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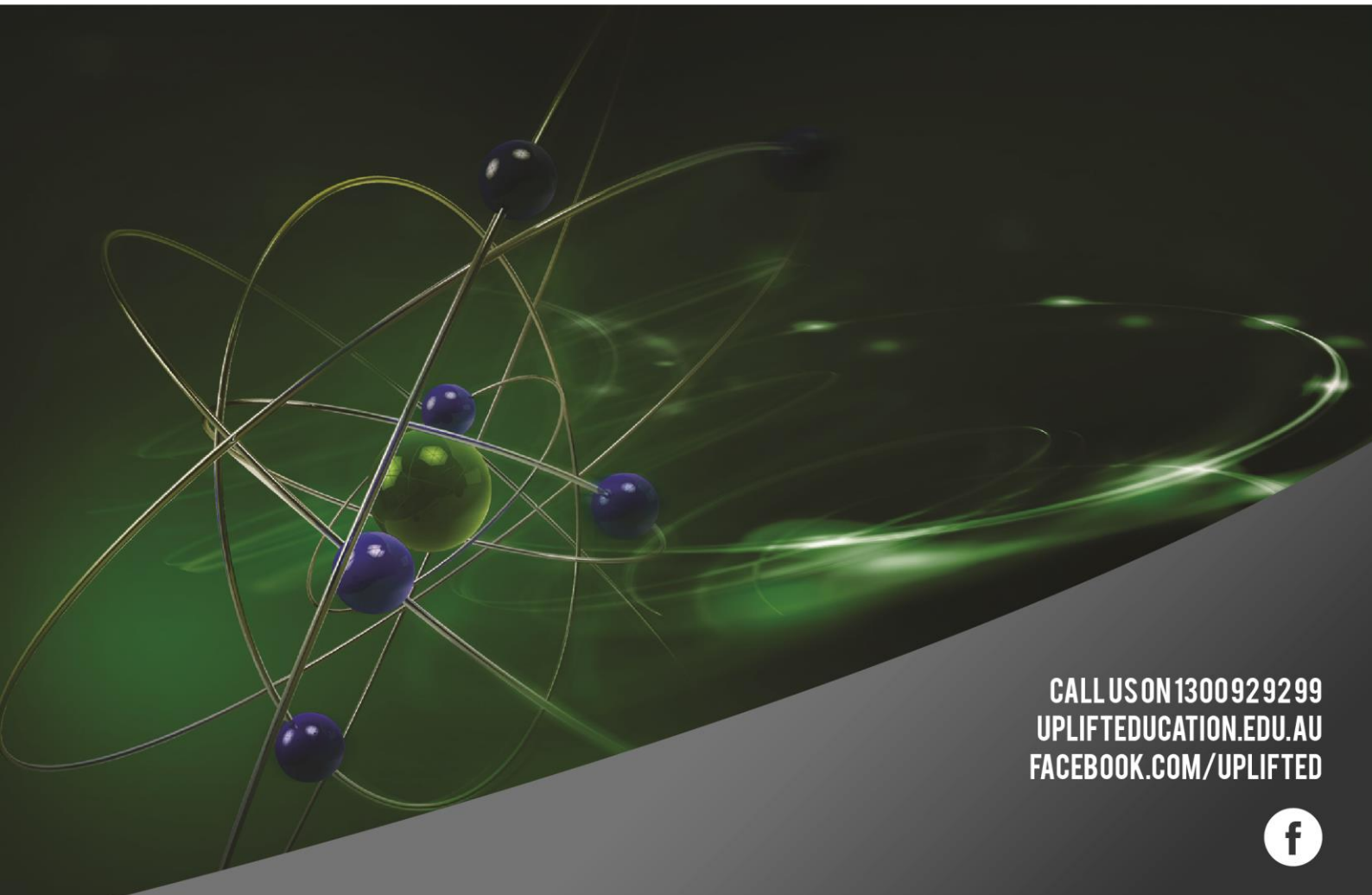
SCIENCE

PRELIMINARY & HSC BIOLOGY PROGRAM



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YEAR 11 & 12: PRELIMINARY & HSC

