



CARIBBEAN
EXAMINATIONS
COUNCIL

Caribbean Certificate of
Secondary Level Competence®

SYLLABUS

INTEGRATED SCIENCE

CCSLC/IS/02/12

Effective for examinations from May–June 2014

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CCSLC/IS/02/12

NOTE TO TEACHERS AND LEARNERS

This document CXC CCSLC/IS/02/12 replaces CXC CCSLC/IS/02/2006.

Please note that the syllabus has been revised and amendments are indicated by italics.

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Please check the website www.cxc.org for updates on CXC's syllabuses.

PLEASE NOTE



This icon is used throughout the syllabus to represent key features which teachers and learners may find useful.

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Caribbean Certificate of Secondary Level Competence

◆ INTRODUCTION

The Caribbean Examinations Council (CXC) in consultation with policy makers and educators in CXC Participating Territories identified the need for a new programme that *would* respond to the changing demands of the education sector. A major development *has been* the move by all territories to universal secondary education *which* enables persons with a wide range of abilities to benefit from educational provision at this level. The decision to implement programmes to achieve universal secondary education is based on an understanding that the region needs a well-educated and trained labour force for an increasingly competitive global environment. A sound secondary education foundation is imperative for further education and training *and for entry in the world of work*.

Several territories, *having* recognised the need for a programme that *would* meet the new needs in secondary education, had embarked on the development of national programmes. However, through consultations at the regional level, policy makers and educators recognised that a regional intervention by CXC *would* have several benefits including cost-effectiveness, *common standards*, portability of certification and regional and international recognition.

CXC has responded. Through the consultative processes employed in syllabus development, *CCSLC was developed* and first examined in 2007. The programme which is competency-based comprises a core of subjects – English, Integrated Science, Mathematics, Modern Languages and Social Studies. Through this core, the learner should acquire the knowledge, skills, competencies, values and attitudes that are desired in a secondary school leaver. The core developed by CXC subject panels will be examined by CXC. In addition, learners can gain additional benefit through special programmes that may be added as electives to the core at national level.

Policy makers and educators have noted that, ideally, this core programme could be taken by all students at the stage when they are ready. However, the decision on who should take the examination and in what year it will be taken will be *made* at national level in consultation with CXC. A person who successfully completes this core should have the foundation for further education and training and for entry level employment. In developing and implementing this programme at the secondary level, CXC, working with its partners, took into consideration the cultural context and the aspirations of regional governments for a well-educated and trained labour force to meet the targets set for social and economic development *as enshrined in the CARICOM document “The Ideal Caribbean Person (2000)”*. *The foundation* that this programme will provide is an imperative as a base for the development of citizens as the most valuable resource of the small states of the region.

The main focus of this programme is derived from the aspirations of regional governments and the Caribbean Community (CARICOM) which acknowledge that education is the route to healthy democracies and sustainable development. The curriculum is therefore competency based and encompasses the knowledge, skills, attitudes, values and attributes expected of high school graduates by regional Governments. Some of these knowledge, skills, attitudes, values and attributes or competencies are generic and cut across all five subjects, whilst others are peculiar to each of the five subjects of the curriculum. The generic and subject specific competencies targeted for development in the curriculum are given below.

GENERIC COMPETENCIES

- PROBLEM SOLVING
- CRITICAL THINKING
- INFORMED DECISION MAKING
- MANAGEMENT OF EMOTIONS
- POSITIVE SELF CONCEPT
- WORKING IN GROUPS

SUBJECT-SPECIFIC COMPETENCIES

- ABILITY TO COMMUNICATE ORALLY AND IN WRITING
- ABILITY TO FUNCTION IN A FOREIGN LANGUAGE
- MATHEMATICAL LITERACY
- SCIENTIFIC LITERACY
- SOCIAL AND CITIZENSHIP SKILLS



- HANDLING CONFLICT
- DEALING WITH DIVERSITY AND CHANGE
- INDEPENDENT LEARNING STRATEGIES
- COMPUTER LITERACY
- TECHNOLOGICAL LITERACY

COMPETENCIES

The structure of the programme takes into consideration that the attainment of the competencies identified is the result of processes that require life-long learning and that mastery is attained by progressive steps over differing periods of time. Bearing in mind that one of the main purposes of the curriculum is to prepare individuals to participate fully as productive members of society, key competencies have been identified that are essential for daily living with emphasis on the workplace. A Learning Grid (Appendix I) lists the key competencies across the five subjects of the curriculum, identifies a reference number and indicates the subjects or group of subjects that specifically engage the learner in its development.

OUTCOMES OF THE CURRICULUM

The curriculum hinges on the realisation that teaching and learning are essential instruments for the development of autonomous individuals who will be able to function effectively as productive members of society. In this regard, the curriculum has identified knowledge, skills, attitudes, values and attributes or competencies that students who master the programme should have attained. These include:

- a positive image of self, family, community, region and world;
- respect for others irrespective of age, class, creed, gender, ethnicity, physical disabilities or nationality;
- an abhorrence of violence in all its forms and commitment to settle disputes through arbitration and conciliation;
- the capacity to understand that individual freedom is consonant with the acceptance of personal responsibility for one's own actions;
- commitment to ethical and moral societies that recognise equality of opportunity, freedom of expression and association, and the right to fair judicial process.

Main Elements of the Curriculum

- *It provides the foundation for knowledge, skills and attitudes required for secondary education.*
- It provides the foundation for further education and training and for entry level employment.
- It provides articulation between and within subject groups offered in the Caribbean Secondary Education Certificate (CSEC) examination by catering for students who continue at secondary school to take General Proficiency examinations in academic or technical and vocational or a mix of academic and technical and vocational subjects.
- It facilitates articulation within the wider school curriculum and responds to the developmental needs of the region.

Integrated Science Syllabus

◆ RATIONALE

Integrated Science is an interdisciplinary subject which provides students with the opportunity to study issues relevant to Science in everyday life. Such study integrates perspectives from various disciplines including Biology, Chemistry, Physics, Earth Science and others.

An understanding of science is central to a young person's preparedness for life in modern society. It enables an individual to participate fully in a society in which science and technology play a significant role. This understanding also empowers individuals to participate appropriately in the determination of public policy where issues of science and technology impact their lives. The inclusion of Integrated Science in the school curriculum will contribute significantly to shaping the quality of life through promotion of personal health practices and respect for the environment. The programme, therefore, aims at providing Caribbean learners with the knowledge, skills, values and attitudes that would help them negotiate an increasingly complex and dynamic technological environment in which they have to live and work, as well as contribute positively to the region and the world.

This course of study will contribute to the development of the Ideal Caribbean Person as articulated by the CARICOM Heads of Government who has respect for human life and is aware of the importance of living in harmony with the environment; demonstrates multiple literacies, independent and critical thinking and the innovative application of science and technology to problem solving. Based on the UNESCO Pillars of Learning, on completion of this syllabus, students will learn to do, learn to be and learn to transform themselves and society.

◆ AIMS

The study of Integrated Science is intended to assist students to:

1. develop knowledge, skills, attitudes and values of science for lifelong learning;
2. develop an appreciation of the role of science in fostering a safe and healthy lifestyle;
3. develop an awareness of the value of science in solving everyday problems *and making informed decisions*;
4. *develop scientific literacy to function effectively within an increasingly technological and scientific global environment*;
5. appreciate the need to contribute to sustainable development through *living in harmony with the environment*;
6. *develop important life skills such as problem solving and critical thinking.*

◆ GENERAL OBJECTIVES

On completion of this syllabus, students should:

1. appreciate the dynamic nature of Science and the impact of Science and Technology on the world in the twenty first century;
2. understand the importance of quantifying the dimensions of matter;
3. be aware of the contributions of the Caribbean to Science and Technology;
4. *understand* the particulate nature of matter, and its chemical and physical properties;



5. understand that there is interdependence *among* living organisms;
6. understand the relationship between structure and function for selected body systems;
7. appreciate the components of the physical environment and their inter-relationship;
8. understand the need to practise a healthy lifestyle;
9. appreciate the role each individual must play in preserving the environment;
10. understand the impact of energy on man's activities and the interchange among the different forms of energy;
11. appreciate the need for responsible use of energy;
12. integrate Information and Communication Technological (ICT) tools and skills.

◆ COMPETENCIES TO BE ASSESSED

1. RECORDING AND COMMUNICATION (RC)

Students will be able to record scientific data and communicate information effectively, orally, graphically and in writing.

Criteria: make accurate observations; accurately record data in table and graph (*titles, correct axes, accurate plots, suitable scales*); classify substances; use scientific format, appropriate language and content; and demonstrate creativity.

2. MANIPULATION AND MEASUREMENT (MM)

Students will be able to safely use appropriate instruments to accurately measure various physical qualities.

Criteria: demonstrate competence and safety for self and others in the sequencing of events; select and use appropriate instruments (*drawing*); take accurate readings (*number of trials*).

3. DRAWING (DR)

Students will be able to make faithful representation of different species.

Criteria: make large, clear, accurate representations; use adequate labelling; use pencil to make smooth lines, indicate magnification and view where appropriate.

4. ANALYSIS AND INTERPRETATION (AI)

Students will be able to carry out, analyse and interpret data from experiments to solve problems.

Criteria: identify relationships and patterns; make logical inferences *and* valid predictions; evaluate data; *relate conclusion to aim*.

5. PLANNING AND DESIGN (PD)

Students will be able to plan and design experiments to solve problems.

Criteria: state problem *and* hypothesis; use *appropriate* method; *identify* variables; *include* controls; *state* limitations.

6. SOCIAL ATTRIBUTES (SA)

Students will be able to function efficiently and effectively *in a group setting*, while collaborating to achieve a common goal.

Criteria: show cooperation and *act responsibly*; resolve conflict and *achieve* consensus in decisions, show respect for others and the environment; demonstrate willingness to review decisions based on feedback from others.

◆ ORGANISATION OF THE SYLLABUS

Module 1	-	Working Like a Scientist
Module 2	-	Investigating Matter
Module 3	-	Understanding Life
Module 4	-	Focusing on me
Module 5	-	Exploring Energy

◆ SUGGESTIONS FOR TEACHING THE SYLLABUS

The organisation of each Module in the syllabus is designed to facilitate inquiry-based learning and to ensure that connections among concepts are established. Teachers should ensure that their lessons stimulate the use of all of the senses in learning. This will help students view science as a dynamic and exciting investigative process. This syllabus caters to varying teaching, learning and assessment strategies. Greater emphasis should be placed on the application of scientific concepts and principles and less on the factual materials, which encourage memorisation and short-term recall. The role of the teacher is to facilitate students' learning of accurate and unbiased information that will directly contribute to a more scientifically literate citizenry that is capable of making educated and ethical decisions regarding the world we live in.

◆ ASSESSMENT GUIDELINES



Assessment is an integral component of the syllabus. Its major functions include facilitating learning, providing information which may be used by students and teachers in the planning of subsequent instructional experiences, and providing information on the highest level of proficiency demonstrated by the student. Teachers are encouraged to take advantage of the flexible structure of the programme to ensure that students demonstrate mastery of each increment of the programme before going on to the next. A student who has attained mastery should, on any subsequent occasion and without assistance, be able to demonstrate the highest levels of proficiency on the same or an equivalent task.

The assessment for each syllabus comprises two major components: School-Based Assessment (SBA) and External Assessment (EA).

SCHOOL-BASED ASSESSMENT (SBA)

This assessment spans two phases.

Phase 1: Formative Assessment

Teachers assess students to identify their areas of strength and weakness. This assessment may be formal or informal, and is usually continuous and integrated with teaching and learning. Some teaching and learning activities are suggested in this syllabus and the assessment tasks may either be designed or sourced by the teacher, or may be selected or adapted from the examples provided in the assessment column of this syllabus.

Information derived from this type of assessment should be used by teachers and students in planning subsequent action. Students should be encouraged to assess themselves (self- and peer- assessment) and, wherever practical, to participate in the planning of subsequent activity. The effectiveness and management of this approach may be enhanced by sharing the assessment criteria with students before the assessment is done, or by engaging them in the development of these criteria.

Phase 2: School-Based Assessment

Teachers assess students in order to create an objective record of the highest level of proficiency demonstrated. Students may be assessed any time after the teacher deems that they have attained mastery. Teachers may also provide practice exercises which integrate skills across the Modules. The students may be assessed individually or in groups, and the

arrangements and scheduling may be influenced by the nature of the task and logistical and administrative considerations. A single standardised summative task is required for each Module. Each subject has five modules and for each student, the teacher will submit to CXC the scores for each of the five modules.

