

Integrated Science Scope and sequence

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Integrated Science: Scope and sequence of content

Course	pp. 9–10	pp. 11–12	pp. 13–14	pp. 15–16	pp. 17–18	pp. 19–20
	P units	Stage 1 units	Unit 2A	Unit 2B	Unit 3A	Unit 3B
The impact of science	<ul style="list-style-type: none"> scientists in our local community importance of science ideas to everyday life acting responsibly and safely when carrying out a local project. 	<ul style="list-style-type: none"> development of scientific knowledge due to evolving ideas and application of technology use of scientific concepts to solve problems related to everyday technology, processes and situations use of scientific evidence in support of different points of view. 	<ul style="list-style-type: none"> describe and explain major trends in: <ul style="list-style-type: none"> causes and outcomes of motor vehicle accidents technology used for hearing protection and enhancement explain the application of science for: <ul style="list-style-type: none"> the development of safety features the effect of drugs including alcohol on the body physiological testing, diagnosis and protection analyse the impact of science on decisions related to: <ul style="list-style-type: none"> the justification of laws using scientific testing and statistical evidence relating to safety devices and speed limits driving laws relating to blood alcohol levels, drugs, wearing of seatbelts, mobile phone use, learner and probationary driver conditions environmental noise levels including personal music devices, vehicle noise, concerts and the workplace. 	<ul style="list-style-type: none"> describe and explain major trends in: <ul style="list-style-type: none"> supply and use of water development around waterways e.g. urban, mining, agriculture, industry explain the application of science for the maintenance and monitoring of water resources analyse the impact of science on decisions related to: <ul style="list-style-type: none"> ensuring the supply of drinking water preservation of natural waterways land use and its effect on natural waterways and drinking water supplies. 	<ul style="list-style-type: none"> describe and explain major trends in resource development explain the application of science for: <ul style="list-style-type: none"> reducing the impact of mining operations on people and the environment the exploration and extraction of resources analyse the impact of science on decisions related to resource development and its impact on the environment. 	<ul style="list-style-type: none"> describe and explain major trends in patterns of energy use over time explain the application of science for: <ul style="list-style-type: none"> efficient energy use in the home and workplace e.g. domestic appliances, business equipment, building design measuring the impact of human activities on the environment analyse the impact of science on decisions related to: <ul style="list-style-type: none"> use of nuclear fuels for energy production in Australia development and location of alternative power generators.
The practice of science	<ul style="list-style-type: none"> contribution of relevant ideas for an investigation based on personal experience important factors to consider in an investigation warning symbols to enhance personal safety read a simple scale 	<ul style="list-style-type: none"> different investigation methods/types including planning, conducting, processing and evaluating skills required to use specific equipment skills used to collect data from field and laboratory record and display data in 	<ul style="list-style-type: none"> interpret a situation, formulate a question or hypothesis to plan and conduct an investigation in which several variables are controlled use equipment that is appropriate for the task use preliminary trials to 	<ul style="list-style-type: none"> interpret a situation, formulate a question or hypothesis to plan and conduct an investigation in which several variables are controlled use equipment that is appropriate for the task use preliminary trials of the 	<ul style="list-style-type: none"> identify real-world problems for investigations, use reference materials in developing an understanding of the problem, and plan one or more experiments in an investigation make and record systematic 	<ul style="list-style-type: none"> identify real-world problems for investigations, use reference materials in developing an understanding of the problem, and plan one or more experiments in an investigation make and record systematic

