Sample Course Outline

Human Biology

ATAR Year 11

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Sample course outline

Human Biology – ATAR Year 11

Unit 1 – The functioning human body

**Science Inquiry Skills**

All the following Science Inquiry Skills must be taught in each unit. The Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated throughout the learning experiences.

* identify, research and construct questions for investigation; propose hypotheses; and predict possible outcomes
* design investigations, including the procedure(s) to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
* conduct investigations safely, competently and methodically for the collection of valid and reliable data
* represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and limitations in data; and select, synthesise and use evidence to make and justify conclusions
* interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments
* select, construct and use appropriate representations, including labelled diagrams and images of various cells, tissues and organ systems, to communicate conceptual understanding, solve problems and make predictions
* communicate to specific audiences, and for specific purposes, using appropriate language, nomenclature, genres and modes, including scientific reports

| Week | Key teaching points |
| --- | --- |
| 1–2 | **Cells and tissues*** Hierarchical structural organisation of the body – cells, tissues, organs, systems
* Microscopy
	+ microscopy techniques
		- preparation of wet mount slide
		- calculating magnification and field of view
		- estimating cell size
		- drawing labelled diagrams of cells observed under the microscope

Practical activity: Microscopy – observing cells* Cell structure and function
* Tissues
	+ structure and function – epithelial, connective, muscular, nervous

Practical activity: Microscopy – observing tissues |
| 3–4 | * Cell membrane

Practical activity: Properties of cell membranes* + fluid mosaic model
* Exchange of materials
	+ osmosis, simple diffusion, facilitated diffusion, active transport and vesicular transport

Practical activity: DiffusionPractical activity: Osmosis* Factors affecting exchange across cell membranes
	+ surface area to volume ratio, concentration gradients, physical and chemical properties

Practical activity: The effect of concentration gradients on exchange of materials |
| 5–6 | **Metabolism*** Types of metabolism
	+ anabolism and catabolism
* Requirements for efficient metabolism
	+ oxygen and nutrients (carbohydrates, proteins, lipids, vitamins and minerals)
* Cellular respiration
	+ aerobic respiration
		- location in cell, amount of energy (ATP) released

Practical activity: Aerobic respiration* + anaerobic respiration
		- location in cell, amount of energy (ATP) released

Practical activity: Anaerobic respiration* Enzymes
	+ models for enzyme functioning – lock and key, induced fit
	+ factors affecting enzymes
		- pH, temperature, inhibitors, co-enzymes, co-factors, concentration of reactants and products

Practical activity: The effect of temperature on enzyme activity**Task 1:** Test – Cells, tissues and metabolism |
| 7 | **Respiratory system*** Structure and function of the respiratory system
* Characteristics for efficient gas exchange
* Mechanics of breathing

Practical activity: Vital capacity |
| 8 | **Circulatory system*** Structure and function of the heart

Practical activity: Heart dissection* Structure and function of blood vessels
* Components of blood and their function

Practical activity: Observing blood* Function of the lymphatic system
* Blood grouping and transfusions

Practical activity: Blood groups and transfusions**Commence Task 2:** Investigation – Cardiovascular health in teenagers |
| 9 | **Digestive system*** Structure of the digestive system
* Function of the digestive system
	+ digestion – mechanical and chemical

Practical activity: Simulating digestionPractical activity: The effect of pH on enzyme activity* + absorption of nutrients
	+ elimination of wastes
 |
| 10–11 | **Excretory system*** Function of the excretory system
* Structure and function of the urinary system
* Role of the nephron in urine formation and composition of body fluids
	+ Filtration, reabsorption and secretion

Practical activity: Modelling nephron function* Diagnosis and treatment of kidney dysfunctions

**Submit Task 2:** Investigation – Cardiovascular health in teenagers |
| 12–14 | **Musculoskeletal system*** Muscular system
	+ functions of the muscular system
	+ sliding filament theory
	+ action of paired muscles
* Skeletal system
	+ functions of the skeleton
	+ axial skeleton
	+ appendicular skeleton
	+ bones
		- microscopic structure

Practical activity: Observing bone tissue* + - types of bones and their function

Practical activity: The anatomy of a long bone* + joints
		- function of joints
		- types of joints – immovable, cartilaginous, synovial joints (structure of synovial joints)