The following three specifications facilitate the standardisation of the summative assessments:

- (a) A generic task is outlined at the end of each Module. This task provides general specifications and conditions which must be satisfied by the assessment undertaken by all students. However, within the limits specified, teachers may adapt the tasks to reflect local or individual interests. For each assignment, one example of an adaptation is given.
- (b) A standardised rubric or mark scheme is defined and is to be used by the teacher in scoring all students' work. This rubric/mark scheme is designed to clearly indicate the dimensions of interest and the relative importance of each; consequently, it may be used by teachers to verify the appropriateness of their adapted task. While the generic task may be adapted, the mark scheme is not to be adjusted. **The same mark scheme is to be used by all teachers and students across all centres and territories.**
- (c) It is expected that quality control and monitoring of teachers' adherence to the specifications will be arranged and managed at the local level.

In order to ensure that students have reasonable opportunity to achieve and demonstrate mastery, teachers can afford their students multiple opportunities to retake or resubmit, the School-Based Assessment for any Module. Feedback and suggestions for improvement may be provided between attempts, however, the process should be transparent and objective, and the mark awarded should be indicative of the level of proficiency that the candidate would be able to demonstrate independently. The achievement of mastery is emphasised in this programme; thus, a student will be expected to achieve a minimum of 50 per cent of the marks available for the School-Based Assessment component that will be completed in preparation for taking the external examination.

MODULE SCHOOL-BASED ASSESSMENT TASKS

MODULE 1: Portfolio

MODULE 2: Investigation

MODULE 3: Portfolio

MODULE 4: Class Test

MODULE 5: Portfolio

MODERATION OF SCHOOL-BASED ASSESSMENT

Teachers will be required to submit when requested by CXC, a sample of candidates' work completed for School-Based Assessment for moderation purposes. This procedure serves to ensure that the scores awarded by teachers throughout the system are consistent with the standards set by CXC. The samples will be reassessed by a CXC examiner. The examiner's comments will be sent to teachers as moderation feedback.

EXTERNAL ASSESSMENT

At any given sitting, candidates may register to write the external examination in one or more subjects. The External Assessment will be a multiple-choice examination comprising 50 items.

◆ ELIGIBILITY FOR CCSLC

A candidate will be awarded the CCSLC certificate if He/She, over a period of up to five years, successfully completes a minimum of **five** subjects selected as follows:

1. **Two compulsory subjects**

Syllabus developed by CXC specifically for this programme

- (a) *English*
- (b) *Mathematics*

2. Three subjects from any group or combination of groups listed below:

(a) **Other subjects developed by CXC specifically for CCSLC**

- (i) *Integrated Science*
- (ii) *Modern Languages: French, Portuguese, Spanish*
- (iii) *Social Studies*

(b) **CSEC, TVET and Business Studies Programme – Grades I, II, III and IV**

<i>Family and Resource Management</i>	<i>Principles of Business</i>
<i>Textiles, Clothing and Fashion</i>	<i>Principles of Accounts</i>
<i>Food, Nutrition and Health</i>	<i>Electronic Document Preparation and Management</i>
<i>Building and Furniture Technology</i>	<i>Electrical and Electronic Technology</i>
<i>Mechanical Engineering Technology</i>	<i>Office Administration</i>
<i>Agricultural Science</i>	<i>Information Technology</i>
<i>Technical Drawing</i>	<i>Economics</i>

(c) **CSEC Creative and Expressive Arts – Grades I, II, III and IV**

<i>Music</i>	<i>Theatre Arts</i>
<i>Visual Arts</i>	<i>Physical Education and Sport</i>

(d) **TVET and other Programmes certified by other Boards**

For example, City and Guilds, Heart Trust/NTA (Jamaica) and Royal College of Music

(e) **TVET Level 1 Programmes available in the Region**

For example, Beauty Culture, Auto Mechanics, Cabinet Making and Hospitality

(f) **Any locally certified enrichment programme which satisfies the criteria set by CXC**

For example, Citizenship Education and Community Service

Candidates are responsible for ensuring that such programmes satisfy these criteria.

3. Reporting CCSLC Results

Scores from the School-Based Assessment (SBA) and the External Assessment (EA) will be combined to give a composite score with a maximum of 100. A single subject grade will be reported. The grade boundaries are as follows:

Composite Score	Grade
75 - 100	Master
50 - 74	Competent
1 - 49	Developing Competence

4. Certification

- (a) A result slip *and a certificate* will be issued after every sitting of subjects developed by CXC.
- (b) A Certificate will be awarded after a candidate achieves a minimum of Competent in five subjects within a five-year period.

◆ FORMAT OF THE ASSESSMENT



School-Based Assessment

Five summative Module-Assessments – one per Module.

External Assessment
(1 hour 15 minutes)

Fifty multiple-choice items; each item will have four options.

NOTES ON THE EXAMINATION

- The teacher will set and mark the assignments that make up the School-Based Assessment of each Module using the Guidelines provided.
- The teacher will submit marks for each of the five Modules.
- Samples submitted for moderation must be accompanied by a scoring rubric.
- The teacher will submit the *marks for each Module* to CXC no later than 31May.
- CXC will combine the marks earned on the School-Based and the External Assessment to produce the candidate's overall grade.
- All School-Based Assessment materials must be retained by the school for at least six months after the issuing of results.*
- The mark allocation for this syllabus is shown below:

Component	Marks Allocated					Total Marks	% Contribution to Composite Score
	Module 1	Module 2	Module 3	Module 4	Module 5		
School-Based Assessment	20	20	20	20	20	100	50
External Assessment	10	10	10	10	10	50	50
% Contribution to Composite Score	20	20	20	20	20	*****	100

- A candidate will be awarded the certificate if he/she, over a period of up to five years, successfully completes a minimum of five subjects as specified on pages 4 – 5.
- A result slip will be provided after every sitting for which a candidate registers for the external examination in one or more subjects.

◆ REGULATIONS FOR RESIT CANDIDATES



- Resit candidates must complete Papers 01 and 02 of the examination for the year for which they re-register. Resit candidates who have earned fifty per cent of the **MODERATED** score for the School-Based Assessment may elect not to repeat this component, provided they re-write the examination no later than the year following their first attempt. The scores for the School-Based Assessment can be transferred once only, that is, to the examination immediately following that for which they were obtained.
- Resit candidates who have obtained less than 50 per cent of the **MODERATED** scores for the School-Based Assessment component must repeat the component at any subsequent sitting.
- Resit candidates must be entered through a school or other approved educational institution.

◆ MODULE 1: WORKING LIKE A SCIENTIST

This Module contains the following topics:

- (a) Science and Technology;
- (b) Responding to Challenges Using Science and Technology;
- (c) *Measurement: An Important Scientific Skill.*

◆ GENERAL OBJECTIVES

On completion of this Module, students should:

1. appreciate the dynamic nature of Science and the impact of Science and Technology on the world in the twenty first century;
2. be aware of the contributions of the Caribbean to Science and Technology.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(a) Science and Technology			
1. distinguish between science and technology;	Science - tools for development of technology. Technology - application of science.	Teacher organises students into groups and asks each group to consider what life would be like without some aspects of technology, for example, pen, electricity, shoes, television, ploughs, fly swatter, cellular phones, X-Ray machine, automobiles. Groups should give a statement about what technology is. Teacher leads the discussion on the role of science in the development of technology. Teacher could ask students to propose how a named technological device or process was developed, for example, pen, shoes, television and automobile. Students are asked to hypothesise why the technology was created and how it might have been developed.	<i>Students will find information on the development of some everyday items such as iron, phone, mechanical pencil and make a presentation on its impact on our lives. (Presentation can be in any form, for example, PowerPoint and poster.)</i>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
<p>2. discuss the importance of maintaining a safe environment;</p> <p>3. <i>identify common safety symbols and what they represent;</i></p>	<p>Home – practices and household safety symbols. School – laboratory rules <i>and safe use of equipment</i>. Community – road safety rules and rules on the playground.</p> <p>Safety symbols <i>and precautions</i>: corrosive, radioactive, flammable, explosive, harmful, poisonous, danger.</p>	<p>Class discussion for road safety to identify the need to follow rules and the importance of obeying signs for the safety of self and others.</p> <p>Students in groups will write three (3) laboratory rules. Class discussion on importance of laboratory rules. <i>Teacher presents scenarios of unsafe practices in the home as a stimulus for class discussion on home safety.</i></p> <p>Students may be asked to collect labels from common household containers and products and bring them to class. Students will compare the symbols found and list the symbols and their meanings.</p> <p><i>N.B. Teacher should ensure that students are familiar with the safe use of common laboratory equipment, for example, Bunsen burner, thermometer and glassware.</i></p>	<p>Have students draw a representation of an unsafe practice and the corresponding safe practice (<i>school and home</i>). Teacher assesses the <i>representation</i> for correctness of content.</p> <p>Teacher will give students a matching activity using five (5) symbols with their meanings. <i>Students will match safety symbols and discuss relevant precautions when using products labelled with each symbol.</i></p>
<p>4. <i>demonstrate</i> ways in which scientists do their work;</p>	<p>Scientists: observe, experiment, measure, record results, interpret results and share findings.</p>	<p>Teacher provides activities for students to develop skills in observing, classifying, inferring, measuring, predicting, interpreting data, forming hypothesis, separating and controlling variables, experimenting, <i>recording and reporting</i>.</p>	<p><i>Students will be taken on a nature walk where they will observe, classify and make inferences about the objects present in the environment.</i></p> <p><i>Students will make simple labelled drawings of whole or part of plant and animal samples found. Teacher assesses students based on Drawing skills.</i></p> <p><i>Students will make a simple pendulum using a stone and string and measure the length of string after it is attached. They will measure and record the time taken for 20</i></p>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
			<p><i>swings. Students will then predict if the time taken for 20 swings will increase or decrease if the length of the pendulum is shortened, then test their prediction. Teacher assesses Analysis and Interpretation and Recording and Communication.</i></p>
<p>5. <i>use scientific format to document scientific information;</i></p>	<p><i>Scientific format:</i></p> <ul style="list-style-type: none"> (a) <i>aim;</i> (b) <i>apparatus and materials;</i> (c) <i>method/procedure;</i> (d) <i>results/observations;</i> (e) <i>discussion and conclusion.</i> 	<p><i>Teacher leads class discussion on the importance of using scientific format in writing reports.</i></p> <p><i>In pairs students measure each other's height and record this information. Students will classify class data into ranges using a table. Students will draw a graph using the information. Students will write a report in scientific format using the information.</i></p>	
<p>6. <i>apply the scientific method to a given situation;</i></p>	<p>The scientific method involves:</p> <ul style="list-style-type: none"> (a) <i>observation/statement of problem;</i> (b) <i>hypothesising;</i> (c) <i>variables;</i> (d) <i>experimenting;</i> (e) <i>recording and reporting;</i> (f) <i>drawing conclusions;</i> (g) <i>redesigning if necessary.</i> 	<p>The teacher <i>guides students</i> through the planning and designing of an experiment to investigate a problem suggested by the class. The teacher highlights the scientific method used and asks students to record the example as it is being developed.</p>	<p>Each learner will be presented with a problem situation (and may also get the resources required), and will be required to plan and design an experiment to investigate this problem. Examples of problems:</p> <ul style="list-style-type: none"> (a) When green fruits are wrapped in newspaper they ripen faster than when left unwrapped. Plan and design an investigation to test this hypothesis. (b) Objects painted black dry faster than objects painted white. Plan and design an experiment to demonstrate this.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
			<p>(c) Iron objects close to the sea rust faster than those further inland. Plan and design an investigation to test this hypothesis.</p> <p>Please note that it is sufficient for the students to do the <u>Planning and Design aspects only</u>.</p>
(b) Responding to Challenges Using Science and Technology			
7. identify <i>challenges</i> specific to the Caribbean;	<p>Examples:</p> <ul style="list-style-type: none"> (a) loss of agricultural land; (b) decrease in potable water sources; (c) limited physical resources; (d) costly energy supplies; (e) lower agricultural yields; (f) increased susceptibility of crops and livestock to diseases; (g) susceptibility of <i>physical</i> structures to <i>damage from weather systems (hurricanes, storms, floods)</i>. 	Students will collect <i>information from electronic and print media</i> that highlight some of the challenges experienced in the Caribbean region <i>and discuss the problems in class</i> .	Students <i>in groups</i> create collage depicting common challenges in the Caribbean. Teacher assesses the <i>activity</i> for <i>Social Attributes</i> .
8. discuss how science and technology have been utilised to solve one (1) of the challenges;	<p>Examples:</p> <ul style="list-style-type: none"> (a) soil conservation methods, terracing and crop rotation; (b) desalination, <i>recycling</i> waste water; (c) hydroponics, tissue culture, <i>greenhouse technology</i>; 	Students in small groups, research changes in technology that have been utilised to solve one of the challenges. <i>Students will give oral presentations of their findings.</i>	Teacher will assess reports using criteria for Recording and Communication.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
	(d) wind farms, biogas, <i>gasohol</i> , solar devices, hydroelectricity, natural gas, bagasse; cloning, genetically modified organisms; (e) stem cell research; (f) new roof designs, building codes.		
9. describe the work of at least three (3) Caribbean Scientists;	The names of selected Caribbean scientists and their areas of work (see appendix II).	Learners, in groups, research and present a display (<i>for example, posters, 3 dimensional models</i>) on the work of a Caribbean scientist. Each group should research a different scientist.	Use a scoring rubric to assess display with criteria related to accuracy of content, breadth of information and creative use of material.
(c) Measurement: An Important Scientific Skill			
10. discuss two reasons measurement is important;	The importance of measurement: (a) accuracy; (b) unreliability of senses; (c) standardisation.	<i>Students will place a finger simultaneously into separate containers of warm and cold water for one minute, then place both fingers in another container of water and estimate its temperature. Teacher needs to use estimates from students to emphasise the unreliability of the senses and the need to use aids to measure.</i>	Students are asked to write a sentence giving two reasons for the importance of measurement.
11. <i>define the terms</i> length, mass, volume, temperature, and time;	Length - distance between two points. The units for length - metre (m), centimetre (cm) and millimetre (mm). Instrument – metre rule.	<i>Students are given stimulus material to check for understanding of length, mass, volume, temperature and time.</i> <i>For example, ball dropped in water to illustrate volume as space occupied; temperature change in migration from a Caribbean climate to Canada.</i>	<i>Students complete a table summarising the quantities, their units, symbols and suggested measuring instruments. The teacher will check the accuracy of the information and assess using criteria for Recording and Communication.</i>
12. state the SI units and instrument used to measure length, mass, volume, temperature and time;	Mass - amount of matter in an object. The units for mass - grams (g) and kilograms (kg). Instrument – laboratory balances.	<i>Students will find information on the units and related instruments for each quantity and discuss findings in class.</i>	

