 'citizen science' approach is encouraged for this unit. • long-term studies and ongoing monitoring of ecosystems allow for the establishment of baseline data and a record of changes in an ecosystem over time • advances in technology enable scientists to collect scientific data online from a variety of sources, including agencies, community groups and individuals, and provides extensive and widespread records **Start Task 11**: **Environmental investigation – A local ecosystem study**. Collaborate with the community in data collection, ecological monitoring and scientific research; present findings to

Week	Key teaching points
	local government, an agency or community group.
2–4	• there is a dynamic interaction between organisms and their environment • differences in geographical and physical conditions result in a wide diversity of ecosystems • abiotic factors, such as climate, pH, salinity and soil strata, impact on the survival of organisms within the environment • the biotic components of an ecosystem transfer and transform energy originating primarily from the sun into biomass • biotic components interact with abiotic components to facilitate biogeochemical cycling • producers, consumers, decomposers and detritivores have a role in the transfer of energy in an ecosystem • food chains and food webs show the feeding relationships between organisms within a community • the amount of energy transferred between trophic levels in food chains and food webs diminishes as the trophic level increases
5–7	• interactions between species in ecosystems include competition, predation and symbiosis (mutualism, commensalism and parasitism) • species interactions affect population densities and are important in determining community structure and composition • ecosystems have carrying capacities that limit the number of organisms (within populations) they can support, and can be affected by changes to abiotic and biotic factors, including climatic events **Task 8: Test – Ecosystems**
8–9	**Biodiversity** • the unique biodiversity in Western Australia has come about through natural selection due to poor fertility in soils, climate, and the length of time Australia has been isolated from other land masses • the southwest of Western Australia has been identified as a biodiversity hotspot with a high degree of niche specialisation • keystone species play a critical role in maintaining the structure of a community • bioindicator species demonstrate the condition of the environment **Start Task 9: Threats to migratory species**
10	• significant threats to migratory species, such as birds, sharks, mammals and turtles, due to climate change, habitat degradation and over-harvesting affect ecosystems worldwide **Task 9: Extended response – Threats to migratory species**. Conduct research into one migratory species selected from a list provided; collate information during discussion with other class members and complete an in-class validation exercise using notes collated from their research and class discussion.
11	**Task 11: Environmental investigation – A local ecosystem study**. Collaborate with the community in data collection, ecological monitoring and scientific research; present findings to local government, an agency or community group.
12–14	• threats to biodiversity include: ▪ loss, fragmentation and degradation of habitat ▪ the spread of invasive species ▪ unsustainable use of natural resources ▪ climate change ▪ inappropriate fire regimes ▪ changes to the aquatic environment and water flows

Week	Key teaching points
	• only the species that belong naturally to an area add to the functional biodiversity of an ecosystem; weeds and introduced species detract from the functioning of the ecosystem **Task 10: Test – Biodiversity**
15	**Task 11: Environmental investigation – A local ecosystem study**. Collaborate with the community in data collection, ecological monitoring and scientific research; present findings to local government, an agency or community group.