

Biology (T/A)

This course covers physiology, genetics and gene technology, ecology and evolution as provided by the Australian Curriculum. Students have the opportunity to complete a minor or major. Students gain skills for further education in a carefully devised program of development in understanding scientific method and science writing as well as an intense program of experiments and practical activities. ICT is used extensively as a tool for statistical analysis, presentation of data, researching and formal writing.

Biodiversity and Connectedness

In this unit students will investigate and describe several diverse ecosystems, exploring the range of biotic and abiotic components to understand the dynamics, diversity, and underlying unity of these systems. Students use classification keys to identify organisms, describe the biodiversity in ecosystems and investigate patterns in relationships between organisms. Students will be introduced to simple statistical analysis, learn to cite and write reference lists and learn the essentials of scientific method. The development of critical thinking skills begins here.

Cells and Organisms

In this unit, students examine inputs and outputs of cells to develop an understanding of the chemical nature of cellular systems, both structurally and functionally, and the processes required for cell survival. Students examine the structure and function of plant and animal systems at cell and tissue levels in order to describe how they facilitate the efficient provision or removal of materials to and from all cells of the organism. Students continue the development of critical thinking, statistics and scientific methodology.

Heredity & Continuity of Life

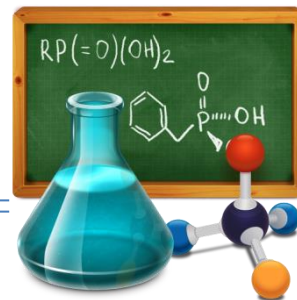
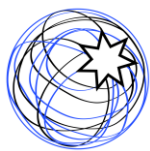
In this unit, students investigate the biochemical and cellular systems and processes involved in the transmission of genetic material to the next generation of cells and to offspring. They consider different patterns of inheritance by analysing the possible genotypes and phenotypes of offspring. Students investigate the genetic basis for the theory of evolution by natural selection through constructing, using and evaluating explanatory and predictive models for gene pool diversity of populations. They explore genetic variation in gene pools, selection pressures and isolation effects in order to explain speciation and extinction events and to make predictions about future changes to populations. The development of investigative skills and their application continues with emphasis on critical thinking and thesis essay writing.

The Internal Environment

In this unit, students investigate how homeostatic response systems control organisms' responses to environmental change – internal and external – in order to survive in a variety of environments, as long as the conditions are within their tolerance limits. Students study how the invasion of an organism's internal environment by pathogens challenges the effective functioning of cells, tissues and body systems, and triggers a series of responses or events in the short- and long-term in order to maintain system function. They consider the factors that contribute to the spread of infectious disease and how outbreaks of infectious disease can be predicted, monitored and contained. Students complete an open-ended investigation and full scientific report.

The usual sequence of units is shown below.

	Typical Order of Units	
	SEM 1	SEM 2
Year 11	Biodiversity and Connectedness	Cells and Organisms
Year 12	Heredity and Continuity of Life	The Internal Environment



Chemistry (T)

This course is designed to provide an excellent background in Chemistry that enables students to appreciate the contribution that the science of chemistry makes to a technological society. This course will also provide the necessary prerequisite for those students intending to study a science-based discipline at a tertiary (T) level, or to enter a science-based occupation. Students develop skills in chemical analysis, problem solving, handling uncertainties and chemical methodologies in a carefully design program of practical activities including open ended investigations.

Chemical Fundamentals: Structure, Properties and Reactions

The materials that students encounter in their everyday lives provide a context for investigating the relationship between structure and properties of atoms and molecules. The concept of a mole as a means of quantifying matter in chemical reactions is introduced. Students relate matter and energy in chemical reactions, as they consider the breaking and reforming of bonds as new substances are produced.

Molecules: Interactions and Reactions

Students explore the characteristic properties of water, gases, aqueous solutions, and acids and bases. They learn how rates of reaction can be measured and altered to meet particular needs, and use models of energy transfer and the structure of matter to explain and predict changes to rates of reaction. Students investigate the behaviour of gases with respect to volume, pressure and temperature.

