Government of Western Australia
School Curriculum and Standards Authority

INTEGRATED SCIENCE

GENERAL COURSE

Year 11 syllabus

IMPORTANT INFORMATION

This syllabus is effective from 1 January 2015.

Users of this syllabus are responsible for checking its currency.

Syllabuses are formally reviewed by the School Curriculum and Standards Authority on a cyclical basis, typically every five years.

2013/44564

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Rationale

Science is a dynamic, collaborative human activity that uses distinctive ways of valuing, thinking and working to understand natural phenomena. Science is based on people's aspirations and motivations to follow their curiosity and wonder about the physical, biological and technological world. Scientific knowledge represents the constructions made by people endeavouring to explain their observations of the world around them. Scientific explanations are built in different ways as people pursue intuitive and imaginative ideas, respond in a rational way to hunches, guesses and chance events, challenge attitudes of the time, and generate a range of solutions to problems, building on existing scientific knowledge. As a result of these endeavours, people can use their scientific understandings with confidence in their daily lives. Because scientific explanations are open to scrutiny, scientific knowledge may be tentative and is continually refined in the light of new evidence.

The Integrated Science General course is a course grounded in the belief that science is, in essence, a practical activity. From this stems the view that conceptual understandings in science derive from a need to find solutions to real problems in the first instance. The inquiring scientist may then take these understandings and apply them in a new context, often quite removed from their original field. This course seeks to reflect this creative element of science as inquiry. It should involve students in research that develops a variety of skills, including the use of appropriate technology, an array of diverse methods of investigation, and a sense of the practical application of the domain. It emphasises formulating and testing hypotheses and the critical importance of evidence in forming conclusions. This course enables them to investigate science issues in the context of the world around them, and encourages student collaboration and cooperation with community members employed in scientific pursuits. It requires them to be creative, intellectually honest, to evaluate arguments with scepticism, and to conduct their investigations in ways that are ethical, fair and respectful of others.

The Integrated Science General course is inclusive and aims to be attractive to students with a wide variety of backgrounds, interests and career aspirations.

Course outcomes

The Integrated Science General course is designed to facilitate achievement of the following outcomes.

Outcome 1 – Science Inquiry Skills

Students investigate to answer questions about the natural and technological world, using reflection and analysis to prepare a plan; collect, process and interpret data; to communicate conclusions; and to evaluate their plan, procedures and findings.

In achieving this outcome, students:

- plan investigations to test ideas about the natural and technological world
- collect and record a variety of information relevant to their investigations
- translate and analyse information to find patterns and draw conclusions to extend their understanding
- reflect on an investigation, evaluate the process and generate further ideas.

Outcome 2 – Science as a Human Endeavour

Students understand that science is a human activity involving the application of scientific knowledge to solve problems and make informed decisions that impact on people and the environment.

In achieving this outcome, students:

- understand the evolving nature of science
- understand that scientific knowledge can be applied to solve problems
- understand that scientific evidence informs decisions that impact on people and the environment.

Outcome 3 – Science Understanding

Students understand relationships within and between living and physical systems by integrating concepts of energy and the structure and nature of matter.

In achieving this outcome, students:

- understand the nature of matter and its relationship to structures in living and physical systems
- understand interactions between components in living and physical systems
- understand interactions between energy and matter.

Organisation

This course is organised into a Year 11 syllabus and a Year 12 syllabus. The cognitive complexity of the syllabus content increases from Year 11 to Year 12.

Structure of the syllabus

The Year 11 syllabus is divided into two units, each of one semester duration, which are typically delivered as a pair. The content within Unit 1 and Unit 2 can be taught in an integrated way in one or more contexts over the year. The notional time for each unit is 55 class contact hours.

Unit 1

The emphasis of this unit is on biological and Earth systems, focusing on the following topics:

- interrelationships between Earth systems
- structure and function of biological systems
- ecosystems and sustainability
- species continuity and change.

Unit 2

The emphasis of this unit is on physical and chemical systems, focusing on the following topics:

- atomic structure
- chemical reactions
- mixtures and solutions
- motion and forces
- energy.

