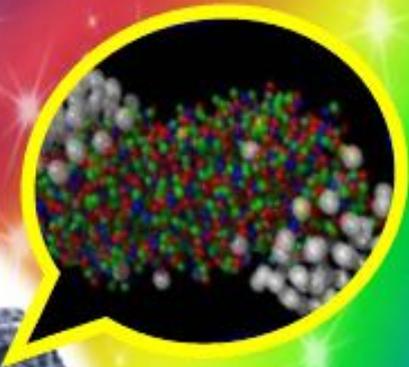
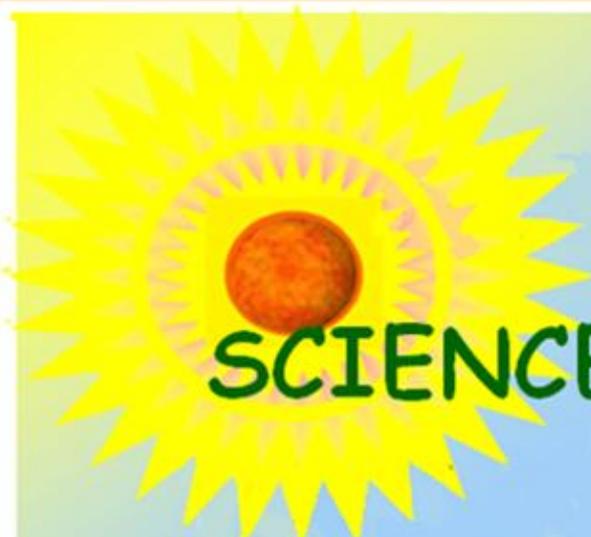


SCIENCE SYLLABUS

CLASS 7 - CLASS 8



PULU SI HONO UA

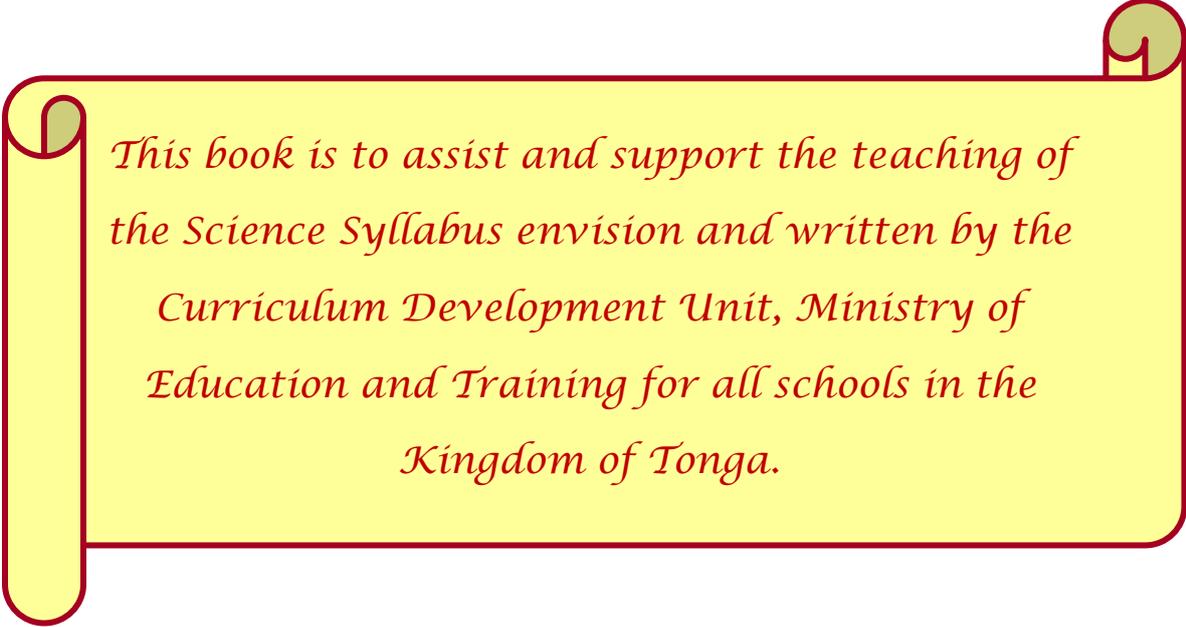


SCIENCE SYLLABUS

CLASS 7 - CLASS 8



TONGAN SCHOOLS



This book is to assist and support the teaching of the Science Syllabus envision and written by the Curriculum Development Unit, Ministry of Education and Training for all schools in the Kingdom of Tonga.

©MET

Second edition October 2012

Funded by the Government of Australia and New Zealand.
Published by the Curriculum Development Unit,
Nuku'alofa, Kingdom of Tonga.

Foreword



‘EMELI POUVALU
Chief Executive Officer for Education and Training

It is with great pleasure that I launch the Second Editions of the Syllabus for Classes 7 to 8 for all Middle and Secondary Schools throughout Tonga, as of 2013 for the next five years.

This is a result of the successful Trial in 2009 to 2011 in selected Middle and Secondary Schools and full implementation in 2012 in most of the Middle and High schools in Tonga.

I wish to remind each student that there are Basic Education **Objectives** and **Activities** being taught in the syllabus from Class 1 to Class 8 to help make learning easy, meaningful and enjoyable. And these are in line with the **Decade of Education for Sustainable Development (DESD) 2005-2014** of the United Nations.

There are **14 Aims** of the **Basic Education curriculum for Class 1 to 8**, and examples are given below to illustrate that **the teacher and his or her student must work together as a team** to:-

- develop a sound level of literacy in Tongan;
- develop a basic level of literacy in English;
- develop a sound foundation of effective reasoning and thinking skills;
- develop the basic knowledge skills and attitudes needed for good health;
- develop basic literacy in the physical and social sciences, the arts and mathematics in ways that are relevant to daily life, and which equip them for successful entry to secondary school;
- regard school as a place to enjoy learning and begin to regard learning as a lifelong process;
- exhibit positive attitudes to the link between effort and achievement; and
- understand and appreciate Tongan identity and knowledgeable about Tongan culture, values and history.

The Ministry of Education and Training is indebted to the Government of Australia (Aus AID) and the Government of New Zealand (New Zealand Aid Programme) for their ongoing funding of the Curriculum Review for Class 1 to 8 since its inception from 2007.

I wish every student success with the quality education resources being launched. And may God's Blessings be on the future pathways of the students of Tonga.

‘EMELI POUVALU
 Chief Executive Officer for Education and Training.

DATE: 14th December, 2012
 Ministry of Education and Training,
 Nuku'alofa,
TONGA

ACKNOWLEDGMENTS

Praise be to God for His great Mercy and Guidance to assist us in our efforts to complete these resources.

We wish to convey our most sincere thanks to the Honourable Minister of Education Women's Affairs and Culture, Dr 'Ana Maui Taufe'ulungaki, the Director of Education, Mrs 'Emeli Moala Pouvalu, for all advices, wisdom and support in the writing of these materials.

The support, guidance and patience of the Deputy Director of the Curriculum Development Unit, Mr, Claude Tupou, the Principal Education Officer, Mrs Teresa Pahulu and Mrs Seilose Uta Fifita, the Deputy Principal Education Officer, Mr. Vilai 'Ilolahia are duly acknowledged.

Particular mention must be made of field officers, teachers and lecturers; your numerous and tireless efforts and assistance in writing these resources are hereby acknowledged. Everyone of us has benefitted from your advices and wisdom.

