**Sample Course Outline**

Integrated Science

ATAR Year 12

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Sample course outline

Integrated Science – ATAR Year 12

Unit 3 and Unit 4

#### Semester 1 – Water

**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 | **Importance of water*** water cycle
* effect of changing rainfall patterns on the Earth’s freshwater supply
* role of the different states of water in regulating climate
 |
| 2 | **Aquatic ecosystems*** properties of water
* molecular structure and surface tension
* polarity
* density
* buoyancy
* specific heat, including calculations (*Q = mcΔT*)
* solubility of salts, nutrients and gases
 |
| 3–5 | * the effects of salt concentration, phosphate, nitrate, dissolved oxygen, turbidity, pH and temperature on aquatic life
* exchange of materials
* exchange processes – osmosis, diffusion, active transport
* gas exchange in aquatic animals
* osmoregulation in salt and freshwater fish

**Task 1:** Science inquiry (practical) – Gas exchange in fish |
| 6–7 | * flow of energy and cycling of matter in aquatic ecosystems
* food webs
* biomass
* energy pyramids
* water monitoring
* physical monitoring techniques
* biological monitoring techniques (macro-invertebrate sampling)

**Commence Task 2:** Science inquiry (investigation) – Comparison of local aquatic ecosystems |
| 8–10 | * human use of aquatic ecosystems for economic and social benefits
* impact of human activities on aquatic ecosystems
* biomagnification
* eutrophication
* oil spills
* impact of human activities on public drinking water

**Task 2:** Science inquiry (investigation) – Comparison of local aquatic ecosystems**Task 3:** Test–Importance of water and aquatic ecosystems |
| 11–12 | **Water resources and sustainability*** potable water in Western Australia
* sources
* availability
* distribution
* treatment
* treatment of domestic waste water

**Task 4:** Extendedresponse – Water treatment |
| 13–14 | * water resources management
* consumption
* desalination plants
* aquifer recharge
* water catchment management strategies to help prevent
* dryland salinity
* eutrophication
* erosion
* land use in catchment areas and preservation of natural waterways

**Task 5:** Test – Water resources and sustainability |
| 15 | **Task 6:** Examination – Semester 1 |

#### Semester 2 – Energy

**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  | **Energy*** forms of energy
* potential: gravitational, chemical, elastic and nuclear
* kinetic: mechanical, sound, heat, electrical
* light energy
* energy transfer and transformation
* work
* the law of conservation of energy
 |
| 3–4 | **Transportation*** energy transformation in the internal combustion engine
* developments in engine design to use alternative fuels

**Task 7:** Extended response – Vehicle engine design |
| 5–6 | **Sources of energy*** the sun as the origin of energy for
* fossil fuels as non-renewable sources of energy
* wind, biomass, biofuels, hydropower and solar as renewable sources of energy
* geothermal (renewable) energy
* nuclear (non-renewable) energy
* investment in renewable energy technologies
* environmental considerations
* economic considerations
* political considerations

**Task 8:** Test – Energy, transportation and sources of energy |
| 7–8 | **Electricity*** generation of electrical current
* electromagnet induction in generators
* electrochemical batteries
* photovoltaic effect in soar cells
* electrical energy transformation in the home for
* lighting
* heating/cooling
* communication
* large-scale electricity generation
* fossil fuel (coal and gas) power plants
* nuclear power plants
 |
| 9–10 | **Heating*** transfer of heat energy
* conduction
* convection
* radiation
* evaporation
* heating of the home
* burning of wood and fossil fuels
* consumption of electricity
* passive solar design

**Task 9:** Science inquiry (practical) – Heat transfer**Task 10:** Test – Electricity and heating |
| 11–14 | **Environmental and societal issues*** electricity generation impacts on society and the environment through
* resource extraction disturbing natural ecosystems
* land clearing for infrastructure
* emissions which contribute to the enhanced greenhouse effect
* international agreements and resultant new technologies
* production of wastes including nuclear
* consumption and pollution of water
* impact of increased demand for energy from non-renewable resources
* gas extraction by hydraulic fracturing
* use of nuclear energy
* safeguards against exposure to radioactive substances
* effects of radiation on the human body
* disposal of radioactive material in geologic storage
* energy consumption
* appliance power consumption calculations $\left(P= \frac{E}{t}\right)$
* efficiency and cost
* energy efficient appliances
* energy efficiency calculations (efficiency = energy out/energy in X 100)
* base load supply
* environmental, economic and social impact

**Task 11**: Science inquiry (investigation) – Energy efficiency light bulbs**Task 12:** Test – Environmental and societal issues |
| 15 | **Task 13:** Examination – Semester 2 |