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
	<p>Volume - amount of space taken up by an object. The units for volume - cubic centimetre (cm³) or millilitres (ml). Instrument – measuring cylinder.</p> <p>Time - measurement period. The units of time - seconds(s) minutes (min) and hour (hr). Instrument – timers, stop clocks.</p> <p>Temperature - how hot a substance is. The unit for temperature - degrees Celsius (°C) Instrument – thermometer.</p>	<p><i>Given an object, students will select a suitable instrument to measure its length, volume or mass.</i></p> <p><i>Similar activities can be selected for time and temperature.</i></p>	
13. demonstrate the correct use of measuring instruments.	<i>Correct reading of scales, selection of suitable instrument, correct procedure for use of equipment.</i>	<p>Review, demonstrate and allow students to practise the correct procedures for the use of the instruments listed.</p> <p>Use the equipment listed to measure length, mass, volume, temperature of various objects and time.</p>	<p>Teacher develops and shares a checklist to evaluate students' mastery in using the measuring devices. Teacher monitors students as various items are measured and assess using criteria for Manipulation and Measurement skills.</p> <p>Students complete a table recording their measurements. The teacher will assess the accuracy of the information.</p>

SCHOOL-BASED ASSESSMENT (SBA)

Generic Task

Key skills to be assessed are **Recording and Communication (RC)**, **Measurement and Manipulation (MM)**, **Drawing (DR)**, **Analysis and Interpretation (AI)**, **Planning and Designing (PD)** and **Social Attributes (SA)**.

Students will create a portfolio of their best work comprising six (6) activities as listed below **and** include a brief reflective piece on at least two things learnt from doing the Module.

- (a) A sample from summary table (Specific Objective 12)
- (b) A sample from checklist evaluating students use of equipment (Specific Objective 13)
- (c) A sample drawing (Specific Objective 4)
- (d) A sample analysis and interpretation exercise (Specific Objective 5)
- (e) A sample planning and designing exercise (Specific Objective 6)
- (f) A sample piece based on group work (Specific Objective 7)

Scoring Rubric

- (a) **Recording and Communication** **(Maximum 3 marks)**

Summary Table

- (i) Accuracy of content (2 marks)

- Content completely accurate (2 marks)
- Content with minor errors (1 mark)
- Content completely inaccurate (0 mark)

- (ii) Correct use of scientific terms (1 mark)

- Correct use of scientific terms (1 mark)
- No use of scientific terms (0 mark)

- (b) **Measurement and Manipulation** **(Maximum 3 marks)**

- (i) Taking accurate measurements (2 marks)

- Ability to take accurate measurements using 3 – 4 measuring instruments (2 marks)
- Ability to take accurate measurements using 1 – 2 measuring instruments (1 mark)
- Inability to take accurate measurements with measuring instruments (0 mark)

- (ii) Proper handling and safety of equipment and apparatus (1 mark)

- Correct handling and appropriate safety of equipment (1 mark)
- Incorrect handling and no safety (0 mark)

- (c) **Drawing** **(Maximum 3 marks)**

- (i) Large Drawing (1 mark)



- Drawings at least ½ page in size (1mark)
- Drawings less than ½ page in size (0 mark)

(ii) *Clear Drawings (1 mark)*

- Clear lines (1 mark)
- Unclear lines (0 mark)

(iii) *Correct labels (1 mark)*

- Most labels correct (1 mark)
- Few labels correct (0 mark)

(d) **Analysis and Interpretation** (Maximum 3 marks)

(i) *Identifying trends/patterns (2 marks)*

- Correctly identify trend(s) (2 marks)
- Incorrectly identifies trend (1 mark)
- No identification of trend (0 mark)

(ii) *Making predictions (1 mark)*

- Accurate prediction (1 mark)
- Inaccurate prediction (0 mark)

(e) **Planning and Designing** (Maximum 3 marks)

(i) *Clear Statement of hypothesis (1 mark)*

- Clear hypothesis (1 mark)
- Unclear hypothesis (0 mark)

(ii) *Identification of variables (1 mark)*

- Correct identification of variables (1 mark)
- Incorrect identification of variables (0 mark)

(iii) *Method of experiment (1 mark)*

- Method appropriate to test hypothesis (1 mark)
- Method not suitable to test hypothesis (0 mark)



- (f) **Social Attributes** **(Maximum 3 marks)**
- (i) *Cooperation with others (1 mark)*
- *Ability to cooperate* *(1 mark)*
 - *Inability to cooperate* *(0 mark)*
- (ii) *Collaborate to get consensus on decisions (1 mark)*
- *Ability to collaborate with group* *(1 mark)*
 - *Inability to collaborate with group* *(0 mark)*
- (iii) *Responsibility to group and respect for others (1 mark)*
- *Ability to take responsibility for assign task* *(1 mark)*
 - *Inability to take responsibility for assigned task* *(0 mark)*
- (g) **Reflective Piece** **(Maximum 2 marks)**
- Description of two new things learnt and impact* *(2 marks)*
- Description of two new things learnt without impact* *(1 mark)*
- Or*
- Description of one new thing learnt and its impact* *(1 mark)*
- No description* *(0 mark)*

◆ MODULE 2: INVESTIGATING MATTER

This Module contains the following topics:

- (a) States of Matter;
- (b) Water;
- (c) *Elements, Compounds and Mixtures*;
- (d) Metals and Non-Metals;
- (e) Acids and Bases.

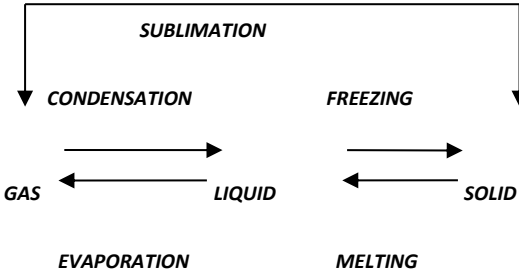
◆ GENERAL OBJECTIVES

On completion of this Module, students should:

- 1. understand the importance of quantifying the dimensions of matter;
- 2. *understand* the particulate nature of matter, and its chemical and physical properties.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(a) States of Matter			
1. <i>define</i> the concept matter;	Matter: anything that has mass and occupies space (has volume).	<i>Teacher asks students to give examples of matter and leads discussion to come up with a definition of matter.</i>	Students will write a sentence defining <i>matter</i> . Teacher assesses for correctness.
2. classify substances into the three states;	Matter exists in three (3) states: (a) solid; (b) liquid; (c) gas.	<i>Students use example of matter given in above activity and sort the substances into three (3) groups. Students will identify the characteristics of the three groups during class discussion.</i>	Students should create posters or other pictorial representations with examples of the three states of matter. Teacher assesses accuracy of content and creativity.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT																				
Students should be able to:																							
3. explain how particle arrangement influences physical properties;	<table border="1"> <thead> <tr> <th>Properties</th> <th>Solid</th> <th>Liquid</th> <th>Gas</th> </tr> </thead> <tbody> <tr> <td>Arrangement of particles</td> <td>Particles packed close together</td> <td>Particles further apart</td> <td>Particles maximum distance apart</td> </tr> <tr> <td>Shape and volume</td> <td>Fixed shape, definite volume</td> <td>No definite shape but definite volume</td> <td>No fixed shape or volume</td> </tr> <tr> <td>Forces of attraction</td> <td>Strong</td> <td>Weak</td> <td>Very weak</td> </tr> <tr> <td>Movement of particles</td> <td>Very limited movement</td> <td>Random movement</td> <td>Rapid, free Movement</td> </tr> </tbody> </table>	Properties	Solid	Liquid	Gas	Arrangement of particles	Particles packed close together	Particles further apart	Particles maximum distance apart	Shape and volume	Fixed shape, definite volume	No definite shape but definite volume	No fixed shape or volume	Forces of attraction	Strong	Weak	Very weak	Movement of particles	Very limited movement	Random movement	Rapid, free Movement	Students make drawings to illustrate arrangement of particles.	<i>Students should create a song or poem with examples of three states of matter as well as their physical properties. Teacher assesses for accuracy of content and creativity.</i>
Properties	Solid	Liquid	Gas																				
Arrangement of particles	Particles packed close together	Particles further apart	Particles maximum distance apart																				
Shape and volume	Fixed shape, definite volume	No definite shape but definite volume	No fixed shape or volume																				
Forces of attraction	Strong	Weak	Very weak																				
Movement of particles	Very limited movement	Random movement	Rapid, free Movement																				
4. explain diffusion and osmosis;	<p>Diffusion: movement of substance particles from higher to lower concentration.</p> <p>Osmosis: movement of water particles across a membrane from a higher water concentration to low water concentration.</p>	<p>Use perfume activity (or using other everyday activities) as stimulus for class discussion. Have students investigate food dye in water and record observations.</p> <p>Ask students to investigate osmosis – Place berries in a bowl and sprinkle sugar over it. Observe after a day.</p> <p><i>Ask students to place potato cubes/strips in salt water or pure water solutions.</i></p> <p>Ask students to explain the following:</p> <p>Red kidney beans left to soak overnight in distilled water take a shorter time to soften during cooking than beans not soaked at all.</p> <p>The teacher explains the concept of diffusion and osmosis using the students' responses.</p>	<p>Assess students' observations and explanations for understanding of diffusion.</p> <p>Students will write a report on the activity using scientific format. Teacher assesses report using criteria for Recording and Communication, and Analysis and Interpretation.</p>																				

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
5. explain the processes for each change of state;	Terms – freezing, melting, evaporation, sublimation, condensation 	Students can heat ice cubes until steam is produced. They will measure the temperature periodically to identify the temperatures at which water changes state. Laboratory activity – finding the boiling point of water. <i>Students will document the activity using the scientific format.</i>	Students' laboratory reports should explain the processes. <i>Assess using criteria for Recording and Communication.</i>
6. identify everyday examples of changes of state;	Condensation of water vapour on mirrors. Toilet bowl fresheners (sublimation). No new substances are formed.	Class discussion on the examples of sublimation – mothballs, smoke machine, and other changes of state.	Teacher gives students activity with at least ten examples of everyday changes of state. Students will identify change of state <i>and provide reasons for each</i> . Teacher assesses for accuracy.
(b) Water			
7. explain the importance of the water cycle;	Water cycle: evaporation, condensation, melting and freezing. Impact of cycle on our water supply, (flood and drought). Water conservation.	Students can make a model (diorama or annotated diagram) to illustrate the water cycle and its importance.	Evaluate the accuracy of the model and students' explanations of the processes and their importance.
8. carry out investigations to show the physical properties of water;	Water: colour, odour. Properties of water: melting and boiling points, surface tension of water.	<i>Have students carry out the following investigations on water:</i> (a) dissolve salt; (b) float paper clip; (c) describe given sample of water. Provide students' with worksheet to record their findings.	Teacher assesses students' reports using criteria for <i>Recording and Communication and Analysis and Interpretation</i> .