Each unit includes:

- a unit description – a short description of the focus of the unit
- unit content – the content to be taught and learned.

Organisation of content

Science strand descriptions

The Integrated Science General course has three interrelated strands: Science Inquiry Skills, Science as a Human Endeavour and Science Understanding, which build on students' learning in the Year 7–10 Science curriculum. The three strands of science should be taught in an integrated way. The content descriptions for Science Inquiry Skills, Science as a Human Endeavour and Science Understanding have been written so that this integration is possible in each unit.

Science Inquiry Skills

Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting data; and communicating findings. This strand is concerned with evaluating claims, investigating ideas, solving problems, reasoning, drawing valid conclusions, and developing evidence-based arguments.

Science investigations are activities in which ideas, predictions or hypotheses are tested, and conclusions are drawn in response to a question or problem. Investigations can involve a range of activities, including experimental testing, field work, locating and using information sources, conducting surveys, and using modelling and simulations.

Science as a Human Endeavour

Science concepts, models and theories are reviewed as their predictions and explanations are continually re-assessed through new evidence, often through the application of new technologies. This review process involves a diverse range of scientists working within an increasingly global community of practice.

The application of science may provide great benefits to individuals, the community and the environment, but may also pose risks and have unintended consequences. As an ever-evolving body of knowledge, science frequently informs public debate, but is not always able to provide definitive answers.

Science Understanding

Science understanding is evident when a person selects and integrates appropriate science concepts, models and theories to explain and predict phenomena, and applies those concepts, models and theories to new situations.

The Science Understanding content in each unit develops students' understanding of the key concepts, models and theories that underpin the subject, and of the strengths and limitations of different models and theories for explaining and predicting complex phenomena.

Safety

Science learning experiences may involve the use of potentially hazardous substances and/or hazardous equipment. It is the responsibility of the school to ensure that duty of care is exercised in relation to the health and safety of all students and that school practices meet the requirements of the *Work Health and Safety Act 2011*, in addition to relevant state or territory health and safety guidelines.

Animal ethics

Through a consideration of research ethics as part of Science Inquiry Skills, students will examine their own ethical position, draw on ethical perspectives when designing investigation methods, and ensure that any activities that impact on living organisms comply with the *Australian code of practice for the care and use of animals for scientific purposes 8th edition 2013* (www.nhmrc.gov.au/guidelines/publications/ea28).

Any teaching activities that involve the care and use of, or interaction with, animals must comply with the *Australian code of practice for the care and use of animals for scientific purposes 8th edition 2013,* in addition to any relevant state guidelines.

The Animal Welfare Act 2002 can be found at www.slp.wa.gov.au. The related animal welfare regulations, along with the licences required for the use and supply of animals, can be downloaded from www.dlg.wa.gov.au

Information regarding the care and use of animals in Western Australian schools and agricultural colleges can be viewed at www.det.wa.edu.au/curriculumsupport/animalethics/detcms/portal/

Mathematical skills expected of students studying the Integrated Science General course

The Integrated Science General course requires students to use the mathematical skills they have developed through the Year 7–10 Mathematics curriculum, in addition to the numeracy skills they have developed through the Science Inquiry Skills strand of the Year 7–10 Science curriculum.

Within the Science Inquiry Skills strand, students are required to gather, represent and analyse numerical data to identify the evidence that forms the basis of scientific arguments, claims or conclusions. In gathering and recording numerical data, students are required to make measurements using appropriate units to an appropriate degree of accuracy.

Students may need to be taught when it is appropriate to join points on a graph and, when it is appropriate, to use a line of best fit. They may also need to be taught how to construct a straight line that will serve as the line of best fit for a set of data presented graphically.