, THE SUPPORTING SCIENCE TEAM:

Mrs. Sela Teisina	(Principal, Vava'u High School)
Mrs. Lola Tokotaha	(Senior Lecturer, Tonga Institute Of Education)
Ms. Manutala'aho Tupou	(School Inspector, Free Wesleyan Church)
Mrs. Siutiti Māhina	(Deputy Principal) , Haveluloto LDS Middle School
Mrs. Henga Fa'ase'e	(Science Teacher, Maamaloa Side School)
Mrs. Mumui La'akulu	(Senior Assistance teacher, Tonga Side School)
Mrs. Sīpola Halafihi	(Assistant Teacher, Tonga High School)
Mrs. 'Oto'ota-He-Kakala Fifita	(Principal, GPS Fanga-'o-Pilolevu)
Mr. Sione Hafoka	(Deputy Principal, GPS Nuku'alofa)
Mrs. Fusi Liava'a	(Senior Assistance Teacher, GPS Kolovai)
Ms. Tēpola Fangaloka	(Senior Assistant Teacher, GPS Nuku'alofa)
Mrs. Quenda Langi	(Senior Assistance Teacher, Tonga Side School)
Mrs. 'Ilaisaane Tongotea	(Senior Assistant Teacher GPS Haveluloto)
Ms. 'Ilaisaane Teisi	(SAT, Vaini Government Middle School)
Ms. 'Olivia Kātoa	(Education Officer, MEWAC)
Ms. Lētī Tangi	(Senior Assistant Teacher, GPS Nuku'alofa)
Mr. Saimone Similai	(Principal , GPS Popua)
Mr. Sione Kāinga	(Principal GPS Ngele'ia)
Mr. Tulikava Sete	(Principal, GPS Nuku'alofa)

All trial schools are hereby acknowledged for trialing and evaluating these materials.

GPS Neiafu, Vava'u

GPS Faleloa, Ha'apai

FWPS Pangai, Ha'apai

GPS Ha'atu'a, 'Eua

GPS Fanga-'o- Pilolevu

GPS Popua, Tongatapu

GPS Tu'aliku, Tongatapu

GPS Fatai, Tongatapu

GPS Kolovai, Tongatapu

GPS Haveluloto, Tongatapu

GPS Puke, Tongatapu

These resources would not be possible without the endurance, courage and tireless efforts of the Science Team.

SCIENCE TEAM:

Rev. Dr. Tu'ipulotu Lofitu Katoanga (Science Consultant, CDU)

Mrs. Mele Talahiva Fine (Professional Development Consultant, CDU)

Mrs. Losena Suka Manu (Senior Education Officer, CDU)

Mrs. Seini Palatita Manu (Education Officer, CDU)

Ms. 'Ema Lile Lātū (Education Officer, CDU)

Desktop Publisher and Graphics Assistants:

Ms. Sela Teukisiafo'ou Fifita

Ms. 'Alilia Lakai Tupou Fine

A special acknowledgement is given to the Governments of New Zealand and Australia for providing the financial assistance to enable the completion of this important task.

This acknowledgement wishes to go out to all who have assisted in planning, writing and the production of these materials. Without your assistance it would not have been possible to complete the tasks. We apologize for failing to mention each one by name and hope that this will not deter you from working hard and well.

We hope that these resources will be useful and support all in teaching Science to a standard envisioned by the Kingdom of Tonga.

To everyone who will use these resources, we wish you well and hope you will enjoy using them.

TABLE OF CONTENTS

	Pages
INTRODUCTION	1-3
▪ Aims for basic education (year 1 to year 8)	
▪ Guiding principles	
▪ Inclusive education	
RATIONALE FOR SCIENCE	4-7
▪ Time allocation	
▪ Rationale for teaching and learning approach	
▪ Essential skills	
▪ Links with other subjects	
▪ The role of language	
ASSESSMENT FOR SCIENCE	8-9
▪ Teaching, learning and assessment cycle	
OVERVIEW OF SYLLABUS	10-39
▪ Overview of learning outcomes	
▪ Core content and triples	
▪ Knows and Dos statement of strands	

1. INTRODUCTION

a) AIMS FOR BASIC EDUCATION (Year 1 to Year 8)

The aims of the basic education curriculum are to enable students to:

- develop a sound level of literacy in Tongan
- develop a basic level of literacy in English
- develop a sound foundation of effective reasoning and thinking skills
- develop the basic knowledge, skills and attitudes needed for good health
- develop a strong sense of identity, ability and self-worth as a sound basis for personal development and success at school
- develop the basic knowledge, skills and attitudes they need for effective physical, social and spiritual development, and community involvement
- develop basic literacy in the physical and social sciences, the arts and mathematics in ways that are relevant to daily life, and which equip them for successful entry to secondary school
- develop key attributes needed for achievement, such as the ability to pay attention, follow instructions, cope with change, uncertainty and competition, take risks, ask and respond to questions, work cooperatively with others, compromise, consider the needs of others, see another person's point of view, express needs, respect rules and boundaries.
- be exposed to a wide range of learning areas so that they can make decisions about areas of future specialization in line with their aspirations, talents and interests
- acquire basic life skills that they can use in their daily lives wherever they live
- develop confidence, self-esteem and respect for others
- regard school as a place to enjoy learning, and begin to regard learning as a lifelong process
- exhibit positive attitudes to the link between effort and achievement, understand and appreciate Tongan identity and knowledgeable about Tongan culture, values and history
- understand and appreciate Tongan identity and knowledgeable about Tongan culture, values and history

b) GUIDING PRINCIPLES

Ten educational principles give direction to the curriculum in Tongan schools. They are based on the understanding that the individual learner is at the centre of all teaching and learning, and that the curriculum for all learners, and classroom teaching and learning will be of the highest quality. (Curriculum Framework for Tonga 2004-2019)

- i. **High expectations for all students.** Clearly defined outcomes are set with the expectation that all students can achieve these with appropriate time allocations and support. The syllabus takes a spiral approach to learning with enough time for practice as it visits and revisits skills at different times throughout the years.
- ii. **A high level of teacher professionalism and highly effective teaching.** The Science syllabus provides teachers with clear guidelines on what to teach and how to teach Science but teachers are expected to exhibit their professionalism through the use of effective assessment practices and adjustment of teaching programs to respond to the results of assessment and the needs of the students.
- iii. **School programs that are planned and flexible.** Teachers are encouraged to work within guidelines in order to plan a program that is consistent across and within schools. However, programs need to be flexible to respond to the needs of students and the context of learning.
- iv. **A bilingual approach to curriculum delivery.** This curriculum promotes the use of Tongan and English for construction of knowledge, skills, values and culture, and for creating and fostering understanding of self, others and of the world. It provides students with the opportunity to be proficient and confident in communicating in Tongan and English in a range of contexts.
- v. **Recognition of the uniqueness of Tonga, its people and its culture.** The approach to teaching in Science reflects the preferred learning style of young Tongans and offers students the opportunity to develop themselves and their understanding of their own culture through Science.
- vi. **Development of the whole person.** The Science syllabus is focused on the students' immediate and future needs as citizens enabling them to function fully within the school and to reach their potential in later life.
- vii. **Learning that is relevant, meaningful and useful** In the Science syllabus all learning will be related to real life contexts. Science skills and knowledge

will be learnt within the subject of science but could be applied within other subject areas.

