REPUBLIC OF TRINIDAD AND TOBAGO

MINISTRY OF EDUCATION

GORTT/IBRD BASIC EDUCATION PROJECT

Primary School Syllabus

Standard Four and Standard Five

SCIENCE

Curriculum Development Division

March 2006

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FOREWORD

The Science Syllabus for Primary Schools in Trinidad and Tobago which was developed and introduced in the early eighties was significantly influenced by the then prevailing curriculum thrust toward acquisition of skills, with the emphasis on scientific processes and pupils' engagement in hands-on, minds-on activities. The Syllabus was then modified in 1994 with the inclusion of topics related to the environment and technology. There remained however, insufficient focus on concepts and content in the programme.

In 2001, the Government of the Republic of Trinidad and Tobago (GORTT) / International Bank for Reconstruction and Development (IBRD) Basic Education Project presented an opportunity to review the existing Primary School Science Syllabus. It also made provision for the training of teachers to improve the implementation of the Syllabus and the supply of equipment and resource materials to support its delivery.

This newly revised Science Syllabus for Primary Schools provides a focus on both the processes and content of science. It is designed to strengthen many of the skills used by pupils every day such as creative problem solving, critical thinking, working co-operatively in teams, and using technology effectively. The Syllabus also reflects a new emphasis on exploring and developing attitudes and values related to science that are consistent with sustainable development and socially accepted moral and spiritual values.

The rapid developments in the fields of science and technology impact on all students of Trinidad and Tobago. Being involved in a search for how the natural world operates and how scientific knowledge can be applied to the benefit of society, allows pupils to take control of their environment. It contributes to development at a personal as well as national level and promotes self-fulfillment. The teaching of science is therefore an important aspect of nation building and is critical to be undertaken by teachers who have mastery of subject matter and of modern teaching and learning techniques.

Teachers should model the behaviours and attitudes that they expect their young charges to acquire, and pupils should be given the opportunities to practise these behaviours and attitudes. If a child is to learn to be creative and inventive, the child must be taught by a teacher who is creative and inventive and allowed to practice being creative and inventive. If a child is to learn to solve problems, the child must be taught by a problem solver and allowed to solve meaningful problems regularly.

The primary science curriculum was reviewed with inputs from an international and a local science consultant, science specialists and a specially selected group of local science educators (see Acknowledgements for names of Science Curriculum Team Members). They combined their expertise and experience to revise the existing curriculum document and to produce the new draft Science Curriculum Document. This draft was implemented on a phased basis, initially at the levels of Infant Year I and II and Standard I in all primary schools in September 2001. The Standard II and Standard III syllabuses were piloted in September 2002.

The Standard IV and Standard V Syllabuses were piloted in September 2003.

It was recognised that there was a need for necessary groundwork to be undertaken prior to full-scale implementation of the Draft Science Syllabus. As part of this preparation, a series of Regional Workshops and School-based Coaching Activities were held to explain as well as orient School Supervisors, Principals and Teachers toward the constructivist approach to the teaching of science. The teaching strategies and techniques that should be employed in implementing the new syllabus were also discussed and modelled in these workshops.

Based on feedback obtained from questionnaires, reports from school visits and workshops, the Science Syllabus for Standard IV and Standard V was refined. This document is the result of these efforts. The Curriculum Development Division welcomes feedback and questions based on this syllabus. Please write to: The Director of Curriculum Development, Rudranath Capildeo Learning Resource Centre, Mc Bean, Couva. Facsimile: 636-9296 or email: curriculum@tstt.net.tt

We are confident that this new Standard IV to Standard V Primary Science Syllabus will contribute significantly to improving the quality of the teaching and learning of science in primary schools and to the achievement of the national educational goals.

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SHARON DOUGLASS-MANGROO
DIRECTOR OF CURRICULUM DEVELOPMENT

March 1st 2006

PRIMARY SCIENCE SYLLABUS

INTRODUCTION

Science is a distinct form of creative human activity, which involves one way of seeing, exploring and understanding reality. It is both a way of finding out about the world and a growing body of ideas and information about the way things work.