It is assumed that students will be able to competently:

- perform calculations involving addition, subtraction, multiplication and division of quantities
- perform approximate evaluations of numerical expressions
- express fractions as percentages, and percentages as fractions
- calculate percentages
- recognise and use ratios
- transform decimal notation to power of ten notation
- comprehend and use the symbols/notations $<$, $>$, Δ, $\approx$
- translate information between graphical, numerical and algebraic forms
- distinguish between discrete and continuous data and then select appropriate forms, variables and scales for constructing graphs
- construct and interpret frequency tables and diagrams, pie charts and histograms
- describe and compare data sets using mean, median and range
- interpret the slope of a linear graph.

Progression from the Year 7–10 curriculum

This syllabus continues to develop student understanding and skills from across the three strands of the Year 7–10 Science curriculum. In the Science Understanding strand, this course draws on knowledge and understanding from the sub-strand of Biological sciences in Years 7, 8, 9 and 10 and Chemical sciences in Year 10.

This course continues to develop the key concepts introduced in the Physical Sciences sub-strand: Forces affect the behaviour of objects, and that energy can be transferred and transformed from one form to another. In the Biological Sciences sub-strand: ecosystems consist of communities of interdependent organisms and abiotic components of the environment; matter and energy flow through these systems; and human activity has an impact on the delicate balance within ecosystems. In the Chemical sciences sub-strand: structure and properties of matter and chemical reactions.

Representation of the general capabilities

The general capabilities encompass the knowledge, skills, behaviours and dispositions that will assist students to live and work successfully in the twenty-first century. Teachers may find opportunities to incorporate the capabilities into the teaching and learning program for the Integrated Science General course. The general capabilities are not assessed unless they are identified within the specified unit content.

Literacy

Literacy is important in students' development of Science Inquiry Skills and their understanding of content presented through the Science Understanding and Science as a Human Endeavour strands. Students gather, interpret, synthesise and critically analyse information presented in a wide range of genres, modes and representations (including text, flow diagrams, symbols, graphs and tables). They evaluate information sources and compare and contrast ideas, information and opinions presented within and between texts. They communicate processes and ideas logically and fluently and structure evidence-based arguments, selecting genres and employing appropriate structures and features to communicate for specific purposes and audiences.

Numeracy

Numeracy is key to students' ability to apply a wide range of Science Inquiry Skills, including making and recording observations; ordering, representing and analysing data; and interpreting trends and relationships. They employ numeracy skills to interpret complex spatial and graphic representations, and to appreciate the ways in which biological and physical systems are structured, interact and change across spatial and temporal scales. They engage in analysis of data, including issues relating to reliability and probability, and they interpret and manipulate mathematical relationships to calculate and predict values.

Information and communication technology capability

Information and communication technology (ICT) capability is a key part of Science Inquiry Skills. Students use a range of strategies to locate, access and evaluate information from multiple digital sources; to collect, analyse and represent data; to model and interpret concepts and relationships; and to communicate and share science ideas, processes and information. Through exploration of Science as a Human Endeavour concepts, students assess the impact of ICT on the development of science and the application of science in society, particularly with regard to collating, storing, managing and analysing large data sets.

Critical and creative thinking

Critical and creative thinking is particularly important in the science inquiry process. Science inquiry requires the ability to construct, review and revise questions and hypotheses about increasingly complex and abstract scenarios and to design related investigation methods. Students interpret and evaluate data; interrogate, select and cross-reference evidence; and analyse processes, interpretations, conclusions and claims for validity and reliability, including reflecting on their own processes and conclusions. Science is a creative endeavour and students devise innovative solutions to problems, predict possibilities, envisage consequences and speculate on possible outcomes as they develop Science Understanding and Science Inquiry Skills. They also appreciate the role of critical and creative individuals and the central importance of critique and review in the development and innovative application of science.

Personal and social capability

Personal and social capability is integral to a wide range of activities in the Integrated Science General course, as students develop and practise skills of communication, teamwork, decision-making, initiative-taking and self-discipline with increasing confidence and sophistication. In particular, students develop skills in both independent and collaborative investigation; they employ self-management skills to plan effectively, follow procedures efficiently and work safely; and they use collaboration skills to conduct investigations, share research and discuss ideas. In considering aspects of Science as a Human Endeavour, students also recognise the role of their own beliefs and attitudes in their response to science issues and applications, consider the perspectives of others, and gauge how science can affect people's lives.

