Year Plan: 9 Science and 9 Foundation Science — Australian Curriculum: Science V8.3

Implementation year: 2012-13 (revised 2018) **School name: IGNATIUS PARK COLLEGE, TOWNSVILLE**

<table>
<tr><td rowspan="4">Identify curriculum</td><td>Year level description</td><td colspan="4">YEAR 9:
The Science Inquiry Skills and the Science as a Human Endeavour strands are described across a two-year band. In their planning, schools and teachers refer to the expectations outlined in the Achievement Standards and to the content of the Science Understanding strand for the relevant year level to ensure that these two strands are addressed over the two-year period. The three strands of the curriculum are inter-related and their content is taught in an integrated way. The order and detail in which the content descriptions are organised into teaching/learning programs are decisions to be made by the teacher.

Over Years 7 to 10, students develop their understanding of microscopic and atomic structures, how systems at a range of scales are shaped by flows of energy and matter and interactions due to forces, and develop the ability to quantify changes and relative amounts. In Year 9, students consider the operation of systems at a range of scales. They explore ways in which the human body as a system responds to its external environment and the interdependencies between biotic and abiotic components of ecosystems. They are introduced to the notion of the atom as a system of protons, electrons and neutrons, and how this system can change through nuclear decay. They learn that matter can be rearranged through chemical change and that these changes play an important role in many systems. They are introduced to the concept of the conservation of matter and begin to develop a more sophisticated view of energy transfer. They begin to apply their understanding of energy and forces to global systems such as continental movement.</td></tr>
<tr><td>Achievement standard</td><td colspan="4">By the end of Year 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.</td></tr>
<tr><td>Course organisation</td><td colspan="4">"Ignatius Park College is proudly dedicated to boys: their spiritual, academic, social and physical growth as they approach maturity. As Townsville's only boys' school, we are uniquely placed to cater for their specific needs."(ipc.qld.edu.au, 2016) The Year 9 Science and Foundation Science course has been carefully developed and implemented using boy friendly pedagogies and assessment to suit the needs of young men, within the given parameters of the College's strategic directions, resources and timetable structure. There are six (6) laboratories that are shared between all Middle and Senior Science classes, which is approximately 45 classes in total. Within the cohort of Year 9 students, there are seven classes of approximately 25 students that are split according to camp organisation in Pastoral Houses. An additional class, titled as 'Foundation Science' caters to the students with verified learning disabilities and includes a maximum of 15 students requiring additional literacy and numeracy support. Over a fortnightly timetable, eight (8) classes of 50 minutes duration are allocated to Science, and each of the four (4) strands of Science are covered over the length of one (1) term as shown below. Of these eight (8) fortnightly lessons it is ensured that there is equitable distribution between the laboratory time and general classroom time for each class. This is dependent on the number of Senior Science classes and the number of Year 9 Science classes that may be running at the same time.</td></tr>
<tr><td>KEY TO GENERAL CAPABILITIES AND CROSS-CURRICULUM PRIORITIES</td><td colspan="4">Literacy Numeracy ICT capability Critical and creative thinking Ethical understanding Personal and social capability Intercultural understanding
Aboriginal and Torres Strait Islander histories and cultures Asia and Australia's engagement with Asia Sustainability</td></tr>
<tr><td rowspan="2">Teaching and learning</td><td>Term / Year overview</td><td>Term 1 – PHYSICAL SCIENCES (~9 Wks)
"ENERGY TRANSFER"
(Term 4 2018)</td><td>Term 2– BIOLOGICAL SCIENCES (~10 Wks)
"COORDINATED BODY SYSTEMS & ECOSYSTEMS"</td><td>Term 3 – CHEMICAL SCIENCES (~10 Wks)
"ATOMS, RADIATION AND CHEMICAL REACTIONS"</td><td>Term 4 – EARTH & SPACE SCIENCES (~7 Wks)
"FUTURE EARTH"
(Term 1 2018)</td></tr>
<tr><td>UNIT RATIONALE</td><td>In this unit students examine, inquire and explain ways in which energy can be transferred through different mediums using the particle model, with respect to heat and electrical energy. Students will have opportunities to form hypotheses, investigate quantitative and qualitative data and information on the flow of electrical energy and heat energy and electrical energy through different appliances, incorporating calculations of power, current, voltage (P=VI), energy (E = Pt) and resistance (V=IR Ohm's Law).

