**AUSVELS - Australian SCIENCE Curriculum, F-10:**

There are **three strands** which are to be taught in an integrated way. The order & detail in which content descriptions are organized in to learning programs are decisions to be made by the teacher.

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| **Science Understanding** – content described by year level | **Science as Human Endeavour** – content described in 2 year bands – the main points are the same, with variations in the elaborating examples | **Science Inquiry Skills** – content described in 2 year bands |
| **Sub strands:**Biological sciencesChemical sciencesEarth and Space sciencesPhysical sciences | **Sub strands:**Nature and development of scienceUse and influence of science | **Sub strands:**Questioning and predictingPlanning and conductingProcessing and analysing data and informationEvaluatingCommunicating |

**Year/Level 9 SCIENCE Students:**

* Consider the operation of systems at a range of scales.
* Explore ways in which the human body responds to its external environment & the interdependencies between biotic & abiotic components of ecosystems.
* Are introduced to atoms as a system of protons, electron & neutrons & how this system can change through nuclear decay.
* Learn that matter can be rearranged through chemical change & that these changes are important to many systems.
* Introduced to the concept of conservation of matter & begin to develop a more sophisticated view of energy transfer.
* Apply their understanding of energy & forces to global systems such as continental movement.

\*This document intends to assist teachers in their implementation of the Australian curriculum through AusVELS– it combines description and elaboration statements. Teachers are advised to consult the online documentation to clarify further detail for themselves. ‘AusVELS’ is the official documentation for Victorian schools.

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| **Science understanding:** | **Science as Human Endeavour:** | **Science Inquiry Skills:** |
| **Biological sciences:**Multi­cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment (ACSSU175) * describing how the requirements for life (for example oxygen, nutrients, water and removal of waste) are provided through the coordinated function of body systems such as the respiratory, circulatory, digestive, nervous and excretory systems
* explaining how body systems work together to maintain a functioning body using models, flow diagrams or simulations
* identifying responses using nervous and endocrine systems
* investigating the response of the body to changes as a result of the presence of micro­organisms
* investigating the effects on humans of exposure to electromagnetic radiations such as X­rays and microwaves

Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems (ACSSU176) * exploring interactions between organisms such as predator/prey, parasites, competitors, pollinators and disease
* examining factors that affect population sizes such as seasonal changes, destruction of habitats, introduced species
* considering how energy flows into and out of an ecosystem via the pathways of food webs, and how it must be replaced to maintain the sustainability of the system
* investigating how ecosystems change as a result of events such as bushfires, drought and flooding

**Chemical sciences:**All matter is made of atoms which are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms (ACSSU177)* describing and modelling the structure of atoms in terms of the nucleus, protons, neutrons and electrons
* comparing the mass and charge of protons, neutrons and electrons
* describing in simple terms how alpha and beta particles and gamma radiation are released from unstable atoms

Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed (ACSSU178)* identifying reactants and products in chemical reactions
* modelling chemical reactions in terms of rearrangement of atoms
* describing observed reactions using word equations
* considering the role of energy in chemical reactions
* recognising that the conservation of mass in a chemical reaction can be demonstrated by simple chemical equations

Chemical reactions, including combustion and the reactions of acids, are important in both non­living and living systems and involve energy transfer (ACSSU179) * investigating reactions of acids with metals, bases, and carbonates
* investigating a range of different reactions to classify them as exothermic or endothermic
* recognising the role of oxygen in combustion reactions and comparing combustion with other oxidation reactions
* comparing respiration and photosynthesis and their role in biological processes
* describing how the products of combustion reactions affect the environment

**Earth and space sciences:**The theory of plate tectonics explains global patterns of geological activity and continental movement (ACSSU180)* recognising the major plates on a world map
* modelling sea­floor spreading
* relating the occurrence of earthquakes and volcanic activity to constructive and destructive plate boundaries
* considering the role of heat energy and convection currents in the movement of tectonic plates
* relating the extreme age and stability of a large part of the Australian continent to its plate tectonic history

**Physical sciences:**Energy transfer through different mediums can be explained using wave and particle models (ACSSU182)* exploring how and why the movement of energy varies according to the medium through which it is transferred
* discussing the wave and particle models and how they are useful for understanding aspects of phenomena
* investigating the transfer of heat in terms of convection, conduction and radiation, and identifying situations in which each occurs
* understanding the processes underlying convection and conduction in terms of the particle model
* investigating factors that affect the transfer of energy through an electric circuit
* exploring the properties of waves, and situations where energy is transferred in the form of waves, such as sound and light
 | **Nature & development of Science:**Scientific understanding, including models and theories, are contestable and are refined over time through a process of review by the scientific community (ACSHE157)* investigating the historical development of models of the structure of the atom
* investigating how the theory of plate tectonics developed, based on evidence from sea­floor spreading and occurrence of earthquakes and volcanic activity
* considering how ideas about disease transmission have changed from medieval time to the present as knowledge has developed
* investigating the work of scientists such as Rutherford, Pierre and Marie Curie on radioactivity and subatomic particles
* investigating how models can be used to predict the changes in populations due to environmental changes, such as the impact of flooding or fire on rabbit or kangaroo populations

Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries (ACSHE158) * considering how common properties of electromagnetic radiation relate to its uses, such as radar, medicine, mobile phone communications and microwave cooking
* investigating technologies involved in the mapping of continental movement
* considering how the development of imaging technologies have improved our understanding of the functions and interactions of body systems