Ethical understanding

Ethical understanding is a vital part of science inquiry. Students evaluate the ethics of experimental science, codes of practice, and the use of scientific information and science applications. They explore what integrity means in science, and they understand, critically analyse and apply ethical guidelines in their investigations. They consider the implications of their investigations on others, the environment and living organisms. They use scientific information to evaluate the claims and actions of others and to inform ethical decisions about a range of social, environmental and personal issues and applications of science.

Intercultural understanding

Intercultural understanding is fundamental to understanding aspects of Science as a Human Endeavour, as students appreciate the contributions of diverse cultures to developing science understanding and the challenges of working in culturally diverse collaborations. They develop awareness that raising some debates within culturally diverse groups requires cultural sensitivity, and they demonstrate open-mindedness to the positions of others. Students also develop an understanding that cultural factors affect the ways in which science influences and is influenced by society.

Representation of the cross-curriculum priorities

The cross-curriculum priorities address contemporary issues which students face in a globalised world. Teachers may find opportunities to incorporate the priorities into the teaching and learning program for the Integrated Science General course. The cross-curriculum priorities are not assessed unless they are identified within the specified unit content.

Aboriginal and Torres Strait Islander histories and cultures

Contexts that draw on Aboriginal and Torres Strait Islander histories and cultures provide opportunities for students to recognize the importance of Aboriginal and Torres Strait Islander Peoples' knowledge in developing a richer understanding of the Australian environment. Students could develop an appreciation of the unique Australian biota and its interactions, the impacts of Aboriginal and Torres Strait Islander Peoples on their environments and the ways in which the Australian landscape has changed over tens of thousands of years. They could examine the ways in which Aboriginal and Torres Strait Islander Peoples' knowledge of ecosystems has developed over time and the spiritual significance of Country/Place.

Asia and Australia's engagement with Asia

Contexts that draw on Asian scientific research and development and collaborative endeavours in the Asia Pacific region provide an opportunity for students to investigate Asia and Australia's engagement with Asia. Students could explore the diverse environments of the Asia region and develop an appreciation that interaction between human activity and these environments continues to influence the region, including Australia, and has significance for the rest of the world. By examining developments in science and technology, students could appreciate that the Asia region plays an important role in scientific research and development through collaboration with Australian scientists.

Sustainability

The Sustainability cross-curriculum priority is explicitly addressed in the Integrated Science General course. The course provides authentic contexts for exploring, investigating and understanding the function and interactions of biotic and abiotic systems across a range of spatial and temporal scales. By investigating the relationships between biological systems and system components, and how systems respond to change, students develop an appreciation for the interconnectedness of the biosphere. Students appreciate that science provides the basis for decision making in many areas of society and that these decisions can impact on the Earth system. They understand the importance of using science to predict possible effects of human and other activity, and to develop management plans, or alternative technologies, that minimise these effects and provide for a more sustainable future.

Unit 1

Unit description

In this unit, students develop an understanding of the processes involved in the functioning of systems from the macro level (cycles in nature and Earth systems) to systems at the organism, cellular and molecular level. They investigate and describe the effect of human activity on the functioning of cycles in nature. By integrating their understanding of Earth and biological systems, students come to recognise the interdependence of these systems.

Students investigate structure and function of cells, organs and organisms, and the interrelationship between the biological community and the physical environment. They use a variety of practical activities to investigate patterns in relationships between organisms.

Practical experiences form an important part of this course. They provide valuable opportunities for students to work together to collect and interpret first-hand data in the field or the laboratory. In order to understand the interconnectedness of organisms to their physical environment, and the impact of human activity, students analyse and interpret data collected through investigations in the context studied. They will also use sources relating to other Australian, regional and global environments.

The context that is used to teach all the key concepts should be broad and integrate all areas of science to assist in the delivery of the key concepts. It should engage students, have local real-life application, and be relevant to the student's everyday life.