- viii. **An integrated approach to learning.** All learning in Science will be based upon present and future needs for scientific literacy and the emphasis will be on meaningful and relevant application of skills. To achieve this the sub strands of Science will be taught in an integrated manner in order to achieve the outcomes. Integration across subjects can occur where there is a clear connection but should not be artificially applied.
- ix. **Learning that relates to the wider world.** Proficiency in Science enables students to participate in the wider world through informed decision making about important issues particularly in relation to health and the environment.
- x. **Expectation of equal educational opportunities**
All students will learn Tongan and English. Teachers adjust programs to ensure all students are supported and challenged in their learning. Inclusive practices will form a normal part of class planning.

c) INCLUSIVE EDUCATION

Gender

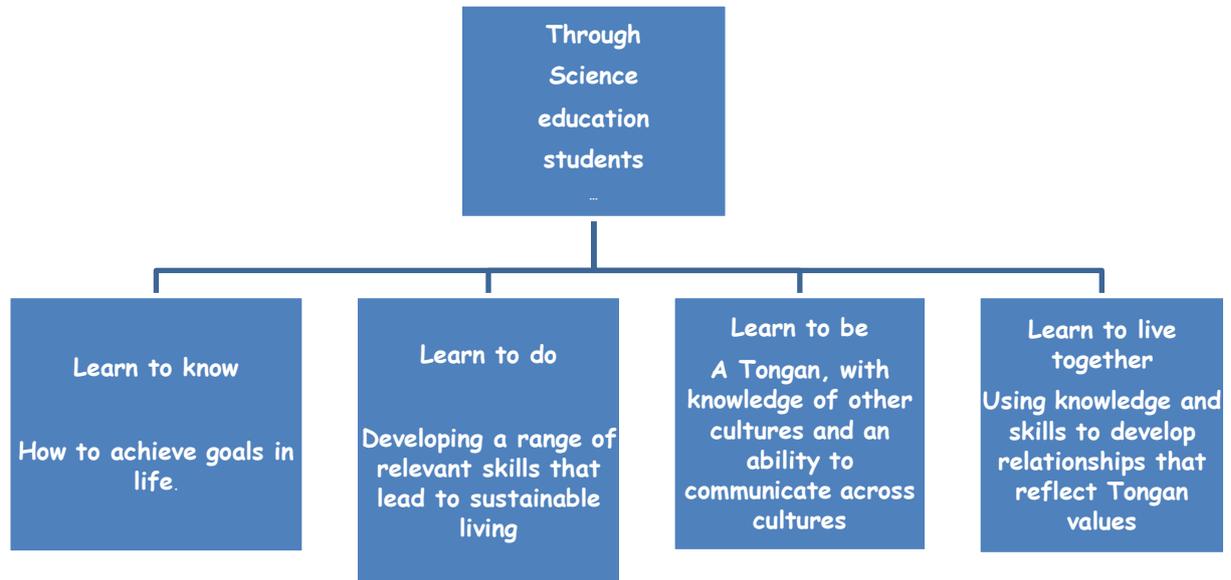
To be inclusive, teachers need to ensure that all students have the opportunity to participate in learning. Teaching practices, including classroom organisation and management, should ensure that students, are able and encouraged to participate fully in all learning activities.

Special needs; gifted students and those with disabilities

Quality education is a right of all children including those with special needs or who are at risk because of social or economic circumstances.

2) RATIONALE FOR SCIENCE

Through studies in Science students learn how to live and they learn about life.



Science education in Tonga is underpinned by strong cultural influences from the past and the present day. The Tongan Islands lie in a unique geographical and geological setting including some of the richest and most diverse environments. These cultural influences and natural environments should form the basis of an integrated and relevant course for the students of Tonga while, at the same time, providing students with a science foundation of international standard. It is intended that this curriculum and the accompanying resources will provide Tongan students with a science course that will meet the national goals and reinforce traditional ways of life.

Science continues to transform our world and many aspects of life are affected by it. Science is a way of generating and organizing knowledge and, as such, is instrumental in shaping and changing the cultural and intellectual development of our society. Science is also responsible for providing employment that preserves our way of life and for the management of our environment.

Science is not merely a collection of facts and theories associated with processes and skills, but consist of a changing body of knowledge shaped by imaginative and creative human endeavor. A study of what scientists have done, can promote students' personal development and their understanding of the actions of others.

Science has a continuing and increasing social impact. Future citizens need to understand this in order to be equipped to cope with present and future change. Those who intend to pursue science as a career need to be aware of its nature and effects. In cultures where technology is relatively new and limited in availability, an understanding of the interactions of science and society is extremely important because change can be rapid.

Time allocation

The **minimum** time allocation for Science is as follows.

Class	Time per week
Early Childhood	
Class 1-2	120
Class 3	120
Class 4	120
Class 5	120
Class 6	120
Form 1	240
Form 2	240

Rationale for teaching and learning approach

The Science syllabus is focused on the achievement of learning outcomes. This shifts the focus from the topics teachers teach (content) and for how much time, to a focus on the skills and knowledge students demonstrate. In line with this shift the approach to classroom teaching and learning will be learner-centered.

A learner-centered classroom environment motivates learners to discover new knowledge and skills and recognizes that learners learn in different ways and at different rates. The Science curriculum encourages teachers to use different ways of teaching to give every learner a chance to learn and to demonstrate their achievement.

Learners should be encouraged to think critically about what they are learning and to take responsibility for their own learning. They should know that learning has a serious purpose, but they should enjoy learning. They should learn how to work things out for themselves and how to find the information they need.

Tongan students learn best by observing, listening, practicing and then performing

Learning (Ako)	Listen (Fanongo)	Observation (Sio)	Practice (Ala)	Perform (Ta)
Teaching (Faiako)	Demonstration (Fakatātā)	Practice with students (Kaungā Ala)	Set meaningful activities	Monitor and evaluate (Fakatonu- tonu)

Essential skills

Each subject has a set of essential skills that fit within the curriculum framework.

In Science students will have opportunities to develop skills including;

- observing;
- planning;
- following instructions;
- recording and communicating;
- predicting;
- analyzing and evaluating data and evidence;
- drawing appropriate conclusion;
- representing data appropriately;
- Designing investigations.

Links with other subjects

The Tongan curriculum makes use of integrated approaches that foster linkages across the seven essential learning areas, demonstrating the interconnectedness of learning across the curriculum. Science involves an exploration of the environment and therefore offers many potential links with other subjects that also use the environment as a teaching and learning resource.

The role of language

The school curriculum promotes the use of Tongan and English languages for construction of knowledge, skills, values and culture, and for creating and fostering understanding of self, of others, and of the world. Science is a rich source of language and particularly descriptive terms and where possible links between Science and Literacy should be made.

3. ASSESSMENT

Assessment should be ongoing (formative), include a range of different assessment strategies and be used to improve learning. Formative assessment should focus on the students' ability to demonstrate their skills and knowledge. Such assessments enable the teacher to:

- identify what individual learners and groups of learners know and what they still need to know to achieve stated learning outcomes
- provide the basis for future teaching plans
- inform teachers of areas where additional support is needed

Assessment can also be at the end of a unit of learning (summative). Such assessment is normally associated with evaluation of the effectiveness of a course of study and as such will influence future planning. Summative information together with teacher reflection will help:

- provide data that can be communicated to a range of people about the progress and achievements of individual students or groups of students
- provide a basis for evaluating teaching effectiveness
- evaluate appropriateness and effectiveness of teaching resources
- monitor overall national educational standards

a) Teaching, learning and assessment cycle



***STARTING POINT**

Teaching learning and assessment are cyclical. While a starting point is indicated in this diagram and definite assessment points are noted, it is possible to assess at any time.

4. OVERVIEW OF SYLLABUS

In the syllabus there will be 5 strands. These are:

STRAND 1	The Living World
STRAND 2	The Physical World
STRAND 3	The Material World
STRAND 4	Planet Earth and Beyond

Integrated with each of these content strands is the process strand:

STRAND 5 Scientific Skills and Attitudes

The Living World

In this strand, students learn to distinguish between living and non-living things and develop a detailed knowledge of the characteristics of living things. Some of the major systems within the human body e.g. the digestive system, are examined and related to issues of health. This strand also develops students' understanding of interactions within the environment and the impact of human behavior on this. Specific attention is paid to global warming and the impact it might have in Tonga. Students are also encouraged to think about conserving important local resources and other ways in which they can live more sustainably.

