SCIENCE SYLLABUS

FOR

SOLOMON ISLANDS SECONDARY SCHOOLS

FORMS ONE TO FIVE

CURRICULUM DEVELOPMENT CENTRE
DEPARTMENT OF EDUCATION AND HUMAN RESOURCES DEVELOPMENT

PREFACE

This Science Syllabus is a revision of the one published in 1991. It is designed to be as useful for those who leave school at the end of Form 3 as it is for those who continue with further science studies. This syllabus contains knowledge and skills objectives organised into 24 Units. These objectives are intended to be achieved by students through investigations which focus on Solomon Island cultural activities and technologies. This method of teaching will ensure that students learn science in a familiar and appropriate way.

The syllabus was developed by the Science Panel during 1994 and 1995 and funded under the Solomon Islands and Australian, Science and Agriculture Education Project.

As the Minister responsible for the provision of education services in Solomon Islands, I now endorse the approval of this syllabus as the official document to be used for the teaching and learning of science in Secondary Schools throughout Solomon Islands.

Honourable Ronidi Mani,
Minister for Education and Human Resources Development.

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ACKNOWLEDGMENTS

The Department of Education and Human Resources Development is grateful to all Science Teachers and to members of the 1994, 1995 and 1999 Science Panels for the work they put into the development of this syllabus.

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STATUS OF THIS DOCUMENT

This science syllabus for Forms 1 to 5 is a revised version of the 1991 syllabus. There are changes to both content and layout but most of the content in the 1991 syllabus still remains.

All science teachers in the country were given the opportunity to complete a questionnaire on the first draft. A response was received from every school. Many teachers met at a workshop in Honiara in July 1995 to discuss the analysis of the questionnaires and make further suggestions. This syllabus was then written taking into account all comments on the first draft. It was approved by the science panel at its meeting in September 1995.

This science syllabus was approved by the National Curriculum Coordinating Committee in February 1996. All secondary schools began to use the syllabus in 1997. The is the second edition of the science syllabus. It was published in September 1999. This syllabus should be used to teach science in the secondary schools until it is reviewed.

The support materials developed are based on the constructivist learning theory and supporting pedagogy for science education. Science teachers are therefore encouraged to use the constructivist learning approach where appropriate in order to help students understand science better and discourage too much teacher-centred learning.

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September 1999.

SCIENCE PANEL REQUIREMENTS

The following paragraphs describe policy on some aspects of science teaching and learning which have all been approved by the Science Panel.

Teaching time for science
The Form 1 to 3 course has been designed for 6 x 40 minute periods per week and the Form 4 and 5 course for 8 x 40 minute periods per week. The number of teaching weeks for each Form was calculated using information provided by teachers and after taking advice from the Panel. The details of the teaching time available for each Form is as follows:-

FORM	AVAILABLE TEACHING WEEKS	TOTAL TEACHING PERIODS PER FORM	TOTAL TEACHING HOURS PER FORM
1	35 weeks	35 x 6 = 210 periods	210 x 40 min = 140 hours
2	35 weeks	35 x 6 = 210 periods	210 x 40 min = 140 hours
3	35 weeks	35 x 6 = 210 periods	210 x 40 min = 140 hours
4	35 weeks	35 x 7 = 245 periods	245 x 40 min = 163 hours
5	25 weeks	25 x 7 = 175 periods	175 x 40 min = 116 hours

The Department of Education and Human Resources Development requires that all schools offering all or any Forms 1 to Form 5 courses offer science to all their students. Time spent on science teaching should be in line with the time listed above.

Communication
Science uses a particular vocabulary and language forms which are used less frequently in common writing and speech. A conscious effort should therefore be made to teach the language of science. This includes teaching the special reporting format as well as the vocabulary of science. This is of great importance to students who are developing their English language skills.

Controversial and Sensitive Issues
Various issues which are controversial may arise while teaching science. Teachers are expected to treat these issues in a sensitive manner and to present related material in a balanced way. It is probable that within one class there will be students who come from families with different beliefs and customs and it is the teacher's responsibility to be aware of this and take such student differences into account in the teaching and learning activity.

Environmental Education
It is now generally recognised that a major problem facing all countries is the need for action if we are to continue to sustain the environment in a condition acceptable to present and future populations. Therefore when teaching this course as many opportunities as possible should be taken to link what is being taught to environmental examples. This does not imply different or additional topic areas of study. Environmental issues provide an interesting and very appropriate context through which to teach many science concepts. This action on the

part of teachers is essential if we are to have a scientifically knowledgeable population in the future who value their environment and are committed to protecting it.

Inclusive Curriculum
The opportunity must be provided for all students to learn science to their full potential. This includes students who may eventually study science at tertiary level as well as students who leave school earlier. Students who leave school and return to work in their own community have as great a need for a good science education as those who intend studying science at further levels. The science teaching and learning approach must therefore take account of this mixed mode of intention about what students will do when they leave school. Teachers are also expected to ensure that girls and boys have equal access to a science education. Science lessons should be presented so that they are just as appealing and as useful to girls as they are to boys. Careers information relating to science should also be available explaining that the jobs are just as suitable for girls as they are for boys.

Safety
Teachers are expected to take reasonable precautions to ensure the safety of themselves and all students in their care. They are expected to be familiar with the materials and the situations in science teaching which may have some risk to their own or their students' safety. Teachers are not expected to put themselves or their students at risk by carrying out any experiment or activity if they are not very sure about the risks being taken or the precautions required. If teachers are in any doubt about the safety of an experiment or an activity they should not carry out that experiment or that activity. Instead they should contact another more experienced teacher or the Principal Curriculum Development Officer Science. Advice about safety precautions for specific instances where extra care is required by teachers will be provided in the teachers guides.

THE RATIONALE FOR SECONDARY SCHOOL SCIENCE

Science and technology are becoming increasingly more important to the Solomon Islands. Science is a very powerful way of organising knowledge and becoming increasingly important to Solomon Islanders as they contribute towards the development, growth and improving standard of living of the population.

The economic future of the Solomon Islands depends on its natural resources and how they are used and developed. Industries such as agriculture, forestry, fishing, mining and manufacturing are all gradually developing and require the skills of increasing numbers of scientists, technologists and trades men and women. Development is also putting ever greater pressure on the Solomon Islands environment including the lagoons and the territorial waters around the country.

In addition to these reasons, there is also a very great need for more understanding about science and technology in the general population. Technologies will increasingly affect the life of every Solomon Islander—not just the scientists. As the environment comes under greater pressure so the whole population will require a greater understanding of the need to, and the knowledge of how to, protect and preserve the environment. This appreciation of scientific knowledge, processes and attitudes has the potential to allow all Solomon Islanders to contribute to decisions about the building of a more productive, ecologically sustainable and prosperous country.

At a personal level science education also gives students the confidence and ability to satisfy their curiosity about how the world works around them. It provides information about how the physical, biological and technological activities happening around them work—and how these can be discussed and explained. A science education also helps students to solve problems. Tasks commonly set in science lessons provide students with opportunities to expand their ability to think critically and creatively, to reason logically and to apply their skills and knowledge to new situations. These skills are not be unique to science education but it is an ideal situation in which to teach such skills.

For all these reasons science should be an important part of every Solomon Islander's education if they are to be responsible members of society and have a full range of opportunities in later life.

THE AIMS OF THE SCIENCE COURSE

This course aims to provide science understanding, for all students who take the course so that they are able to use and apply what they learn to their own and their community's advantage.

In achieving this aim this course must fulfil two major functions. One is to provide a useful science education for students who leave school at the end of Form 3 (or later) and who are unlikely to undertake further formal study of the subject. The other is to provide a Form 1 to Form 5 science education which is going to be useful to those students who are likely to study science at Form 6 level or higher. Both these functions must be fulfilled by this science course if it is to achieve its aim of being useful to all participating students.

In fulfilling its main aim this course has specific contributions to make to the education of Solomon Islands secondary school students by developing

- knowledge and understanding about their physical surroundings, the materials, the plants and the animals of their world
- knowledge and understanding about the relationships and interaction between these physical and biological elements
- the ability to investigate and communicate scientifically and the to use scientific knowledge to their own and their community's advantage.