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	<ul style="list-style-type: none"> simple activities involving a small number of steps strategies for small group work recording results using a tally, prepared table or a drawing events or observations using cause and effect relationships use of everyday language to share science ideas with teacher and peers protocols for handling animals in a caring manner protocols for investigations and using equipment safely and responsibly. 	<p>different ways including tables, graphs and spreadsheets</p> <ul style="list-style-type: none"> analyse data, including identifying trends (qualitative and quantitative) extrapolate their knowledge and skills of investigation methods to new situations safe handling of chemicals, samples and equipment ethical handling of organisms use of relevant scientific conventions and terminology skills for presentation of scientific information <ul style="list-style-type: none"> ICT audio/visual. 	<p>improve the procedure or measurement techniques to collect valid and reliable data</p> <ul style="list-style-type: none"> make conclusions which are consistent with the data and explain patterns in the data in terms of scientific knowledge refer to possible bias and experimental error to make general suggestions for improving the techniques or the design of the investigation perform simple calculations: <ul style="list-style-type: none"> averages and percentages for accident statistics and blood alcohol concentration conversion between units linear motion <ul style="list-style-type: none"> stopping distance = reaction distance + braking distance reaction distance = vt speed: $v = \frac{s}{t}$ acceleration: $a = \frac{v - u}{t}$ distance: $s = ut + \frac{1}{2}at^2$ speed of sound: $v = f\lambda$ 	<p>investigative procedure to improve the procedure or measurement techniques to collect valid and reliable data</p> <ul style="list-style-type: none"> make conclusions which are consistent with the data and explain patterns in the data in terms of scientific knowledge refer to possible bias and experimental error to make general suggestions for improving the techniques or the design of the investigation perform simple calculations: <ul style="list-style-type: none"> solubility concentration including grams per litre, parts per million conversion between units surface area to volume ratio water usage rates. 	<p>observations and measurements with accuracy and precision, using standardised techniques and recognise when to repeat measurements</p> <ul style="list-style-type: none"> draw conclusions consistent with the data, explain them in terms of scientific knowledge; and question whether the data are sufficient to support the conclusions drawn identify inconsistencies in data and sources of measurement error, limitations in sampling and inadequacies in control of variables, and explain how these deficiencies can be remedied perform calculations: <ul style="list-style-type: none"> volume estimation of ore body size percentage composition by mass for ore concentration, yield and purity of products energy loss from food chains sampling population densities. 	<p>observations and measurements with accuracy and precision, using standardised techniques and recognise when to repeat measurements</p> <ul style="list-style-type: none"> draw conclusions consistent with the data, explain them in terms of scientific knowledge and question whether the data are sufficient to support the conclusions drawn identify inconsistencies in data and sources of measurement error, limitations in sampling and inadequacies in control of variables, and explain how these deficiencies can be remedied perform calculations: <ul style="list-style-type: none"> energy: $E_k = \frac{1}{2}mv^2$; $E_p = mgh$ work: $W = Fs$; $W = \Delta E$ power: $P = \frac{W}{t}$; $P = VI$ efficiency $= \frac{\text{energy out}}{\text{energy in}} \times 100\%$ Ohm's law: $V = IR$
Conceptual understandings	<ul style="list-style-type: none"> knowledge of everyday science in at least two of the following fields: <ul style="list-style-type: none"> biological science physical science earth/environmental science common equipment and how it works. 	<ul style="list-style-type: none"> knowledge and understanding of at least two of the following fields in one unit or all three fields over two units: <ul style="list-style-type: none"> biological science physical science environmental/earth sciences knowledge and 	<p>Adolescents and driving The driver:</p> <ul style="list-style-type: none"> describe basic structure of the nervous system (brain, nerves, spinal cord) describe the transmission of messages by the nervous system define and apply the term 'reaction time' 	<p>Importance of water</p> <ul style="list-style-type: none"> explain the role of water in biological systems describe the water cycle outline the significance and use of water in its different states on Earth. <p>Properties of water</p> <ul style="list-style-type: none"> describe the molecular and 	<p>Resource exploration and environmental implications</p> <ul style="list-style-type: none"> differentiate between the terms mineral and ore explain why ores are generally non-renewable resources discuss exploration techniques including: <ul style="list-style-type: none"> geological mapping, 	<p>Energy, energy production and use</p> <ul style="list-style-type: none"> define and apply the terms energy, work and power, and the units associated with each explain the production of electricity using coal and natural gas identify energy