Practical activity: Observing joints* Osteoporosis and osteoarthritis

Practical activity: Modelling the effect of osteoporosis on bone strength**Commence Task 3:** Extended response – Osteoporosisand osteoarthritis |
| 15 | Revision**Submit Task 3:** Extended response – Osteoporosis and osteoarthritis |
| 16 | **Task 4:** Semester 1 examination |

Unit 2 – Reproduction and inheritance

**Science Inquiry Skills**

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* design investigations, including the procedure(s) to be followed, the materials required, and the type and amount of primary and/or secondary data to be collected; conduct risk assessments; and consider research ethics
* conduct investigations safely, competently and methodically for the collection of valid and reliable data
* represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and limitations in data; and select, synthesise and use evidence to make and justify conclusions
* interpret a range of scientific and media texts, and evaluate processes, claims and conclusions by considering the quality of available evidence; and use reasoning to construct scientific arguments
* select, construct and use appropriate representations, including models of DNA replication, transcription and translation, Punnett squares, pedigrees and karyotypes, to communicate conceptual understanding, solve problems and make predictions
* communicate to specific audiences, and for specific purposes, using appropriate language, nomenclature, genres and modes, including scientific reports

| Week | Key teaching points |
| --- | --- |
| 1–2 | **DNA*** DNA structure and function

Practical activity: Make a DNA model* DNA replication

Practical activity: Modelling DNA replication* Protein synthesis

Practical activity: Modelling protein synthesis* DNA and gene expression
	+ increased understanding through biotechnological techniques
	+ epigenetics
 |
| 3 | **Cell reproduction*** Mitosis
	+ purpose of mitosis
	+ sequence
		- DNA replication
		- chromosome duplication
		- chromosome separation
		- production of daughter cells

Practical activity: Modelling mitosis* Stem cell differentiation
* Tumours and cancer, including technologies assisting early detection
 |
| 4–5 | * Meiosis
	+ purpose of meiosis
	+ sequence
		- DNA replication
		- chromosome pairing
		- two nuclear divisions
		- production of daughter cells (gametes)

Practical activity: Modelling meiosis* Variation in gametes and genotypes result from
	+ crossing over

Practical activity: Modelling crossing over* + non-disjunction
	+ random assortment
	+ fertilisation
* Difference between mitosis and meiosis

Task 5: Practical – Observing mitosis |
| 6–7 | **Human reproduction*** Structure and function of the male and female reproductive systems
* Hormonal regulation
	+ male reproductive system
	+ female reproductive system, including menstrual cycle and ovarian cycles
* Production of gametes

**Commence Task 6**: Extended response – Genetic screening |
| 8–9 | * Conception
* Development of the embryo, including germ layers and placenta
* Genetic screening, including risks and ethical considerations
	+ before implantation
	+ during early development
		- blood tests
		- ultrasound
		- amniocentesis
		- chorionic villi sampling

Practical activity: Interpreting karyotypes* Stages of labour and birth, including changes in child’s circulatory system

**Submit** **Task 6:** Extended response – Genetic screening |
| 10–11 | * Contraception methods, including risks, benefits, limitations and ethical considerations
	+ fertility awareness
	+ steroid hormones
	+ physical barriers
	+ chemical spermicides
	+ sterilisation
	+ after coitus
* Sexually transmitted infections
	+ prevention
	+ early detection
	+ treatment
* Lifestyle choices affecting foetal development, including diet, illicit drugs, alcohol and nicotine
* Assisted reproductive technologies, including risks, benefits and limitations
 |
| 12–14 | **Types of inheritance** * Predicting genotypes and phenotypes
	+ Punnett squares
* Patterns of inheritance
	+ dominance
	+ co-dominance
	+ autosomal (e.g. Huntington’s disease, PKU)
	+ sex linked traits (e.g. red-green colour blindness, haemophilia)
	+ multiple alleles (e.g. ABO blood groups)
* Use of pedigree charts to reveal patterns of inheritance and make prediction for future generations

**Task 7:** Test – Human reproduction and types of inheritance  |
| 15 | Revision |
| 16 | **Task 8:** Semester 2 examination |