The development of such understandings and skills will enable students to

- think logically and satisfy their curiosity about the world around them
- complete tasks and solve problems in a scientific manner
- compare similarities and differences between traditional customs, values and observations and scientific views, values and assumptions
- use their secondary science learning to prepare for tertiary education and direct employment

- develop their own informed opinions about the advantages or disadvantages of the use of science and technology

- use science as a tool to understand and to persuade others to protect and preserve their environment

- take appropriate action regarding the use of the natural resources of Solomon Islands and support ways in which science can usefully help in sustaining these resources for the benefit of all Solomon Islanders.

The course as a whole also aims to present the science knowledge and skills within the context of Solomon Islands activities, technologies and materials.

SCOPE AND SEQUENCE

The scope and sequence provides a summary of the whole Form 1 to Form 5 science course. Its main purpose is to list and classify the outcomes of the science course from Form 1 to Form 5 so that teachers and others can have an overview of what the course is all about.

The outcomes broadly describe the knowledge and skills which students should learn during the course. The unit objectives, described under each unit in the main body of this document, are examples of the knowledge and skills which students should acquire if these outcomes are achieved. Each outcome in the scope and sequence has beside it at least one topic number from a unit so that teachers can see the relationship between these outcomes and the unit objectives.

Outcomes describing knowledge and outcomes describing skills and attitudes are listed separately in the scope and sequence so that what the course is designed to teach can be clearly documented. Science knowledge, skills and attitudes however must be taught in an integrated manner and this is how they are presented in the course units and in the proposed teacher and student books.

The Scope and Sequence consists of the following elements: -

Strands	The strands are simply the main areas of science teaching. They are 1. Biology 2. Chemistry 3. Earth Science 4. Physics 5. Skills and Attitudes
Subjects	The subjects are sub-sets of the strands and are equivalent to the subjects in the 1991 document. There are three subjects within each strand.
Outcomes	Outcomes describe the knowledge, the skills or the attitudes to be taught and learned throughout the five year course. There are generally two or three outcomes listed for each subject at each Form level.

SCOPE AND SEQUENCE TABLES

STRAND:-**BIOLOGY**

SUBJECT:-	**Living Together**	**Structure and Function**	**Reproduction and Adaptation**
	Students should have a knowledge of:-	Students should have a knowledge of:-	Students should have a knowledge of:-
Form 1	the importance good water supply to all organisms and how to preserve good water supplies (1.4.2)	the characteristics of living organisms (1.2.1) the major similarities and differences between types of plants and animals and how these are used in classification (1.2.1) a range of cause and effect mechanisms in plants and animals (1.5.3)	
Form 2	the biology of some small local organisms and plant species (2.3.1, 2.3.2, 2.3.3)	the structure and classification of the major groups of living things (2.1.2) the structure of small organisms (2.3.1) major tissue systems and their functions in plants (2.3.2) major marine systems (2.3.3)	cell growth and reproduction (2.3.1) reproduction and growth in plants (2.3.2)

Form 3	all aspects of their own local environment (3.3.1) the interdependence of environmental factors for the requirements of all living things (3.3.1) local and South Pacific environmental concerns (3.3.2) some of the causes and precautions to take against diseases including nutritional diseases (3.4.2)	structure and function of animals in a local ecosystem (3 3.1) human nutrition, digestion and circulation and co-ordination (3.4.2, 3.4.3, 3.4.4)	the biology of human reproduction and the need for and means of family planning (3.4.1)
Form 4	the human body's defence mechanisms (4.5.2) the reasons for protecting local ecosystems (4.6.3)	classification of bacteria (4.5.1) the structure and growth of bacteria and viruses (4.5.1) the cyclic movement of elements through the environment (4.6.2) chromosome and gene structure (4.4.1) the structure and functioning of at least one local ecosystems (4.6.3)	the reproduction of disease causing microbes (4.5.1) the mechanics of inheritance and evolution (4.4.1, 4.4.2)
Form 5	why it is important to measure the effect of people's activity on the environment (5.5.1) how to measure the effect of a people's activity on the local environment and report scientifically on such activity (5.5.1)	the mechanics of energy supply, transfer and use in plant and animal communities (5.4.1, 5.4.2) homeostatic mechanisms in living organisms (5.4.3)	the rate of population increase in Solomon Islands and in the world (5.5.1) population of species in an environment (5.5.1) adaptive features of organisms (5 5.3)

STRAND:- **CHEMISTRY**

SUBJECT:-	**People and materials**	**Structure and properties**	**Reactions and change**
	Students should have a knowledge of:-	Students should have a knowledge of:-	Students should have a knowledge of:-
Form 1	dangers associated with some common materials and the need to use them with care (1.4.1)	the particle model used to explain the structure, states and characteristics of materials (1.2.2, 1.4.1, 1.5.2) the chemical concept of purity (1.4.1, 1.4.2)	conditions which influence reaction and change in materials (1.5.2)
Form 2	the chemical composition of some useful materials (2.1.1)	the atomic structure criteria used to describe the behaviour of materials (2.1.1) ways in which materials are structured as elements, compounds, mixtures and crystals (2.1.1)	chemical processes which combine or separate materials (2.1.1)
Form 3	how some metal ores are extracted and used (3.1.4) the major elements used by living organisms (3.1.1)	the criteria used for the basic classification of elements in the periodic table (3.1.3)	The reactivity of some common elements (3.1.1)
Form 4	the properties, care and use of acids, bases and salts (4.2.1) preparation of solutions (4.2.1) the extraction, use and recycling of metal (4.2.2) the uses of some metals and their alloys (4.2.3)	the first 20 elements in the periodic table (4.1.1) the atomic structure of elements in order to explain classification in the periodic table (4.1.1) the properties of a range of metals and their alloys (4.2.3)	the reactions of some important metals and non metals (4.1.2) bonding and valency (4.1.2) chemical names, formulas and equations (4.1.3)

Form 5	some useful non metals and their compounds (5.1.1) the combustion of carbon and carbon compounds and the effect of this on the environment (5.1.2, 5.1.5) some fuel alternatives (5.1.2, 5.1.5) the effect of burning plastic (5.1.5)	the structure and properties of nitrogen, sulfur, oxygen, phosphorus and chlorine (5.1.1) the properties of the group IV elements (5.1.3) the structure and properties of organic compounds (5.1.4, 5.1.5)	the processes used in the production of fuels, plastics and concrete (5.1.3, 5.1.5) the principles of fermentation (5.1.4) the metabolic effects of alcohol (5.1.4) some chemical reactions in organic chemistry (5.1.3, 5.1.4, 5.1.5)

STRAND:-**EARTH SCIENCE**

SUBJECT:-	**People and resources**	**The changing Earth**	**Earth in space**
	Students should have a knowledge of:-	Students should have a knowledge of:-	Students should have a knowledge of:-
Form 1	effects of weather on Solomon Islands communities	the weather and how it is recorded (1.2.3)	the changes in the appearance of the moon (1.5.4)
Form 2	the effects of major geological forces on people (2.2.1)	the processes which cause cyclones, earthquakes and volcanoes in the South Pacific area (2.2.1)	changes which can be observed due to the Earth's movement (2.2.2)
Form 3	renewable energy resources in the Solomon Islands (3.1.4) the occurrence of economic mineral deposits in the Solomon Islands (3.1.2)	the most common of the Earth's elements (3.1.1) the rocks and minerals of this area, their formation and subsequent weathering (3.1.2)	the basic structure of the Solar system (3.1.1) the sun as a source of energy (3.1.4)
Form 4	the extraction use and recycling of some metals (4.1.3)	the occurrence and formation of fossils (4.4.2)	satellite communication (4.3.3)
Form 5	the production and distillation of fossil fuels (5.1.2) the historical use of carbon (5.1.2)	how fossil fuels are formed (5.1.2)	the wavelength in the electromagnetic spectrum from the Sun used in photosynthesis