Science is one of the essential features of any society. It has profound effects on people's lives and the environment, especially through its application for practical purposes. It is not a homogenous activity generating a single form of knowledge but consists of a variety of distinguishable, interconnected and overlapping disciplines within the scientific domain.

At the heart of scientific activity is the desire to explore and understand the world and to do so using a distinctive mode of enquiry. Central to this mode of enquiry is a set of systematic processes such as hypothesizing, observing, measuring, designing and carrying out experiments, recording and analyzing data, and evaluating investigations.

It is this mode of enquiry that allows students to collect the type of data needed for acquiring a view of the world that can complement other perspectives. Consequently, science has earned a place in any balanced education and is a crucial factor in enhancing sustainable development in nations.

The overall goal of science education is to develop scientific capability in all young people from 5 – 18. The term "scientific capability" is used instead of "scientific literacy", since it conveys more clearly the focus of science education for action as well as for personal enlightenment and satisfaction.

Scientific capability encompasses five distinct but connected aspects:

1)	Competence	ability to investigate scientifically
2)	Curiosity	an enquiring habit of mind
3)	Understanding	making sense of scientific knowledge and the way science works
4)	Creativity	ability to think and act in a non-linear way
5)	Sensitivity	critical awareness of the role of science in society combined with a caring and responsible disposition

Becoming scientifically capable therefore involves not merely the acquisition of skills, knowledge, understanding and development of appropriate personal qualities and attitudes but also focuses on integrating and applying these personal and intellectual resources for both cognitive and practical purposes in a variety of contexts.

Organization of the syllabus

This syllabus is sequenced from Infant I to Standard 5. There are (6) strands through each year of the syllabus which helps pupils to develop important concepts in primary science. They help the pupil develop a sound understanding of the living and material world. The strands are:

1) Living things
2) Ecosystems
3) Matter and Materials
4) Structures and Mechanisms
5) Energy
6) Earth and Space

Each strand is presented under the headings: Concepts, Objectives, Enquiry Skills, Suggested Teaching/Learning Activities, and Suggested Assessment Activities.

Two types of objectives are specified: Those that relate to concepts and those that relate to process.

One major change in this syllabus is the identification of concepts which pupils need to develop.

The second type of objectives relates to Enquiry skills. As pupils achieve the objectives they will develop and refine their approach to enquiry in science. By setting science in context, pupils should be more able to transfer their learning to situations they meet outside the classroom setting. They will be able to:

Make predictions and hypotheses;
Devise and carry out investigations to answer their questions;
Interpret the outcomes and
Evaluate their work and that of their peers.

In the objectives, you may recognize the twelve processes from the 1994 syllabus. There are a number of Enquiry Skills, which pupils develop as they study the six (6) strands previously listed. These are grouped into those that relate to:

- Planning Enquiries
- Conducting Enquiries
- Communicating Outcomes and Commenting on their Investigations.

The processes defined in the 1994 syllabus are here integrated across this New Syllabus. They are classified to match the Enquiry Skills.

Planning Enquiries.	Predicting	Describe in advance the outcome of an event based on a pattern formed from previous experience.
	Hypothesizing	A prediction based on observation or scientific knowledge and understanding. It should be testable.
	Controlling variables	Discriminating among factors that will, and will not, affect the outcome of an experiment.
	Designing procedures	To obtain information about interrelationships between objects and events.
Conducting Enquiries.	Observing	Using the senses – seeing, tasting, touching, hearing and smelling – to find out about objects or events in the environment. Using space-time relationships. Perceiving and describing objects in terms of their shape, motion, position or location. Perceiving and describing events in terms of sequences, duration, period of time between them and other events.
	Measuring	Finding out about an unknown quantity by comparing it with a known quantity.
	Classifying	Grouping objects or events using one or more observed properties.
	Carrying out	Carrying out procedures systematically and recording results in appropriate formats.
Communicating Outcomes and Commenting on Investigations.	Inferring	Figuring out an explanation based on observations of an object or event.
	Interpreting data	Explaining the meaning or the significance of information regarding an object or event.
	Defining Operationally	Constructing information from what has been done and what has been observed.
	Communicating and Commenting	Conveying information by means of oral or written descriptions, pictures, graphs, maps, demonstrations etc, and evaluating outcomes and procedures.