Additionally, students will build on their</td><td>During this term students extend on their knowledge of key human body systems to look at the ways in which they work together in balance to support life. They outline how essential requirements for life are provided internally through a coordinated approach. Students analyse and predict the effects of the environment on body systems, and discuss how the body responds to changes. Additionally, students will engage in the exploration of concepts of change and sustainability within an ecosystem. It focuses on engaging students in the understanding that</td><td>In this unit students will explore the development of scientific ideas about atoms and their subatomic particles, protons, neutrons and electrons. They will investigate the structure and uses of isotopes and consider the processes and products of radioactive decay including radiation and half-life. Students will also engage in the exploration of chemical reactions and the application of these in living and non-living systems. Students examine heat energy transfer in reactions, the nature and reactions of acids as well as the conservation of mass in chemical reactions. Students engage in investigations that</td><td>In this unit students explore the historical development of the theory of plate tectonics. They model and investigate geological processes involved in Earth movement. Students compare different types of tectonic-plate boundaries and the tectonic events which occur at these boundaries. They explore technological developments that have aided scientists in the study of tectonic-plate movement and consider how these assist societies living in tectonic-event areas. Students study the impact of tectonic events such as earthquakes, tsunamis and volcanoes</td></tr>
</table>

		knowledge of energy transfer to include the wave-based models of energy transfer related to sound and light. Students investigate wave motion and how different mediums affect sound and light transfer. Students will design and conduct investigations to transmit a form of energy through a medium using available equipment and materials.	*all life is connected through ecosystems and changes to its balance can have an effect on the populations and interrelationships that exist. It provides students with an opportunity to investigate and reflect upon the state of Australian environments, locally and nationally, and their individual and collective responsibility for the sustainability of ecosystems.*	*examine photosynthesis, respiration and hyperacidity that continue to develop their scientific inquiry skills. They apply their understanding to evaluate claims related to environmental issues and consider how the application of chemistry affects people's lives.*	*on humans and describe where science and technology are contributing to the development of safer buildings.*
	SCIENCE UNDERSTANDING (SU)	**Energy transfer through different mediums can be explained using wave and particle models** (ACSSU182)	**Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment** (ACSSU175) **Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems** (ACSSU176)	**All matter is made of atoms that are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms** (ACSSU177) **Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed** (ACSSU178) **Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer** (ACSSU179)	**The theory of plate tectonics explains global patterns of geological activity and continental movement** (ACSSU180)
	SUGGESTED ELABORATIONS	Suggested elaborations: -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	Suggested elaborations: -describing how the requirements for life (eg. O2, nutrients, water and removal of waste) are provided through the coordinated function of body systems such as the respiratory, circulatory, nervous, endocrine 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 micro-organisms -investigating the effects on humans of exposure to electromagnetic radiations such as X-rays and microwaves -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	Suggested elaborations: -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 -identifying reactants and products in chemical reactions -modelling chemical reactions in terms of rearrangement of atoms -describing observed reactions using word equations and interpreting symbol 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 (formulating and balancing) -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	Suggested elaborations: -recognising the major plates on a world map -modelling sea-floor 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 it s plate tectonic history

				their role in biological processes -describing how the products of combustion reactions affect the environment	

KEY TO GENERAL CAPABILITIES AND CROSS-CURRICULUM PRIORITIES	Literacy Numeracy ICT capability Critical and creative thinking Ethical understanding Personal and social capability Intercultural understanding Aboriginal and Torres Strait Islander histories and cultures Asia and Australia's engagement with Asia Sustainability
Aboriginal and Torres Strait Islander Perspectives	Science provides opportunities for students to strengthen their appreciation and understanding of Aboriginal peoples and Torres Strait Islander peoples and their living cultures. Specific content and skills within relevant sections of the curriculum can be drawn upon to encourage engagement with: • Aboriginal and Torres Strait Islander frameworks of knowing and ways of learning • Indigenous contexts in which Aboriginal and Torres Strait Islander peoples live • Aboriginal peoples' and Torres Strait Islander peoples' contributions to Australian society and cultures. Science provides opportunities to explore aspects of Australian Indigenous knowing with connection to, and guidance from, the communities who own them. Using a respectful inquiry approach, students have the opportunity to explore non-Indigenous science interpretations of Aboriginal and Torres Strait Islander lifestyles including knowledge of nature phenomena; native flora and fauna; and land water and waste management. Using an inquiry approach enables students to learn science in contexts that are valued by Aboriginal and Torres Strait Islander students, their peers and communities, acknowledging their values and approaches to learning.

