**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 anaemia Practical 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 |