Suggested contexts

Possible contexts (this list is not exhaustive) which may be used for the teaching of the key concepts are:

- environmental degradation
- marine biology
- sustainability and biodiversity
- water
- biotechnology.

Unit content

This unit includes the knowledge, understandings and skills described below. The order and detail in which the key concepts are organised into teaching/learning programs are decisions to be made by the teacher.

Science Inquiry Skills

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods
- conduct investigations safely, competently and methodically for the collection of valid and reliable data
- represent data in meaningful and useful ways; organise and analyse data to identify trends and patterns; qualitatively describe sources of measurement error and use evidence to make and justify conclusions

- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- use appropriate representations, to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations

Science as a Human Endeavour

- the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations
- the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences
- scientific knowledge can enable scientists to offer valid explanations and make reliable predictions
- scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability

Science Understanding

Earth systems/cycles in nature

- interaction between the hydrosphere, lithosphere and atmosphere are represented by biogeochemical cycles
- conservation of matter occurs in cycles in nature
- natural resources are important in everyday life
- human activities and natural processes impact on cycles in nature

Structure and function of biological systems

- the cell is the simplest form of organisation that can perform activities required for life
- forms of organisation of multicellular organisms include tissues, organs and systems
- changes in a system can affect the survival of organisms; variation assists survival of individuals

Ecosystems and sustainability

- interrelationship between systems assist cellular activity to sustain life
- biological communities interact with each other and their physical environment

Species continuity and change

- reproduction and inheritance play an important role in the continuity of species
- change in physical environment leads to eventual change in biological characteristics of a species

Unit 2

Unit description

In this unit, students develop an understanding of the processes involved in the transformations and redistributions of matter and energy in biological, chemical and physical systems, from the atomic to the macro level. Students will investigate the properties of elements, compounds and mixtures, and how substances interact with each other in chemical reactions to produce new substances. They explore the concepts of forces, energy and motion and recognise how an increased understanding of scientific concepts has led to the development of useful technologies and systems.

Practical experiences are an important part of this course that provide valuable opportunities for students to work together to collect and interpret first-hand data. In order to understand the interconnectedness of organisms to their physical environment, and the impact of human activity, students analyse and interpret data collected through investigation of the context studied. They will also use sources relating to other Australian, regional and global environments.

The context that is used to teach all the key concepts should be broad and integrate all areas of science to assist in the delivery of the key concepts. It should engage students, have local real-life application, and be relevant to the student's everyday life.

Suggested contexts

Possible contexts (this list is not exhaustive) which may be used for the teaching of the key concepts are:

- forensic science
- rocketry
- kitchen chemistry
- cosmetics
- marine archaeology
- mining.

Unit content

This unit includes the knowledge, understandings and skills described below. The order and detail in which the key concepts are organised into teaching/learning programs are decisions to be made by the teacher.

Science Inquiry Skills

- construct questions for investigation; propose hypotheses; and predict possible outcomes
- plan, select and use appropriate investigation methods, to collect reliable data; assess risk and address ethical issues associated with these methods
- conduct investigations safely, competently and methodically for the collection of valid and reliable data

- represent data in meaningful and useful ways; organise and analyse data to identify trends, patterns and relationships; qualitatively describe sources of measurement error and use evidence to make and justify conclusions
- interpret a range of scientific and media texts, and evaluate the conclusions by considering the quality of available evidence
- use appropriate representations, to communicate conceptual understanding, solve problems and make predictions
- communicate scientific ideas and information for a particular purpose, using appropriate scientific language, conventions and representations

Science as a Human Endeavour

- the use of scientific knowledge is influenced by social, economic, cultural and ethical considerations
- the use of scientific knowledge may have beneficial and/or harmful and/or unintended consequences
- scientific knowledge can enable scientists to offer valid explanations and make reliable predictions
- scientific knowledge can be used to develop and evaluate projected economic, social and environmental impacts, and to design action for sustainability