BIOLOGY PROGRAM OVERVIEW

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Course Overview

Preliminary and HSC Biology provides students with a contemporary and coherent understanding of the concepts explaining the functioning, origins and evolution of living things. Biology explores the levels of organisation of life, from the molecular level through cellular to higher levels of organisational structure and function, which exhibit evolution as a common source of unity and diversity. It includes developing an understanding of the interactions within and between organisms and between organisms and their environment. The study of biology recognises that, while humans are part of nature, they continue to have a greater influence on the environment than any other species. The history and philosophy of science, as it relates to the development of the understanding, utilisation and manipulation of living systems by the human species, is an integral part of the study of contemporary biology and assists students to recognise their responsibility to conserve, protect, maintain and improve the quality of all environments for future generations. Preliminary and HSC Biology draws upon, and builds onto, the knowledge and understanding, skills and values and attitudes developed in junior science. It further develops students' understanding of science as a continually developing body of knowledge, the role of experimentation in deciding between competing theories, the provisional nature of scientific explanations, the interdisciplinary nature of science, the complex relationship between evidence and ideas and the impact of science on society. The study of biology involves students working individually and with others in practical, field and interactive activities that are related to the theoretical concepts considered in the course. It is expected that students studying biology will apply investigative and problem-solving skills,

effectively communicate biological information and understanding and appreciate the contribution that a study of biology makes to their understanding of the world.

Unit Sequence

Unit 1: A Local Ecosystem (Preliminary – 22 hours)

The environment has an impact on all organisms in ways that a Biology student will learn to recognise and explain. Students are able to draw on existing knowledge of their own local area and expand on their understanding of biological concepts that can be identified through careful analysis of the biotic and abiotic factors operating. While the study of the relationships of organisms with each other and with their physical environment can be theoretically presented in a classroom setting or by using simulations of natural populations, communities and even ecosystems, the study of ecology in the field is essential. Study of this module must include field experience of a local terrestrial or aquatic ecosystem to observe and measure some of the abiotic parameters to which the main plant and animal species are adapted and to study some of the trophic, competitive and symbiotic interactions between organisms in that ecosystem. Students should be encouraged to analyse and report on those aspects of the local environment that have been affected by people and propose realistic solutions to the problems that exist. The report should include: a statement of purpose; a clear and detailed description of the area studied; any background material collected on the area; appropriate presentation of data collected; analysis of data; suggestions of the relationships that exist in the area; and an assessment of human impact on the area. This module increases students' understanding of the nature, practice and applications of biology.

Unit 2: Patterns in Nature (Preliminary – 22 hours)

Detailed examination of one or two species of living things does not provide an overview of the general features of living things. By looking across the range of commonly occurring living organisms, patterns in structure and function can be identified. These patterns reflect the fundamental inputs and outputs of living things – the absorption of necessary chemicals and the release of wastes. At a microscopic level, there are patterns in the structure and function of cells. The fundamental structural similarities exist because the biochemical processes are similar. Some important differences between plant and animal cells reflect the fundamental differences between plants and animals – the process of photosynthesis in plants. Many living things have evolved complex and efficient systems with large surface areas to facilitate the intake and removal of wastes. Transport systems allow distribution and collection of nutrients and wastes. The processes of sexual reproduction also follow similar patterns in living things – these processes reflect the purpose of

sexual reproduction as well as a common evolutionary origin for multicellular plants and animals. This module increases students' understanding of the history, applications and uses of biology

Unit 3: Life on Earth (Preliminary – 22 hours)

Life has evolved over millions of years from the common elements found in the cosmos. Simple terrestrial life has been found to exist in the most hostile of conditions on Earth and evidence from Australian scientists has shown that bacteria exist kilometres deep in the Earth's crust and have done so for millions of years. Organic molecules formed on Earth in an environment that is very different to that existing today. When these organic molecules were separated from their environment by a membrane, they began to carry out the chemical reactions of life in such a way as to sustain their existence and allow reproduction. The evolution of photosynthesis caused a change from an anoxic to an oxic environment that continues to support most of the living things on Earth today. Fossil evidence indicates changes in complexity and diversity of life forms. It is the diversity of living organisms that has led scientists to develop classification systems that group these organisms according to their structural or genetic similarity. Recent advances in molecular biology and biochemistry have allowed scientists to better describe the origins, processes and evolution of life. This module increases students' understanding of the history, nature and practice of biology and current issues, research and developments in biology

Unit 4: Evolution of Australian Biota (Preliminary – 22 hours)