In Forms 1 and 2 strand deals specifically with the major human body systems and health related issues. These issues include communicable conditions such as obesity and diabetes that have become increasing common in recent year partly as a result of the adoption of high-energy foods and a more sedentary life style. Communicable diseases such as dengue fever are also dealt with. In all cases preventative measures are explained particularly in relation to diet and exercise

The Physical World

In this strand, students learn about forces and energy and the interactions between these. Specific attention is paid to how electricity is generated, what alternative forms of energy exist and the potential for these in Tonga. Students should develop a good understanding of a wide range of energy types and how these can be converted from one form to another but also conserved. They should also understand the impact of force on our lives.

The Material World

In this strand, students examine the properties of a wide range of materials including those used locally. They learn to relate the properties of materials to their various uses and to test for specific properties. The three states of matter (solids, liquids and gases) are also examined along the energy interactions involved in change of state. Ways of using change of state are explored, particularly in relation to separating and purifying materials. A number of local artifacts are examined and the materials used in their construction identified along with their properties.

The Planet Earth and Beyond

In this strand, students develop an understanding of how day and night and seasonal change result from the Earth's rotation and orbit respectively. The stars and solar system are examined in the context of traditional Tongan navigation methods. Students also learn about the major components of weather and how these can be measured. Various forms of natural disasters that impact on Tonga such as cyclones and earthquakes are examined, and students learn the precautions that can be taken to reduce the impact of these.

Scientific Skills and Attitudes

This strand explicitly identifies the skills and attitudes that students will develop as they complete the four content strands. These involve making systematic observations and measurements and recording data appropriately. Using scientific data and evidence to draw appropriate conclusions and designing investigations to answer questions. In particular, students are provided with many opportunities to use fair testing in order to determine the link between cause and effect.

Overview of Learning Outcomes

The Living World	The Physical World	The Material World	Planet Earth & Beyond	Developing Scientific Skills and Attitudes
Form 1 Learning Outcome	Form 1 Learning Outcome	Form 1 Learning Outcome	Form 1 Learning Outcome	Form 1 Learning Outcome
Students can explain that living things have internal structures and systems and understand how to keep these healthy	Students design and perform investigations into various forms of energy	Students can explain that underlying structure determines the properties of materials	Students recognize and can explain some interactions between systems of the Earth and beyond	Students can design plans and obtain, present and evaluate evidence.
Form 2 Learning Outcome	Form 2 Learning Outcome	Form 2 Learning Outcome	Form 2 Learning Outcome	Form 2 Learning Outcome
Students identify the main communicable and non-communicable diseases occurring in Tonga and are aware of preventative measures	Students explain that energy is transferred and transformed and forces act on all objects	Students understand that scientific ideas about the particle theory of matter can be used to explain the properties of matter	Students can explain that present day features on the Earth have resulted from the impact of various processes on the planet over a very long period	Students can design plans and obtain, present and evaluate evidence.

Developing Scientific Skills and Attitudes

Form 1 and 2

By the end of Form 2 students will be able to

Plan

- ask a series of related questions and refine these to make them suitable for scientific investigation;
- identify possible solutions to trial;
- design a range of scientific investigations;
- design a fair test and modify it to test a range of variables.

Obtain and present evidence

- produce a clear set of scientific instructions;
- take accurate measurements with a range of equipment;
- manipulate scientific equip safely;
- ensure all appropriate safety precautions are taken during investigations;
- obtain and critique information from the community.

Consider evidence and evaluate

- make detailed evaluations of a range of investigations and modify them if appropriate;
- decide whether conclusions agree with predictions and whether further predictions are needed;
- identify the limitations of some investigations;
- explain the importance of replication

Core Content and Triples

UNIT 7.0: LABORATORY SAFETY, EQUIPMENT AND SCIENTIFIC SKILLS

CORE CONTENT AND TRIPLE: CLASSES 6 TO 8

CLASS 6	CLASS 7	CLASS 8
<p>Lab safety, equipment and scientific skills Students should be able to demonstrate and apply some important scientific skills.</p>	<p>Lab safety, equipment and scientific skills Students should be able to define Science, explain laboratory safety rules, identify laboratory equipments and demonstrate and apply some important scientific skills.</p>	<p>Lab safety, equipment and scientific skills Students should be able to explain safety rules, identify laboratory equipments and demonstrate and apply some important scientific skills.</p>
<p>CORE CONTENT Plan</p> <ul style="list-style-type: none"> ask questions that can be investigated scientifically and decide how to find the answers; make testable predictions; design a fair test to test one variable while controlling all others. <p>Obtain and present evidence</p> <ul style="list-style-type: none"> follow a range of written instructions; identify appropriate equipment for making certain measurements; record observations and measurements systematically identify the best ways to present data; obtain and information from a variety of sources, including media, and electronic sources. <p>Consider evidence and evaluate</p> <ul style="list-style-type: none"> use their findings to answer their initial questions and evaluate their investigation; use observations and measurements to draw conclusions; decide whether conclusions agree with predictions. 	<p>CORE CONTENT Science</p> <ul style="list-style-type: none"> Define Science and describe what scientists do in general. <p>Laboratory Safety</p> <ul style="list-style-type: none"> Identify some lab safety symbols and also demonstrate and follow lab safety rules. <p>Laboratory Equipments.</p> <ul style="list-style-type: none"> Name lab equipments and manipulate them properly. <p>Scientific Skills</p> <ul style="list-style-type: none"> Demonstrate and apply important and appropriate skills. These skills are detailed in the syllabus and will be continuously applied throughout the year. 	<p>CORE CONTENT Laboratory Safety</p> <ul style="list-style-type: none"> Remind those safety symbols and rules in class 7. Add some more safety symbols and rules to meet the requirement of class 8. <p>Laboratory Equipments.</p> <ul style="list-style-type: none"> Broaden their knowledge on naming and using of lab equipments <p>Scientific Skills</p> <ul style="list-style-type: none"> Expand their scientific skills appropriately. Details of the skills are given in the syllabus and will be applied throughout the year.

UNIT 8.0: LABORATORY SAFETY, EQUIPMENT AND SCIENTIFIC SKILLS

CORE CONTENT AND TRIPLE: CLASSES 7 TO 9

CLASS 7	CLASS 8	
<p>Lab safety, equipment and scientific skills Students should be able to define Science, explain laboratory safety rules, identify laboratory equipments and demonstrate and apply some important scientific skills.</p>	<p>Lab safety, equipment and scientific skills Students should be able to explain safety rules, identify laboratory equipments and demonstrate and apply some important scientific skills.</p>	
<p>CORE CONTENT Science</p> <ul style="list-style-type: none"> Define Science and describe what scientists do in general. <p>Laboratory Safety</p> <ul style="list-style-type: none"> Identify some lab safety symbols and also demonstrate and follow lab safety rules. <p>Laboratory Equipments.</p> <ul style="list-style-type: none"> Name lab equipments and manipulate them properly. <p>Scientific Skills</p> <ul style="list-style-type: none"> Demonstrate and apply important and appropriate skills. These skills are detailed in the syllabus and will be continuously applied throughout the year. 	<p>CORE CONTENT Laboratory Safety</p> <ul style="list-style-type: none"> Remind those safety symbols and rules in class 7. Add some more safety symbols and rules to meet the requirement of class 8. <p>Laboratory Equipments.</p> <ul style="list-style-type: none"> Broaden their knowledge on naming and using of lab equipments <p>Scientific Skills</p> <ul style="list-style-type: none"> Expand their scientific skills appropriately. Details of the skills are given in the syllabus and will be applied throughout the year. 	