Pupils can learn about science as a human activity by emphasizing that people of all ages, backgrounds and groups have made contributions to science and technology throughout history. They should then be able to recognize parallels between the way they work in the classroom and how scientists operate. Like scientists, pupils talk about and review their work and the work of others. Scientists and pupils often work in teams and produce knowledge together. Pupils will be asking questions and answering them through a variety of types of investigations. They will learn to use a range of instruments to develop an appreciation of a quantitative approach to their investigations. They will learn that others may interpret their evidence differently. Through their school science, it is hoped that pupils will demonstrate greater objectivity in assessing scientific information with more open-mindedness and appreciation for alternative ideas.

The teaching and learning approaches in this science syllabus draw on recent research in science learning and promote the constructivist style of learning. Pupils come to school with views on many science concepts which impact on learning. Teaching of each new concept should start by identifying what pupils think. They can do this by brainstorming, sorting activities, sentence completion, drawing, discussing concepts, cartoons, journal entries and so on.

The assessment of pupils' learning can be done by observing them at work and by looking at the outcomes of their work. There is not always a need for many formal and traditional assessment exercises. There is thus a shift towards more formative assessments, during the lesson, and the integration of performance-based assessments where pupils engage in activities to demonstrate skills developed and also present in a variety of ways to their peers. Assessments can be in the form of written, oral, hands-on or technology-based presentations.

STRANDS

1. Living Things
2. Ecosystems
3. Matter and Materials
4. Structures and Mechanisms
5. Energy
6. Earth and Space

The following six strand-charts show the relationship between the strands, the sub-strands and the topic covered.

STRAND 1 – LIVING THINGS

SUB-STRANDS	STANDARD 4	STANDARD 5
GROWTH	Variation of growth rates.	Puberty – changes that occur.
REPRODUCTION	Flowers – function.	
IRRITABILITY/ SENSITIVITY	Ears and hearing.	Temperature. Growth response of moulds.
MOVEMENT		
NUTRITION		Food Preservation.
EXCRETION	Waste produced as a result of body function.	
RESPIRATION		

STRAND 2 – ECOSYSTEMS

SUB-STRANDS	STANDARD 4	STANDARD 5
HABITAT	Wetlands are important as a habitat. Organisms found in wetlands.	
VARIETY	There are different types of wetlands.	
INTERACTION		
ORGANISMS		
ENVIRONMENT		The Ozone Layer.

STRAND 3 – MATTER AND MATERIALS

SUB-STRANDS	STANDARD 4	STANDARD 5
PROPERTIES	Properties of water. Hard and soft water. Physical Properties of materials.	Measuring – units. Volume of regular/irregular solids .
CHANGE		
SEPARATION		
USES		

STRAND 4 – STRUCTURES AND MECHANISMS

SUB-STRANDS	STANDARD 4	STANDARD 5
STRUCTURES		Forces act on structures.
MECHANISMS	Levers, pulleys and gears.	Safety when using simple machines.

STRAND 5 - ENERGY

SUB-STRANDS	STANDARD 4	STANDARD 5
SOURCES / TYPES	Sound energy.	Magnetic energy. First Law of Magnetism. Electrical Energy.
USE	Light energy.	Series and Parallel circuits. Investigating an electromagnet.
TRANSFER	How sound is transferred.	
CONSERVATION		Safety measures with electricity. Conservation in home, community, nation. Environmental impact of the use of fossil fuel.

STRAND 6 – EARTH AND SPACE

SUB-STRANDS	STANDARD 4	STANDARD 5
SPACE TRAVEL		
SOIL & ROCKS		
PLANETS		Planets in our solar system. The Universe.
EARTH	Weather and climate. Weather symbols.	Movement of the earth – earthquakes.