Science Understanding

Atomic structure

- atoms consist of a nucleus of protons and neutrons and are surrounded by electrons
- the properties of elements, compounds and mixtures determine the use of substances

Chemical reactions

- rearrangement of matter occurs during chemical reactions to form new substances
- chemical reactions involve energy; different types of reactions are used to produce a variety of products

Mixtures and solutions

- mixtures, including solutions, contain a combination of pure substances that can be separated using a range of techniques

Motion and forces

- linear motion of an object is unidirectional and can be determined mathematically
- the Laws of Motion can assist in predicting the motion of objects
- forces can be exerted by one object on another by direct contact or from a distance

Energy

- energy has different forms: kinetic, potential and heat, which can cause change

School-based assessment

The Western Australian Certificate of Education (WACE) Manual contains essential information on principles, policies and procedures for school-based assessment that needs to be read in conjunction with this syllabus.

Teachers design school-based assessment tasks to meet the needs of students. The table below provides details of the assessment types for the Integrated Science General Year 11 syllabus and the weighting for each assessment type.

Assessment table – Year 11

Type of assessment	Weighting
Science Inquiry Science inquiry involves identifying and posing questions; planning, conducting and reflecting on investigations; processing, analysing and interpreting data; and communicating findings. Students evaluate claims, investigate ideas, solve problems, reason, draw valid conclusions, and/or develop evidence-based arguments. **Science Inquiry: Practical** Practical work can involve a range of activities, such as practical tests; modelling and simulations; qualitative and/or quantitative analysis of second-hand data; and/or brief summaries of practical activities. **Science Inquiry: Investigation** Investigations are more extensive activities, which can include experimental testing; conducting surveys; and/or comprehensive scientific reports.	50%
Extended response Tasks requiring an extended response can involve: selecting and integrating appropriate science concepts, models and theories to explain and predict phenomena, and applying those concepts, models and theories to new situations; interpreting scientific and/or media texts and evaluating processes, claims and conclusions by considering the quality of available evidence; and using reasoning to construct scientific arguments. Assessment may take the form of answers to specific questions based on individual research; exercises requiring analysis; and interpretation and evaluation of information in scientific journals, media texts and/or advertising.	30%
Test Tests typically consist of multiple-choice questions and questions requiring short and extended answers. Tests should be designed so that students can apply their understanding and skills in the Integrated Science General course.	20%

Teachers are required to use the assessment table to develop an assessment outline for the pair of units (or for a single unit where only one is being studied).

The assessment outline must:

- include a set of assessment tasks
- include a general description of each task
- indicate the unit content to be assessed
- indicate a weighting for each task and each assessment type
- include the approximate timing of each task (for example, the week the task is conducted, or the issue and submission dates for an extended task).

In the assessment outline for the pair of units, each assessment type must be included at least twice, except in Investigation, which must be included at least once. In the assessment outline where a single unit is being studied, each assessment type must be included at least once.

The set of assessment tasks must provide a representative sampling of the content for Unit 1 and Unit 2.

Assessment tasks not administered under test/controlled conditions require appropriate validation/authentication processes.

Grading

Schools report student achievement in terms of the following grades:

Grade	Interpretation
A	Excellent achievement
B	High achievement
C	Satisfactory achievement
D	Limited achievement
E	Very low achievement

The teacher prepares a ranked list and assigns the student a grade for the pair of units (or for a unit where only one unit is being studied). The grade is based on the student's overall performance as judged by reference to a set of pre-determined standards. These standards are defined by grade descriptions and annotated work samples. The grade descriptions for the Integrated Science General Year 11 syllabus are provided in Appendix 1. They can also be accessed, together with annotated work samples, through the Guide to Grades link on the course page of the Authority website at www.scsa.wa.edu.au

To be assigned a grade, a student must have had the opportunity to complete the education program, including the assessment program (unless the school accepts that there are exceptional and justifiable circumstances).

Refer to the WACE Manual for further information about the use of a ranked list in the process of assigning grades.