Assessment

Term 1 - PHYSICAL SCIENCES (~9 Wks) "ENERGY TRANSFER" (Term 4 2018)		**Term 2 - BIOLOGICAL SCIENCES (~10 Wks) "COORDINATED BODY SYSTEMS & ECOSYSTEMS"**		**Term 3 - CHEMICAL SCIENCES (~10 Wks) "ATOMS, RADIATION AND CHEMICAL REACTIONS"**		**Term 4 - EARTH AND SPACE SCIENCES "FUTURE EARTH" (~7 Wks) (Term 1 2018)**	
Week	**Assessment instrument**	**Week**	**Assessment instrument**	**Week**	**Assessment instrument**	**Week**	**Assessment instrument**
7	***SUMMATIVE –*** ***ENERGY TRANSFER EXPERIMENTAL INVESTIGATION*** *Design and construction task of an energy transfer device, and presentation of a scientific report including a research component and experimental component* *Eg. solar cooker; solar robot; lighting system; alarm system; skill tester; etc* *(incorporating assessment of critical content and calculations relating to energy transformations, energy transfer, calculations and waves concepts)*	7 10	***SUMMATIVE –*** ***"SYSTEMS" COLLECTION OF WORK*** ***A: COORDINATED BODY SYSTEMS ANNOTATED RESEARCH TASK*** *Informative task involving depth into the coordination of two pairs of chosen body systems (more depth than just the structures and functions of systems done in Yr 8 – analogies involved);* *A higher order, problem solving task would be incorporated, where a given environmental change/medical issue is addressed to predict/suggest immediate effects on systems and evaluate the possible solutions/outcomes.* *Eg. Coordination of:* *Skeletal/Circulatory systems* *Reproductive/Endocrine system* *Nervous/Muscular systems* ***B: ECOSYSTEMS CONSTRUCTION TASK*** *Short response questions and construction/interpretation of chains/webs/energy flow diagrams; integration of abiotic/biotic factors;* *Extended response question/s to address ecosystems issues (factors affecting population size, changes to ecosystems)*	8 10	***SUMMATIVE – (SU FOCUS)*** ***ATOMS, RADIATION AND CHEMICAL REACTIONS RESEARCH ASSIGNMENT*** *Topics include atomic structure, atomic decay, radiation types* ***SUMMATIVE – (SIS FOCUS)*** ***ACIDS AND BASES TITRATION PRACTICAL INVESTIGATION*** *(In-class task of 5 lessons)* *Group experiment involving the investigation of an acid-base relationship (eg. heartburn tablets/solution in the treatment of excess stomach acid/hyperacidity); 1 lesson to design, plan (ie aim, hypothesis, theory, equip; 2 lessons to conduct titration trials (have a research lesson prior for the background theory and also bring in 30 words of notes for introduction); 2 lessons for results (tabulating, graphing) and answering of given discussion questions (discussion, conclusion, references).* ***Critical content to consider (Yr 10 presumed knowledge):*** *ionic and covalent bonding, dot diagrams, word equations, generating simple symbol equations, Law of Conservation of Mass and balancing simple equations, types of reactions in living/non-living systems (combustion, acids and bases, respiration,*	9 – T1 2018 8	***Term 1 2018 – non-experimental investigation (Earthquake epicentre task conducted over 3 lessons)*** ***SUMMATIVE –*** ***FUTURE EARTH SUPERVISED EXAMINATION (2-3 LESSONS)*** *Incorporating extended PEEL paragraphing exercises in exam;* *Topics include plate tectonics and history, global patterns of geological activity (earthquakes, volcanoes), convection currents (cyclones, tsunamis, etc)*