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		<p>understanding of scientific concepts appropriate to the chosen context/s</p> <ul style="list-style-type: none"> knowledge and understanding of scientific laws, principles generalisations and relationships appropriate to the chosen context/s. 	<ul style="list-style-type: none"> describe factors affecting reaction time on the physiology of the driver including: <ul style="list-style-type: none"> anticipation driving experience fatigue age eyesight and hearing environmental distractions e.g. mobile phones, passengers, music, external environmental factors drugs including alcohol, THC (cannabis), methylamphetamine ('speed' or 'ice') MDMA ('ecstasy'), and prescription medications describe standard drinks and blood alcohol concentration consider implications of variations in driver reaction times explain procedures used in the detection of drugs e.g. breathalyser, urine tests, blood tests. <p>The motor vehicle:</p> <ul style="list-style-type: none"> analyse accident statistics e.g. time of day/week, age of fatalities, location, wearing of seatbelts, road design distinguish between reaction distance, braking distance and stopping distance interpret graphs and tables relating to stopping distance relate speed/stopping distance to variable speed zones such as school zones, built up areas and highways describe factors affecting braking distance i.e. types of friction, road and weather conditions, brakes and tyres state and explain how Newton's Laws of Motion relate to vehicle occupants 	<p>physical properties of water:</p> <ul style="list-style-type: none"> polarity solvent properties specific heat capacity <ul style="list-style-type: none"> relate uses of water to its properties explain the behaviour of water as a solvent and its ability to dissolve ionic, polar and non-polar solutes explain the significance of an insulating ice layer in cold environments describe solubility of substances (salt, nutrients, gases) in water and significance for organisms apply the different measurements of concentration including grams per litre, ppm explain the impact of fresh and salt water on buoyancy describe the specific heat properties of water define pH and use a pH scale describe surface tension. <p>Aquatic ecosystems</p> <ul style="list-style-type: none"> explain the effects of the physical conditions of water on aquatic life including salt concentration, nutrients, dissolved oxygen, turbidity, pH and temperature describe the role of producers and consumers in the cycling of matter and flow of energy explain the processes of diffusion and osmosis explain osmoregulation in marine and freshwater fish explain factors affecting gas exchange explain the effect of water temperature on abundance of aquatic life e.g. 	<p>satellite imagery and aerial photography</p> <ul style="list-style-type: none"> geophysical e.g. magnetism, elasticity, gravity, electrical properties geochemical exploration e.g. soil samples, stream sediments, rocks seismic surveys drilling <ul style="list-style-type: none"> explain the purpose of an environmental impact statement for: <ul style="list-style-type: none"> protection of unique and endangered species cultural heritage community consultation local habitat management explain the relationship between the components of an ecosystem explain energy flow in an ecosystem discuss economic, environmental and social factors affecting mining exploration. <p>Mining methods and environmental impacts</p> <ul style="list-style-type: none"> describe the mining methods: strip, open-cut, underground, drilling: <ul style="list-style-type: none"> examples of minerals mined in this way explanation of the process involved health and safety risks explain the impact of mining methods on the ecosystem including: <ul style="list-style-type: none"> production of waste and disposal topography and soil profiles flora and fauna populations and distribution 	<p>transformations occurring in the production of electricity</p> <ul style="list-style-type: none"> explain key electrical terms: current, voltage and resistance explain the transmission of electricity from power station to house describe forms of energy used in the home explain thermal energy transfers, including conduction, convection, radiation and evaporation describe the role of energy efficient appliances in conserving energy compare patterns of energy use in Australia and a developing country. <p>Fossil fuels and climate change</p> <ul style="list-style-type: none"> identify coal, oil and natural gas as fossil fuels explain the photosynthetic origins of the chemical energy in fossil fuels discuss the implications of using the different fossil fuels explain that the greenhouse effect is a natural phenomenon explain the various sources of greenhouse gas emissions including fossil fuels, biological sources of methane and land use changes explain the enhanced greenhouse effect and its relationship to climate change discuss evidence for and against climate change. <p>Nuclear power</p> <ul style="list-style-type: none"> differentiate between alpha, beta and gamma emissions