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
		<p>Students will document the activity using scientific format.</p> <p>Teacher makes reference to previous activity that investigated melting and boiling points.</p>	
9. relate the properties of water to its uses;	<p>As a solvent – washing, drinking</p> <p>Habitat – ponds, rivers, seas</p> <p>Transport – blood, <i>ships/boats</i></p>	<p>Refer to the results of the worksheets given in the previous activity.</p> <p>Students will gather information from various media on how the uses of water are related to its properties.</p> <p><i>Students will use the information to expand their worksheet to include uses based on properties.</i></p>	<p>Students will use information gathered to create a performance piece (skit, song) or printed display (brochure). Teacher assesses piece for accuracy of content. Do peer assessment of performance piece or printed display using checklist developed by teacher and students.</p>
10. explain the effects of pollution on aquatic life;	<p>(a) Pollution from domestic and industrial sources.</p> <p>(b) Deforestation and erosion (resulting in soil runoff).</p> <p>Effects of pollutants: detergents, hot water, silt (damage to corals), pesticide, raw sewage and fertiliser run off, waste from cruise ships, oil spills.</p>	<p>In groups of four (4), students research and make presentations on the effects of pollution on aquatic life in the water ways found in their surroundings, or parish or district or country.</p> <p>Students may collect samples and make observations, <i>for example, colour, smell, cloudiness.</i></p>	<p>Presentations should be assessed using criteria from <i>Recording and Communication</i>.</p>
(c) Elements, Compounds and Mixtures			
11. <i>define the term atom;</i>	<i>Atom – smallest unit of matter.</i>		
12. <i>describe the structure of an atom;</i>	<i>Atoms made up of protons, neutrons (found in the nucleus) and electrons found outside the nucleus.</i>	<i>Students will build a model of an atom.</i>	<i>Teacher assesses model for creativity and accuracy.</i>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
<p>13. identify the chemical symbols of commonly found elements;</p> <p>14. distinguish among an element, a compound and a mixture;</p>	<p>Na, K, Mg, Ca, Fe, Pt, Cu, Ag, Au, Zn, Hg, Al, C, Si, Pb, N, O, S, F, Cl, I, He, Ne.</p> <p><i>Each element is different because it is made up of a particular atom.</i></p> <p>An element contains one type of particle (atom). A compound contains two or more elements that are chemically combined <i>and not easy to separate.</i></p> <p>A mixture contains two or more elements that are <i>physically combined</i> and can be easily separated.</p>	<p><i>Teacher gives fill-in-the blanks story with English names of elements for which students will identify their symbols. (See example on page 27).</i></p> <p><i>Periodic table or list of elements and symbol given as resource material.</i></p> <p>Teacher lists the names and formulae of elements and compounds (water, table salt, carbon dioxide). Teacher places the substances into two groups and asks students to state the criteria used for the placements.</p> <p><i>Teacher demonstration and questioning.</i> <i>Teacher adds salt to water and stirs. Teacher prompts students to state whether the salt can be separated from the water and how. Teacher should heat saltwater solution until water evaporates to get back the salt.</i></p> <p><i>Teacher adds powdered antacid (Eno, Andrew's salts or Alka Seltzer) to water and asks students to decide if the antacid can be separated from the water and how. Teacher heats solution.</i></p> <p>Teacher provides examples of mixture(s) and leads class discussion on the differences between mixtures and compounds.</p>	<p>Students bring in five (5) labels from common household items and list as many elements as possible and their symbols. Teacher checks that students correctly match names with the symbols.</p> <p>Review students' responses to ensure understanding of the definition of elements, compounds and mixtures.</p> <p>Students are provided with a list of substances and are asked to classify them into the three groups. Teacher checks classification for correctness.</p>
<p>15. classify mixtures as solutions and suspensions;</p>	<p>Distinction between solution and suspension.</p>	<p>Teacher guides students through definitions in class discussion. Students rotate through a circus of workstations with samples of mixtures and complete a classification table.</p>	<p>Assess the classification table for accuracy.</p>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
16. perform simple separation techniques;	(a) Filtration. (b) Decanting. (c) Evaporation. (d) Chromatography. (e) Simple distillation. Separation method used is dependent on the particle size, difference in density or other physical differences.	Teacher demonstrations followed by student practice. Teacher shares checklist for assessment with students. Students write up laboratory reports of the practical activities using scientific format. Use chalk and water; inks; salt solution, oil and water <i>for practical activities</i> .	Checklist used for assessment should include proper use of equipment, safety when handling chemicals and equipment and other criteria from Manipulation and Measurement. Teacher may <i>also</i> assess reports using criteria for <i>Analysis and Interpretation</i> .
(d) Metals and Non-metals			
17. classify substances as metals and non-metals;	Metals: good conductors of heat and electricity, ductile, malleable, sonorous, have lustre. Non-metals: poor conductors of heat and electricity, dull in appearance, light, soft, brittle.	Provide students with examples of substances and ask them <i>to sort substances</i> in two (2) groups. Students describe the characteristics of the groups and justify the grouping. Teacher uses student information as basis for discussion on differences between metals and non-metals.	Teacher provides students with a new set of materials to group as metals and non-metals giving reasons for their choices. Teacher assesses <i>the activity</i> using Analysis and Interpretation.
18. relate the properties of metals and non-metals to their uses;	Uses differ due to properties. Exceptions: silicon mercury	In pairs, students can compare the advantages and disadvantages of using metals and non-metals for various purposes, for example, car bodies, food containers. Present findings to peers. Group discussion on exceptions. Students could select a product and create a flyer advertising the superior quality of the material for the particular product compared to a product made of an alternative type of material.	Teacher monitors the discussions. Asks students to share their ideas on the use of metals and non-metals. Evaluate students' presentation. Assess the flyer and its content for accuracy, visual impact and creativity.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING AND LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(e) Acids and Bases			
19. name some common acids and bases;	<p>Examples of acids: vinegar, Ascorbic Acid, sting of ants (Formic Acid), Hydrochloric Acid (HCl), Sulphuric Acid (H₂SO₄).</p> <p>Examples of bases: for example Sodium Hydroxide (NaOH), Magnesium Hydroxide (Mg(OH)₂), Ammonium Hydroxide/Ammonia solution (NH₄OH).</p>	<p>Students should be provided with samples of common household substances such as vinegar and baking soda so they can test with blue and red litmus paper. Students should complete a worksheet grouping the substances based on their effect on litmus.</p> <p>Teacher uses student information to introduce and discuss acids and bases.</p>	Teacher administers a test on the common names of acids and bases and their characteristics.
20. recall the characteristics of acids and bases;	<p>Acids - taste sour, have low pH. Most bases - insoluble in water and are soapy. Alkalis - bases soluble in water.</p>	Students find information on <i>additional</i> characteristics of acids and bases.	
21. determine the degree of acidity and alkalinity of common household products;	<p>pH – indicates level of acidity and alkalinity</p> <p>0-----7-----14</p> <p>Acidic Neutral Basic</p>	Using the household chemicals from previous activity, <i>students will test with universal indicator to find the pH. Discussion follows to classify each substance as strong or weak acid or base, or neutral.</i>	<i>Teacher gives students a sheet with unknown substances and their pH. Students will complete the sheet by classifying each substance as strong or weak acid or base, or neutral.</i>
22. state the meaning of the term neutralisation;	<p>Acids and Bases:</p> <ul style="list-style-type: none"> - react to form salt and water 	<p>Have students perform neutralisation reactions using dilute acid and <i>base</i>, and an indicator. Use pH indicator to test acid, base and solution formed by neutralisation.</p> <p>Teacher could demonstrate neutralisation process using titration method.</p> <p>Neutralisation reactions can be done with dilute ethanoic acid and seltzer tablets or powder.</p>	Teacher observes and assesses the activity recognising the point of neutralisation. <i>Teacher can also assess the use of dropper using criteria from Manipulation and Measurement.</i>
23. cite examples of neutralisation.	<i>Treatment of heartburn, indigestion and insect bites.</i>	Discuss simple treatment for wasp and bee stings, and the use of lime to treat soil that are acidic.	

SCHOOL-BASED ASSESSMENT (SBA)

Generic Task

Key skills to be assessed are **Measurement and Manipulation (MM) and Planning and Design (PD)**.

Students will carry out two investigations.

- (a) **Give students three known and three unknown substances, one acidic, one basic and one neutral and ask them to test the pH of the three substances and classify them.**

Known	Unknown
Vinegar	Bicarbonate
Rust	Citric acid
Tannic Acid	Borax

10 marks

- (b) **A student found an unlabelled bottle of a transparent, odourless liquid in the kitchen. The student believes that this liquid is water. Design an experiment to determine if this substance is pure water.**

10 marks

Scoring Rubric

- (a) **Manipulation and Measurement**

(Maximum 10 marks)

Practical Activity

- (i) **Safety for self and others (2 marks)**

- Demonstrates safety to self and others at all times 2 marks
- Demonstrates safety to self and others sometimes 1 mark
- Demonstrates safety to self and others rarely 0 mark

- (ii) **Appropriate instrument used (2 marks)**

- Appropriate instrument used always 2 marks
- Appropriate instrument used sometimes 1 mark
- Appropriate instrument used rarely 0 mark

(iii) Accuracy of readings (3 marks)

- Readings always accurate 3 marks
- Readings mostly accurate 2 marks
- Readings rarely accurate 1 mark
- Readings never accurate 0 mark

(iv) Competence in use of materials (3 marks)

- Competent in the use of materials always 3 marks
- Competent in the use of materials usually 2 marks
- Competent in the use of materials rarely 1 mark
- Competent in the use of materials never 0 mark

(b) **Planning and Design**

(Maximum 10 marks)

Planning and Designing activity

(i) Hypothesis (2 marks)

- Testability of hypothesis is clear 2 marks
- Testability of hypothesis is unclear 1 mark
- Testability of hypothesis is not possible 0 mark

(ii) Appropriate method (5 marks)

- Appropriate methods used always to test hypothesis 5 marks
- Appropriate methods used mostly to test hypothesis 3 - 4 marks
- Appropriate methods used rarely to test hypothesis 1 - 2 marks
- Inappropriate methods used to test hypothesis 0 mark

(iii) Control present (2 marks)

- Relevant controls stated 2 marks
- Some controls stated are not relevant 1 mark
- Controls either not stated or not relevant 0 mark

(iv) Limitation(s) stated (1 mark)

- Limitations present 1 mark
- No limitations 0 mark

Suggested Teaching and Learning Activity for Module 2, Specific Objective 13

Once upon a time, as I floated away light as (He) _____, I saw something as valuable as (Au) _____ but it was even rarer like (Pt) _____. I picked it up and found it was as heavy as (Pb) _____. It reacted easily with water like (K) _____ and (Na) _____ and brightened the place like (Ne) _____ in bulbs. I looked around and saw a piece of (Zn) _____ from a roof, half-buried in the (Si) _____ of the sand.

As I used the (Fe) _____ spade to unearth the piece, I started gasping due to lack of (O) _____, and realised that a gas cloud of (Cl) _____ had been accidentally released from the nearby water treatment plant. I moved as quickly as (Hg) _____ in a thermometer, to put as much distance between myself and the cloud as I could, then stopped to have some (Mg) _____ salts to settle my upset stomach. An old woman standing close by shouted that I was lucky to be alive and should guard my health as if it was valuable like (Ag) _____ is regarded. I thanked her and climbed out of the valley on cables of (Cu) _____ to see labourers applying 'whitewash' containing (Ca) _____ to the fences and around the trunks of the trees, as Christmas would soon be here.

Unfortunately, I fell and bruised my knee and so had to put (I) _____ on the wound to prevent infection. Nearby, a huge industrial complex was releasing toxic clouds containing (S) _____ dioxide and my eyes began to blur and my throat constrict, and I began falling as the vehicles whizzing by released the (C) _____ dioxide in their exhaust, I woke up out of the dream I was having.

I then brushed my teeth with the toothpaste containing (F) _____ and went to my bed as it was late at night.

◆ MODULE 3: UNDERSTANDING LIFE

This Module contains the following topics:

- (a) Living Organisms;
- (b) Plants;
- (c) Air;
- (d) Pests and Pesticides;
- (e) Soils.

