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

SAMPLE COURSE OUTLINE

BIOLOGY
GENERAL YEAR 11

Sample course outline

Biology – General Year 11

Unit 1 and Unit 2

Unit 1 – Classification and cell processes

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 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; 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 classification keys, diagrams of structures and processes, and images from different imaging techniques, 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

Week	Key teaching points
1–2	**Classification** • biological classification is hierarchical and based on different levels of similarity of physical features, methods of reproduction and molecular sequences • classification is a human construct which allows scientists to easily communicate information regarding organisms, and is constantly under discussion and review based on new information and evidence; for example, eucalypts, Phytophthora dieback, human evolutionary groups • binomial nomenclature is used to provide individual species with a unique name based on classification through the hierarchy • the functional unit of classification is the species, which is a group of morphologically or genetically similar individuals, or a group of organisms, that are able to interbreed to produce fertile offspring in natural conditions – but, in all cases, exceptions are found • herbariums, museums and zoos provide reference collections for classification of unknown species
3–4	• use appropriate representations, including classification keys, to communicate conceptual understanding, solve problems and make predictions • keys are limited in their application due to their range and examples used in their construction; for example, snakes of WA • use of classification keys is vital to solving life threatening situations, including identification of species for selection of anti-venom, and source of suspected food poisoning **Start Task 1**: Environmental investigation – use dichotomous keys to classify organisms in the local habitat. Select a group of plants or a group of animals on which to focus your investigation.
5–6	Continue with fieldwork for the environmental investigation. **Submit Task 1**: Environmental investigation – use dichotomous keys to classify organisms in the local habitat.

Week	Key teaching points
	Task 2: Test – Classification
7–10	**Cell processes** • the cell is the smallest unit of all organisms that carries out life processes necessary for survival • prokaryotic cells exhibit less complexity of structure than cells found in eukaryotic organisms and can be identified by: ▪ having no clearly defined internal organelles ▪ being significantly smaller than eukaryotes ▪ having a circular chromosome (plasmid) ▪ existing as single cells • in eukaryotic cells there are many specialised organelles whose functions include control of cell activities, such as photosynthesis; respiration; and removal of cell products. These processes are carried out efficiently due to the structure and function of: ▪ cytoplasm ▪ nucleus ▪ mitochondria ▪ chloroplasts ▪ plasma membrane ▪ cell wall ▪ vacuoles • plan, select and use appropriate investigation methods, including laboratory experimentation and microscopy techniques, to collect reliable data; assess risk and address ethical issues associated with these methods • developments in microscopy and associated preparation techniques have contributed to more sophisticated models of cell structure and function ▪ history of the microscope ▪ microscopy techniques **Task 3**: Practical – Microscopy techniques. Prepare slides, set up and focus a microscope, state magnification, measure cell size, interpret images and draw diagrams.
11–12	**Start Task 4**: Investigation – Respiration in seeds. • living organisms require inputs and produce outputs that need to be exchanged with the environment. Energy requirements of organisms are reflected in their lifestyle, energy source and cellular contents • plant and animal cells show differences in structure and function based on their energy source • respiration provides the useable energy for living organisms and is affected by environmental and cellular conditions; this process can be summarised using a word equation • fermentation, a type of anaerobic respiration carried out by yeasts and bacteria, is used in the production of food and beverages **Task 4**: Investigation – Respiration in seeds. Set-up, monitor and collect data conducted over two weeks. A scientific report will be written individually in class under supervised conditions.
13–14	• photosynthesis provides the useable energy for living organisms and is affected by environmental and cellular conditions; this process can be summarised using a word equation • commercial plant growth can be controlled by altering the conditions for photosynthesis **Task 5**: Extended response – maximising photosynthesis to improve commercial plant growth. Research the topic and write responses to set questions during 30 minutes in class under supervised conditions. A half-page of notes can be used.
15	• the cell membrane model has been continually reconceptualised and revised since the mid-nineteenth century, and the currently accepted model, based on the evidence from improved technologies, is the fluid mosaic model • transport of substances across the cell membrane occur through processes of ▪ diffusion ▪ osmosis