							photosynthesis, exothermic/endothermic reactions)		
Make judgments / use feedback	**Moderation**	Teachers develop tasks and plan units, where initiated by draft assessment formulated by team champion and team meeting to collaborate on learning activities/resources of the master unit plan. Teachers perform moderation of assessment components through peer-pair review, and provide completed proforma to faculty leader.		Teachers develop tasks and plan units, where initiated by draft assessment formulated by team champion and team meeting to collaborate on learning activities/resources of the master unit plan. Team meeting for random sampling review of 3 student responses for each collection of work item (eg. A possible A, B and C standard response – take one sample from 3 different class groups)		Teachers develop tasks and plan units, where initiated by draft assessment formulated by team champion and team meeting to collaborate on learning activities/resources of the master unit plan. Teachers perform moderation of assessment components through peer-pair review, and provide completed proforma to faculty leader.		Teachers develop tasks and plan units, where initiated by draft assessment formulated by team champion and team meeting to collaborate on learning activities/resources of the master unit plan. Exemplar PEEL paragraphs using topics different to the assessment. Team meeting for random sampling review of 3 student responses for the examination (eg. Possible A, B and C standard – one sample from 3 different class groups) OR Compile all class sets together and allocate a particular section for each teacher to mark, for consistent approach and fast conclusion to the year's marking for the reporting period.

Year 9 Science: Term review for balance and coverage of content descriptions

Science Understanding	1	2	3	4
TERM 1 2 3 4 **PHYSICAL → BIOLOGICAL → CHEMICAL → EARTH AND SPACE**				
Multi-cellular organisms rely on coordinated and interdependent internal systems to respond to changes to their environment		✓		
Ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems		✓		
Energy transfer through different mediums can be explained using wave and particle models	✓			
All matter is made of atoms that are composed of protons, neutrons and electrons; natural radioactivity arises from the decay of nuclei in atoms			✓	
Chemical reactions involve rearranging atoms to form new substances; during a chemical reaction mass is not created or destroyed			✓	
Chemical reactions, including combustion and the reactions of acids, are important in both non-living and living systems and involve energy transfer			✓	
The theory of plate tectonics explains global patterns of geological activity and continental movement				✓

Science as a Human Endeavour	1	2	3	4
NATURE AND DEVELOPMENT OF SCIENCE				
Scientific understanding, including models and theories, is contestable and are refined over time through a process of review by the scientific community (ACSHE157)	✓			✓
Advances in scientific understanding often rely on developments in technology and technological advances are often linked to scientific discoveries (ACSHE158)	✓	✓	✓	✓
USE AND INFLUENCE OF SCIENCE				
People use scientific knowledge to evaluate whether they accept claims, explanations or predictions, and advances in science can affect people's lives, including generating new career opportunities (ACSHE160)			✓	✓
Values and needs of contemporary society can influence the focus of scientific research (ACSHE228)	✓	✓		

Science Inquiry Skills	1	2	3	4
QUESTIONING AND PREDICTING				
Formulate questions or hypotheses that can be investigated scientifically (ACSIS164)	✓		✓	
PLANNING AND 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)	✓		✓	
Select and use appropriate equipment, including digital technologies, to collect and record data systematically and accurately (ACSIS166)	✓		✓	
PROCESSING AND ANALYSING DATA AND INFORMATION				
Analyse patterns and trends in data, including describing relationships between variables and identifying inconsistencies (ACSIS169)	✓		✓	✓
Use knowledge of scientific concepts to draw conclusions that are consistent with evidence (ACSIS170)	✓	✓	✓	✓
EVALUATING				
Evaluate conclusions, including identifying sources of uncertainty and possible alternative explanations, and describe specific ways to improve the quality of the data (ACSIS171)	✓	✓	✓	
Critically analyse the validity of information in primary and secondary sources and evaluate the approaches used to solve problems (ACSIS172)	✓	✓		✓
COMMUNICATING				
Communicate scientific ideas and information for a particular purpose, including constructing evidence-based arguments and using appropriate scientific language, conventions and representations (ACSIS174)	✓	✓	✓	✓