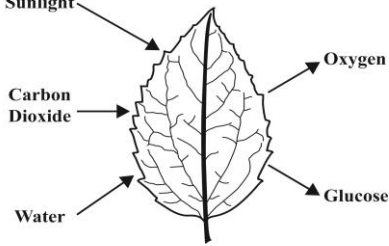
◆ GENERAL OBJECTIVES

On completion of this Module, students should:

1. understand that there is interdependence *among* living organisms;
2. understand the relationship between structure and function for selected body systems;
3. appreciate the components of the physical environment and their inter-relationship;
4. appreciate the role each individual must play in preserving the environment.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT								
Students should be able to:											
(a) Living Organisms											
1. describe the characteristics of living things;	Respiration, excretion, movement, nutrition, reproduction, sensitivity (response to stimuli), growth.	In small groups, ask students to identify features of a car and an animal, for example, a cat. Students should give reasons why the cat is alive and not the car. Each group reports its list of reasons and teacher will record reasons presented and focus discussion to ascertain the characteristics.	Students create a game to show understanding of characteristics of living things. Teacher assesses game for creativity and presentation.								
2. compare plants and animals;	Differences between plants and animals. <table border="1" data-bbox="584 699 1066 1002"> <thead> <tr> <th data-bbox="584 699 779 730">Animals</th> <th data-bbox="779 699 1066 730">Plants</th> </tr> </thead> <tbody> <tr> <td data-bbox="584 730 779 794">Cannot make their own food</td> <td data-bbox="779 730 1066 794">Make their own food (green and have leaves)</td> </tr> <tr> <td data-bbox="584 794 779 882">Can move from one place to another</td> <td data-bbox="779 794 1066 882">Plants cannot move from one place to another</td> </tr> <tr> <td data-bbox="584 882 779 1002">Generally respond speedily to stimuli</td> <td data-bbox="779 882 1066 1002">Generally responds slowly to stimuli</td> </tr> </tbody> </table>	Animals	Plants	Cannot make their own food	Make their own food (green and have leaves)	Can move from one place to another	Plants cannot move from one place to another	Generally respond speedily to stimuli	Generally responds slowly to stimuli	On the school compound, students in groups of four (4) will make observations of living things (during a 10 minute period) and compile a list. On their return to the classroom, each group should categorise the list into plants and animals giving reasons for their choices. The teacher will guide class discussion to ensure understanding of basic differences stated in the content.	Teacher develops a test to assess students' knowledge of characteristics of living things and the differences between plants and animals.
Animals	Plants										
Cannot make their own food	Make their own food (green and have leaves)										
Can move from one place to another	Plants cannot move from one place to another										
Generally respond speedily to stimuli	Generally responds slowly to stimuli										
3. <i>define the term cell;</i>	Cell - basic unit of living things.	Students will use puzzle pieces or toy building blocks (LEGO) to put together a shape or structure. Teacher will use this activity to guide discussions to focus on a cell as the basic unit of living things. <i>Note: Teacher should make link with atom as units of matter (Module 2, Specific Objective 11).</i>	<i>Students define the term cell in their own words.</i>								
4. state one function of each major cell part;	Common cell structures: (a) cell membrane-controls movement of substances into and out of cell;	Students draw and label a typical plant cell. Teacher gives students a selected narrative that discusses the functions of the major cell	Have students complete an activity that requires them to match the cell structures with their functions. Teacher checks								

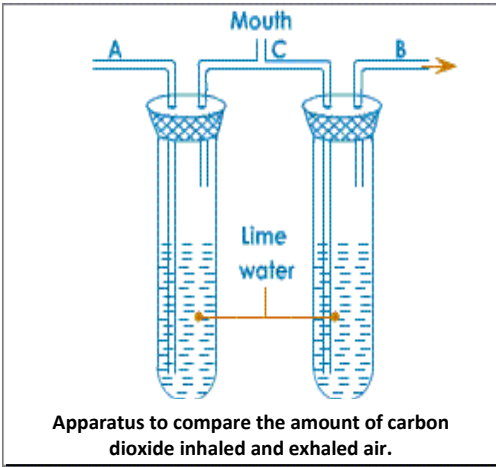
SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT												
Students should be able to:															
	<table border="1"> <tr> <td data-bbox="582 363 752 480">Reproductive</td> <td data-bbox="752 363 902 480">Produces off springs</td> <td data-bbox="902 363 1066 480">flowers, testes, uterus, ovary, penis</td> </tr> <tr> <td data-bbox="582 480 752 627">Skeletal</td> <td data-bbox="752 480 902 627">Provides support. Facilitates movement</td> <td data-bbox="902 480 1066 627">limbs, xylem</td> </tr> <tr> <td data-bbox="582 627 752 743">Transport</td> <td data-bbox="752 627 902 743">Facilitates movement of substances</td> <td data-bbox="902 627 1066 743">stem, root, heart, blood vessels</td> </tr> <tr> <td data-bbox="582 743 752 839">Respiratory</td> <td data-bbox="752 743 902 839">Facilitates exchange of gases</td> <td data-bbox="902 743 1066 839">leaf, lung</td> </tr> </table>	Reproductive	Produces off springs	flowers, testes, uterus, ovary, penis	Skeletal	Provides support. Facilitates movement	limbs, xylem	Transport	Facilitates movement of substances	stem, root, heart, blood vessels	Respiratory	Facilitates exchange of gases	leaf, lung		
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Transport	Facilitates movement of substances	stem, root, heart, blood vessels													
Respiratory	Facilitates exchange of gases	leaf, lung													
(b) Plants															
9. explain the importance of plants to humans;	<p>Plants as producers of food and animals as consumers.</p> <p>Example: Food Chain</p> <pre> grass → cow → man producer primary secondary consumer consumer </pre>	In small groups, have students identify food chains from a food web. For each food chain, students should explain how each organism is dependent on the other.	Teacher provides students with a simple two-chain food web and asks them to explain the impact of eliminating a named organism from the web.												

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
<p>10. draw <i>labelled</i> diagram of a simple leaf;</p> <p>11. describe the process of photosynthesis;</p>	<p>External leaf parts: stalk, margin, vein, midrib, lamina.</p> $\begin{array}{c} \text{sunlight} \\ \text{Carbon dioxide + Water} \xrightarrow{\text{chlorophyll}} \text{Food + Oxygen} \end{array}$	<p>Students provide samples of simple leaves. The teacher leads discussion on identifying the parts.</p> <div data-bbox="1106 595 1599 943" style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p style="text-align: center;"><u>Photosynthesis</u></p>  </div> <p>Use simple diagram illustrating photosynthesis as shown above to stimulate discussion on the raw materials and products of photosynthesis. Students will test plant leaves for starch and investigate the need for light and chlorophyll for photosynthesis. The investigation is to be written up as a laboratory practical <i>using</i> the <i>scientific</i> format.</p> <p>N.B. Use water bath when heating alcohol.</p>	<p>Students are asked to draw a labelled diagram of a leaf.</p> <p>Teacher assesses drawing for accuracy, correct labels and correct label lines, appropriate title, magnification and view.</p> <p><i>Teacher assesses report using the criteria for Recording and Communicating and Analysis and Interpretation.</i></p>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
12. state the functions of each part of a flower;	(a) Male part Stamen (anther, filament) - produces pollen (b) Female part Pistil (stigma, style, ovary) – where fertilisation occurs and new fruits are formed. (c) Petals– protect reproductive parts, attract insects. (d) Sepals– protect the young flower (bud). (e) Stalk – connects flower to plant.	Students are provided with half of a flower to examine. Teacher guides discussion using a diagram on the parts of the flower. Flower sample may be <i>Bauhinia purpurea</i> (Poor Man’s Orchid), <i>Caesalpinia pulcherrima</i> (Pride of Barbados), <i>Delonix regia</i> (Flamboyant). N.B. Hibiscus should not be used because it is not a typical flower. Where available, students may engage in virtual dissection/reassembly of flowers. Suggested website: croptechnology.unl.edu/animation	Students will be asked to draw and label one half of a flower and state the function of at least two parts. Teacher assesses drawing for accuracy, correctness of functions and view.
13. describe pollination;	Pollination – transfer of pollen from anther to stigma of the same flower (self pollination) or different flower (cross pollination) of the same species.	Use stimulus material depicting animal (insect, bird) visiting a flower to lead discussion on pollination and agents of pollination.	
14. identify two agents of pollination;	Animal, water and wind. Some insects are regarded as beneficial while others may be pests.		Students will be assessed using a completion activity similar to the example below: During_____ pollen grains are transferred from the _____ to the _____ of a flower. _____ grains can be transferred by _____ or _____. Teacher assesses for correctness.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
<p>15. describe fertilisation and seed production in plants;</p>	<p>Formation of pollen tube. Fertilisation - fusion of the male and female cells. flower → fruit with seed → germination → new plant</p>	<p>The teacher uses a diagram similar to the one shown below to explain the growth of pollen tube and fertilisation to form seeds.</p> <div data-bbox="1106 477 1592 1166" data-label="Diagram"> <p>Fertilisation in Plants</p> <ul style="list-style-type: none"> Pollen Stigma Pollen Tube Style Ovary Ovule Embryo Sac Endosperm Nucleus Egg Nucleus Male Gamete <p>When a pollen grain lands on the stigma it grows a pollen tube down the style to the egg and the male gamete fuses with the egg.</p> </div>	<p>Students should be asked to make a simple flow diagram of the processes involved in fertilisation and seed formation.</p>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
16. investigate the conditions necessary for germination;	Conditions for germination: suitable temperature, air and water.	Students set up containers with seeds of the same plant and place them under varying conditions to observe if germination will occur. Observations are made over a one week period. Students write a laboratory report <i>using</i> scientific format.	Teacher assesses the laboratory report using the criteria for Recording and Communicating, and Analysis and Interpretation.
(c) Air			
17. identify the main components of air <i>and their percentage composition</i> ;	Constituents of air: nitrogen (N ₂), 78% oxygen (O ₂), 21% carbon dioxide (CO ₂), 0.03% and inert gases (as a group), 0.001% water vapour varied percentage	Use pie charts and graphs as stimulus for class discussion.	<i>Information gathered from the discussion should be recorded on a table stating:</i> (a) constituent gases; (b) percentage in air composition. <i>Teacher assesses table for accuracy.</i>
18. describe the uses of components of air;	Nitrogen - plant growth, fertiliser, preserve foods. Oxygen - respiration and combustion. Carbon dioxide – photosynthesis, refrigerant, fire extinguishers, dry ice used for stage effects, carbonated drinks. Inert Gases - Neon for lighting. Helium for balloons. Argon for incandescent light bulbs.	Organise students in small groups and have each group research the uses of one of the major components of air. Findings are presented to class.	Presentation is assessed for <i>Recording and Communication and Social Attributes</i> .

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT															
Students should be able to:																		
19. carry out investigation to compare inhaled and exhaled air;	<table border="1" data-bbox="589 387 1055 572"> <thead> <tr> <th>Content</th> <th>Inhaled Air</th> <th>Exhaled Air</th> </tr> </thead> <tbody> <tr> <td>Carbon Dioxide</td> <td>Less</td> <td>More</td> </tr> <tr> <td>Oxygen</td> <td>More</td> <td>Less</td> </tr> <tr> <td>Warmth</td> <td>Less</td> <td>More</td> </tr> <tr> <td>Moisture</td> <td>Less</td> <td>More</td> </tr> </tbody> </table>	Content	Inhaled Air	Exhaled Air	Carbon Dioxide	Less	More	Oxygen	More	Less	Warmth	Less	More	Moisture	Less	More	<p>Students will be asked to carry out the following activities.</p> <p>(a) Use apparatus shown below to compare the cloudiness of the limewater.</p> <div data-bbox="1106 523 1599 991" data-label="Diagram">  <p style="text-align: center;">Apparatus to compare the amount of carbon dioxide inhaled and exhaled air.</p> </div> <p>(b) Collect exhaled air and invert container over lit candle and time how long it takes for the candle to go out. Repeat using ordinary air instead and compare the results.</p> <p>(c) Measure the surrounding temperature and record the temperature. Breathe on the bulb of a thermometer to measure the temperature of exhaled air and note differences.</p> <p>(d) Breathe on a mirror and note observations.</p>	<p>Students will construct a table to compare the composition of inhaled and exhaled air.</p> <p>Teacher assesses table for accuracy of content.</p>
Content	Inhaled Air	Exhaled Air																
Carbon Dioxide	Less	More																
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SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT												
Students should be able to:															
20. explain the importance of respiration;	<p>Respiration – process by which energy stored in food is released.</p> <p>Food + Oxygen → Energy + Water + Carbon Dioxide</p> <p><i>Breathing is the mechanism used to obtain oxygen and to get rid of carbon dioxide waste.</i></p>	<p>Students will do a number of activities as instructed by the teacher for example: lifting objects, walking, breathing deeply. Teacher will use these activities to initiate discussion to elicit that energy is needed to carry out all activities for both plants and animals. The discussion on respiration follows.</p> <p><i>Teacher discusses with students breathing as mechanisms to provide oxygen for cells and remove carbon dioxide from body.</i></p>	<p>At the end of the class, each student should write one paragraph explaining the importance of respiration. Teacher assesses the narrative for accuracy.</p> <p><i>Students will be assessed using a completion activity similar to the example below.</i></p> <p><i>Organisms need _____ for all life processes. This is provided during the process of _____. The raw materials are _____ and _____. The main product is _____ and the by-products are _____ and _____.</i></p>												
21. identify common air pollutants;	<table border="1" data-bbox="589 863 1021 1238"> <thead> <tr> <th>POLLUTANT</th> <th>SOURCES</th> </tr> </thead> <tbody> <tr> <td>Sulphur dioxide – SO₂</td> <td>Industrial wastes, Volcanoes</td> </tr> <tr> <td>Carbon dioxide – CO₂</td> <td>Vehicle exhaust Industries</td> </tr> <tr> <td>Carbon monoxide – CO</td> <td>Vehicle exhaust Industries</td> </tr> <tr> <td>Particulate matter</td> <td>Burning</td> </tr> <tr> <td>Methane – CH₄</td> <td>Agriculture</td> </tr> </tbody> </table>	POLLUTANT	SOURCES	Sulphur dioxide – SO ₂	Industrial wastes, Volcanoes	Carbon dioxide – CO ₂	Vehicle exhaust Industries	Carbon monoxide – CO	Vehicle exhaust Industries	Particulate matter	Burning	Methane – CH ₄	Agriculture	<p><i>Students research to complete table of air pollutants and their sources.</i></p>	<p><i>In groups students make a presentation on one of the pollutants. Teacher assesses students' work using criteria for Recording and Communication and Social Attributes.</i></p>
POLLUTANT	SOURCES														
Sulphur dioxide – SO ₂	Industrial wastes, Volcanoes														
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Particulate matter	Burning														
Methane – CH ₄	Agriculture														