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			<p>in collisions</p> <ul style="list-style-type: none"> describe how speed and mass affect momentum considering implications for unrestrained people and objects in vehicles explain design principles used in safety devices and features of vehicle e.g. airbags, seatbelts, crumple zones. <p>Adolescents and music Sound production and transfer:</p> <ul style="list-style-type: none"> describe the production of sound describe sound waves as a transfer of energy disturbance define and apply the following terms to the wave model: displacement, amplitude, period, compression, rarefaction, frequency, wavelength, velocity describe the characteristics of sound—pitch, loudness, quality interpret graphs and tables relating to sound levels explain acoustics in buildings. <p>Hearing:</p> <ul style="list-style-type: none"> describe the path of a sound wave through the external, middle and inner ear describe the detection and differentiation of sound by the ear describe types and causes of hearing loss i.e. conductive deafness and nerve deafness explain the thresholds of hearing for loudness and frequency describe how hearing aids and cochlear implants work. 	<p>circulation of water currents along the Western Australian coast</p> <ul style="list-style-type: none"> explain the importance of water's specific heat properties on aquatic life and the atmosphere explain the consequences of biological and chemical imbalance on the ecology of aquatic ecosystems explain biomagnification explain the causes and consequences of algal blooms explain the impact of oil pollution on aquatic environments. <p>Water resources and sustainability</p> <ul style="list-style-type: none"> describe the distribution of fresh and salt water in Western Australia analyse and describe the changing rainfall patterns in Western Australia discuss the location of local water catchment areas discuss biological or chemical contamination of water supply due to inappropriate catchment management e.g. salination, eutrophication and erosion describe the sources used to provide potable water explain processes involved in local water treatment including groundwater treatment and desalination discuss strategies for minimisation of water use explain the processes involved in the treatment of sewage discuss the reuse of greywater and the risks to health and the environment. 	<ul style="list-style-type: none"> spread of pathogens e.g. jarrah dieback describe mine site rehabilitation relating to the different mining methods. <p>Extraction, processing and environmental impact</p> <ul style="list-style-type: none"> describe physical methods of separation describe the principles of oxidation and reduction relate the metal reactivity and method of extraction used describe the processes used for chemical extraction describe the extraction of iron using carbon reduction describe the process of electrolysis describe the components and operation of an electrolytic cell describe the use of electrolysis in the: <ul style="list-style-type: none"> purification of metals e.g. copper extraction of aluminium compare the energy requirements of different methods for the extraction of metals describe the use of biotechnology describe work site hazards associated with extraction methods describe short term, local effects of metal extraction and processing techniques on human health and the environment discuss global implications of metal extraction and processing techniques. 	<ul style="list-style-type: none"> describe the effects of radiation on the human body due to uncontrolled exposure e.g. genetic mutations, and controlled exposure e.g. cancer diagnosis and treatment compare and contrast the processes of nuclear fission and nuclear fusion explain the design features of a pressurised water reactor including fuel rods, moderators, control rods and coolant explain the production of electricity by a nuclear reactor describe safe handling and storage of nuclear material in mining, power production and disposal. <p>Sustainable energy use</p> <ul style="list-style-type: none"> discuss the processes involved in electricity production using photovoltaic, geothermal, biomass, hydrogen, wind and nuclear fuels discuss the advantages and disadvantages of alternative energy sources including photovoltaic, geothermal, wind, biomass (biofuels), nuclear fuels consider current and future sources and applications of sustainable energies explain the finite nature of fossil and nuclear fuels e.g. peak oil evaluate the sustainability of a range of energy sources.

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