SYLLABUS OF WORK

STANDARD 4 – LIVING THINGS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
1. Organisms grow at different rates.	Pupils will be able to: i demonstrate that individuals of the same age vary widely in size, height, etc.	Measurement Communicating by using tables, histograms Commenting	Pupils investigate the range of sizes of pupils in the class. Carry out activities based on a hypothesis, e.g. girls are taller than boys; boys' heads are bigger than girls' heads. Make measurements. Tabulate data. Analyse data. Comment on their investigations. Pupils and teacher determine range of heights among boys and girls. Compare the height of shortest girl with shortest boy, etc. Pupils make statements to answer experimental questions.	Draw a histogram to display the differences between the measurements of boys vs. girls.

STANDARD 4 – LIVING THINGS (Cont'd)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
2. The flower is the reproductive structure of the plant	i. describe the functions of various parts of a flower	Observe by seeing, touching and smell. Inferring	Using Barbados Pride or similar flower, pupils observe differences between an open flower and a bud. They then suggest the function of the sepals. Teacher leads discussion on possible reasons for the presence of coloured or scented petals. Observe structures producing pollen. Discuss function of pollen. Dissection of the flower to compare the shape of the ovary with that of the fruit. Discussion on pollination.	Pupils summarize the functions of the selected parts of the flower and describe events which result in the development of the fruit and seeds.
3. The ear detects sound	i explain how sound travels to the ear	Observe by seeing, touching and listening	Blow a balloon. Stretch neck while air is coming out. Record what you see and hear. Place hand on throat say "Aah". What do you feel in your throat? Class discussion on how sound is produced and transmitted.	Explain why one does not have to sit in front of a radio in order to hear it.
	ii. discuss the need for two ears rather than one	Design and carry out investigation	With teacher's help, pupils design an investigation, to determine the direction from which a sound originates e.g. cover left/right ear of a person at centre of a circle while another at some position on the circumference, taps a can. The listener points to where he/she thinks sound is coming from. Another person records true direction. Repeat exercise with both ears uncovered.	Tabulate results and construct a general rule.

STANDARD 4 – LIVING THINGS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
4. Waste materials are produced as a result of activities within the human body.	i. identify waste products of the body.	Communicating orally	Ask pupils to draw and annotate a diagram of what happens to food inside us. Discussion on products generated as a result of body function, e.g. sweat, urine. Distinguish between undigested food material and metabolic waste.	Make a table to display waste products, how they are produced and the structures that get rid of them.
	ii. describe how these waste substances are produced.	Communicating orally	Sweat is generated when the body temperature rises. Urine consists of excess water and salts.	
	iii. describe how the body gets rid of these waste products.	Communicating orally Observe by seeing	Sweat – through the skin Urine – through the kidneys Pupils locate these parts on chart of the human body.	

STANDARD 4 – ECOSYSTEMS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:-			
1. Wetlands are important as a habitat for many organisms	i describe general characteristics of wetlands.	Observation	Pupils are made familiar with the basic components of wetlands. Use can be made of videos/pictures of wetland areas.	Pupils list components
	ii name some local wetlands	Communicate visually	Pupils locate local wetlands on a map of Trinidad and Tobago.	Matching wetlands with parts of the country
	iii name some common organisms found in local wetlands	Communicate in writing	Visit to Wild Fowl Trust or other wetland area to observe organisms in a wetland. Class discussion on observations made. Photographic display.	Pupils write a report on the field trip.
	iv explain the importance of wetlands to man and other organisms	Communicate orally Design models	Discuss importance of wetlands as a breeding ground for many organisms e.g. shrimp, fish; as a feeding ground for birds, dragonflies, crabs, oysters, etc.; as a source for commercial activity e.g. harvesting of crabs, oysters. Use models to demonstrate the value of wetlands in reducing flood damage, preventing soil erosion etc.	Pupils make models to illustrate the variety of organisms present in a wetland area. Pupils prepare a document advocating conservation of wetlands.