STRAND:-**PHYSICS**

SUBJECT:-	**People and energy**	**Sources and transmission of energy**	**Energy and action**
	Students should have a knowledge of:-	Students should have a knowledge of:-	Students should have a knowledge of:-
Form 1	how to measure volume , speed and force using simple local examples(1.3.1, 1.3.2 , 1.3.3)	different fuels and how energy is classified (1.2.2) the effect on some materials as they act as receivers of energy (1.5.2)	relationship between a variety of energy sources and force and motion (1.3.2, 1.3.3) the conventions for measuring a range of physical quantities (1.3.3)
Form 2	the importance of design criteria such as stability and frictional properties in common constructed items (2.1.4) energy requirements in the local area (2.4.1)	transmission and reflection of sound and light (2.4.2, 2.4.3) transmission of energy by conduction, convection and radiation (4.2)	the transformation of energy in the operation of machines (2.4.3)
Form 3	how electricity is transmitted and used including the safety precautions required (3.2.3)	the properties of light (3.2.2) the basics of electric circuitry (3.2.1)	how electricity is used to drive machinery including the use of the electromagnet (3.2.1) refraction and dispersion of light and how these properties are used (3.2.2)

Form 4	the use of simple machines in the local area (4.2.3) the history, development and usefulness of electronics (4.3.3)	ways of measuring and describing energy, force, work and power (4.2.1, 4.2.3, 4.2.4) ways of measuring speed and acceleration (4.2.2) the conversion of energy forms and the measurement of specific and latent heat (4.3.1, 4.3.2) the calculations required for simple circuitry (4.3.4)	how simple machines work (4.2.3) the mechanics and usefulness of heat transfer (4.3.2) the mechanics of generating electricity (4.3.4) of how some simple electronic components work (4.3.3)
Form 5	the principals of flotation as applied to a canoe and in diving (5.2.1) the use of energy from the electromagnetic spectrum (5.3.1)	ways of measuring and describing the energy transmission of light and sound (5.3.1, 5.3.2, 5.3.3) how to measure density and pressure (5.2.1, 5.2.2)	the operation of how fluids are used in hydraulics (5.2.2) technologies which transmit sound and light (5.3.2, 5.3.3)

STRAND:-**SKILLS AND ATTITUDES**

SUBJECT:-	**Communication skills**	**Investigation skills**	**Understanding science and technology**
	Students should be able to:-	Students should be able to:-	Students should be able to:-
Form 1	use some of the language of science in the correct context discuss and debate science issues at an appropriate level with other students demonstrate what they observe through drawings	carry out instructions and procedures involving a small number of steps organise and use experimental equipment collect and record information accurately	understand what science is and what scientists do identify ways they use science themselves in their day to day life describe the ways people in their local community use science
Form 2	recognise that science has much of its own vocabulary and that some of the words used in non science contexts have completely different meanings. classify scientific information using drawing, graphical and other appropriate forms	consider fairness when planning investigations design experiments and investigations to solve simple scientific problems assess dangers and follow correct experimental procedure at all times	compare and suggest different ways of solving problems and finding explanations describe scientific techniques that can be used to extend the information they can gather with their senses
Form 3	use procedural and discussion text in an appropriate form when reporting science activities and experiments. communicate scientific ideas to others by written, oral, graphical and other forms	demonstrate care, accuracy and attention to detail in their handling of data identify factors to be considered in their investigation, controls which may be necessary, and ways control might be achieved suggest improvements to their investigations after considering their results	identify particular career areas or individual jobs in the Solomon islands as "scientific" or requiring someone with a scientific background describe the level of training required for some of the scientific careers available today.

Form 4	use language to classify, connect and create ideas about Science select ways to present information which identifies patterns and assists in making generalisations	select appropriate pathways for investigations given the purpose and the resources available draw conclusions that link the information gathered to the purposes or hypotheses of the investigation	report on factors that have either limited or made possible technologies used in the Solomon Islands today such as television, concrete and fibre glass. talk about the value to Solomon Island people of some of the modern technologies available today
Form 5	use a formal impersonal scientific writing style when making field notes, recording observations and reporting assignments and experiments communicate using correctly the full range of physical quantities and graphical methods as detailed in appendix 4.	identify, consider and evaluate sources of error in their own and other experiments use information gathered as a stimulus for further investigations or analyses	discuss and try to predict the types of scientific jobs which might be required in the Solomon Islands in the future analyse and compare scientific theories and methods with other more traditional beliefs and values of the community.

It may not be easy to see which of the Skills and Attitudes detailed here relate to which outcomes in the syllabus. This is because development of science skills and attitudes are more closely related to the teaching methodology than the knowledge objectives of the syllabus. The teacher guides will contain some information on this.

A SUMMARY OF ALL UNITS

This is a summary of all units in each of Forms 1 to Form 5 for the whole science course. In these units one period equals 40 minutes. The period numbers allocated are only a rough guide to the time which should be spent on each topic. Teachers may spend more time on some topics and less on others. Note that the total periods allocated are slightly less than the total available for each year of the course except for Form Five.

FORM 1

UNITS	TOPICS	PERIODS
1.1 What is Science?	Understanding what scientists do	10
	Working scientifically	16
		26
1.2 Observing and Classifying	Observing and classifying living material	24
	Observing and classifying non-living material	20
	Observing and recording the weather	12
		56
1.3. Measuring	Investigating volume	14
	Investigating force	10
	Investigating speed	12
		36
1.4 Purifying	Solvents and solutes	12
	Keeping drinking water clean	12
	Domestic waste management	10
		34
1.5 Changes	Introducing change	4
	Changes in materials	24
	Growth changes	12
	The changing moon	12
		52
		202

FORM 2

2.1 Structure	Very small structures	20
	Structure and classification of living things	20
	Structures and stability	6
		46
2.2 The Changing Earth	Changes to the earth's surface	20
	Changes due to the Earth's movement	16
		36
2.3 Living Systems	Small organisms and cell reproduction	12
	Plant systems	24
	Marine systems	18
		54
2.4 Energy	Everyone needs energy	18
	Transferring energy	18
	Transformation and conservation of energy	9
	What is sound energy?	8
		53
		189

FORM 3

3.1 Resources	Origin of the elements Mineral resources Properties of metals Energy resources	18 18 16 12 **64**
3.2 Electricity and Light	Electrostatics Electric circuits and applications The properties of light	6 18 18 **42**
3.3 Considering our Future	Local environmental concerns South Pacific environmental concerns	21 15 **36**
3.4 Animal Systems	Reproduction and growth in humans Nutrition life style and disease Blood transport in mammals Movement and co-ordination in humans	18 20 10 16 **64**
		206

FORM 4

4.1 Atomic structure and chemical reactions	Atomic structure and the periodic table Bonding valency and chemical reactions Chemical names, formulas and balancing of chemical equations	16 14 10 **40**
4.2 Materials	Acids, bases and salts Metal production and use Metal alloys Important non-metals	14 8 20 12 **54**
4.3 Motion, Force, Work and Power	Force Distance, speed and acceleration Work Energy and power	8 8 10 16 **42**
4.4 More About Energy	Energy forms and energy conversions Energy transfer and specific and latent heat Electronics Electrical energy	12 10 16 18 **56**
4.5 Genetics and Evolution	Genetics Evolutionary changes	16 12 **28**
4.6 Disease and Defence	Bacteria and viruses Defence mechanisms	12 8 **20**
		242

FORM 5

5.1 Using Chemistry	Properties of the Group IV elements Origins of carbon and its compounds Organic compounds Carbon compounds in the atmosphere	10 4 14 10 **38**
5.2 Density and Pressure	Density Pressure	6 18 **24**
5.3 Transferring Light and Sound Energy	Energy transfer Sound energy Light energy	12 10 14 **36**
5.4 Energy and Control in Living Organisms	Energy supply for living organisms The use of energy by living organisms Homeostasis and excretion	16 16 16 **48**
5.5 Local Ecological Study	Population growth Natural cycles in the environment Ecology Environmental Impact Study	6 4 18 12 **40**
		186

FORM 1 UNIT OUTLINES

The five units for Form 1 are:-	**Suggested Timing**
1.1. What is Science?	26 periods
1.2 Observing and Classifying	56 periods
1.3. Measuring	36 periods
1.4. Purifying	34 periods
1.5. Changes	52 periods
TOTAL	204 periods

Unit 1.1 What is Science?