UNIT 7.1: THE LIVING WORLD

CORE CONTENT AND TRIPLE: CLASSES 6 TO 8

CLASS 6	CLASS 7	CLASS 8
<p>Living World outcome Students identify, describe and evaluate interactions between living things and their environment</p>	<p>Living World outcome Students can explain characteristics of living things, plants needs and their ecosystems, and also some human organs and related health issues</p>	<p>Living World outcome Students can describe some features of living things, plants and animals in Tonga, and two human body systems and related health issues</p>
<p>CORE CONTENT Plants & Animals</p> <ul style="list-style-type: none"> • introduced species - some examples such as the cane toad in Australia and the damage it has caused <p>Ecology & Environment</p> <ul style="list-style-type: none"> • food chains and webs - the feeding relationships between living things - plants carnivores and herbivores • local ecosystems - the animals and plants that live in various ecosystems in Tonga and how they interrelate. • human impact on ecosystems -depleting resources and pollution • climate change and global warming - the impact on Tonga and the world of increasing temperatures • conserving resources • recycling and reusing - different items and materials that can be reused an recycled • micro-organisms - how micro-organisms help things to decay and rot 	<p>CORE CONTENT Characteristics of living things</p> <ul style="list-style-type: none"> • characteristics of living things <p>The living Plants</p> <ul style="list-style-type: none"> • Germination and sensitivity to light and gravity • Plants' needs <p>Plant systems</p> <ul style="list-style-type: none"> • shoot system • root system <p>Ecosystems</p> <ul style="list-style-type: none"> • Photosynthesis • Respiration • Food chains and food webs <p>Human organs -</p> <ul style="list-style-type: none"> • Eyes, ears, tongue and teeth <p>Health issues</p> <ul style="list-style-type: none"> • Causes and prevention of problems or diseases to these organs: eyes, ears, tongue and teeth. 	<p>CORE CONTENT Features of living things</p> <ul style="list-style-type: none"> • cell theory • classification • unicellular organisms • multi-cellular organisms • good and bad micro-organisms and esp. the diseases they cause <p>Plants in Tonga</p> <ul style="list-style-type: none"> • Classification of plants in Tonga • Adaptation to various ecosystems in Tonga • Important plants in Tonga • horticulture and organic farming <p>Animals in Tonga</p> <ul style="list-style-type: none"> • Classification of varieties in Tonga • Important animals in Tonga • Study in more details one of the important animals <p>Two human body systems (structure and function)</p> <ul style="list-style-type: none"> • respiratory system • digestive system <p>Health issues</p> <ul style="list-style-type: none"> • Causes and prevention of diseases related to the respiratory and digestive systems.

UNIT 8.1: THE LIVING WORLD

CORE CONTENT AND TRIPLE: CLASSES 7 TO 9

CLASS 7	CLASS 8	
<p>Living World outcome Students can explain characteristics of living things, plants needs and their ecosystems, and also some human organs and related health issues</p>	<p>Living World outcome Students can describe some features of living things, plants and animals in Tonga, and two human body systems and related health issues</p>	
<p>CORE CONTENT Characteristics of living things</p> <ul style="list-style-type: none"> characteristics of living things <p>The living Plants</p> <ul style="list-style-type: none"> Germination and sensitivity to light and gravity Plants' needs <p>Plant systems</p> <ul style="list-style-type: none"> shoot system root system <p>Ecosystems</p> <ul style="list-style-type: none"> Photosynthesis Respiration Food chains and food webs <p>Human organs -</p> <ul style="list-style-type: none"> Eyes, ears, tongue and teeth <p>Health issues</p> <ul style="list-style-type: none"> Causes and prevention of problems or diseases to these organs: eyes, ears, tongue and teeth. 	<p>CORE CONTENT Features of living things</p> <ul style="list-style-type: none"> cell theory classification unicellular organisms multi-cellular organisms good and bad micro-organisms and esp. the diseases they cause <p>Plants in Tonga</p> <ul style="list-style-type: none"> Classification of plants in Tonga Adaptation to various ecosystems in Tonga Important plants in Tonga horticulture and organic farming <p>Animals in Tonga</p> <ul style="list-style-type: none"> Classification of varieties in Tonga Important animals in Tonga Study in more details one of the important animals <p>Two human body systems (structure and function)</p> <ul style="list-style-type: none"> respiratory system digestive system <p>Health issues</p> <ul style="list-style-type: none"> Causes and prevention of diseases related to the respiratory and digestive systems. 	

UNIT 7.2: THE PHYSICAL WORLD

CORE CONTENT AND TRIPLE: CLASSES 6 TO 8

CLASS 6	CLASS 7	CLASS 8
<p>Physical World outcome Students identify and apply processes involved in manipulating using and changing energy and forces</p>	<p>Physical World outcome Students design and perform investigations into the relationships between forces and energy</p>	<p>Physical World outcome Students explain that energy is transferred and transformed and forces act on all objects</p>
<p>Core content</p> <p>Energy</p> <ul style="list-style-type: none"> conserving energy - energy can be changed from one form to another <p>Forces</p> <ul style="list-style-type: none"> friction - is a type of force air and resistance - are forms of friction floating and sinking in saltwater and other liquids - objects behave differently in different types of liquids how ships float 	<p>Core Content</p> <p>Heat</p> <ul style="list-style-type: none"> Sources of heat Movement of heat in solids, liquids and gases Expansion and contraction Using a thermometer <p>Light</p> <ul style="list-style-type: none"> Reflection of light and the angles of incidence and reflection Refraction of light and its uses and problems Colours - splitting 'white' light into different colours Detection - the structure of the human eye <p>Sound</p> <ul style="list-style-type: none"> Transmission of sound through solids liquids and gases Pitch and loudness are related to the frequency and amplitude of a sound wave Detection - the structure of the human ear <p>Forces</p> <ul style="list-style-type: none"> Push, pull and twist Simple machines-revise lever and pulley Incline plane, wheel and axel 	<p>Core content</p> <p>Energy</p> <ul style="list-style-type: none"> Forms of energy - energy occurs in a large number of forms Storing energy Changes in energy forms - observing and explaining various energy changes Making energy do work - using energy sources to move objects Conserving energy <p>Forces</p> <ul style="list-style-type: none"> Types of forces - there are two main types of forces Measuring forces using a force meter Gravity Reducing friction Unbalanced forces Forces and cycling

UNIT 8.2: THE PHYSICAL WORLD

CORE CONTENT AND TRIPLE: CLASSES 7 TO 9

CLASS 7	CLASS 8	
<p>Physical World outcome Students design and perform investigations into the relationships between forces and energy</p>	<p>Physical World outcome Students explain that energy is transferred and transformed and forces act on all objects</p>	
<p>Core Content</p> <p>Heat</p> <ul style="list-style-type: none"> • Sources of heat • Movement of heat in solids, liquids and gases • Expansion and contraction • Using a thermometer <p>Light</p> <ul style="list-style-type: none"> • Reflection of light and the angles of incidence and reflection • Refraction of light and its uses and problems • Colours - splitting 'white' light into different colours • Detection - the structure of the human eye <p>Sound</p> <ul style="list-style-type: none"> • Transmission of sound through solids liquids and gases • Pitch and loudness are related to the frequency and amplitude of a sound wave • Detection - the structure of the human ear <p>Forces</p> <ul style="list-style-type: none"> • Push, pull and twist • Simple machines-revise lever and pulley • Incline plane, wheel and axel 	<p>Core content</p> <p>Energy</p> <ul style="list-style-type: none"> • Forms of energy - energy occurs in a large number of forms • Storing energy • Changes in energy forms - observing and explaining various energy changes • Making energy do work - using energy sources to move objects • Conserving energy <p>Forces</p> <ul style="list-style-type: none"> • Types of forces - there are two main types of forces • Measuring forces using a force meter • Gravity • Reducing friction • Unbalanced forces • Forces and cycling 	