**Use & influence of science:**People can use scientific knowledge to evaluate whether they should accept claims, explanations or predictions (ACSHE160)* using knowledge of science to test claims made in advertising or expressed in the media
* describing how science is used in the media to explain a natural event or justify actions
* evaluating claims relating to products such as electrical devices, fuels, indigestion tablets
* considering the impacts of human activity on an ecosystem from a range of different perspectives

Advances in science and emerging sciences and technologies can significantly affect people’s lives, including generating new career opportunities (ACSHE161)* investigating how technologies using electromagnetic radiation are used in medicine, such as in the detection and treatment of cancer
* investigating the use of nanotechnology in medicine, such as the delivery of pharmaceuticals
* considering the impact of technological advances developed in Australia, such as the cochlear implant and bionic eye
* considering how communication methods are influenced by new mobile technologies that rely on electromagnetic radiation
* recognising aspects of science, engineering and technology within careers such as medicine, medical technology, telecommunications, biomechanical engineering, pharmacy and physiology

The values and needs of contemporary society can influence the focus of scientific research (ACSHE228)  **ã*** considering how technologies have been developed to meet the increasing needs for mobile communication
* investigating how scientific and technological advances have been applied to minimising pollution from industry
* considering how choices related to the use of fuels are influenced by environmental considerations
* investigating the work of Australian scientists such as Fiona Wood and Marie Stoner on artificial skin
* considering safe sound levels for humans and implications in the workplace and leisure activities
* investigating contemporary science issues related to living in a Pacific country located near plate boundaries, for example Japan, Indonesia, New Zealand
 | **Questioning & predicting:**Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)* using internet research to identify problems that can be investigated
* evaluating information from secondary sources as part of the research process
* revising and refining research questions to target specific information and data collection or finding a solution to the specific problem identified
* developing ideas from students own or others' investigations and experiences to investigate further

**Planning & conducting:**Plan, select and use appropriate investigation methods, including field work and laboratory experimentation, to collect reliable data; assess risk and address ethical issues associated with these methods (ACSIS165)* explaining the choice of variables to be controlled, changed and measured in an investigation
* identifying the potential hazards of chemicals or biological materials used in experimental investigations
* ensuring that any investigation involving or impacting on animals is justified, humane and considerate of each animal's needs
* using modelling and simulations, including using digital technology to investigate situations and events
* combining research using primary and secondary sources with students' own experimental investigationconsidering how investigation methods and equipment may influence the reliablity of collected data

Select and use appropriate equipment, including digital technologies, to systematically and accurately collect and record data (ACSIS166)* using probes and data loggers to record information
* applying specific skills for the use of scientific instruments

**Processing & analyzing data & information:**Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169)* using spreadsheets to present data in tables and graphical forms and to carry out mathematical analyses on data
* describing sample properties (such as mean, median, range, large gaps visible on a graph) to predict characteristics of the larger population
* designing and constructing appropriate graphs to represent data and analysing graphs for trends and patterns

Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170)* comparing conclusions with earlier predictions and reviewing scientific understanding where appropriate
* suggesting more than one possible explanation of the data presented

**Evaluating:**Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171)* identifying gaps or weaknesses in conclusions (their own or those of others)
* identifying alternative explanations that are also consistent with the evidence

Critically analyse the validity of information in secondary sources and evaluate the approaches used to solve problems (ACSIS172)* discussing what is meant by 'validity' and how we can evaluate the validity of information in secondary sources
* researching the methods used by scientists in studies reported in the media
* describing how scientific arguments are used to make decisions regarding personal and community issues

**Communicating:**Communicate scientific ideas and information for a particular purpose, including constructing evidence­ based arguments and using appropriate scientific language, conventions and representations (ACSIS174)* presenting results and ideas using formal experimental reports, oral presentations, slide shows, poster presentations and contributing to group discussions
* using secondary sources as well as students’ own findings to help explain a scientific concept
* using the internet to facilitate collaboration in joint projects and discussions
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| **Level 9 Achievement Standard:**By the end of Level 9, students explain chemical processes and natural radioactivity in terms of atoms and energy transfers and describe examples of important chemical reactions. They describe models of energy transfer and apply these to explain phenomena. They explain global features and events in terms of geological processes and timescales. They analyse how biological systems function and respond to external changes with reference to interdependencies, energy transfers and flows of matter. They describe social and technological factors that have influenced scientific developments and predict how future applications of science and technology may affect people’s lives.Students design questions that can be investigated using a range of inquiry skills. They design methods that include the control and accurate measurement of variables and systematic collection of data and describe how they considered ethics and safety. They analyse trends in data, identify relationships between variables and reveal inconsistencies in results. They analyse their methods and the quality of their data, and explain specific actions to improve the quality of their evidence. They evaluate others’ methods and explanations from a scientific perspective and use appropriate language and representations when communicating their findings and ideas to specific audiences. |

Cross-curriculum priorities to be included in all learning areas: Aboriginal and Torres Strait Islander histories and cultures (); Asia and Australia’s engagement with Australia (ã ); Sustainability ()

Reference : <http://ausvels.vcaa.vic.edu.au/> This grid is an adaption of the information from the VCAA site to create a visual representation to assist teachers.