STANDARD 4 – MATTER AND MATERIALS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
1. Water from different sources may have different properties	i compare the properties of different water samples with soap	Conduct experiments to show how water samples behave when soap is added to them.	Pupils provide water samples from sources such as rain, pipe borne, spring, bottled and use a soap sample provided by the teacher to compare height of lather formed.	Provide pupils with different water samples and ask them to compare the amount of lather formed. Identify soft and hard water samples.
		Operationally define hard and soft water.	Establish whether various water samples are different. Pupils identify hard and soft samples. From observation and interpretation of results, pupils define hard and soft water.	Display of water samples after testing.
		Control variables in the experiment		Poster presentation.
		Measure height of lather and volume of liquid.		
		Record and interpret data.		

STANDARD 4 – MATTER AND MATERIALS (cont'd)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
2. Materials can be classified according to their properties.	i compare the ability of substances to conduct heat	Make and record pupils' observations.	Elicit pupils' ideas. Challenge those ideas. Pupils design and conduct activities to answer the following questions among others: Which material conducts heat, the best?	Groups design and make articles from materials based on their properties.
	ii compare the strengths of various samples of paper.	Compare strengths of various common materials.		Group presentations.
	iii compare the ability of different types of paper to absorb water.	Compare absorbency of paper with water.	Which is the best greaseproof paper? Which is the most absorbent paper?	Display of products
	iv investigate the ability of materials to transmit sound.	Design experiments to find which materials transmit sound. Conduct a fair test where appropriate.	Plan and carry out investigations to find out about other properties Which material transmits sound or light?	
	v investigate the ability of materials to transmit light.	Plan and conduct experiment to find out if the shape of an object affects transfer of sound.	Pupils design and complete experimental reports on the two investigations. Group discussion after presentations Pupils identify appropriate applications for each activity.	Group presentations Poster display

STANDARD 4 – STRUCTURES AND MECHANISMS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
1. Levers, pulleys and gears increase the effect of forces.	i. Identify parts of levers, pulleys and gears.	Communicate examples and applications of levers, pulleys and gears.	Pupils are shown photographs, samples or a video of levers, pulleys and gear systems. Pupils will identify the relevant machines and applications.	Pupils make chart on levers, pulleys and gears. Pupils will describe and explain their choices.
	ii Describe how levers, pulleys and gears make work easier.	Experiment with simple machines.	Hands-on activities to demonstrate how each machine makes work easier. Pupils will draw conclusions on the functions of these machines. Project: Groups design and construct model lever, pulley and gear systems.	Pupils demonstrate how simple machines make work easier. Presentation on how each machine works and its applications. Reports included in a portfolio.

STANDARD 4 – ENERGY

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
1. Vibrating objects produce sound	i demonstrate that sound is produced by the vibration of an object.	Investigate how sound is produced.	Elicit pupils ideas about sound. Have pupils interact with triangles, tuning forks, rubber bands and chac chac. Relate the production of sound to vibrations.	Observation and assessment of pupils investigations.
	ii explain that sound travels only through a medium.	Investigate the need for a medium for sound to travel.	Telephones made with cups and linked with string/wire Pupils will: (a) Strike a solid object-example steel bar. Touch objects and feel the vibration. Compare a vibrating object to one that is at rest. (b) Touch throat while making a sound and compare reaction when no sound is being produced. (c) Make a musical instrument using water in bottles. Play a song using this instrument.	Presentation of a chart on sounds and their vibrating media.

STANDARD 4 – ENERGY (Cont'd)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to: iii explain why sound and noise should be controlled.	Communicating the need to control sound levels.	Pupils relate situations where noise is experienced. Provide noise control justification. Presentation by EMA personnel.	Letter to the EMA/newspaper on noise pollution and control measures suggested.
2. Light is needed for seeing.	i. Explain that light travels from a source.	Observe objects in varying light intensities.	Look at an object in a 'dark box'. When light is admitted, the more clearly the object can be seen. Identify light source.	Pupils will display a variety of light sources by creating a poster with pictures.
	ii Explain that we see when light from a source is reflected from an object and enters our eyes or comes directly from the source.	Control variables to observe an object.	Pupils investigate the process of seeing using light sources, mirror, "dark box". Question pupils and let them record which materials allow light through them.	Presentations on how we see – Demonstration/Poster sessions.
	iii Investigate the passage of light through different materials.	Control variables to observe the passage of light.	Pupils manipulate materials in order to investigate the passage of light through them.	
		Classify materials based on the ability to transmit light.	Pupils compare with original ideas. Discussion on differences of information.	Pupils classify materials based on their ability to transmit light.