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
1.1.1 Understanding what scientists do 10 periods	know that science is an investigating process used to solve problems or discover something new and usually involves observing, thinking carefully and experimenting or trying out new methods know that science is a process which everyone can practice during daily activities for example when gardening, cooking, fishing or building—and be able to give examples be able to describe and discuss with others what is meant by an experiment or investigation and how the processes involved can be used to solve everyday problems understand the names of the main branches of science such as physics, chemistry, biology and geology understand and discuss with others how science has brought about some major changes such as the invention of the internal combustion engine, cures for many of the major diseases of the world, the atomic bomb and DDT.
1.1.2 Working scientifically 16 periods	understand something of the discipline of accuracy thoroughness and safety which is required for good science work be able to work safely in a laboratory and follow laboratory rules know how science sometimes (but not always) involves stating a hypothesis and then devising an experiment to test it be able to make and record observations using all of their senses and use simple instruments where appropriate.

1.1.2 continued	be able to contribute to the design and conduct a few simple experiments or investigations involving activities such as • measuring the rise and fall in temperature of water in a beaker as it is heated and then cools again • measuring the heights of students in the class • testing for O_2 or CO_2 using a lighted splint and lime water • testing acidic and alkaline solutions using litmus and pH scale understand the value of working scientifically in their homes and villages be able to discuss and record their activities using diagrams where appropriate

Unit 1.2 Observing and Classifying

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
1.2.1 Observing and classifying living material 24 periods	be able to list the seven main characteristics of living things which usually distinguish them from non-living things *(growth, movement, respiration, reproduction, and response to stimulus)* be able to describe in a simple way the structure and function of the main parts of plants *(root, stem, leaf and flower)* understand how these structures are used to classify plant groups be able to give details about the criteria used to classify animals into vertebrates and invertebrates and into the five vertebrate classes of fish amphibians, birds, mammals and reptiles be able to apply the classification criteria which they have learned in the correct context be able to describe their activities and what they observe in written prose and by using diagrams or drawings where appropriate.
1.2.2 Observing and classifying non-living material 20 periods	be able to describe the three states of matter—solid, liquid and gas, in terms of particle spacing be able to describe how some materials change between states and use the names for changes between states *(including sublimation)* know what a fuel is and that when substances such as wood, petrol, kerosene burn they produce heat know that energy comes in different forms and that it can be transferred from one form to another *(heat, light, sound, electrical, chemical, nuclear, potential and kinetic)* be able to make observations and conduct simple experiments in order to list the criteria which distinguishes metals from non metals be able to describe their activities and what they observe in written prose and by using diagrams where appropriate.

1.2.3 Observing and recording the weather 12 periods	be able to use a rain gauge and record daily rainfall for a given time be able to make a wind direction machine and record wind direction for a given time be able to contribute to a class weather diary recording daily weather patterns including rain, cloud cover, wind strength and direction and temperature in a scientific way know the seasonal variations in wind, temperature and rainfall for their area and for Solomon Islands as a whole know some of the weather features which are described on radio such as tropical depression and cyclone.

Unit 1.3 Measuring

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
1.3.1 Investigating volume 14 periods	know and use the correct symbols for length, area, volume, weight, time and temperature be able to use a range of suitable instruments to measure length, area, volume, weight, time and temperature be able to use units appropriate to the nature and magnitude of the measurement be able to make estimates of the volume of irregularly shaped objects and check their estimates know that objects of similar volume and significantly different weights have different densities be able to describe in writing, using diagrams, how they were able to calculate the volume of regular and irregularly shaped objects
1.3.2 Investigating force 10 periods	be able to describe in their own words what is meant by a force and that gravity, friction and magnets can cause forces be able to set up investigations to measure a variety of forces used everyday in their own environment be able to use a Newton meter or any spring balance to measure force know the difference between mass and weight *(mass is a constant for an object but its weight depends on its position)* know the rule for attraction and repulsion between magnetic poles *(like poles repel and unlike poles attract)* be able to describe the lines force around a bar magnet and know that the Earth itself acts in a similar manner be able to describe in writing, using diagrams, how they were able to calculate the force applied to some object.

1.3.3 Investigating speed 12 periods	be able to describe in their own words what is meant by speed be able to set up an investigation to discover the speed at which friends move in different circumstances know the conventions for calculating and describing speed such as km h^{-1} or $m\ s^{-1}$ be able to make estimates of the speed of everyday objects such as canoes and trucks and know how to check these estimates be able to describe in writing, using diagrams, how they were able to calculate the speed of particular objects.

Unit 1.4 Purifying

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
1.4 1 Solvents and solutes 12 periods	know the meanings of the words dissolve, solution, solvent, soluble, solute, suspensions and mixtures be able to conduct investigations into how different materials dissolve in solvents such as water, kerosene and petrol be able to discuss and describe which materials are soluble and which are not, in the various solvents give examples of the many different types of mixtures around us be able to use several methods to separate mixtures be able to conduct experiments to compare the difference between melting and dissolving (ice and sugar in water for example) be able to describe in their own words, in terms of particle spacing, how solvents hold solutes without apparently increasing in volume know the dangers associated with some common household solvents.
1.4.2 Keeping drinking water clean 12 periods	be able to discuss which pollutants are likely to be dissolved in their drinking water and which may be in the water but not dissolved—and the consequences know the main methods of filtration and chlorination of water supplies and which if any method is used in their area be able to investigate how materials can or cannot be separated from water using filter paper and funnel be aware of the reasons for correct sitting and use of toilets

1.4.3 Domestic waste management 10 periods	be able to increase their awareness of solid waste generated in homes and schools identify and make use of sources of information about waste in homes and schools identify some of the problems associated with waste develop an understanding of methods available for minimising problems related to waste relate individual and community responsibilities to waste problems and waste management.

Unit 1.5 Changes

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
1.5.1 Introducing change 4 periods	know that changes occur all around us in for example our way of life, customs, in medicine, religion and in living things as they grow and reproduce understand that in science much of what is studied is the processes of, or the result of, change in materials, energy or living organisms.
1.5.2 Changes in materials 24 periods	know that heating causes expansion of most substances and the advantages and disadvantages of this know that solids, liquids and gases all expand on heating and that allowances have to be made for this in constructing bridges, roads and overhead cables for example be able to write a short account of how the expansion of material caused by heat affects some local activity with which they are familiar be able to observe, note temperatures and record the changes which occur when candle wax melts and water boils and freezes be able to conduct an experiment to prove that a chemical change has occurred, although the change may not be visible, such as • using lime water to test for CO_2 • or anhydrous copper sulfate to test for water know the difference between physical and chemical change and be able to give examples.
1.5.3 Growth changes 12 periods	know the basics of how temperature, light, carbon dioxide, water and minerals affect plant growth be able to develop an understanding of the range of changes in biology from life cycles of insects to life cycles of large trees be able to describe in writing the sequence of changes in the life cycle of a plant or animal.

1.5.4 The changing moon 12 periods	be able to observe and record the changing appearance of the moon understand the cause of the phases of the moon be able to observe and record the changes in the tides be able to relate the phases of the moon to the regular changes in the tides in simple diagrammatic form know the importance of the phases of the moon to fishing and other local activity.

FORM 2 UNIT OUTLINES

The four units for Form 2 are:-	Suggested Timing
2.1 Structure	46 periods
2.2 The Changing Earth	36 periods
2.3 Living Systems	54 periods
2.4 Energy	53 periods
TOTAL	189 periods

Unit 2.1 Structure

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
2.1.1 Very small structures 20 periods	know that atoms are very small particles that can combine to form molecules be able to describe experiments with gases and coloured solutions which demonstrate diffusion know that diffusion can be used to infer the particle theory of matter know the chemical symbols for the common elements of at least—C, Cl, Cu, Fe, H, K, Mg, N, Na, O, S, Zn, Ca be able to distinguish between some common mixtures and compounds (mixtures being easy to separate and with variable proportions of the ingredients while compounds are difficult to separate and elements making up the compound are always in the same proportion) have experience of growing crystals and be able to relate their regular shape to their construction from masses of exactly the same particle be able to acquire a visual perception of the molecular structure of some molecularly simple materials through the use of appropriate models and drawings.

