Government of **Western Australia**
School Curriculum and Standards Authority

SAMPLE COURSE OUTLINE

HUMAN BIOLOGY
ATAR YEAR 12

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

Week	Key teaching points
	▪ 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

Week	Key teaching points
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

Week	Key teaching points
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