UNIT 7.3: THE MATERIAL WORLD

CORE CONTENT AND TRIPLE: CLASSES 6 TO 8

CLASS 6	CLASS 7	CLASS 8
<p>Material World outcome Students make judgments about properties of materials for building structures</p>	<p>Material World outcome Students understand that scientific ideas about the particle theory of matter can be used to explain the properties of matter</p>	<p>Material World outcome Students can explain that underlying structure determines the properties of materials</p>
<p>Core content</p> <p>Grouping and classifying materials</p> <ul style="list-style-type: none"> materials in the modern world - polythene and other plastics and fiberglass have a number of useful properties that can be tested <p>Changing materials</p> <ul style="list-style-type: none"> built structures including an 'umu - what properties does this structure have to make it work well <p>Separating materials</p> <ul style="list-style-type: none"> solar stills can be used to get fresh water from leaves or salt water immiscible liquids like oil and water can be separate by pouring oil refining - gives us petrol, kerosene, bitumen and a range of plastics 	<p>Core content</p> <p>Particle Theory</p> <ul style="list-style-type: none"> Particle model of matter Change of state of matter - using particle theory to explain these Explaining the water cycle using particle theory Dissolving - explaining solubility using particle theory Diffusion of gases <p>Air & Water</p> <ul style="list-style-type: none"> Air is a mixture of gases Water Quality - Hard and soft water Using water to do work 	<p>Core Content</p> <p>Mass, volume & density</p> <ul style="list-style-type: none"> Measuring the mass of different substances Measuring the volume of different substance Calculating the density of different substances Floating, sinking and density <p>Air & Water</p> <ul style="list-style-type: none"> Adding salt to water increases it density Water pressure - pressure increases with depth in water Air exerts pressure Air takes up space and has mass Heat and air - air will expand and rise when heated Burning and air - the oxygen in is needed for burning Physical and chemical changes

UNIT 8.3: THE MATERIAL WORLD

CORE CONTENT AND TRIPLE: CLASSES 7 TO 9

CLASS 7	CLASS 8	
<p>Material World outcome Students understand that scientific ideas about the particle theory of matter can be used to explain the properties of matter</p>	<p>Material World outcome Students can explain that underlying structure determines the properties of materials</p>	
<p>Core content</p> <p>Particle Theory</p> <ul style="list-style-type: none"> • Particle model of matter • Change of state of matter - using particle theory to explain these • Explaining the water cycle using particle theory • Dissolving - explaining solubility using particle theory • Diffusion of gases <p>Air & Water</p> <ul style="list-style-type: none"> • Air is a mixture of gases • Water Quality - Hard and soft water • Using water to do work 	<p>Core Content</p> <p>Mass, volume & density</p> <ul style="list-style-type: none"> • Measuring the mass of different substances • Measuring the volume of different substance • Calculating the density of different substances • Floating, sinking and density <p>Air & Water</p> <ul style="list-style-type: none"> • Adding salt to water increases it density • Water pressure - pressure increases with depth in water • Air exerts pressure • Air takes up space and has mass • Heat and air - air will expand and rise when heated • Burning and air - the oxygen in is needed for burning • Physical and chemical changes 	

UNIT 7.4: PLANET EARTH AND BEYOND

CORE CONTENT AND TRIPLE: CLASSES 6 TO 8

CLASS 6	CLASS 7	CLASS 8
<p>Planet Earth and Beyond outcome Students identify and explain that the Earth is a dynamic system that is constantly changing and part of a larger solar system</p>	<p>Planet Earth and Beyond outcome Students can explain that present day features on the Earth have resulted from the impact of various processes on the planet over a very long period</p>	<p>Planet Earth and Beyond outcome Students recognize and can explain some interactions between systems of the Earth and beyond</p>
<p>Core content Earth, moon and sun</p> <ul style="list-style-type: none"> phases of the moon - the moon changes phase from new to full during each month <p>Weather</p> <ul style="list-style-type: none"> cyclones - cyclones are seasonal and produce high speed winds and heavy rain that can cause flooding <p>Planets and Stars</p> <ul style="list-style-type: none"> solar system the solar system is made up of 8 planets constellations - the stars are 'suns' that can be grouped in constellations navigation - ancient travelers used the stars to navigate <p>Earth Processes</p> <ul style="list-style-type: none"> erosion - is cause by a number of factors volcanoes and earthquakes both occur in Tonga along fault lines 	<p>Core content Earth Structure</p> <ul style="list-style-type: none"> The structure of the earth - the Earth is made up of a number of layers <p>Rocks</p> <ul style="list-style-type: none"> Major rock types and their formation Observation and classification of rocks from Tonga Uses of rocks in Tonga <p>Erosion and weathering</p> <ul style="list-style-type: none"> The effect of heat and water on rocks Erosion and weathering of rocks helps produce soils 	<p>Core content Earth and Moon</p> <ul style="list-style-type: none"> The orbit of the moon - how the moon orbits the earth The phases of the moon - why the phases of the moon occur Tides - tides result from the gravitational pull of the sun and moon interacting with the Earth Gravitational pull on different planets <p>Weather and climate</p> <ul style="list-style-type: none"> Components of weather (temperature, rainfall, humidity, pressure and winds) How they affect weather and how to measure them. Land and sea breezes Cloud formation and rain - the major causes of cloud formation <p>Soil</p> <ul style="list-style-type: none"> Soil formation from rocks Soils have parent rock Classification of Tongan soil (properties and types)

UNIT 8.4: PLANET EARTH AND BEYOND

CORE CONTENT AND TRIPLE: CLASSES 7 TO 9

CLASS 7	CLASS 8	
<p>Planet Earth and Beyond outcome Students can explain that present day features on the Earth have resulted from the impact of various processes on the planet over a very long period</p>	<p>Planet Earth and Beyond outcome Students recognize and can explain some interactions between systems of the Earth and beyond</p>	
<p>Core content</p> <p>Earth Structure</p> <ul style="list-style-type: none"> The structure of the earth - the Earth is made up of a number of layers <p>Rocks</p> <ul style="list-style-type: none"> Major rock types and their formation Observation and classification of rocks from Tonga Uses of rocks in Tonga <p>Erosion and weathering</p> <ul style="list-style-type: none"> The effect of heat and water on rocks Erosion and weathering of rocks helps produce soils 	<p>Core content</p> <p>Earth and Moon</p> <ul style="list-style-type: none"> The orbit of the moon - how the moon orbits the earth The phases of the moon - why the phases of the moon occur Tides - tides result from the gravitational pull of the sun and moon interacting with the Earth Gravitational pull on different planets <p>Weather and climate</p> <ul style="list-style-type: none"> Components of weather (temperature, rainfall, humidity, pressure and winds) How they affect weather and how to measure them. Land and sea breezes Cloud formation and rain - the major causes of cloud formation <p>Soil</p> <ul style="list-style-type: none"> Soil formation from rocks Soils have parent rock Classification of Tongan soil (properties and types) 	

Knows and Dos Statements of Strands

UNIT 7.0: LABORATORY SAFETY, EQUIPMENT AND SCIENTIFIC SKILLS

Learning outcome for UNIT 7.0	
Students should be able to define Science, explain laboratory safety rules, identify laboratory equipments and demonstrate some important scientific skills.	
What students should KNOW	What students should be able to DO
(1) Science	<ul style="list-style-type: none"> i. Define the word "Science. ii. Describe what scientists do in general; iii. Explain how scientists do their investigations.
(2) Laboratory Safety	<ul style="list-style-type: none"> i. Identify and describe some important laboratory safety symbols. ii. Explain and demonstrate most of the basic laboratory safety rules.
(3) Laboratory Equipment	<ul style="list-style-type: none"> i. Identify and name the equipments they will use this year. ii. Draw each equipment properly. iii. Manipulate the equipments properly
(4) Scientific skills	<ul style="list-style-type: none"> i. Demonstrate some important and useful scientific skills especially. those they will apply this year. ii. Apply those scientific skills appropriately.

UNIT 8.0: LABORATORY SAFETY, EQUIPMENT AND SCIENTIFIC SKILLS**Learning outcome for UNIT 8.0**

Students should be able to explain safety rules, identify laboratory equipments and demonstrate and apply some important scientific skills.