2.1.2 Structure and classification of living things 20 periods	be able to observe, explain and record the similarities as well as the differences between plant and animal cells know how to distinguish between monocotyledon and dicotyledon plants know the major structures of, and reasons for classification of, the major plant groups have a general understanding of the anatomy of higher plant parts such as root tips and buds, leaf structures and conducting tissue be able to relate plant structure to the use made of local plants such as building timber and bush rope be able to use diagrams and drawings to explain examples of the relationships between structure and function.
2.1.3 Structures and stability 6 periods	know the leverage principle and how it can be used to advantage be able to make simple calculations on leverage (effort times distance to the fulcrum equals load times distance to the fulcrum) be able to examine a variety of structures and explain why some structures are stable and others are not be able to report in writing, using appropriate diagrams, how items are designed to make them stable.

Unit 2.2 The Changing Earth

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
2.2.1 Changes to the earth's surface 20 periods	know about the major geological forces which are shaping the Solomon Islands • plate tectonics • mountain building • volcanism know that fossils are evidence of past changes to the earth's surface have an understanding of the scientific work being undertaken to explain and perhaps predict volcanic eruption know what precautions can be or are being taken to minimise the effects of such events in their local area.
2.2.2 Changes due to the Earth's movement 16 Periods	be able to observe and record sunrise and sunset be able to relate observations of the Sun's apparent path to night and day and seasonal changes understand that the Earth orbits the sun know some of the major stars and groups of stars and their significance historically and culturally to Solomon Islanders be able to observe and record some changes in star positions during the night

Unit 2.3 Living Systems

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
2.3.1 Small organisms and cell reproduction 12 periods	be aware that the cell is the basic unit of living things and be able to discuss and describe the basic structure and function of cells understand that cells grow and divide to produce many cells which develop into tissues and that different tissues have different types of cell recognise that organisms reproduce their own kind by asexual or sexual means and know the difference between sexual and asexual reproduction be able to explain in writing and using appropriate diagrams how some local types of single celled protozoans, fungi or algae reproduce.
2.3.2 Plant Systems 24 periods	be able to describe the main features of sexual and asexual reproduction in flowering plants using local examples—including pollination, seed production and various types of vegetative reproduction be able to identify the parts of a flower of one local plant and the function of these parts in reproduction be able to describe its seed formation and its method of dispersal know that there are a variety of methods by which plant seeds from different species are dispersed be able to describe the structure and function of a leaf in relation to photosynthesis know the elements required for the photosynthetic process and be able to describe the equation in words have an understanding of the mechanisms of respiration and be able to compare it with photosynthesis be able to recognise the transport tissue in a local plant species and understand how sugar, water and minerals are transported throughout the plant.

2.3.3 Marine systems 18 Periods	be able to describe a range of animals and plants living in the local inter tidal and shallow reef area know the relationships between the organisms in these areas and be able to construct simple food chains or webs have some understanding of how the processes of photosynthesis, respiration and movement of nutrients happens in this marine ecosystem know how some of these organisms are used by the local people and whither these organisms are increasing or decreasing in number be able to describe how one or more species of marine life is farmed or otherwise taken care of by the local people in order to ensure that it is available for future use.

Unit 2. 4 Energy

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
2.4.1 Everyone needs energy 18 periods	be able to describe what energy is and where it comes from list the many different forms of energy (eg heat, light and electrical) know the relationship between temperature, heat, light and energy know the energy requirements of their own area in terms of energy for activities such as cooking, transport, and light be able to give examples of the alternative forms of energy which might be used in their area in the future know that their own bodies use energy from food for all of their functions know the basic food types are grouped (proteins, fats, carbohydrates, vitamins and minerals), the importance of a balanced diet and the reasons for practising food hygiene be able to understand the energy requirements for their local area and provide a written report.
2.4.2 Transferring energy 18 periods	know that light travels in straight lines and that this fact can explain for example eclipses and the formation of images in plane mirrors be able to devise and conduct experiments with shadows and mirrors so that they are able to measure angles of incidence and reflection from a plane mirror using a protractor understand that heat can travel by conduction, convection and radiation and be able to give examples of the transfer of energy by these means be able to write a report or give a short talk explaining how a piece of equipment or set of apparatus—which they have used, operates to measure the transfer of energy.

2.4.3 Transformation and conservation of energy 9 periods	know that the sun is the main source of energy on earth explain the law of conservation of energy be able to give examples of how energy forms change in for example, motors, light bulbs, loudspeakers and generators be able to complete a diagram showing and explaining where the energy changes from one form to another form as a piece of equipment is operated.
2.4.4 What is sound? 8 periods	be able to describe what sound is identify the different objects that produce sound describe the characteristics of sound such as pitch, tone, duration and quality be able to describe how people hear sound identify and explain the mediums in which sound can be transmitted.

FORM 3 UNIT OUTLINES

The four units for Form 3 are:-	Suggested Timing
3.1 Resources	64 periods
3.2 Electricity and Light	42 periods
3.3 Considering our Future	36 periods
3.4 The Human Body	64 periods
TOTAL	206 periods

Unit 3.1 Resources

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
3.1.1 Origin of the elements 18 periods	understand the basic structure of the solar system and its place in the universe have a knowledge and understanding of the Earth's composition be able to name the common elements found in the Earth's crust, oceans and atmosphere—H, O, Al, Si, Mg, Ca, Na, K, Fe and C be able to relate the occurrence of the elements to their reactivity have a basic understanding and knowledge of the periodic table as it relates to these common Earth elements know the relative importance (economically and physiologically) of these elements to humans and to other living organisms.
3.1.2 Mineral resources 18 periods	understand the terms renewable and non-renewable resource as they apply to mineral resources, energy resources and biological resources be able to identify common minerals and rocks of the Solomon Islands know which minerals and rocks are present in their own area and in the Solomon Islands generally in commercial quantity know how minerals and rocks weather understand how Solomon Islands mineral deposits have formed be able to explain with the aid of diagrams how metals can be extracted from their ores.

3.1.3 Properties of metals 16 periods	know that our use of metals depends on their properties such as malleability, ductility, density, corrosion resistance and conductivity be able to say which metals are more reactive than others with oxygen, water and dilute acids—and be able to explain these reactions be able to explain corrosion such as the rusting of iron know about the law of conservation of mass and how this relates to balancing chemical equations be able to balance chemical equations—simple examples only have formed an opinion about the process and value of recycling metals.
3.1.4 Energy resources 12 periods	know that the sun's energy is produced by nuclear fusion know that the sun is the source of almost all energy on earth and be able to explain how this energy is available to all animals and plants as well as for economic use by humans know how much energy Solomon Islands currently buys from other countries, what it costs and what it is used for know about geothermal sources of energy, how these are currently used in places in the Solomon Islands and how geothermal energy might be more widely used in the future understand how much Solomon Islands depends on timber as a source of energy be able to describe some other renewable sources of energy that could be, or are being used, in the Solomon Islands.

Unit 3.2 Electricity and Light

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
3.2.1 Static electricity 6 periods	understand that atoms possess small particles called *electrons*, which are negatively charged; *protons* are positively charged and *neutrons* have a zero charge understand that static electricity is generated when electrons are transferred from one object to another through friction understand that like charges *repel* one another and unlike charges *attract* one another describe some examples of static electricity which occurs in nature.
3.2.2 Electric circuits and applications 18 periods	be able to set up circuits from diagrams using cells, bulbs and meters classify materials according to how well they conduct electricity understand the meaning of the terms series and parallel in electrical circuits using bulbs measure potential difference and current in simple circuits be able to explain, discuss and represent electric circuits using simple diagrams understand the importance of earthing mains circuits as a safety precaution against electric shock and the use of fuses and circuit breakers to prevent overloading of circuits be able to correctly wire a three pin plug be able to read and understand a domestic electric meter understand that a current in a coil produces a magnetic field and the application of this to solenoids and electric bells *(Fleming's rule not required)* explain a direct connection between electricity and magnetism compare the magnetic field around a coil with the magnetic field around a bar magnet.

