A unique appreciation of life and a better understanding of the living world are gained through studying the Biological Science course. Students develop a range of practical skills through investigations and field work.

**Biological Science 2AB**

This is a single Biological Science course which provides opportunities for applied learning but there is a focus more on academic learning. It is for students to develop an advanced understanding of adaptations for survival and patterns of change.

**Recommended Background**

To be successful in this course, it is recommended that students should have completed Biological Science 1AB, or achieved an A/B grade in Life and Living (Science); and A/B grade in English.

**Commitment**

Students will be required to complete 1 hour of general study per week; minimum of 2 hours of homework per week; 30 minutes minimum of daily revision and partake in up to two excursions per year.

**Course Content (2A)**

During this course students will:

- Identify and explain classification as a hierarchical system;
- Identify and explain the main classification groups: kingdom, phylum, class, order, family, genus, species;
- Explain binomial nomenclature and the use of taxonomic keys;
- Identify and explain the role of organisms including autotrophs, heterotrophs and decomposers in the ecosystem;
- Construct and interpret energy flow and food chains, webs and pyramids;
- Compare and contrast abiotic and biotic;
- Explore and explain the carbon cycle;
- Compare and contrast biomass and productivity in different trophic levels;
- Identify and explain the requirements of living organisms;
- Explain the processes of photosynthesis, respiration and fermentation;
- Explain the role of carbohydrates, lipids and proteins in living organisms;
- Identify and explain the structures and functions of nucleus, mitochondria, chloroplasts, plasma membrane, cell wall, vacuoles;
- Compare and contrast eukaryotic and prokaryotic cells;
- Compare and contrast plant and animal cells;
- Identify and explain diffusion, osmosis; factors affecting the rate of exchange of materials, surface area to volume ratio, concentration gradient;
- Identify and explain structural, physiological and behavioural adaptations of plants and animals living in terrestrial, marine and freshwater habitats;
- Explain adaptations for transport, gas exchange, excretion and for acquiring nutrients; and
- Plan and conduct biological research (scientific reports).

**Course Content (2B)**

During this course students will:

- Explain the relationships between organisms in communities and their impact on population size and distribution;
- Identify and explain causes of population change;
- Identify and explain the carrying capacity of an ecosystem;
- Explain the impact of population growth on ecosystems;
- Explain the influence of population dynamics including birth, death and migration rates on: population size, density, composition, and distribution;
- Conduct population calculations using birth, death and migration rates;
- Explain how reproductive processes influence the success of populations;
- Identify and explain mitosis, and its roles in growth repair and asexual reproduction;
- Explain the cell cycle;
- Compare and contrast asexual and sexual reproduction in flowering plants including structures involved in pollination and fertilisation. Plus sexual reproduction in animals;
- Compare and contrast the advantages and disadvantages of sexual and asexual reproduction for survival of species in stable and in changing environments;
- Identify and explain adaptations for improving species survival, through seed dispersal, parental care, number of offspring;
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- Explain life cycles including metamorphosis;
- Identify and explain meiosis: roles of meiosis and fertilisation in the change of chromosome number (haploid/diploid) in a life cycle;
- Identify and explain the structure and function of DNA, genes and chromosomes;
- Predict the frequencies of genotypes and phenotypes of offspring from monohybrid crosses;
- Interpret pedigree charts for patterns of inheritance and probabilities;
- Explain the influence of the environment; and
- Plan and conduct biological research (scientific report).

Biological Science 3AB

This is a single Biological Science course which provides opportunities for applied learning, however there is a strong focus on academic learning. It is for students to extend knowledge and understandings in challenging academic learning contexts, and develop a complex understanding maintaining balance and evolution. It is suitable for students wishing to continue towards a university pathway.

Recommended Background

To be successful in this course, it is recommended that students studying Biological Science 3AB should have completed Biological Science 2AB and achieved an A/B grade in a high level of English.

Commitment

Students will be required to complete 1 hour of general study per week; minimum of 2 hours of homework per week; 30 minutes minimum of daily revision and partake in up to two excursions per year.

Course Content (3A)

During this course students will:

- Explain biodiversity in terms of genetic, species and ecosystem;
- Identify and explain the differences between types of ecosystems, including input and outputs; amount of recycling; stability and productivity;
- Explain the causes and consequences of salinity, deforestation, desertification, eutrophication, biomagnification, fire, climate change;
- Explain photosynthesis using the chemical equation of photosynthesis and factors affecting the rate of photosynthesis;
- Explain light dependent and light independent reactions;
- Explain respiration using anaerobic and aerobic pathways of cell respiration and factors affecting the rate of cellular respiration;
- Explain energy transfer using ATP and ADP cycles for cell functioning;
- Explain active transport of materials across the cell membrane;
- Explain Enzymes, including lock and key, induced fit, activation energy changes; factors which affect enzymes and the importance of enzymes;
- Identify and explain the principles of homeostasis and negative feedback;
- Identify and explain structural, behavioural and physiological adaptations in plants and animals which allow homeostasis; and
- Plan, conduct and interpret biological research (scientific report).

Course Content (3B)

During this course students will:

- Identify conservation projects and strategies for maintaining biodiversity and the prevention of extinction including: genetic strategies, captive breeding programs, DNA profiling, development of new strains;
- Identify and explain environmental strategies such as biological control, revegetation, introduced species, pest control;
- Identify and explain the use of management strategies, national parks, protected zones, licences, open seasons;
- Explain DNA in terms of replication; protein synthesis; cloning and genetic modification of organisms;
- Explain recombinant DNA techniques;
- Identify and explain applications of DNA technologies;
- Explain the significance of meiosis in terms of sources of variation including gene mutation, the independent assortment of chromosomes, crossing over during meiosis and random mating;
- Explain isolation/barriers to gene flow;
- Explain the process of natural selection leading to change in characteristics of a population such as selective pressures leading to change or extinction, loss of habitat, predation and practical application of artificial selection;
- Explain gene pools, changes in allele frequency due to: natural selection, sexual selection, the founder effect and genetic drift;
- Identify and explain evidence for evolution;
- Evidence for evolution including; fossils, embryology of vertebrates; and
- Plan, conduct and evaluate biological research (scientific report).