What students should KNOW	What students should be able to DO
(1) Laboratory Safety	i. Identify and describe some additional important laboratory safety symbols to those studied in Class 7. ii. Explain and demonstrate most of the basic laboratory safety rules.
(2) Laboratory Equipments	i. Identify and name equipments they will use this year ii. Draw each equipment properly iii. Manipulate the equipments properly
(3) Scientific skills	i. Demonstrate some important and useful scientific skills especially those they will apply this year ii. Apply those scientific skills appropriately.

UNIT 7.1: LIVING WORLD

Learning outcome for UNIT 7.1:

Students should be able to explain characteristics of living things, plants needs and their ecosystems, and also some human organs and related health issues.

What students should KNOW	What students should be able to DO
(1) The characteristics of a living thing	i. List the characteristics of living things. ii. Explain how living things carry out or fulfill those characteristics iii. Different living things from non-living things using specific examples.
(2) The living Plants - germination and sensitivity to light and gravity - plants' needs	i. Identify the right conditions for a plant seed to start growing (germinate). ii. Demonstrate and describe how shoots and roots are sensitive to light and gravity. iii. Describe the needs of plants in general.
(3) Plant systems	i. Draw and label these two plant systems: shoot system (shoot, stem, leaves, flowers) and root system (root and root hairs). ii. Describe the functions of each part of the two systems.
(4) Ecosystems	i. Define and describe an ecosystem. ii. Explain how plants make their food (photosynthesis). iii. Describe how plants breathe (respiration). iv. Explain the feeding relationship between living things using some ecosystems in Tonga.
(5) Human organs (eyes, ears, tongue and teeth)	i. Draw and label parts of each of these organs: eye, ear, tongue and teeth; ii. Describe the function of each part of those organs.
(6) Cause and prevention of problems or diseases to the eyes, ears, tongue and teeth.	i. Identify some sources of the problems or health risk to these organs: eyes, ears, tongue and teeth. ii. Explain ways to prevent those problems.

UNIT 8.1: LIVING WORLD

Learning outcome for UNIT 8.1:

Students should be able to describe some features of living things, plants and animals in Tonga, two human body systems and related health issues.

What students should KNOW	What students should be able to DO
(1) Features of living thing (I) - cell theory and classification.	<ul style="list-style-type: none"> i. Describe the cell theory. ii. Identify and label structures of a typical animal and plant cells. iii. Describe the functions of some parts of the cell. iv. Classify all living things into 5 main kingdoms.
(2) Unicellular, multi-cellular and micro-organisms.	<ul style="list-style-type: none"> i. Describe unicellular and multi-cellular organisms. ii. Identify good (useful) and bad (harmful) micro-organisms. iii. List some diseases that bad micro-organisms cause. iv. Describe some ways to control or stop infectious ('pipihi', communicable, transferable) diseases.
(3) Plants in Tonga	<ul style="list-style-type: none"> i. Classify plants in Tonga. ii. Explain how plants adapt to various ecosystems in Tonga. iii. Identify some important plants in Tonga and their uses. iv. Describe horticulture and organic farming. v. Demonstrate horticulture and organic farming.

<p>(4) Animals in Tonga</p>	<ul style="list-style-type: none"> i. Classify animals in Tonga. ii. Identify some important animals in Tonga and explain why they are important. iii. Pick one of the important animals in Tonga and study it in more details (project).
<p>(5) The major components and functions of the respiratory system</p>	<ul style="list-style-type: none"> i. Identify the major components of the respiratory system on a diagram ii. Explain the function of each component based on nasal cavity, pharynx, larynx, trachea, bronchi, bronchus, bronchiole, alveolus and diaphragm. iii. Demonstrate breathing using a model lung consists of balloons, straw and a plastic bottle. iv. Describe that respiration is a chemical reaction and relate it to burning using the word equation: <div style="background-color: #e0ffe0; padding: 5px; margin: 5px 0;"> $\text{Food} + \text{Oxygen} = \text{Energy (heat \& movement)} + \text{Carbon Dioxide} + \text{Water}$ </div> v. Conduct activities to show that carbon dioxide and heat are produced during respiration
<p>(6) The major components of the digestive system</p>	<ul style="list-style-type: none"> i. Identify the major components of the digestive system on a diagram. ii. Explain their functions based upon the mouth, esophagus, stomach, liver, pancreas, large and small intestine, rectum and anus and some of the key enzymes.
<p>(7) Health issues related to the respiratory and digestive systems.</p>	<ul style="list-style-type: none"> i. Identify some sources of the problems or health risks to the respiratory and digestive systems. ii. Explain ways to prevent those problems.

UNIT 7.2: PHYSICAL WORLD

Learning outcome for UNIT 7.2: Students design and perform investigations into various forms of energy	
What students should KNOW	What students should be able to DO
1) a number of heat sources	i. List number of heat sources - the sun, fire, electricity chemical, friction and how they are used
2) how heat moves in solids, liquids and gases	i. Explain that heat moves by conduction in solids and convection in liquids and gases ii. carry out activities to demonstrate how heat moves in (i)
3) substances expand when heated and contract when cooled	i. Use substances to demonstrate how they expand when heated and contract when cooled ii. Explain their observations
4) how to read a thermometer	i. Use a thermometer to record a variety of different temperatures ii. Tabulate the data
5) Sources of light	i. Identify sources of light ii. Classify sources as man-made or natural

SCIENCE SYLLABUS

<p>6) White light is made up of colours</p>	<p>i. Carry out an activity to show that white light can be split up into a sequence of different colours</p>
<p>7) Light changes speed and directions as it moves from one medium to another</p>	<p>i. Explain why refraction occurs ii. Describe how refraction is use in lenses to magnify an image</p>
<p>8) Light is reflected at the angle it strikes a smooth shiny surface</p>	<p>i. Determine the relationship between the angle of incidence and the angle of reflection using a ray of light, a mirror and a protractor ii. Using a ball bouncing off a surface at an angle to model the reflection of light</p>
<p>9) How an image is formed by the eye</p>	<p>i. explain how a focused image is formed in the retina of the eye</p>
<p>10) Sound travel through solid, liquid, gases at different speed</p>	<p>i. Design activities to show that sound can travel through different media ii. Explain why it travels fastest in solid using particle theory.</p>
<p>11) The relationship between pitch, loudness, frequency and amplitude</p>	<p>i. Explain how the pitch and loudness of a note can be changed ii. Draw wave diagrams of notes showing how pitch is related to frequency and loudness to amplitude iii. Observe a demonstration of how sound waves travel using a slinky</p>

12) How the human ear detect sounds	<ul style="list-style-type: none"> i. Explain how sound is transmitted within the ear, eg. The pinna, auditory, canal, eardrum, incus (anvil), malleus (hammer) & stapes (stirrup), cochlea.
13) Push, pull and twist	<ul style="list-style-type: none"> i. Demonstrate a push, pull and twist as forces ii. Identify examples of push, pull and twist in their environment
14) Simple machines	<ul style="list-style-type: none"> i. Revise and identify levers and pulley in their environment ii. Identify examples of incline planes and wheel and axle iii. Draw and label the parts of an incline plane and wheel and axle iv. Demonstrate how an incline plane and a wheel and axle work as a simple machine

UNIT 8.2: PHYSICAL WORLD

Learning outcome for UNIT 8.2: Students explain that energy is transferred and transformed and forces act on all objects	
What students should KNOW	What students should be able to DO
1) there are many different forms of energy	i. List the forms of energy
2) energy can be stored in a number of ways	i. Identify the ways in which energy can be stored
3) energy can be stored in a number of ways	i. Explain numbers of energy conversions e.g. falling coconut, fuel in a car, food and human movement, a windup toy, a battery powered torch
4) energy can be used to do work	i. Build a paddle wheel ii. explore ways of making it spin with steam, water and wind iii. explain the energy conversions involved
5) various ways of conserving energy in Tonga	i. List ways in which energy consumption can be reduced by individuals in Tonga and relate this to the benefits it would bring ii. Write a letter to the government encouraging it to raise awareness of energy conservation and explaining why this is important for Tonga
6) that forces can be measured	i. Build a simple force meter and use it to measure the weight of various objects ii. Compare the accuracy of the home-made force meter by weighing the same objects with a standard force meter (balance)