3.2.3 The properties of light 18 periods	be able to explain how light energy is transferred by radiation and converted to other forms of energy be able to describe the emission and absorption characteristics of different surfaces be able to devise simple experiments to test emission or absorption characteristics of different surfaces know that light bends when it travels from one medium to another and may be split into a spectrum be able to explain the behaviour of light as it passes through media of different density *(no laws or calculations required)* know how refraction of light is used in converging and diverging lenses and give examples of how this is used.

Unit 3.3 Considering our Future

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
3.3.1 Local Environmental Concerns 21 periods	have studied one local ecosystem such as forest, garden area, village area, beach, inter tidal area or reef in their own local area and listed the reasons why this ecosystem is important to them be able to describe the interdependence of some living things in the local ecosystem they study be able to construct food chains and food webs representing the dependence of a group of organisms on one another within one ecosystem be able to conduct an investigation or experiment which will measure scientifically at least one aspect of the ecosystem they study be able to list some of the dangers, risks or damage the ecosystem is experiencing—or might experience if it is not looked after properly be able to describe scientifically the sequence of processes which might result from misuse, damage or exploitation, causing soil erosion that damage water supplies, soil fertility and reefs have a knowledge and understanding of the reasons for the reduction in numbers of turtles and other marine species on which Solomon Islanders rely know the risks associated with continued population increase in the Solomon Islands.
3.3.2 South Pacific Environmental concerns 15 periods	know that the world we live in is changing and actions taken now can affect the future of everyone know the composition of air understand the term "global warming" and describe some possible causes have an understanding of the possible effects of increased world temperatures on South Pacific island environments have a knowledge and understanding of the affects of land movement on apparent sea levels and the environment.

Unit 3.4 The Human Body

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
3.4.1 Reproduction and growth in humans 18 periods	have an understanding of the main features of human reproduction including the male and female reproductive systems, the menstrual cycle and fertilisation be able to describe the role of the placenta and the umbilical cord in the nutrition and respiration of the foetus be able to identify the main events accompanying birth have an understanding of the main aspects of after birth care including nutrition for both mother and baby discuss with others and list what would be included in a good diet for a young child using only locally available food develop an understanding of the need for and methods of family planning.
3.4.2 Nutrition, life style and diseases 20 periods	be able to describe the structure and function of the main parts of the human digestive system be able to classify the basic types of food needed for body growth and development including the basic vitamins and minerals essential for good health and some food sources from which they can be obtained know the tests used to identify starch, sugar, fat and protein be able to explain the importance of enzymes in the digestive process such as the action of salivary amylase on starch be able to list the risks to health and the kinds of common diseases which can spread in unhygienic conditions know the best locations for toilet areas and other conditions which must exist in a village situation to keep everyone healthy know the life cycle of the parasites responsible for malaria and the basic precautions to take against the disease know the risks to health and the kinds of diseases which are now more common in the Solomon Islands due to, poor diet; lack of exercise; misuse of alcohol, tobacco and betel nut; and for other life style reasons.

3.4.3 Blood transport 10 periods	be able to list the components of the blood and their major functions know how the heart, veins and arteries are constructed and operate understand the major causes of circulatory diseases.
3.4.4 Movement and co-ordination 16 periods	understand that movement is a necessary activity for the survival of many species be able to describe the role of antagonistic muscles and their inter-action with the skeleton to produce voluntary movement understand the main features of the human eye and describe its functions know the main structure and function of the parts of the ear be able to identify the location product and function of the main endocrine glands—thyroid, adrenals, gonads and pancreas.

FORM 4 UNIT OUTLINES

The Six units for Form 4 are:-	**Suggested Timing**
4.1. Atomic Structure and Chemical Reactions	42 periods
4.2. Materials	54 periods
4.3 Motion, Force, Work and Power	42 periods
4.4. More About Energy	56 periods
4.5 Genetics and Evolution	28 periods
4.6 Disease and Defence	20 periods
TOTAL	242 periods

UNIT 4.1 Atomic Structure and Chemical Reactions

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
4.1.1 Atomic structure and the periodic table 16 periods	know the components of the atom—proton, electrons and neutron with their charge, size and properties know the structure of the atom, the meaning of the terms; atomic mass, atomic number and be able to perform simple calculations using these and the numbers of protons, electrons and neutrons in the atom know the arrangement of the periodic table be able to explain what is meant by periods and groups and determine the position in the table from the electronic structure of the first 20 elements given their atomic numbers be able to identify metals and non-metals from their position in the periodic table be able to identify the 'groups' of elements; halogens, alkali and alkaline earth metals and noble gases be able to investigate and report on the properties of some of the first 20 elements.

4.1.2 Bonding, ions and chemical reactions 16 periods.	understand the concept of a chemical bond know that ions are formed when atoms or groups of atoms gain or lose electrons and that for atoms, the number of electrons involved depends on position in the Periodic Table. know that ionic compounds are formed by the transfer of electrons and covalent compounds by sharing electrons and the differences in physical properties of the two types of compound conduct simple experiments to investigate the ionic and covalent nature of some substances conduct simple experiments to study the reactions between; acids and metals, acids and alkalis and acids and carbonates. understand the factors that affect the rate of chemical reactions
4.1.3 Chemical names, formulas, and equations 10 periods.	be able to name the common chemical compounds from their formulas be able to write the chemical formulas of common ionic and molecular compounds by using their ions and valency electrons describe what a chemical equation represent determine the number of atoms in a compound on each side of the equation be able to write both the word and chemical equations of reactions and to balance chemical equations.

UNIT 4.2 Materials

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
4.2.1 Acids, bases and salts 14 periods	be able to describe the properties of acidic, alkaline and neutral solutions be able to tell the differences between an acid and an alkaline solution in terms of their chemical properties be able to test the strength of acidic and alkaline solutions using indicators (*eg. litmus paper, phenolphthalein and pH scale*) understand the safety precautions when handling acidic and alkaline solutions be able to make an acidic or alkaline solution by using the relationship: *amount = volume x concentration* be able to make dilute solutions from concentrated solutions using the relationship, $V_i \times M_i = V_f \times M_f$ (where $V_i \times M_i$ stand for the initial volume and molarity and $V_f \times M_f$ stand for the final volume and molarity) conduct experiments which involve neutralisation reactions know the properties and uses of common salts (eg sodium chloride, copper sulfate, magnesium sulfate, sodium carbonate and sodium bicarbonate and silver nitrate) be able to make salts by mixing soluble salts using precipitation reaction.
4.2.2 Metal production and use 8 periods	be able to describe the steps necessary for the production of at least one metal from its ore have some knowledge of the risks to the environment caused by mining and the precautions taken to protect the environment be able to give examples of what kind of metals are used locally and the metallic properties which make them useful for these purposes be able to demonstrate a knowledge of resource conservation in terms of recycling of metals.

4.2.3 Metals and alloys 20 periods	be able to describe briefly the uses of metals and alloys through history including in the Solomon Islands be able to explain why different metals or alloys are used for different purposes be able to explain in chemical terms what gives metals their typical characteristics be able to use a single bulb circuit to determine metallic/non-metallic properties be able to perform displacement reactions and predict results in terms of the activity series know that duralumin, mild steel, stainless steel, brass and bronze are alloys know that alloying affects the; hardness, strength, appearance and resistance to corrosion of metals be able to describe items used locally which contain alloys and the useful property required of the particular alloys be able to explain in atomic terms why metals and non-metals react differently.
4.2.4 Important non-metals 12 periods	For the elements nitrogen, sulfur, oxygen, phosphorus and chlorine:- • know their physical and chemical properties • know some common natural compounds containing these elements • be able to describe some important synthesised chemicals containing these elements • be able to investigate the properties of some their common compounds • know the form in which some of these elements *(eg. N, P, S and O)* are taken up by plants.