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
22. discuss <i>some effects of air pollution</i> ;	<i>Respiratory ailments.</i> <i>Greenhouse effect, global warming</i> <i>Damage to external structures.</i>	<i>Students create poster on any one of the effects.</i>	<i>Teacher assesses posters for accuracy of content, presentation and creativity.</i>
(d) Pests and Pesticides			
23. identify plant pests;	Types of plant pests: (a) other plants, for example, weeds; (b) plant parasites, for example, Dodder; (c) insects, for example, caterpillar; (d) other animals, for example, rats; parasites, for example, worms.	A resource person (for example, an Agriculture Officer or teacher of Agricultural Science) makes a presentation on plant pests, their control methods and the <i>effects of pesticides</i> .	Students will write a summary which describes at least two (2) pests and the pest control methods. Teacher assesses for accuracy.
24. describe two methods of pest control;	Chemical, (<i>insecticides</i>); <i>biological (other organisms)</i> and mechanical (<i>screen barriers</i>) or physical.	Discussion to identify pests in homes, control methods and impact of these.	Debate on advantages and disadvantages of using pesticides.
25. discuss the impact of pesticides;	(a) <i>Introduction of toxins into food chains.</i> (b) <i>Washed into water causing contamination (pollution) or death of organisms.</i>		Students may give a multimedia presentation on one named Caribbean plant pest. Presentation must include name of the plant it affects, its impact on the plant, methods of control and possible effects of the control methods on the environment. Teacher assesses presentation using criteria from Social Attributes and Recording and Communication.
(e) Soils			
26. compare <i>the physical properties of the three major types of soil</i> ;	<i>Sand, clay and loam. Comparison of texture, water holding capacity, drainage.</i>	Students in groups do comparison of soil samples relating to texture (by mixing with water and rolling into a ball), <i>particle size</i> , water holding capacity, drainage and air content.	<i>Laboratory reports are assessed for Recording and Communication; and Analysis and Interpretation.</i>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
		<p>The groups complete <i>a laboratory report of their findings, using scientific format.</i></p> <p>Have the students grow a selected type of a plant in each soil type. Students will compare the growth (height) of the plant over a two week period.</p>	
27. explain why soil is important;	Importance of soil: food production, plant growth, water retention, habitat, aesthetic appeal, source of minerals.	Class discussion and brainstorming session on why soil is important. Students generate list of reasons.	The teacher should use generated list to provide feedback.
28. describe soil conservation methods.	Soil conservation methods - contour ploughing, terracing, strip cropping, crop rotation, increasing <i>vegetative cover.</i>	Present visual scenario of land with certain features and ask students to suggest methods for conserving the soil and justify the methods. Teacher leads discussion using student suggestions.	Students <i>could</i> be taken on a field trip to view soil conservation methods or lack thereof. Students can collect information and pictures and present their findings. Teacher assesses presentation using criteria for Social Attributes and Analysis and Interpretation.

SCHOOL-BASED ASSESSMENT (SBA)

Generic Task

Key skills to be assessed are **Drawing (DR), Recording and Communication (RC) and Social Attributes (SA)**.

Students will create a portfolio of their best work comprising three (3) activities as listed below **and** include a brief reflective piece on at least two things learnt from doing the model.

- (a) One sample from drawing (Specific Objective 10 or 12)
- (b) One sample of a laboratory report (Specific Objectives 11, 16, 26)
- (c) One sample from presentation (Specific Objective 18 or 25)

Scoring Rubric

(a) Drawing		(Maximum 4 marks)
(i) <i>Large (1 mark)</i>		
- <i>Drawing more than ½ page</i>		<i>1 mark</i>
- <i>Drawing less than ½ page</i>		<i>0 mark</i>
(ii) <i>Clear lines (1 mark)</i>		
- <i>Clear lines</i>		<i>1 mark</i>
- <i>Unclear lines</i>		<i>0 mark</i>
(iii) <i>Proportion (1 mark)</i>		
- <i>Proportional drawing</i>		<i>1 mark</i>
- <i>Drawing not proportional</i>		<i>0 mark</i>
(iv) <i>Labels (1 mark)</i>		
- <i>Most labels correct</i>		<i>1 mark</i>
- <i>No labels correct</i>		<i>0 marks</i>

- (b) **Recording and Communication** **(Maximum 10 marks)**
- (i) *Logical sequence of report (2 marks)*
- *Most of the report correctly sequenced* *2 marks*
 - *Part of the report correctly sequenced* *1 mark*
 - *No sequence* *0 mark*
- (ii) *Section headings named (2 marks)*
- *Most of the section headings correctly named* *2 marks*
 - *Some of the section headings correctly named* *0 mark*
 - *None of the section headings correctly named* *0 mark*
- (iii) *Accuracy of observations (4 marks)*
- *Observations completely accurate* *4 marks*
 - *Observations with minor errors* *2-3 marks*
 - *Observations with major errors* *1 mark*
 - *Inaccurate observations* *0 mark*
- (iv) *Correct use of scientific terms (2 marks)*
- *Correct use of scientific terms always* *(2 marks)*
 - *Correct use of scientific terms sometimes* *(1 mark)*
 - *No use of scientific terms* *(0 marks)*
- (c) **Social Attributes** **(Maximum 4 marks)**
- (i) *Cooperation with others (2 marks)*
- *Ability to cooperate at all times* *(2 marks)*
 - *Ability to cooperate sometimes* *(1 mark)*
 - *Inability to cooperate* *(0 mark)*
- (ii) *Collaborate to get consensus or decisions (1 mark)*
- *Ability to collaborate with group* *(1 mark)*
 - *Inability to collaborate with group* *(0 mark)*

(iii) *Responsibility to group and respect for others (1 mark)*

- *Ability to take responsibility for assigned tasks and show respect for others (1 mark)*
- *Inability to take responsibility for assigned tasks and show respect for others (0 mark)*

(d) **Reflective Piece** **(Maximum 2 marks)**

Description of two new things learnt and impact (2 marks)

Description of two new things learnt without impact (1 mark)

Or

Description of one new thing learnt and its impact (1 mark)

No description (0 mark)

◆ MODULE 4: FOCUSING ON ME

This Module contains the following topics:

- (a) Reproduction;
- (b) Drugs;
- (c) Diseases;
- (d) Food and Me;
- (e) Blood and its importance.

◆ GENERAL OBJECTIVES

On completion of this Module, students should understand the need to practise a healthy lifestyle.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(a) Reproduction			
1. <i>compare secondary sexual characteristics of the human male and female;</i>	Puberty and the development of secondary sexual characteristics.	Discussion on the secondary sexual characteristics.	Students in groups will assemble information comparing the secondary sexual characteristics of males and females. Teacher will assess the content for correctness.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
2. identify the parts of the human reproductive system (male and female); 3. state the functions of the parts of the male and female reproductive systems;	<u>Female</u> Ovary – production of egg Fallopian tube – carries the egg from the ovary towards the uterus. Uterus – where the foetus develops Cervix – holds mucus plug during pregnancy Vagina – birth canal <u>Male</u> Testes – sperm production Urethra – carries semen and urine to the outside Sperm duct – passage way for sperm to the urethra Penis – allows for penetration Prostate – provides fluids for sperm movement	Teacher may use charts, models, drawings or computer software to point out the parts of the reproductive system. Teacher leads discussion on the functions of each. The biological names for the parts of the reproductive system must be used.	Students will be asked to label the parts of the human reproductive system and fill in the related functions on a worksheet. Assess accuracy of information on the worksheets.
4. describe the process of sexual reproduction in humans;	Fertilisation, development of foetus and birth.	Teacher uses visual aids, a sequence of visuals and graphics, for example, flow charts to aid discussion on the process of reproduction. Students write a simple description of the process from fertilisation to birth.	Teacher uses an objective type tests to check students’ understanding of the process.
5. explain the need for pre- and post-natal care in humans;	Pre- and post- natal care: (a) immunization; (b) clinic visits; (c) testing for Sexually Transmitted Infections (STIs).	In pairs, students research the need for pre- and post-natal care and design a brochure for expecting parents.	Peer assessment of brochure using checklist developed by the teacher and students. Brochure assessed for accuracy of information, creativity and presentation and any other criteria for Recording and Communication.
6. briefly describe the principles governing different contraceptive methods;	Contraception: <i>Abstinence – no sexual activity</i> <i>Barrier methods – for example, condoms, diaphragm, IUD</i> <i>Chemical- kills sperms and prevents egg release, for example, vaginal rings</i>	Invite a resource person to discuss contraceptive methods and some of the related myths and practices related to contraception.	Students complete a matching activity which requires them to match contraceptive methods with the principle on which they work. Assess accuracy of responses.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
	<p><i>Natural – no artificial means, for example, rhythm and withdrawal methods.</i></p> <p><i>Sterilisation – surgical prevention, for example, vasectomy, tubal ligation</i></p>		
7. justify the need for screening examinations in maintaining good reproductive health;	<p>Screening examinations:</p> <p>(a) breast examinations; (b) PAP smears; (c) prostate <i>examinations</i>; (d) blood test for STIs.</p>	Students select one type of examination from the list of screening examinations in the area of reproductive health and justify the need. Present opinions to class.	Peer assessment of oral presentation using checklist developed by teachers and students.
8. discuss the impact of pregnancy on a teenager;	<p><i>Importance for early detection and treatment</i></p> <p>The adverse effects of teenage pregnancy:</p> <p>(a) <i>Life choices</i> (i) <i>career</i>; (ii) <i>economic</i>; (iii) <i>education</i>.</p> <p>(b) <i>Medical</i> (i) <i>psychological (male also)</i>; (ii) <i>physiological</i>.</p>	Teacher leads discussion on the effects of teenage pregnancy.	<p>Students develop a poster, cartoon or documentary on the effects of teenage pregnancy.</p> <p>Assess product using the criteria for Recording and Communication.</p>
(b) Drugs			
9. define the term drug;	A drug - chemical substance that exerts some effect on the normal functions of the body.	Teacher may facilitate a discussion on drugs from which the students may elicit a definition of drugs.	