Equilibrium, Acids and Redox

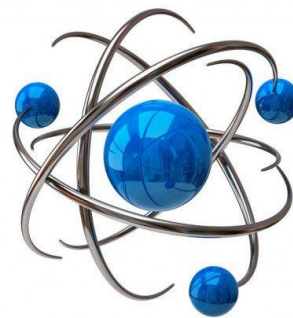
Reversible reactions and factors affecting dynamic equilibrium are studied in this unit, with an emphasis on acid-base equilibria. Students investigate the principles of oxidation and reduction reactions and the production of electricity from electrochemical cells.

Structure, Synthesis and Design

Students focus on the principles and applications of chemical synthesis, particularly in organic chemistry. This involves considering where and how functional groups can be incorporated into already existing carbon compounds in order to generate new substances with properties that enable them to be used in a range of contexts. Students select and use data from instrumental analysis to determine the identity and structure of a range of organic materials.

The usual sequence of units is shown below.

Year 11	
SEM 1	SEM 2
Chemical Fundamentals	Molecules
Year 12	
SEM 1	SEM 2
Equilibrium and Redox	Structure, Synthesis and Design



Physics (T)

The course will provide an excellent basis for students who intend to study a science-based discipline at a tertiary level or to take on a science-based occupation. Students taking this course are advised to select a tertiary Mathematics (minimum Maths Methods) course and to be achieving good grades in Mathematics. The study of Physics provides skills for the 21st Century. Students are encouraged to construct conceptual and mathematical models of physical phenomena through experimental investigation and problem solving. Critical evaluation of experimental procedures and results is a focus of our practical work. Students gain skills in experimental design and the rigorous treatment of uncertainties. Students develop communication, questioning and co-operative problem solving skills through regular, informal presentations to their classmates, related discussion and small groups work. ICT is used extensively by students throughout the physics course as a tool in research, data analysis and presentation of ideas.

Linear Motion and Waves

As well as providing an introduction to core practical investigation skills, this unit covers the foundation concepts of motion and waves. Students will analyse motion, momentum, energy and collisions using models and practical experience. Wave motion and properties with special reference to light are examined in depth.

Thermal, Nuclear and Electrical

Students investigate properties of heat, temperature and energy transfer. Nuclear energy is studied in depth with emphasis on radiation, fission and fusion highlighted. In the studies of electricity circuits and the physical principles that govern them investigation uses practical activities. Energy and conservation of energy is the uniting theme in this topic.

Gravity and Electromagnetism

This unit builds on previous units but explores more complex motion in two dimensions that relates to projectile and circular motion, incorporating gravity. Electrical and magnetic fields are investigated and their applications such as motors and generators are the focus of this unit. Vector analysis and motion in fields are studied in depth.

Revolutions in Modern Physics

The fundamentals of our understanding of the Universe is examined in this unit as studied through the evolution of scientific models in Physics over the last 100 years. Concepts explored relate to relativity, the quantum light model and its applications and the standard model for the building blocks of matter.

The usual sequence of units is shown below.

	Typical Order of Units	
	SEM 1	SEM 2
Year 11	Linear Motion and Waves	Thermal, Nuclear and Electrical
Year 12	Gravity and Electromagnetism	Revolutions in Modern Physics

Human Biology (T/A)

Human Biology is an excellent course for students planning a career in the medical or health care area such as medicine, nursing and physiotherapy and enriches the STEMM focus (Science, Technology, Engineering, Mathematics and Medicine). It is specifically designed to complement the Biology course so students can study Biology at the same time, or Human Biology can be studied on its own. Students have the opportunity to study Human Biology as a minor or major with the possibility of a major minor if a student undertakes a unit of negotiated study. It is ideal to team this course with the pre-med R unit which is more career oriented.