Unit 4.2 Motion, Force, Work And Power

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
4.2.1 Force 8 periods	recognise examples and describe types of forces occurring in nature and in the school laboratory know the existence of friction as a force opposing relative motion between surfaces and be able to explain the advantages and disadvanteges of types of friction be able to explain in their own words what gravity is and how it affects us be able to distinguish between the terms mass and weight and give examples which demonstrate the difference in meaning be able to measure forces using a Newton/spring balance be able to use a beam balance to measure mass know the relationship between force, mass and acceleration and use the equation $F = ma$ to solve problems.
4.2.2 Distance, speed and acceleration 8 periods	be able to recognise distance-time graphs and plot graphs for some journeys understand speed and plot speed time graphs of journeys. understand the difference between speed and acceleration enough to discuss it.
4.2.3 Work 10 periods	be able to distinguish between the scientific term 'work' and the every day use of the term be able to solve simple problems using the scientific term 'work' and use the correct units with these problems know how to use levers, pulleys and inclined planes to reduce the effort required to achieve a task but that such machines do not reduce the total energy expended be able to write a report on how one or more of these simple machines are used in the local area.

4.2.4 Energy and power 16 periods	be able to distinguish between potential and kinetic energies and calculate the P.E. and K.E. of bodies at rest and in motion be able to investigate and measure the P.E. and K.E. required for local activities such as pulling a canoe up the beach be able to explain the P.E. and K.E. changes occurring in hydroelectric power production be able to distinguish between the term 'power' in general use and the power as the rate of doing work *(1 watt = 1 joule per second)* know that power expended is equal to work done divided by time taken be able to report on how they calculated the power required to perform particular activities in the local area.

UNIT 4.3 More About Energy

TOPIC	STUDENT OBJECTIVES By the end of the unit students should
4.3.1 Energy forms and energy conversions 12 periods	be able to describe transformations between different forms of energy—atomic, chemical, electrical, heat, kinetic, light, potential and sound understand how energy is transferred by waves through different mediums and through the electromagnetic spectrum understand that chemical reactions involve energy change know examples of common exothermic and endothermic reactions be able to measure temperature changes in simple local exothermic and endothermic reactions understand that energy cannot be created or destroyed, only changed into other forms.
4.3.2 Energy transfer and specific and latent heat 10 periods	understand how heat is transferred by conduction, convection and radiation and the theory of what happens at the molecular level be able to describe some local practical uses of heat transfer and insulation and explain how they work know that specific heat capacity is why different substances reach different temperatures with the same amount of added heat and be able to give local examples appreciate why water is so useful for cooking and transferring heat be able to report on an experiment or investigation which demonstrates that when a change of state occurs latent heat is taken in or given out.

4.3.3 Electronics 16 periods	know the main events in the history of electronics and its development have an understanding of the role of electronics in everyday life through local examples and devices *(telephone, radio cassette, two way radio and satellite communication)* be able to describe using diagrams the function of the main components of electronic systems *(diodes and transistors for example)* have some knowledge and understanding of simple electronics investigate and report on some simple electronic circuit.
4.3.4 Electrical energy 18 periods	be able to assemble, take measurements and understand simple electric circuits in series and parallel understand voltage, current and resistance and be able to do simple calculations involving $V = IR$ be able to do calculations involving Power = VI and Energy = VIt understand how kinetic energy is transformed into electrical energy know how dry cells are constructed and that it converts chemical to electrical energy know how a lead/acid battery is used and how to care for it understand the relationship between magnetism and electricity and its application (eg the dc motor effect) have an understanding of electricity generation and the energy transformations involved write a report on the electricity generation system in a particular village *(the size of the system, cost , and reliability).*

UNIT 4.4 Genetics and Evolution

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
4.4.1 Genetics 16 periods	be able to describe chromosome and gene structure be able to describe how sex is determined in humans based on their knowledge of the sex chromosomes understand the basic methods and function of mitosis in cell division, replication and tissue formation understand the basic methods and function of meiosis in the production of gem cells and the transmission of characteristics (traits) including dominant and recessive traits to offspring be able to appreciate the significance of meiosis with regard to genetic variation in the offspring *(enough to know that genes from parents diploid cells regroup and reform to produce a unique recombination of genes in the haploid cells—details of the cross-over mechanism is not required)* be able to compare and discuss meiosis and mitosis in terms of their functions be aware of the application of genetics in agriculture, animal husbandry and medicine *(include some of the recent technologies of gene manipulation).*

4.4.2 Evolutionary changes 12 periods .	know that in some species unique individuals can now be created through gene manipulation have a knowledge and understanding of the Darwinian theory of evolution • know that fossils are evidence for changes in flora and fauna—over very long periods of time • understand that rearrangement or changed genetic structure is the mechanism which results in the creation of unique individuals and over considerable time changes in populations and species • understand that evolution of new species of plants and animals as well as extinction of species are natural processes • understand that environmental change can be the cause of evolution of new species just as it can also be the cause of the extinction of species know that changes to the environment caused by people have lead to many extinctions of species in recent years have a knowledge and understanding of the recent changes in resistance to drugs of some malaria parasites.

Unit 4.5 Disease and Defence

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
4.5.1 Bacteria and viruses 12 periods	be able to classify bacteria in terms of their shape be able to identify the requirements that bacteria and viruses need to grow describe the a technique used to culture bacteria describe, the production of bacteria by the process called binary fission describe the general structure and characteristics of viruses and describe typical viruses life cycles know the differences between viral and bacterial infections understand the ability of viruses to evolve new strains relatively quickly.
4.5.2 Defence mechanisms 8 periods	be able to explain the human body's defensive system (immune system) and antibodies be able to explain the importance of immunisation as a means to defend against bacterial infections understand the importance of antibiotic drugs to treat diseases be able to understand the importance of having safety precautions when using drugs in the treatment of diseases.

FORM 5 UNIT OUTLINES

The five units for Form 5 are:-	Suggested Timing
5.1 Using Chemistry	38 periods
5.2 Density and Pressure	24 periods
5.3 Transferring Light and Sound Energy	36 periods
5.4 Energy and Control in Living Organism	48 periods
5.5 Local Ecological Study	40 periods
TOTAL	186 periods

Unit 5.1 Using Chemistry

TOPIC	STUDENT OBJECTIVES By the end of the unit students should
5.1.1 Properties of the Group IV elements 10 periods	know carbon and silicon's position in the periodic table and therefore the basic bonding of these elements and their compounds know the structure of the allotropes of carbon—graphite and diamond and be able to explain the hardness of diamond and the lubricant properties of graphite in terms of structure know that carbon can burn to form carbon monoxide or carbon dioxide under different conditions know the properties, uses and hazards of carbon dioxide and carbon monoxide know the properties and uses of carbon *(as a lubricant, ingredient in explosive, diamonds and their uses, coke in steel manufacture, as a reducing agent)* know the properties and uses of silicon *(as adhesives, fillers, in concrete, human implants, electronic chips)* be able to list the materials and chemical processes involved in the manufacture of cement, concrete and glass.
5.1.2 Origins of carbon and its compounds 2 periods	know the historical use of carbon by humans be able to describe the process of formation and the occurrence of fossil fuels know the methods used to produce useful products from fossil fuels *(LPG, petrol, tar, coal, coke and avgas).*

5.1.3 Organic compounds 14 periods	know the importance of hydrocarbons to all living organisms be able to name straight-chain alkanes of up to 5 carbon atoms. be able to define alkanes alkenes and alkynes and calculate the numbers of carbon and hydrogen atoms in each compound be able to use simple tests to distinguish some well known organic compounds (eg alkanes) be able to prepare alcohol by fermentation and investigate its properties be able to describe in writing and by using diagrams the chemical breakdown of alcohol and its effect on the nervous system as it is metabolised in the body be able to test for the breakdown products of alcohol
5.1.4 Carbon compounds in the atmosphere 10 Periods	know the main sources of methane and carbon dioxide and their effects on the properties of the atmosphere know the effects of CFCs on the ozone layer know the properties of fuel alternatives for example CNG, LPG, ethanol and methanol including their benefits understand and be able to explain how at least one type of plastic is manufactured and the products which are formed when it burns. be able to explain the advantages and disadvantages of manufactured chemicals such as plastics and pesticides be able to give a talk or write a detailed report on the effect of one carbon compound on the environment.