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
10. discuss the effects of drugs on individuals;	<p>The effects on the body and the dangers associated with drug use, misuse and abuse.</p> <p>Include legal and illegal drugs.</p> <p>Focus on the following drugs:</p> <ul style="list-style-type: none"> (a) alcohol; (b) marijuana; (c) nicotine; (d) caffeine; (e) cocaine; (f) amphetamines, for example, ecstasy. 	<p>Police or drug awareness personnel could give a talk to the students.</p> <p>Facilitate the discussion on how to resist peer and media pressure to use alcohol, given the effects on the body.</p> <p>The students may be encouraged to read labels to determine primary ingredient in tea, coffee, soda, energy drinks. Students will research effects of caffeine on the body. An empty cigarette box may be shown to the students for them to read the contents and the warning printed on the box. Students to suggest the reason(s) for putting the warning label on the box.</p> <p>Diseases associated with smoking could be done at this time.</p>	Students prepare and present a short <i>skit</i> on the abuse of drugs. Teacher assesses presentation using criteria for Recording and Communication.
(c) Diseases			
11. compare the different types of diseases;	<p>Types of diseases:</p> <ul style="list-style-type: none"> (a) nutritional deficiency disease; (b) physiological; (c) inherited disorders; (d) infectious. <ul style="list-style-type: none"> (i) Nutritional deficiency – anaemia, goitre, rickets. (ii) Physiological diseases – diabetes cancer-breast and prostate. (iii) Inherited disorders – sickle cell anaemia, haemophilia. (iv) Infectious diseases – STIs, ringworm, 	<p>Provide information as stimulus for class discussion on types of diseases.</p> <p>Invite a community nurse to talk about diseases prevalent in their territory.</p>	Students to construct a table with types of diseases, triggering conditions, two examples of each. Teacher assesses <i>using criteria for</i> Recording and Communication.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
dengue fever, acute respiratory infections, malaria.			
12. explain the importance of maintaining personal hygiene;	Maintenance of personal hygiene (a) regular washing of the hair; (b) care of teeth; (c) regular baths; (d) hygiene of genital areas; (e) importance of clean clothing.	Teacher should facilitate discussion on the importance of maintaining personal hygiene.	<i>Students will develop a poster to demonstrate the importance of personal hygiene. Teacher assesses for creativity and presentation.</i>
13. explain the importance of practising healthy lifestyle;	Aspects of a healthy lifestyle: (a) balanced diet; (b) exercise; (c) rest; (d) personal hygiene.	Teacher provides an initial index of healthy lifestyle parameters, for example, components of a balanced diet, frequency of exercise. Students use this to rate themselves. The survey results can be used for further discussion on aspects of their lifestyles that need improvement. Students may suggest specific changes that would be required. Further discussion on how the various aspects of a healthy lifestyle can benefit an individual.	<i>Students compose and present a song/poem on the benefits of practising a healthy lifestyle. Teacher assesses content for accuracy, creativity and presentation.</i>
(d) Food and Me			
14. discuss the role of nutrients in the body;	Nutrients – proteins, fats, carbohydrates, vitamins, minerals, water, fibre. Protein – growth and repair. Carbohydrates- energy supply (fibre-movement of food). Fat – energy.	Lead discussion on the <i>role</i> of nutrients in <i>the body</i> .	Students are placed in groups. Each group will be assigned a nutrient and asked to develop a summary sheet. Information should include examples of foods rich in the nutrient and its importance. The <i>information</i> from each group can be put together <i>as</i> a booklet for display.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
	Vitamins and Minerals – facilitate metabolism. <i>Water – transport substances.</i> <i>Fibre (roughage) – assist in the removal of undigested substances.</i>		Teacher may assess each group’s activity using the criteria for <i>Social Attributes</i> . The product of each group can be assessed using the criteria for Recording and Communication.
15. perform simple food tests;	Food tests: (a) Starch – iodine test (b) Simple sugars – Benedict’s Test (c) Protein test- Biuret Test (d) Fat- grease spot	Teacher does a demonstration of food tests. Food tests include test for starch, simple sugars, protein and fat.	Students bring samples of food from a meal and perform food tests on local foods and fruits and present findings in a report using scientific format. Assess laboratory activity and report using the criteria for Manipulation and Measurement and Recording and Communication.
16. develop balanced diets for different groups of individuals;	A balanced diet - contains the right kinds of foods in the proportions necessary for the body to carry out all its functions. Diet - dependent on age, sex, lifestyles, job type, for example, physical and sedentary. <i>Caribbean Food groups- fats and oils, fruits, staples, legumes, vegetable, food from animals.</i> Unbalanced diet.	Students in groups develop balanced diets for different groups of individuals depending on age, sex and job type. Presentations to class follow. Dishes could be prepared or brought by students. Each student will select a balanced meal from the available dishes.	Assess presentations for accuracy of content, audience impact, interest. Peer assessment of each student’s meal choice.
17. describe diseases and disorders associated with poor diet;	Eating diseases or disorders Malnutrition – obesity, under nutrition Anorexia Bulimia	Using multimedia materials, for example, videos, audio recordings, as stimulus for discussion on causes and effects of disorders or diseases.	Students prepare <i>a paragraph</i> on one of the diseases or disorders. Assess the report for accuracy.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(e) Blood and its importance			
18. identify the components of blood;	Red and white blood cells, platelets, plasma.	Use multimedia, for example, videotape, slides, audio recordings and films, on the composition of blood to initiate discussion.	Students will make models of blood components. Teacher assesses models using Recording and Communication criteria.
19. state the functions of blood;	Transport of oxygen, carbon dioxide, digested material, waste products, hormones, heat, and defence of the body (fight infections, clotting).	Students find information on the components of blood and its functions and summarise <i>it</i> in their own words.	Students design a matching activity on blood components and function. Assess accuracy of content and creativity.
20. describe the components of the circulatory system and their functions;	(a) Heart (b) Arteries (c) Veins (d) <i>Capillaries</i>	Teacher uses diagrams or multimedia <i>learning objects</i> showing the various types of blood vessels. Students are asked to note the differences among the vessel types.	In groups, <i>students</i> build models of the components of the circulatory system with annotated labels. Assess the models for accuracy, correct labels and other criteria from Recording and Communication.
21. identify the blood groups;	Blood groups A, B, O and AB;	Survey done of the various blood groups of students. <i>The findings should be presented in a histogram or bar chart.</i> Teacher uses this as a stimulus for class discussion. A resource person can be invited to present to students on blood group testing, and importance of blood donations.	
22. discuss the impact of blood groups on transfusion.	Precaution in transfusions – Universal donor and recipient.	Students may find information on blood groups, universal donor and recipient.	Students write a paragraph explaining the importance of finding out blood groups for the purpose of transfusion. Teacher assesses the product for accuracy of content.

SCHOOL-BASED ASSESSMENT (SBA)

Generic Task

Key skills to be assessed are **Recording and Communication (RC) and Analysis and Interpretation (AI)**.

Have students complete a test developed by the teacher. The test should be designed so that it comprehensively measures the students' knowledge of **Reproduction, growth and development, food, drugs and diseases** and the ability to apply this knowledge.

Scoring Rubric

Recording and Communication and Analysis and Interpretation

The Class Test

(Maximum 20 marks)

This should be a twenty item objective type test. It should comprise four (4) items from each of the following topics. Two of these items will measure the **RC** skills and two will measure the **AI** skills.

- (a) *Reproduction*
- (b) *Growth and development*
- (c) *Food*
- (d) *Drugs*
- (e) *Diseases*

A sample class test is shown overleaf.

SAMPLE CLASS TEST

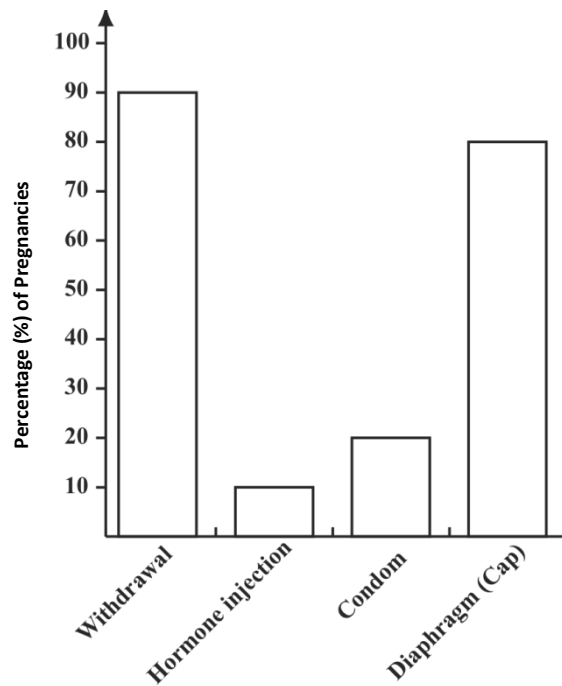
1. The process by which a sperm and an ovum fuse to produce a zygote is called

- (a) cleavage
- (b) ovulation
- (c) fertilisation
- (d) implantation

2. In which of the following structures is sperm produced?

- (a) Testes
- (b) Epididymis
- (c) Prostrate gland
- (d) Seminal vesicles

Items 3 - 4 refer to the graph below which shows the number of pregnancies occurring in one year for groups of couples using various methods of contraception.



3. Which is the MOST effective contraceptive methods used by these couples?
- (a) Condom
 - (b) Withdrawal
 - (c) Diaphragm (cap)
 - (d) Hormone injection
4. Which contraceptive method resulted in approximately 20 per cent of the couples in the group becoming pregnant?
- (a) Condom
 - (b) Withdrawal
 - (c) Diaphragm
 - (d) Hormone injection

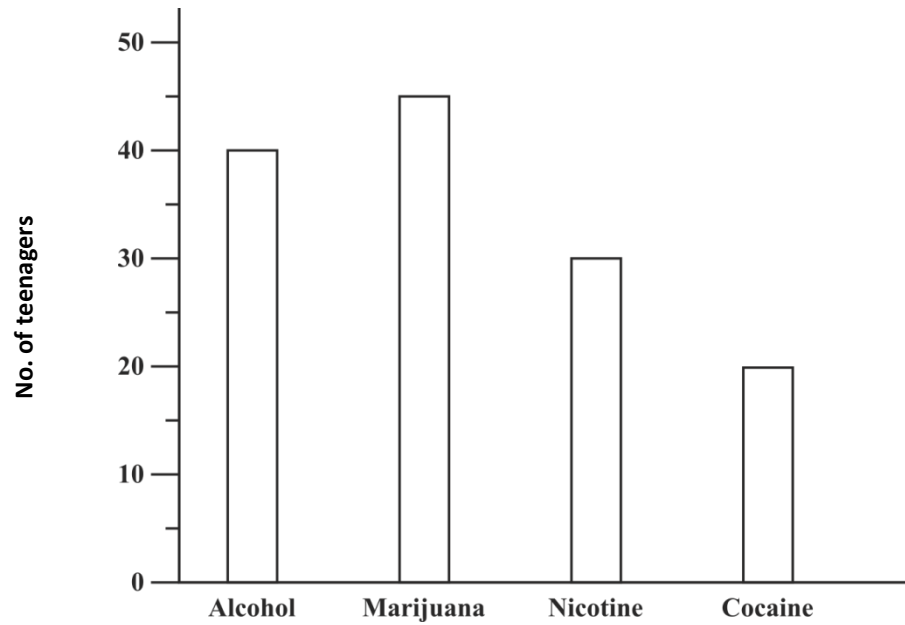
Items 5 - 7 refer to the table below which shows the results of food tests carried out on five food samples.

Food Sample	Purple Colour Present	Blue black	Translucent Mark	Red-brown Precipitate
P		✓		
Q	✓		✓	
R			✓	
S	✓	✓		
T				✓

5. Which of the food samples contain starch?
- (a) P and S
 - (b) S and T
 - (c) Q and P
 - (d) R and T
6. The red precipitate for sample T means that it contains
- (a) fat
 - (b) starch

- (c) *protein*
(d) *reducing sugar*
7. *Which of the food samples contain the nutrients needed most by a body builder?*
- (a) *S and T*
(b) *Q and S*
(c) *Q and P*
(d) *R and S*
8. *Which of the following food tests is used for starch?*
- (a) *Biuret*
(b) *Iodine*
(c) *Benedict's*
(d) *Grease spot*
9. *The smoking of marijuana will affect the reactions of an individual because it causes*
- (a) *malnutrition and diabetes*
(b) *severe liver damage and cancer*
(c) *difficulties in thinking and reasoning*
(d) *an increase in excretion leading to dehydration*
10. *In which of the following substances is nicotine found?*
- (a) *Coffee*
(b) *Tobacco*
(c) *Marijuana*
(d) *Alcoholic drinks*

Items 11-12 refer to the graph below which shows the numbers of teenagers in a drug rehabilitation programme who experimented with various drugs

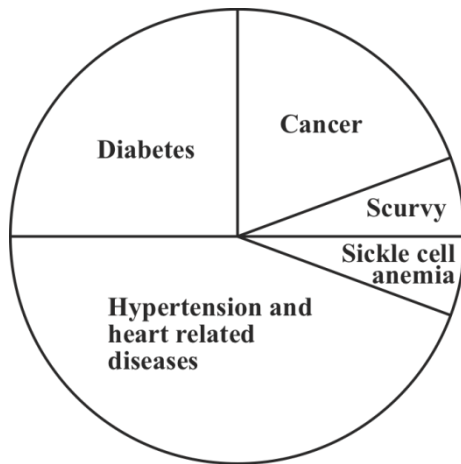


11. The drug which was MOST commonly used by the teenagers in the drug rehabilitation programme is
- (a) alcohol
 - (b) cocaine
 - (c) nicotine
 - (d) marijuana
12. The number of teenagers in the drug rehabilitation programme who experimented with cocaine is
- (a) 10
 - (b) 15
 - (c) 20
 - (d) 25

13. A drum with water was left uncovered in a yard for several weeks. The disease MOST likely to affect the residents is

- (a) anaemia
- (b) leukaemia
- (c) dengue fever
- (d) haemophilia

Item 14 refers to the chart below which shows the percentage of deaths from various diseases in a Caribbean island.