STANDARD 4 – EARTH AND SPACE

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
1. Weather and climate are different	Pupils will be able to: i state differences between weather and climate.	Observe the effects of the sun. Classify weather and conditions.	Pupils are asked to observe the weather pattern over 2 to 3 days, listen to weather reports and bring in newspaper based report. Discussion follows to distinguish between weather and climate. Presentation by Meteorological Officers.	Pupils are given examples of climate and weather conditions and asked to classify each one.
2. The sun affects weather conditions	i describe the ways in which the energy from the sun affects weather conditions.	Predict the effects of the sun on weather.	Discussion of the effect of energy from the sun on weather, e.g. cloud formation.	Pupils are given varying situations of the presence or absence of the sun's energy and asked to predict the effects. Pupils justify predictions.
3. Weather conditions can be recorded using symbols.	i Record weather conditions using standard symbols	Communicate information about the weather.	Pupils are invited to develop ways of recording weather conditions. Standard symbols are introduced and students restructure their symbols where possible.	Project: Pupils engage in a role play of a weather reporter doing a presentation.

STANDARD 5 – LIVING THINGS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
1. Distinct physical changes in the body occur at puberty	Pupils will be able to:			
	i place themselves on a continuum between babyhood and adulthood, in terms of physical changes.	Communicating orally and by sequencing of photographs	Let pupils arrange pictures of humans of different ages and body types (e.g. tall pupils, short adults) in order of development. Identify states as babyhood, childhood, adolescence, and adulthood. Discuss the relative lengths of each period. Let pupils identify where they think they are on the continuum.	Pupils are shown pictures of persons at various stages of development. They are asked to identify with reasons, the stage of each person.
	ii identify changes which indicate that they are moving towards adolescence.	Communicating orally Observe by seeing	Ask pupils to suggest reasons to support their chosen position of the continuum. Identify puberty as the stage between childhood and adulthood.	Discuss reasons put forward.
	iii discuss obvious physical changes which occur during puberty.	Communicating	Identify changes that occur during puberty – sexual maturation, changes in voice, onset of pimples and acne, rapid growth, etc. Discuss how there is a wide variation in onset and rate of such changes.	Let pupils determine to what extent they are undergoing these changes.
	iv state that changes happen at different ages and different rates for different people.	Observe by seeing, hearing		

STANDARD 5 – LIVING THINGS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
2. Organisms respond to changes in temperature of the environment	i identify experimental conditions which should be kept constant during an experiment.	Controlling variables, e.g. by using samples of bread of similar size and type Hypothesizing Experimenting	Pupils are taught safe procedures of mould growth e.g. growing in a sealed plastic bag. Pupils suggest a hypothesis and plan and carry out an investigation on the effect of temperature on mould growth.	Let pupils make a written record of observations.
	ii monitor the growth of mould on bread at different temperatures.	Observe by seeing	Pupils observe growth of mould over a period of time.	Discussion – Where would be the best place to store bread in your home?
	iii identify the temperature at which mould grows best. iv state safe procedures for growing micro-organisms.	Communicate by written description Comment on investigation Inferring	Based on their observations, pupils make inferences about the relationship between temperature and the rate of growth of mould and communicate the outcome. Pupils identify safety procedures. Pupils and teacher comment on the investigation.	

STANDARD 5 – LIVING THINGS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
3. Proper food storage is important in preventing diseases.	i. describe how a mould feeds	Communicate with written description	Review previous activity on effect of temperature on growth of mould. Describe how mould feeds on bread in order to grow. Include the fact that poisons may be produced. Discuss the consequences of eating mouldy food e.g. food poisoning. Stress no touching or smelling of moulds.	Small group presentations
	ii explain that poisons may be produced as mould grows	Observe by looking		
	iii describe methods of reducing/preventing growth of mould on various foods	Communicate by written description	Field trip to a shop or supermarket. Let pupils make lists of the types of food stored in chillers, freezers and at room temperature. Explain how these methods work to prevent the growth of mould on these foods.	List and discuss other ways in which foods are protected from developing mould in the supermarket e.g. putting in cans/bottles, covering with plastic wrap etc.