<p>7) gravity is a force cause by the pull of the Earth</p>	<ul style="list-style-type: none"> i. Demonstrate why all objects fall towards the Earth when they are dropped ii. Demonstrate why a great deal of energy is required to leave the surface of the Earth
<p>8) ways to reduce friction</p>	<ul style="list-style-type: none"> i. Explain how friction occurs and the problems and benefits that result from friction ii. Explain how friction can be reduced by using rollers to move a large block or applying oil to a bicycle wheel or Tongan oil between the hands
<p>9) that unbalanced forces cause objects to move</p>	<ul style="list-style-type: none"> i. Demonstrate how pushing an object results in unbalanced forces and therefore movement and explain this phenomena ii. Use a 'tug of war' to demonstrate balanced and unbalanced forces and relate this to movement
<p>10) the forces involved in pedaling a bicycle</p>	<ul style="list-style-type: none"> i. Explain how the force from the human leg is used to move a bicycle

UNIT 7.3 MATERIAL WORLD

Learning outcome for UNIT 7.3:	
Students understand that scientific ideas about the particle theory of matter can be used to explain the changes in matter	
What students should KNOW	What students should be able to DO
1) all matter is made up of particles	<ul style="list-style-type: none"> i. Role play the particle behaviour for different state changes ii. explain the interaction between particles and energy
2) change of state is due to particles gaining or losing energy	<ul style="list-style-type: none"> i. Observe a number of actual changes of state ii. Explain these in terms of particle behaviour e.g. melting of ice or dripping, etc
3) the processes involved in the water cycle	<ul style="list-style-type: none"> i. Make rain model with a boiling kettle and a cold surface ii. Draw and label the water cycle and explain how heating and cooling 'drive' it
4) a number of water sources and that water can be hard or soft	<ul style="list-style-type: none"> i. Identify water sources in Tonga ii. Test water hardness using detergent iii. Make hard water soft
5) dissolving is the mixing of particles	<ul style="list-style-type: none"> i. Explain the dissolving of potassium permanganate crystals in terms of particle mixing

6) Dissolving substances in water	i. Test substances for their solubility ii. Design and conduct a fair test to determine the relationship between heat and dissolving
7) Diffusion	i. Conduct an activity to demonstrate that gases diffuse ii. explain diffusion in terms of particle movement
8) The importance of air	i. Conduct an activity to show that air (oxygen) is needed for burning and makes up around 20% of air
9) Water can do work	i. Make a water wheel and explain how it can be used to do work

UNIT 8.3 MATERIAL WORLD

Learning outcome for UNIT 8.3: Students can explain that underlying structure determines the properties of materials	
What students should KNOW	What students should be able to DO
1) the meaning of 'mass' and how it is measured	<ul style="list-style-type: none"> i. Measure and record the mass of different objects ii. Explain the difference between mass and weight
2) how to measure the volume of irregular shaped objects	<ul style="list-style-type: none"> i. Measure and record the volumes of a number of irregular shaped objects
3) how to calculate the density of irregular objects	<ul style="list-style-type: none"> i. Calculate the density of an irregular shaped object, ii. predict if the object will float in fresh water and test predictions
4) objects that float and sink have different densities	<ul style="list-style-type: none"> i. Calculate the volume of a regular objects ii. Measure the mass of regular objects iii. Calculate the density of a regular object iv. Determine the density above which objects sink in fresh water
5) the effect of adding salt on the density of water	<ul style="list-style-type: none"> i. Explain the effect on density of water when salt is added

6) water pressure increases with depth	<ul style="list-style-type: none"> i. Conduct an activity to show that water has weight ii. Explain and demonstrate how depth affects water pressure iii. Explain the risks involved in diving for long periods and surfacing too rapidly
7) air has weight and volume	<ul style="list-style-type: none"> i. Design some activities to show that air has weight and volume, ii. Explain the outcomes of the activities
8) air exerts pressure	<ul style="list-style-type: none"> i. Conduct an activity to show that air exerts pressure ii. explain the outcome of the activity
9) air rises when heated	<ul style="list-style-type: none"> i. Explain and demonstrate how air expands and contracts ii. Differentiate between sea breeze and land breeze
10) particles behave differently during physical and chemical change	<ul style="list-style-type: none"> i. Explain why physical changes can be reversed while chemical changes cannot be reversed ii. Use the particle theory to explain this

UNIT 7.4: THE PLANET EARTH AND BEYOND

Learning outcome for UNIT 7.4:	
Students can explain that present day features on the Earth have resulted from the impact of various processes on the planet over a very long period	
What students should KNOW	What students should be able to DO
1) the earth consists of a core, a mantle and a crust	i. Draw and label a diagram of a section through the Earth ii. Explain the ideas of the rocks on the Earth's crust
2) Different formation of rock types	i. List the 3 major rock types with examples: (Igneous, Sedimentary and Metamorphic) ii. Explain how they are formed iii. Group and classify rocks according to their properties iv. Identify the similar properties across the 3 main rock types
3) Rock have particular uses related to their properties	i. Identify and list the major uses of rocks in Tonga ii. Compare these uses to their properties
4) The properties of rocks can be altered by heating and other factors (waves, wind, etc) and this can result in erosion	i. Record observations of the structural changes when heated samples of rocks are plunged into cold water
5) Weather <ul style="list-style-type: none"> • Heating causes land and sea breeze 	i. Describe land and sea breezes ii. Compare land and sea breezes to contract and expand iii. Demonstrate warm air rises and cool air sinks (convection)

6) How to measure temperature, rainfall, wind speed and direction	<ul style="list-style-type: none">i. Make simple weather instruments to measure and record the temperature, rainfall, wind speed and directionii. Demonstrate that air rises when heated and sinks when cooled.
---	--

UNIT 8.4 THE PLANET EARTH AND BEYOND

Learning outcome for UNIT 8.4:	
Students recognize and can explain some interactions between systems of the Earth and beyond	
What students should KNOW	What students should be able to DO
1) the moon is a natural satellite of the Earth	<ul style="list-style-type: none"> i. Make and produce a model to show how the moon moves around the Earth ii. Role play the rotation of Earth and moon around the sun iii. Explain why we only see one side of the moon iv. Research the importance of the moon to Tongans (agriculture , fishing and tides)
2) Phases of the moon	<ul style="list-style-type: none"> i. Observe and record the phases of the moon for a month ii. Model the changes of the phases of the moon iii. Explain why and when the moon changes from new to full over the period of a month
3) Eclipse of the moon	<ul style="list-style-type: none"> i. Draw and label the position of sun, moon and earth in lunar and solar eclipse ii. Explain what causes a lunar and a solar eclipse
4) The earth and the moon's gravitational pull causes tides	<ul style="list-style-type: none"> i. Record tides from the weather forecast (radio) for a month ii. Determine the relationship of the phases of the moon and tides (low and high tides)
5) Group of stars and directions	<ul style="list-style-type: none"> i. Draw , name and label the major galaxies (milkyway, magellanic clouds) and constellation(southern cross and the Sword of Orion)

	ii. Explain how stars help in navigation
6) Soil have a parent rock	<ul style="list-style-type: none">i. Explain how soils are formed from rocksii. Observe the erosion of soil in the environmentiii. Relate properties of soil to their parent rockiv. Identify the different types of Tongan soil and how they are formed