The Essentials of Human Life

Students learn about the stem cells from which tissue form in the embryo and which are the foundation for the growing therapeutic treatment of a number of degenerative diseases. Relationships between the tissue types are explored in order to develop an understanding of the intricate interconnectivity that produces the specialised organs of the human body, such as the heart and the liver, with a specialised function.

The Aging Human Body

Students learn about human reproduction and the complexity of growth and development of the human body through childhood, adolescence and adulthood. They will also focus on a range of illnesses that relate to age and tissue types so that they gain a deep understanding of how disease relates to tissue function in the body. Students will be exposed to a wide variety of case studies to deepen their understanding of diseases throughout the life cycle.

Human Health and the Environment

This unit investigates the impact of environmental conditions upon the health of humans both at the individual and population level. The environmental causes of disease will be considered, based on the nature of the risk: biological, chemical, physical and social. Mental illness will be investigated as well as its causes, symptoms, and treatment. Major mental health issues that affect teenagers will be considered in order to give the content real world relevance for the students.

Treating the Human Body

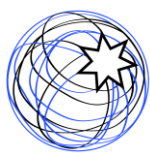
In this unit, students study the exponential growth of research and knowledge about the functioning of the human body that informs the Western mode of treating illness, and also consider alternative ways of treating illness in Australia. Students consider multiple types of diagnostic procedures to develop their diagnostic and treatment skills.

Negotiated Unit

Students may negotiate to undertake a major investigation or project in a specific area of interest in human biology. The unit may include study outside of the college (e.g., at universities, CSIRO, etc.). It may include a working relationship with a professional scientist in the chosen field or may take another form of investigation.

The usual sequence of units is shown below

	Typical Order of Units		Negotiated unit can be done at any time in year 12. It is done offline and is counted as a unit of work for Human Biology
	SEM 1	SEM 2	
Year 11	The Essentials of Human Life	The Ageing Human Body	
Year 12	Human Health and the Environment	Treating the Human Body	



Science Extension (R)

1. Pre Med

Pre-Med is designed to extend student's knowledge in human biology as well as helping prepare students for careers in the health professions. These include careers in Nursing, Medicine, Veterinary Science, Dentistry, Physiotherapy, Paramedics, medical research, and many others. It is a perfect accompaniment to Human Biology and Biology courses and extends the STEMM focus in Science.

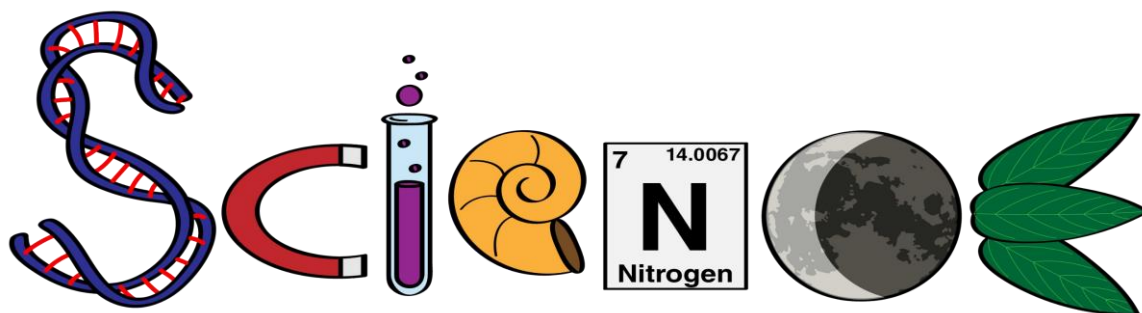
The program is less academic than Biology and Human Biology and aims to provide students with skills, information and experience to make informed decisions regarding post-college study options in medical and health science fields. It also aims to help them in their applications for University, CIT and employment, including UMAT and, in close association with the WEX and Careers team, can provide interview preparation where appropriate.