STANDARD 5 – ECOSYSTEMS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:-			
1. The ozone layer protects the earth from harmful radiation.	1. describe the ozone layer.	Communicate orally and in writing.	Pupils research features of the ozone layer e.g. location and function.	Based on their research, pupils prepare posters for display in the classroom.
	2. discuss the effects of depletion of the ozone layer.	Communicate orally. Predict consequences.	General discussion on substances which damage the ozone layer and effects of its depletion on humans e.g. skin diseases, bad sunburns, damage to the eyes.	Pupils suggest and list methods for reducing the effects of a depleted ozone layer on humans.
	3. identify ways in which damage to the ozone layer can be reduced.	Make inferences. Communicate in writing.	Pupils examine their everyday practices and identify ways in which they can help to reduce damage to the ozone layer.	Pupils prepare a brochure to help encourage their families to engage in conservation activities.

STANDARD 5 – MATTER AND MATERIALS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
1. Matter can be measured in standard units	i state the importance of units of measurements	Communicate orally the rationale for units of measurements	Groups identify measurements made previously in the course and the units of measurement. Pupils discuss and present in groups the importance of measurements.	Calypso/Role play on the importance of units in measurement.
	ii Determine the volume of regular and irregular shaped solids that (a) sink in water or (b) float in water	Measure the dimension of objects accurately	Question pupils to elicit how the volume or an irregular shaped object can be measured (one that sinks in water).	Give pupils irregular shapes that sink to measure volume.
		Measure the volume and mass of irregular shaped objects by the displacement method	Elicit from pupils how the volume of irregular shaped objects can be measured Suggest: tie a sinker, to submerge the object, use a pointer.	Give pupils irregular shapes that float; e.g. piece of Styrofoam and ask to measure the volumes Teacher observation. Record in portfolio.
		Measure the volume of an irregular object that floats on water.	Class discussion on sources of errors and how to improve accuracy. Apply to accurately measure volumes.	Presentation of findings.

STANDARD 5 – STRUCTURES AND MECHANISMS

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
1. Forces act on Structures	i describe a force in terms of a push or a pull	Define operationally a force	Pupils are presented with an object and asked to suggest ways of moving it. Pupils demonstrate their suggestions. Pupils identify what is needed to move an object.	Pupils will write an operational definition of force in terms push, pull.
	ii compare the force needed to lift a load, with and without a simple machine.	Experiment with machines	Pupils will perform a variety of activities and report their results to the class. The lever, pulley, inclined plane and gear systems are suggested.	Performance assessment to show a comparison of force with and without a machine.
	iii describe safety measures when using simple machines	Communicating safety measures via song	Pupils in groups compose a calypso or rap on safety when using simple machines. Research in the library or via the internet. Interview/observe workers using machines.	Calypso/rap contest on safety when using machines.

STANDARD 5 – ENERGY

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:-			
1. Magnetism is a form of energy	i identify magnetic and non-magnetic materials.	Observe the effects of magnets on materials.	Pupils draw cartoons to identify their perception of the effects of magnets.	
		Classify materials	Teacher asks pupils to classify some objects in a box. Magnets are introduced as a means of separation of materials, and pupils explore their use here. Materials are classified as magnetic or non-magnetic.	Construct a mechanism that uses magnetism e.g. a toy.
	ii identify the north and south seeking poles of the magnet.	Observe magnetic poles.	Groups suspend a bar magnet to identify the North and South seeking poles. Teacher supports pupils in defining the poles of the magnet.	Observations of pupils.
	iii State that like poles repel, unlike poles attract.	Define operationally the first law of magnetism.	Groups interact with two magnets of known poles. Make inferences based on observations when two poles are close to each other. The first law of magnetism is introduced based on pupils' responses.	Groups present their findings from interactions.