Unit 5.2 Density And Pressure

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
5.2.1 Density 6 periods	be able to compare densities of regular-shaped objects, irregular shaped objects, liquids and gases understand Archimedes Principle and its application to floating and sinking be able to make a simple hydrometer and describe its use understand buoyancy and applications of this principle in everyday life *(canoes, boats, buoyancy devices in scuba diving)* be able to write a report including appropriate diagrams describing how and why a canoe (made of wood or metal) floats.
5.2.2 Pressure 18 periods	be able to measure pressure in liquids and gases using simple apparatus *(tyre gauge for example)* understand Pascal's Principle understand the relationship between pipe size, pressure and be able to calculate flow rate be able to devise and conduct experiments to find the differences in pressure due to forces acting on different areas know the existence of atmospheric pressure, understand why it decreases with altitude and how it can be measured with a mercury barometer be able to provide a written explanation including diagrams where appropriate about how the fluid behaves in one piece of hydraulic machinery be able to use the formula pressure equals force divided by area $P = F/A$ to solve pressure problems be able to use $P = \rho hg$ to evaluate pressure of liquids be able to observe and explain the pressure changes caused by depth and density in liquids and the hazards associated with diving

5.2.2 continued	know the factors which cause pressure changes in gases understand a molecular/kinetic explanation for the existence of gas pressure and for the changes in pressure produced by changes in volume and temperature.

Unit 5.3 Transferring Light And Sound Energy

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
5.3.1 Energy transfer 12 periods	understand how a wave transfers energy and how particles move in both longitudinal and transverse waves know and understand the terms wavelength, amplitude, velocity and frequency be able to perform calculations involving $v = f\lambda$ know that heat, light, UV, radio waves and x-rays are all parts of the electro-magnetic spectrum differing in wave length and frequency understand the application of energy transfer in modern communication equipment *(satellite TV, microwave transmitters, radio, remote sensing of changes to the environment using satellites)* be able to write an account about one application of the use of energy from the electromagnetic spectrum *(microwave oven, x-rays in hospitals, UV-rays in sterilisation, IR-rays in photography and applications as above).*
5.3.2 Sound energy 10 periods	know that sound energy is produced by vibrations and needs a medium for its transmission by longitudinal waves understand that sound travels through different media at different speeds understand that a higher pitch is produced by raising the frequency and that loudness depends on the amplitude be able to describe with the aid of diagrams one technology which uses the transmission of sound *(telephone, microphone, ultrasound in the hospital or sonar in fishing boats)* be able to devise, describe and report on a method of determining the speed of sound in air using echoes.

5.3.3 Light energy 14 periods	understand that light is a form of energy by observation of its conversion into other forms know that light travels very fast, in straight lines, without the need for a material medium understand the law of reflection of light and the formation and properties of images in plane mirrors know that refraction takes place when light passes through a boundary between two media at an angle to that boundary and know that the angle of refraction towards or away from the normal depends on density of the medium understand how refraction leads to an apparent reduction in depth of water when light is reflected from an object in the water be able to observe the formation of images by converging and diverging lenses and understand the difference between real and virtual images in terms of whether they can be formed on a screen know that the focus of a converging lens is the point at which rays parallel to the axis converge on emerging from the lens understand why the image of a distant object is formed approximately at the focus of a converging lens and hence be able to determine the approximate focal length of a converging lens be able to observe and know the changes that take place in the image formed by a converging lens as the object is brought progressively closer to the lens understand about how lenses can correct long and short sight

Unit 5.4 Energy And Control In Organisms

TOPIC	STUDENT OBJECTIVES **By the end of the unit students should**
5.4.1 Energy supply for living organisms 16 periods	know that green plants fix the sun's energy by photosynthesis and know the conditions necessary for photosynthesis *(chlorophyll, wavelength within a specific range from the electromagnetic spectrum—called light, carbon dioxide, water and a suitable temperature)* be able to describe basic experiments which support what is known about the process of photosynthesis *(use no light, different coloured lights and different temperatures)* be able to write the chemical equation which describes photosynthesis describe the growth of seaweed or other algae at increasing depths in the sea know that energy is passed on (with losses) through the food chain be able to write down simple food chains in marine and terrestrial habitats be able to identify the main modes of heterotrophic nutrition *(all animals, some plant parasites, fungi and bacteria).*
5.4.2 The use of energy by living organisms 16 periods	know that we obtain energy from the food we eat and be able to use tables to calculate their daily intake of energy be able to describe an experiment which measures the amount of energy in a food sample be able to describe an experiment they devised and carried out to measure the energy requirements of a particular animal or plant be able to write the chemical equation which describes aerobic respiration and compare it with the photosynthesis equation be able to describe the respiratory system in mammals understand the role of haemoglobin in oxygen transport and the function of plasma in CO_2 transport recognise that many plants and animals respire in the absence of oxygen.

5.4.2 continued	be able to describe anaerobic respiration and give examples of organisms which use this method of respiration be able to write the chemical equation which describes anaerobic respiration.
5.4.3 Homeostasis and excretion 16 periods	know the principle of homeostatic control and understand the term be able to describe why it is necessary for the body to use these mechanisms know the main features of homeostatic control as it applies to body temperature and blood sugar level be able to explain excretion as an important aspect of homeostasis be able to identify specific products of excretion including; carbon dioxide, urea and salt and relate these products to the parts of the body involved in their excretion be able to describe an experiment they devised and carried out to test a homeostatic mechanism in a plant or animal.

Unit 5.5 Local Ecological Study

TOPIC	STUDENT OBJECTIVES By the end of the unit students should
5.5.1 Population growth 6 periods	know at least one method of estimating the population of a species within a given area be able to estimate the population of one species in a local area know which populations are under threat in their local area be able to compare and discuss the present rate of increase in the world population to the rate of population increase in the Solomon Islands—and decide what this means for the Solomon Islands.
5.5.2 Natural cycles in the environment 4 periods	be able to interpret and describe the carbon, nitrogen, other nutrient and the water cycle in the environment be able to develop and describe these cycles with reference to the animals, plants and abiotic factors in their local environment.
5.5.3 Ecology 18 periods	have conducted a simple ecological study with the objectives of: • observing a variety of organisms in their natural habitats • distinguishing (classifying) some of the major groups of organisms present in the chosen habitat • recognising the role of some of the more important organisms present • observing the adaptive features of the organism which fit it for its particular role • understanding and describing the interdependence of the organisms present • recognising the importance of some of the physical and chemical features of the habitat in the lives of the organisms • measuring of the more important physical features of the environment *(temperature, light intensity or water velocity as appropriate)* be able to present a report of their findings written in formal scientific style.

5.5.4 Environmental Impact Study 12 periods (and a lot of their own time)	be able to scientifically evaluate the effect of one aspect of local work or business such as gardening, fishing, fish farming, firewood business, plantation, forestry or a tourism business on the natural environment through • a study of the range of the activities employed by people in the work or in the business • scientifically measuring the parameters of one activity which they believe has an effect on the environment (*for example how many trees are cut each week, over what area, how many fish are taken from the lagoon, how much waste runs into the river in a week etc.*) • scientifically measuring associated aspects of the environment affected by this activity (*for example what is the natural density of the trees and the range of species, what was the history of fish stocks in the lagoon in times past, what plants and animals live in the river in a place away from where the waste enters the river etc.*) • calculating the effects of the activity on the natural environment and making scientific estimates of the effect over a period of years (*for example. the effects of tree cutting, fishing or letting waste run into the river.*) be able to write an environmental impact report containing their recommendations concerning the future of the particular activity.