2. Science Society

This program is for students who have a keen interest in all things Science. The program schedule includes:

- Excursions to ANU
- Q & A's with real life Scientists
- National Competitions
- Assistance with external selective programs
 - ANU Extension
 - UC Accelerated Pathway program.
 - Titration Competitions
 - National Youth Science Forum
 - Questacon Science Explainers program

There is no formal assessment for R units and the completion of tasks is not competitive. A minimum of 11 hours provides students with 0.2 of a unit and students with demanding workloads do not have to complete all sessions to remain in the program.





Extra-curricular Program and Community Partnerships

Students have the opportunity to participate in an extensive extra-curricular Science program. They will gain credit for these as R units. Further information on these activities is available by contacting staff in the Science faculty.

Typical activities conducted in recent years include the following:

National Youth Science Forum - Year 11 only (possibility to participate in extension activities and **International Youth Science Forum**). This is a specialty of Canberra College. Students are selected and advised on participation in the program. The program is two weeks of fun and fascination at an Australian University stimulating student interest in all fields of science and developing career pathways and leadership skills. Students may be invited to attend various Extension weekends or can be invited to attend the International Youth Science Forum which can be held in a number of venues overseas. Students from this college have attended the IYSF and found it a mind-blowing experience. Students are required to seek Rotary funding to attend the NYSF and to give a presentation to their Rotary club upon their return.



**NATIONAL YOUTH
SCIENCE FORUM**

Inspiring young Australians
to futures in science each year since 1984



ANU Extension – a complete minor taken out of normal class time at ANU. Offerings in science include Astrophysics, Conservation Biology, Chemistry, Physics and Engineering. Enrolments for this are in the first weeks of year 11. These units are credited as full academic units toward your senior certificate. **The satisfactory completion of this minor can lead to an early offer of entry to ANU and a unit credit toward your degree.** Students in science who take up this challenge find it a worthwhile and rewarding experience. Canberra College has a very high uptake and success rate for these courses.



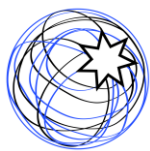
UC Accelerated Pathways Program - Studying in the University of Canberra Accelerated Pathways Program will complement your ACT Year 11 and 12 College studies and give you access to the library, computer systems and modern learning and research facilities at UC. Systemic and Anatomy and Physiology is the subject specific course available, where students will Investigate the structure and function of the human body including cells, tissues and organs, exploring the interrelationships and the regulation of physiological functions.



**UNIVERSITY OF
CANBERRA**

Independent Projects – can be done as an R unit. The projects can be done in association with The Science Mentors program ACT and may involve CSIRO crest program and may lead to selection for BHP Billiton Science Competition. The project needs to be sufficiently complex to fulfil the requirements of the R unit at college level. The choice of project is your own but you will be guided by teachers and scientists. Independent projects are also completed as a part of the Interdisciplinary Science course as indicated above.





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National Chemistry Titration Competition – requires learning the important analytical skill of titration in order to compete at ANU with students from all over Canberra. Canberra College students are often competing in the National finals of this prestigious competition.



Australian Science Olympiads – 2-hour exams in Chemistry, Physics and Biology for Year 11 students. Some top students can be eligible for the Australian Olympiad Summer School in January. This summer school is the equivalent of first year university studies in the chosen area and gives a large R unit credit. Canberra College Students have attended on a number of occasions in the past.



Science Competitions

- National Chemistry Quiz - a one-hour multiple-choice test covering chemistry from either Year 11 or Year 12.
- ICAS- a one-hour multiple-choice test covering science concepts from all areas of science, but the concepts are more challenging.



Questacon Schools Training Program - this is an extensive program provided by Questacon to train gallery presenters and workshop assistants. It requires 12 hours of training and 40 hours of hands-on work. There are 2 streams: in the gallery as a science communicator or in the workshops designing and building displays. Students completing the training are eligible to volunteer at Questacon.



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