The very large southern landmass, Gondwana, persisted for some time, giving rise to an array of species that spread across it. When Gondwana broke up, it did so in stages but eventually the Australian continent was isolated from Antarctica and South America. The available evidence suggests that, as Gondwana was breaking up, a number of global climatic changes were also occurring. These changes in environmental conditions impacted on Australian ecosystems and are reflected in the fossil record. As the biotic and abiotic features of ecosystems were altered, those organisms best adapted to these changes survived and passed on their genetic information to their offspring. The contribution of paleontology and the study of past environments is important to our understanding of how our present actions may affect our environment and the distribution of flora and fauna in the future. This module increases students' understanding of the applications and uses of biology, implications for society and the environment and current issues, research and developments in biology

Unit 5: Maintaining a Balance (HSC – 22 hours)

Multicellular organisms have specialised organ systems that are adapted for the uptake and transport of essential nutrients from the environment, the utilisation or production of energy and the removal of waste products arising from cellular activities. The basis of healthy body-functioning in all organisms is the health of their cells. The physical and chemical factors of the environment surrounding these cells must remain within narrow limits for cells to survive. These narrow limits need to be maintained and any deviation from these limits must be quickly corrected. A breakdown in the maintenance of this balance causes problems for the organism. The nervous and endocrine systems in animals and the hormone system in plants bring about the coordinated functioning of these organ systems. They are able to monitor and provide the feedback necessary to maintain a constant internal environment. Enzyme action is a prime example of the need for this balance. Enzymes control all of the chemical reactions that constitute the body's metabolism. As enzymes normally function only within a narrow temperature range, even a small rise in body temperature can result in the failure of many of the reactions of metabolism that are essential to life. This module increases students' understanding of the applications and uses of biology, implications for society and the environment and current issues, research and developments in biology.

Unit 6: Blueprint of Life (HSC – 22 hours)

Because all living things have a finite life span, the survival of each species depends on the ability of individual organisms to reproduce. The continuity of life is assured when the chemical information that defines it is passed on from one generation to the next on the chromosomes. Modern molecular biology is providing opportunities to alter the information transferred from one generation to the next in technologies such as cloning and in the production of transgenic species. The segregation and independent assortment of the genetic information within a species provides the variation necessary to produce some individuals with characteristics that better suit them to surviving and reproducing in their environment. Changes in the environment may act on these variations. The identification of mutations and their causes becomes important in preventing mutations and in identifying and potentially nullifying the effects of mutations in living organisms. This module increases students' understanding of the history, nature and practice of biology, the applications and uses of biology, the implications of biology for society and the environment and current issues, research and developments in biology.

Unit 7: The Search for Better Health (HSC – 22 hours)

When physiological processes malfunction, the body tries to repair the damage. The process is similar in all living things and it is only when the process fails to contain the damage that disease can be recognised. Humans have long recognised the symptoms of disease both in themselves and the animals and plants around them. Since the beginnings of recorded history, they have noted the signs that reveal that the body is malfunctioning. Increasing understanding of the causes of disease together with accompanying advances in technology have changed approaches to treatment and management of disease. The search for measures to treat and manage diseases of humans and other organisms continues and this search is paralleled by continued refinements in technology. This module increases students' understanding of the history, nature and practice of biology, the applications and uses of biology, and the implications of biology for society and the environment.

Unit 8: Option Topic (HSC – 22 hours)

HSC Biology students have the option of choosing one of the following five topics for study in this module.

- Communication
- Biotechnology
- Genetics: The Code Broken?
- The Human Story
- Biochemistry

Uplift Education is aware that the chosen option topic may vary depending on the school that the student attends. This module will be taught in the form of seminars to ensure that all students will be able to cover their chosen topic.

Assessment

Students will be required to sit a module exam at the end of each unit to monitor progress and set achievable medium-term goals. Students will also be given homework research tasks throughout the semester which will be marked and placed in the Student Work Portfolios as evidence of teaching and learning. Short revision quizzes will also be given to students within their classes to monitor their understanding of the scientific concepts they have learnt.

Plagiarism and Academic Integrity

Uplift Education has a zero-tolerance plagiarism policy. In the case that plagiarism is found in a student's work, Uplift Tutors may penalise students with a reduction of marks, or in more serious cases, Uplift Education reserves the right to deny service to the student. Uplift Education defines plagiarism in the forms of:

Copying: using the same or very similar words to an original piece of work without acknowledgement or credit, or acquiring another person's academic work and copying it.

Inappropriate paraphrasing: changing words and/or phrases while retaining the original structure and/or information without acknowledgement or credit.