Biology



Course Description

Biology is a diverse and evolving science discipline that seeks to understand and explore the nature of life, past and present. Despite the diversity of organisms and their many adaptations for survival in various environments, all life forms share a degree of relatedness and a common origin. VCE Biology enables students to investigate the processes involved in sustaining life at cellular, system, species and ecosystem levels. In undertaking this study, students examine how life has evolved over time and understand that in the dynamic and interconnected system of life all change has a consequence that may affect an individual, a species or the collective biodiversity of Earth. The study gives students insights into how knowledge of molecular and evolutionary concepts underpin much of contemporary biology, and the applications used by society to resolve problems and make advancements. In VCE Biology students develop a range of inquiry skills involving practical experimentation and research, analytical skills including critical and creative thinking, and communication skills.

Course Structure

Unit 1 – How do organisms regulate their functions?

This unit introduces students to some of the challenges to an organism in sustaining life. Students examine the cell as the structural and functional unit of life, from the single celled to the multicellular organism, and the requirements for sustaining cellular processes. They explore how systems function through cell specialization in vascular plants and animals, and consider the role homeostatic mechanisms play in maintaining an animal's internal environment. Students will focus on cell growth, replacement and death and the role of stem cells in differentiation.

Area of Study

- 1. How do cells function?
- 2. How do plant and animal systems function?
- 3. How do scientific investigations develop understanding of how organisms regulate their functions?

Unit 2 – How does inheritance impact diversity?

This unit will focus on cell reproduction and the transmission of biological information from generation to generation and the impact this has on species diversity. They will examine the process of DNA replication and compare cell division in both prokaryotic and eukaryotic organisms. Students will explore the mechanisms of asexual and sexual reproductive strategies, including the use of reproductive cloning technologies. Students will explain the inheritance of characteristics, analyse patterns of inheritance, interpret pedigree charts and predict outcomes of genetic crosses.

Students study structural, physiological and behavioral adaptations that enhance an organism's survival. They will explore interdependencies between species, focusing on how keystone species and top predators structure and maintain the size, density and distribution of a population.

Area of Study

- 1. How is inheritance explained?
- 2. How do inherited adaptations impact on diversity?
- 3. How do humans use science to explore and communicate contemporary bioethical issues?

Unit 3 – How do cells maintain life?

This unit investigates the workings of the cell from several perspectives. They explore the relationship between nucleic acids and proteins in key cellular processes Students study the synthesis, structure and function of nucleic acids and proteins as information molecules, gene structure and expression in prokaryotic and eukaryotic cells. They will examine the biological consequences of manipulating the DNA molecule and applying technologies. They will examine the nature of biochemical pathways, with reference to photosynthesis and respiration. They explore how the application of biotechnologies to biochemical pathways could lead to improvements in agricultural practices. Students apply their knowledge of cellular processes through investigation of a selected case study, data analysis and/or a bioethical issue.

Area of Study

- 1. What is the role of nucleic acids and proteins in maintaining life?
- 2. How are biochemical pathways regulated?

Unit 4 – How does life change and respond to challenges?

This unit considers the continual change and challenges to which life on Earth has been subjected. They study the human immune system and the interactions between its components to provide immunity to a specific pathogen. They investigate the relatedness between species and the impact of various change events on a population's gene pool and the biological consequences of changes in allele frequencies. Students examine the evidence for relatedness between species and change in life forms using evidence from palaeontology, biogeography, developmental biology and structural morphology. They explore how technological developments in the fields of comparative genomics, molecular homology and comparative genomics. Students examine the structural and cognitive trends in the human fossil record, recognizing that interpretations can be contested, refined or replaced when challenged by new evidence. Students demonstrate and apply their knowledge of how life changes and responds to challenges through investigation of a selected case study, data analysis and/or bioethical issue.

Area of Study

- 1. How do organisms respond to pathogens?
- 2. How are species related over time?
- 3. How is scientific inquiry used to investigate cellular processes and/or biological change?

Entry and Recommendations

There are no prerequisites for entry to Units 1, 2 and 3. Students must undertake Unit 3 prior to undertaking Unit 4. Students entering Unit 3 without Units 1 and/or 2 may be required to undertake additional preparation as prescribed by their teacher.

Assessment

Satisfactory Completion

Demonstration of achievement of outcomes and satisfactory completion of a unit are determined by evidence gained through the assessment of a range of learning activities and tasks.

Level of Achievement

Unit 1 and 2

- Coursework
 - Tests
 - Practical activities
 - o Scientific research
 - Examination

Unit 3 and 4

- Unit 3 School-based Assessment (20%)
 - Practical reports
 - Assessment tasks
- Unit 4 School-based Assessment (30%)
 - Practical Reports
 - Assessment tasks
 - o Scientific Inquiry and investigation presented as a Scientific Poster.
- Examination (50%)