Appendix 1 – Grade descriptions Year 11

A	**Science Inquiry Skills** Uses research to formulate a clearly defined hypothesis, identifies several variables to be controlled in an investigation, and explains why these need to be controlled. Explains reasons for collecting quantitative data and conducting multiple trials. Analyses experimental data, uses scientific concepts to explain patterns and trends, and draws conclusions that relate to the stated hypothesis. Explains how limitations in the experimental design affect the validity and reliability of the data, and makes suggestions to overcome these limitations. Recognises anomalous data. Uses simple formulae to perform calculations, providing evidence of working and correct use of units.
	Science Understanding and Science as a Human Endeavour Identifies and analyses issues and problems, explains the impact on society, and discusses alternative solutions. Provides evidence for and against a viewpoint, and discusses strategies to influence society's opinions and attitudes. Interprets and evaluates scientific information to provide clear and concise explanations of concepts that are supported by comprehensive evidence; for example, diagrams, data in the form of tables and graphs, media articles, surveys and bibliographies. Uses scientific terminology accurately to communicate ideas.

B	**Science Inquiry Skills** States the hypothesis as the relationship between the dependent and independent variables, and identifies more than one variable to be controlled in an investigation. Clearly describes the method of trialling an hypothesis and includes a plan for preliminary trials. Uses well-organised tables to record data. Uses scientific concepts to explain patterns and trends in the data, forms a conclusion and states whether it supports the hypothesis. Comments on validity of results due to limitations in the experimental design, and suggests specific improvements to the design. Uses simple formulae to perform calculations, providing some evidence of working to get the correct answers. Generally uses correct units.
	Science Understanding and Science as a Human Endeavour Identifies issues and problems, provides evidence to support one particular viewpoint, and clearly explains the impact on society. Interprets and summarises scientific information to explain concepts and data using illustrative forms; for example, tables and graphs. Correctly lists a range of sources of information in a bibliography. Uses scientific terminology to communicate ideas.

C	**Science Inquiry Skills** Identifies a link between relevant variables, and lists one variable to be controlled. Clearly describes the method of trialling an hypothesis, and presents data using simple tables. Identifies patterns and trends in the data, and writes a simple conclusion. Identifies problems in the experimental design, and suggests general improvements. Uses simple formulae to perform simple calculations.	
	Science Understanding and Science as a Human Endeavour Recognises issues and briefly describes their impact on self or surroundings. Recognises that there are different opinions on a topic and provides a personal opinion, but with limited substantiating evidence. Summarises scientific information to describe concepts, using illustrative forms; for example, tables, but does not refer to the data to support the answer. Collects information from a limited range of sources. Uses key scientific terminology in isolation from the main text of an answer.	

D	**Science Inquiry Skills** Makes predictions when provided with a problem to solve, and recognises the need to control some aspects of the investigation, but does not identify variables to be controlled. Briefly describes the method of trialling an hypothesis, and records brief observations in simple tables. Comments on the results, and recognises when a problem exists in the experimental design. Performs simple calculations using given formulae, with limited accuracy.
	Science Understanding and Science as a Human Endeavour Briefly describes the impact of issues and problems on themselves or their surroundings. Recognises and briefly summarises key scientific concepts and ideas. Provides limited evidence to support answers and demonstrate scientific concepts, such as choosing diagrams, pictures and tables that are not relevant. Includes key scientific terminology, but answers do not demonstrate clear interpretation of these.

E	**Science Inquiry Skills** Writes an aim rather than an hypothesis, and does not identify the relevant variables. Collects limited data and makes simple observations about the investigation. Comments on personal aspects of the investigation, but does not recognise problems in the experimental design. Selects incorrect information needed to perform simple calculations, often not recognising that an answer is unreasonable, and confuses units.
	Science Understanding and Science as a Human Endeavour Makes simple, sometimes inaccurate, statements regarding the effect of issues and problems on their surroundings. Uses conceptual information inaccurately. Collects information that is irrelevant to the topic, or does not present it in a logical way. Uses key scientific terminology out of context.