**Sample Course Outline**

Human Biology

ATAR Year 12

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# Sample course outline

# Human Biology – ATAR Year 12

## Unit 3 and Unit 4

#### Semester 1 – Homeostasis and disease

**Science Inquiry Skills**

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

| **Week** | **Key teaching points** |
| --- | --- |
| 1–2 | **Endocrine system*** Endocrine glands
* location of endocrine glands - hypothalamus, pituitary, thyroid, parathyroid, pancreas, thymus, gonads, pineal and adrenal glands
* specific target organs and action of hormones secreted from endocrine glands - hypothalamus, pituitary, thyroid, parathyroid, pancreas and adrenal glands
* hypothalamic control of pituitary gland
* Hormones
* types of hormones
* water-soluble
* lipid-soluble
* synthetic hormones
* development using recombinant DNA
* for treatment of endocrine dysfunctions – diabetes mellitus, hypothyroidism and hyperthyroidism

**Commence Task 1:** Extended response - Recombinant DNA technology and its uses |
| 3 | **Central and peripheral nervous system*** Division of the nervous system
* Central nervous system
* Structure and function of the CNS – cerebellum, cerebrum, medulla oblongata, hypothalamus, corpus callosum, spinal cord, meninges and cerebrospinal fluid
* Practical activity – Brain dissection
* Peripheral nervous system
* Autonomic and somatic
* Sympathetic and parasympathetic
* Afferent and efferent
 |
| 4–5 | **Task 1:** Extended response - Recombinant DNA technology and its uses* Receptors
* Function of thermoreceptors, osmoreceptors, chemoreceptors, touch and pain

Practical activity – Perception of stimuli* Neurons
* Structure and function of neurons – sensory, motor and interneuron
* Transmission of nerve impulses
* Reflex arc

Practical activity – Reflexes |
| 6 | * Nervous system disorders
* Cell replacement therapy for treatment Alzheimer’s and Parkinson’s
* Comparison of the endocrine and nervous systems
* Speed of action
* Duration of action
* Nature and transmission of the message
* Specificity of message

**Task 2:** Test – Endocrine and nervous systems |
| 7–8 | **Homeostasis*** Need for homeostasis
* Negative feedback/stimulus response models
* Thermoregulation
* Methods of heat loss and gain
* Metabolic activity
* Conduction, convection, radiation
* Evaporation
* Methods of controlling heat loss and gain
* Physiological – vasoconstriction, vasodilation, shivering, sweating
* Behavioural
* Negative feedback/stimulus response model for thermoregulation

**Task 3:** Science inquiry (practical) – Thermoregulation in the human body |
| 9 | * Regulation of blood sugar levels
* The liver
* Glycogenesis
* Glycogenolysis
* Gluconeogenesis
* The pancreas
* Insulin
* Glucagon
* The adrenal glands
* Glucocorticoids
* Adrenaline and noradrenaline
* Negative feedback/stimulus response models for the regulation of blood sugar levels
* Treatment of diabetes mellitus, including synthetic hormones and gene therapy
 |
| 10 | * Regulation of body fluid concentrations
* Methods of water loss and gain
* ADH and Aldosterone
* Thirst reflex
* Negative feedback/stimulus response models for the regulation of water balance
* Regulation of gas concentrations
* Negative feedback model for the control of breathing
* Voluntary control of breathing
 |
| 11 | **Task 4:** Test – Homeostasis**Response to infection*** Pathogens
* Types of pathogens - viruses and bacteria
* Transmission of pathogens
* Direct and indirect contact
* Transfer by body fluids
* Disease-specific vectors
* Contaminated food and water
 |
| 12 | **Task 5:** Science inquiry (investigation) – Modelling the spread of pathogens * External defence mechanisms against pathogens
* Skin
* Digestive tract
* Urogenital tract
* Respiratory system
* The ear
* The eye
* Non-specific immune response
* Inflammation
* Fever
 |
| 13 | * Specific immune responses
* antibody-mediated immunity
* cell-mediated immunity
* Treatment and prevention of pathogen induced infections
* Antiviral drugs
* Mode of action
* Antibiotic drugs
* Mode of action
* Vaccines
* Types
* Mode of action
* Production, including the use of recombinant DNA
* Immunity
* passive and active immunity
* herd immunity
* immunisation
* social influences on immunisation programs
* economic influences on immunisation programs
* cultural influences on immunisation programs
 |
| 14 | Revision |
| 15 | **Task 6:** Examination – Semester 1 |

#### Semester 2 – Human variation and evolution

**Science Inquiry Skills**

Science Inquiry Skills align with the Science Understanding and Science as a Human Endeavour content of the unit and are integrated into the learning experiences.

| **Week** | **Key teaching points** |
| --- | --- |
| 1 | **Mutations*** Causes of gene and chromosomal mutations
* DNA replication
* Cell division
* Mutagens
* Mutations can be favourable or unfavourable for survival
* Causes of variation
* Mutations introducing new alleles
* Environment influence on genotypes producing a variety of phenotypes
 |
| 2–4 | **Gene pools*** Gene pools and populations
* Cause of changes to gene pools
* Mutations
* Selection pressures
* Random genetic drift, including founder effect
* Barriers to gene flow

**Task 7:** Science inquiry (practical) – Simulating changes to gene pools* Effect of genetic diseases on gene pools
* Tay-Sachs disease
* Thalassemia
* Sickle-cell anaemiaPractical activity – Genetic diseases and changing gene pools
 |
| 5–6 | * Natural selection
* Mechanisms underpinning evolution by natural selection
* Variation
* Isolation
* Struggle for existence
* Selection
* Speciation

Practical activity – Natural selection**Task 8:** Extended response – Natural selection in humans**Task 9:** Test – Mutations and gene pools |
| 7–8 | **Evidence for evolution*** Comparative biochemistry
* DNA (genomic and mitochondrial) and proteins
* Biotechnological techniques used to facilitate DNA sequencing
* Polymerase chain reaction (PCR) – denaturing, annealing, elongation
* Bacterial enzymes
* Gel electrophoresis
* Ethical considerations for interpretation and use of genetic information

Practical activity – Gel electrophoresis |
| 9 | * Comparative anatomy
* Homologous structures
* Embryology
* Vestigial structures

Practical activity: Comparative anatomy |
| 10 | * Bioinformatics
* Phylogenetic trees

**Task 10:** Science inquiry (practical) – Our close relations |
| 11 | * Fossils
* Fossil formation
* Problems and limitations of the fossil record
* Application and limitations of dating methods
* relative dating techniques – stratigraphy and index fossils
* absolute dating techniques – radio-carbon and potassium-argon

Practical activity – Dating fossils |
| 12–14 | **Hominid evolutionary trends*** Classification of humans and great apes
* Differences between humans and great apes
* relative size of cerebral cortex
* mobility of digits
* locomotion
* prognathism and dentition

Practical activity – Comparing apes and man * Possible relatedness and evolutionary pathways
* *Australopithecus afarensis*
* *Australopithecus africanus*
* *Paranthropus robustus*
* *Homo habilis*
* *Homo erectus*
* *Homo neanderthalensis*
* *Homo sapiens*

Practical activity – Trends in Hominid skulls* Tool cultures of *Homo habilis, Homo erectus, Homo neanderthalensis* and *Homo sapiens*
* Trends in manufacturing techniques and materials
* As evidence for cognitive evolution and lifestyle

**Task 11:** Test – Evidence for evolution and hominid evolutionary trends |
| 15 | **Task 12:** Examination – Semester 2 |