Week	Key teaching points
	▪ active transport • factors affecting the rate of exchange of materials include: ▪ surface area to volume ratio ▪ concentration gradient **Task 6**: Test – Cell processes

Unit 2 – Solving problems to survive

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 observation of organisms in their environment, laboratory experimentation, and real or virtual dissections 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; 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 diagrams of structures and processes 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

Week	Key teaching points
1	**Functioning organisms** • the complexity of systems allows for efficient exchange of materials between cells and the environment • the use of animals in research has played an important role in furthering scientific understanding of the structure and function of multicellular organisms. Ethical use of animals is regulated by state laws • exchange surfaces are thin and moist, have a large surface area and a good blood supply: ▪ significance of surface area to volume ratio ▪ concentration gradient
2	• different organisms have a range of specialised structures and surfaces for gas exchange: ▪ animals (lungs, gills, spiracles, skin) ▪ plants (leaves, stems) • most animals need to digest food to release useable nutrients and obtain energy **Task 7**: Practical – Gas exchange in animals. Dissect fish gills and make comparisons with a sheep's pluck (heart and lungs). Respond to questions guiding them through the activity.
3–4	• plants and animals have a range of specialised structures for obtaining nutrients that are dependent upon the mode of nutrition: ▪ animals (carnivorous, herbivorous and parasitic) ▪ plants, fungi and bacteria (photosynthetic, chemosynthetic, saprophytic, parasitic and insectivorous) **Task 8**: Practical – Specialised structure for nutrition in carnivores, herbivores and parasites. Observe skulls of carnivores and herbivores to compare teeth structure and compare these with structures of parasites, e.g. hookworm. Draw diagrams, summarise findings and make inferences on other organisms' mode of nutrition.
5–6	• large multicellular organisms have transport systems to allow efficient exchange of substances between the cells and the environment: ▪ plants (xylem and phloem) ▪ animals (open and closed systems, role of the heart) **Task 9**: Extended response – Exchange surfaces in plants. Research the topic and write responses to questions in class under supervised conditions. Time allowed – 30 minutes. A half-page of notes can be used.

Week	Key teaching points
7–8	• many animals remove metabolic wastes (nitrogenous, water, salts, gases) through the digestive system, skin, lungs and/or the kidneys before they accumulate to toxic levels **Task 10**: Test – Functioning organisms
9	**Adaptations** • environmental factors that affect an organism's survival include availability of resources (including food, light, water and gases) as well as variations in temperature, salinity, water turbulence, supporting the body against gravity and escaping predators • organisms have adaptations (structural, physiological and/or behavioural) to meet these challenges in their particular environment • parks, museums, herbariums and zoos enable the community to appreciate a variety of organisms and their adaptations that enhance survival in different environments Excursion/incursion – wildlife park, zoo, virtual tour, audiovisual
10–12	• organisms in aquatic habitats meet these challenges in different ways ▪ animals have adaptations for movement, buoyancy, efficient gas exchange and coping with low or high levels of salinity ▪ vascular plants and algae have adaptations for efficient gas exchange, obtaining light, anchorage and support; for example, mangroves, water lilies, kelp **Task 11**: Investigation – Adaptations of vascular plants and algae for an aquatic environment. Visit an aquatic ecosystem to make observations of plants; collect data and record observations. Use field notes to write a report in class under supervised conditions.
13–15	• many Australian plants and animals have unique features that enable them to survive in the harsh Australian environment • organisms in terrestrial habitats meet these challenges in different ways ▪ animals have adaptations for obtaining food and oxygen, escaping predators, supporting their body against gravity and coping with changes in temperature ▪ vascular plants have adaptations for obtaining energy, supporting their body against gravity and coping with variability of water availability and temperature ▪ human intervention increases the chances of survival in agricultural crops by producing strains of plants to cope with adverse environmental conditions; for example, salt tolerant wheat strains **Task 12**: Test – Adaptations