STANDARD 5 – ENERGY (Con't)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
	Pupils will be able to:			
2. Electricity flows under certain conditions.	i Construct a simple series circuit ii Construct a parallel circuit	Define operationally types of circuits.	Pupils, using bulbs, wires and a cell, explore different connections to make the bulb light. Pupils use fair testing to demonstrate the effect of the removal or addition of different parts of the circuit. Pupils draw the resulting circuits.	Pupils make and explain electric circuits. Observe pupils' investigation and assess their reports. Pupils develop an operational definition for types of circuits. Problem: Why does the rest of the lights in a Christmas tree light when one bulb blows? Pupils construct parallel /series circuit to demonstrate. Pupils identify other applications of parallel circuits.
	iii Construct an electromagnet	Experiment with circuits	Use wire, cell or battery, and an iron nail to make an electromagnet. Pupils use fair testing to manipulate variables when experimenting with the strength of the electromagnet. Pupils explore applications of electromagnets.	Pupils plan and design a simple project e.g. buzzer and explain function. Display of electromagnets with explanations.
	iv Develop a list of electrical safety measures	Communicate visually, orally and via drama about electrical safety	Resource personnel discuss with pupils about electrical safety e.g. PowerGen, University of Trinidad and Tobago, UWI engineers. Use newspaper clippings for research. Drama/role play on electrical safety.	Electrical safety posters display.

STANDARD 5 – ENERGY (Con't)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT STRATEGIES
3. The consumption of electrical energy can be reduced.	Pupils will be able to: i List ways to conserve electricity	communicate orally, ways of conserving electricity	Pupils discuss how electricity can be conserved in their homes, communities, country. Invite Powergen/TTEC personnel.	Group presentations on electrical energy conservation.
	ii Evaluate the environmental impact of the use of fossil fuel.	Investigate alternatives to fossil fuel.	Projects on alternatives to fossil fuel are done using secondary sources. EMA presentation to students	Develop a portfolio on the environmental impact of the use of fossil fuels. Project presentations.

STANDARD 5 – EARTH AND SPACE

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
1. Earthquakes cause damage and loss of life.	Pupils will be able to: i explain the causes of earthquakes.	Communicate causes of earthquakes.	Teachers explores pupils' experiences of earthquakes. Ask pupils to draw and label a picture of what they think causes earthquakes. Discussion ensues to clarify misconceptions. Reference books/CDs used. Discuss the causes and effects of earthquakes including extent of damage and loss of life.	Pupils are given newspaper/internet report of an earthquake and asked to comment on the causes and effects of earthquakes
2. The planets are in a fixed relationship with one other.	i describe characteristics of the planets in our solar system	Communicate relationships among the planets	Pupils research the solar system, focusing on relationships among planets. Teacher discusses with pupils, the size of the planets; obtain agreement on scale, pupils draw a model to scale with respect to both size and distance. The class is divided into groups each group makes a model of the solar system. The model is put together using wire. Visit to National Science Centre. Presentation by the Astronomical Society of Trinidad and Tobago	Pupils are given the characteristics and asked to identify the planet or vice versa. Group presentations. Display. Teacher assesses the model for accuracy and creativity.

STANDARD 5 – EARTH AND SPACE (cont'd)

CONCEPTS	OBJECTIVES	ENQUIRY SKILLS	SUGGESTED TEACHING/LEARNING ACTIVITIES	SUGGESTED ASSESSMENT ACTIVITIES
3. Space is a vast entity made up of several galaxies	i define the term 'universe'.	Observe the position of stars and planets.	Pupils are invited on a clear night to lie on their backs on the ground on a sheet and observe the sky. Note what they observe. Discussion in class. Teacher points out the constellations on star charts and other celestial bodies.	Make a scrap book on "our skies"
	ii identity the nature of the universe.	Communicate the nature of the universe via drawing.	Teacher discusses the meaning of galaxies. Groups research the nature of the universe and present to the class. Invite personnel from the Astronomical Society of Trinidad and Tobago, UWI Physics Department	Poster presentation by groups.

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