14. Which of the following types of diseases is responsible for the MOST deaths in this island?

- (a) Inherited
- (b) Infectious
- (c) Nutritional
- (d) Physiological

15. Lack of iron in the diet may cause

- (a) cancer
- (b) scurvy
- (c) anaemia
- (d) diabetes

16. Which of the following is NOT a nutritional disease?
- (a) Anorexia
 - (b) Obesity
 - (c) Bulimia
 - (d) Haemophilia
17. Which of the following blood groups is that of the 'Universal donor'?
- (a) A
 - (b) B
 - (c) O
 - (d) AB
18. Which of the following components of blood fights infections?
- (a) Plasma
 - (b) Platelets
 - (c) Red blood cells
 - (d) White blood cells
19. Which of the following does NOT describe the veins?
- (a) Thin walls
 - (b) Thick walls
 - (c) Large lumen
 - (d) Presence of valves
20. A biker of blood type O was in a serious accident; he lost a lot of blood and needed a blood transfusion. Which blood type should he have been given?
- (a) A
 - (b) B
 - (c) O
 - (d) AB

KEY FOR SAMPLE TEST

Question No	Syllabus Objective	Key	Skill
1	4.A.4	C	RC
2	4.A.2	A	RC
3	4.A.6	D	AI
4	4.A.6	A	AI
5	4.D.15	A	AI
6	4.D.15	D	AI
7	4.D.16	B	AI
8	4.D.15	B	RC
9	4.B.10	C	RC
10	4.B.10	B	RC
11	4.B.10	D	AI
12	4.B.10	C	AI
13	4.C.11	C	RC
14	4.C.11	D	AI
15	4.C.11	C	RC
16	4.C.11	D	RC
17	4.E.22	C	RC
18	4.E.19	D	RC
19	4.E.20	B	RC
20	4.E.22	C	AI

◆ MODULE 5: EXPLORING ENERGY

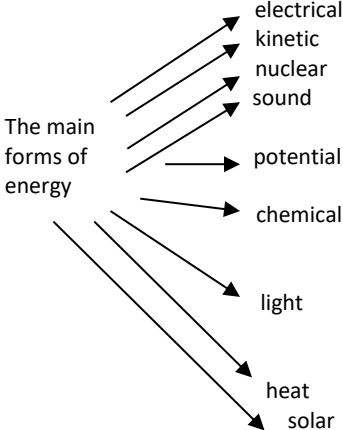
This Module contains the following topics:

- (a) Forms of energy;
- (b) Energy conversions;
- (c) Energy sources;
- (d) *Energy in the home;*
- (e) *Energy interaction.*

◆ GENERAL OBJECTIVES

On completion of this Module, students should:

1. understand the impact of energy on man's activities and the interchange among the different forms of energy;
2. appreciate the need for responsible use of energy.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(a) Forms of energy			
1. state the main forms of energy; 2. define the term energy; 3. identify the forms of energy present in a named object or situation;	<p><i>Energy – ability to do work</i></p>  <p>The main forms of energy</p> <ul style="list-style-type: none"> electrical kinetic nuclear sound potential chemical light heat solar 	Present students with various situations and ask them to identify the forms of energy present. Students may work in groups.	In small groups, students will develop a game to assist with remembering the various forms of energy. Criteria for <i>Social Attributes</i> can be used to assess students as they plan the design of the game. The teacher assesses the game for accuracy of content, creativity and visual impact. <i>Students will complete a word puzzle to identify the different forms of energy. Teacher assesses for accuracy.</i>
(b) Energy conversions			
4. identify the energy conversions (changes) occurring in given situations;	Recall that energy is neither created nor destroyed, but is changed from one form to another. Energy conversions - some energy is wasted or lost (heat). <i>For example, TV: electrical – light, sound and heat. Efficiency of energy conversion in appliances to reduce wasted energy.</i>	Teacher uses photographs, samples and or models of appliances and/or labour saving devices to begin discussions. Discussion should elicit the types of energy used and given out.	Students will create flow charts or other graphic organisers to illustrate energy changes in named appliances or devices. <i>This should be assessed for accuracy of content, creativity and visual impact.</i> <i>Students in groups create an advertisement highlighting the efficiency of their chosen product. Assess using criteria for Recording and Communication.</i>
5. discuss the impact of energy conversions on everyday activities;	Energy - needed for all activities and is stored, must be converted, helps with transportation, industry and entertainment.	<i>Work in groups to research the impact of energy conversions on everyday activities. Produce written project document or oral presentation and share findings in a presentation.</i>	Oral presentations or project document should be assessed for content, creativity and impact on audience as well as Social Attributes.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
6. <i>classify heat energy transfers as examples of conduction, convection or radiation;</i>	<p><i>Conduction - transfer of heat from the source through a medium such as the metal base of a saucepan.</i></p> <p><i>Convection - transfer of heat by fluid movement.</i></p> <p><i>Radiation - movement of heat from a source through space.</i></p> <p><i>Examples may include cooking, sunbathing, drying clothes, heating substances.</i></p>	<p><i>Students are organised into groups and complete a simple practical on conduction, convection and radiation. Record the results.</i></p> <p><i>Discussion follows on the types of heat transfer and suitability for cooking and other everyday activities.</i></p>	<p><i>Students work in groups to prepare potatoes using each of the three types of heat transfer. Write up the practical activity using the scientific format.</i></p> <p><i>Report assessed for Analysis and Interpretation, and Social Attributes.</i></p> <p><i>Students and teachers critique and offer suggestions.</i></p>
(c) Energy sources			
7. <i>classify energy sources as renewable and non-renewable;</i>	<p>Renewable energy sources, for example, sun, wind, hydroelectricity, geothermal, biogas and wood</p> <p>Non-renewable energy sources. Fossil fuels, for example, coal, oil and gas.</p>	<p>Teacher leads a brainstorming session to check for prior knowledge on renewable and non-renewable energy.</p> <p>Students to work in small groups and use available resources (textbook, Internet) to research either renewable or non-renewable energy sources.</p>	<p>Students create matching activity on renewable and non-renewable sources of energy.</p> <p>Criteria for Recording and Communication can be used for assessment.</p>
8. <i>define the term fossil fuel;</i>	<p>Fossil fuel – an energy source created from the remains of plants and animals slowly decaying over a period of time while exposed to extreme pressure and temperature.</p>	<p>Students to use their knowledge of fuels and a dictionary definition of fossil to generate a definition of the term fossil fuels. Teacher to use students' responses to fashion a working definition of fossil fuels.</p>	

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
9. discuss the effects of fossil fuels on the environment;	<p>Burning of fossil fuels - production of carbon dioxide.</p> <p><i>Greenhouse effect, global warming</i></p> <p><i>Refer to Module 3, Specific Objective 22.</i></p> <p><i>Contributes to climate change causing more extremes in natural phenomena, for example, hurricanes, droughts, rising sea levels.</i></p>	Class discussion on the effects of burning fossil fuels.	<p><i>Divide class into groups and ask each group to research the effects of burning fossil fuels and prepare a one page report.</i></p> <p><i>Teacher assesses group report using the criteria for Recording and Communication, and Social Attributes.</i></p>
10. discuss the need to conserve energy;	High energy cost, limited resources in the Caribbean, the finite global sources of energy.	Present students with the following scenario: The Government has declared that homes that have implemented energy conservation measures will receive monetary incentives. Teacher prompts students to identify which measures can be taken to receive the incentive.	Students can be asked to add three other practices that would help with energy conservation outside of the home. Teacher checks list using Recording and Communication criteria.
11. <i>compare the feasibility of alternative energy sources to fossil fuels;</i>	<p>Advantages of alternative energy sources - readily available, lower production cost, low emission of pollutants and inexhaustible.</p> <p>Disadvantages of alternative source of energy - initial cost of equipment high, require large land space, for example, wind.</p> <p>Sun, wind, hydroelectricity, geothermal, biomass, (biogas, gasohol, bagasse), waves and tides.</p>	Students go on a field trip (virtual or otherwise) to a power generation facility. Students discuss findings.	Students can be organised into groups and the groups paired to form opposing pairs to debate the use of an assigned alternative energy form. Groups will submit a report of points to be used in their debate presentations. The written report and presentation can be assessed for correctness and using the criteria for Recording and Communication, and Social Attributes.

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
(d) Energy in the home			
12. classify items as either conductors or insulators;	Conductors, for example, copper and aluminium. Insulators, for example, plastic and wood.	<i>Teacher constructs simple circuit to test various materials for electrical conductivity, for example, wood, a piece of concrete, foil, charcoal, plastic, rubber as demonstration to stimulate class discussion.</i> <i>The students prepare a collage displaying common household items as conductors or insulators.</i> <i>Research the use of insulators in the home, especially the kitchen. Prepare a flyer for circulation at a seminar on safety in the kitchen.</i>	Teacher assesses collage or flyer for accuracy of content and visual appeal.
13. discuss the usefulness of conductors and insulators to humans;	<i>Usefulness of conductors – route electricity, cooking, route heat, cooking utensils.</i> <i>Insulators - prevents electrocution, handle of cookware.</i>	Guided discussion. Stimulus material, for example, print media or photographs may be used to stimulate discussion.	Students complete a pen and paper test to assess their understanding of conductors and insulators. Teacher assesses for correctness.
14. explain the safety rules to be followed when dealing with electricity and electrical mains;	Care when interacting with electrical devices: (a) ensuring that hands are free of moisture; (b) make sure the main switch is off when working on domestic wiring; (c) using rubber soled boots; (d) wearing protective clothing; (e) child safety outlet caps.	<i>Students to research or brainstorm measures on home rules that would protect against harm when dealing with electricity. Students use information to make a pamphlet, brochure or song.</i> <i>Teacher can invite resource person to make presentation on safe use of electricity and heat.</i>	<i>Assess pamphlet/brochure or song. Emphasis should be placed on content, appeal and accuracy of information.</i>
15. list safety devices used to prevent electrical disasters;	Fuses, circuit breakers, surge protectors, Uninterruptible Power Supply (UPS), line conditioners	Teachers use diagrams to demonstrate how safety devices work.	

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
16. discuss the dangers of overloading an electrical circuit;	Power outages, electrical fires, malfunctioning outlets, damage to electrical appliances.	Class discussion on dangers of overloading electrical circuits.	
17. compare parallel and series circuit;	Parallel – alternative path for current Series – single path for current	Students will be given examples of parallel and series circuit diagrams to compare and note their observations. Teacher will move around class and provide guidance. Students will assemble circuits and check for functionality. Students write up the laboratory activity using scientific format.	Teacher assesses the points of comparison as recorded by students for correctness. Teacher may also assess students as they set up the circuits for Manipulation and Measurement skills. The report is assessed using the criteria for Analysis and Interpretation.
18. read electrical meter to determine energy usage;	<i>Read analogue and digital meters Kilowatt hour as energy term (units)</i>	Take initial reading of meters and read again everyday for two weeks. Students can then calculate usage and present results graphically.	Students should write up activity in scientific format. Assess the report using criteria for Recording and Communication including: (a) suitable title (b) accuracy (c) correct axes (d) suitability of the scale Report should also be assessed using criteria for Analysis and Interpretation.
19. calculate the cost of electricity usage;	<i>Cost per kilowatt hour (unit) Fuel charge where applicable</i>	Collect related bills and teacher guides determination of usage and the calculation of cost.	Teacher asks students to calculate various quantities, for example, usage (kilowatt hours), fuel charge (where applicable), total bill.
(e) Energy Interactions			
20. describe the effects of forces;	<i>Start motion, stop motion, change speed, change direction, remain the same (balance).</i> <i>Gravity - keeps us earthbound.</i>	<i>Students perform various activities, for example:</i> <i>(a) Marbles hitting each other.</i> <i>(b) Dropping objects of different materials.</i>	<i>Students create a performance piece to depict life without gravity or friction.</i> <i>Teacher assesses for correctness of content</i>

SPECIFIC OBJECTIVES	CONTENT	SUGGESTED TEACHING & LEARNING ACTIVITIES	ASSESSMENT
Students should be able to:			
	<i>Friction - enables safe movement.</i>	<p>(c) <i>Opening and closing doors.</i> (d) <i>Using ramps of different materials and angles with toy cars.</i> (e) <i>Opening cans.</i> (f) <i>Twisting modelling clay.</i></p> <p><i>Students will give their own explanations for what forces are and their effects.</i></p>	<i>using Recording and Communication criteria.</i>
21. <i>state the types of forces.</i>	<i>Contact (pull, push, twist), for example, friction At a distance (gravity, magnetic, electrostatic).</i>	<p><i>Teacher asks students for examples of push, pull and twist forces in everyday life.</i></p> <p><i>Teacher demonstrates the types of forces using magnets, charged objects and dropping objects from a height.</i></p> <p><i>Students will perform these activities if equipment is available.</i></p>	<p><i>Students construct table naming force involved and their effects.</i></p> <p><i>Teacher assesses for correctness of content using Recording and Communication criteria.</i></p>

SCHOOL-BASED ASSESSMENT (SBA)

Generic Task

Key skills to be assessed are **Analysis and Interpretation and Social Attributes**

Students will create a portfolio of three samples of their best work comprising three activities as listed below **and** include a brief reflective piece on at least two things learnt from doing this Module.

- (a) An investigative activity on series and parallel circuits
- (b) A laboratory report on a meter reading activity
- (c) A group report

(a) **Analysis and Interpretation.**

(Maximum 12 marks)

(i) An investigative activity on series and parallel circuits.

- Correct connections of components in series 2 marks
- Correct connections of components in parallel 2 marks
- Incorrect connections of components in parallel 0 mark

(ii) A laboratory report on a meter reading activity

(iii) Identify relationships and patterns (2 marks)

- Identifies all relationships and patterns 2 marks
- Identifies some relationships and patterns 1 mark
- Does not identify any relationships and patterns 0 mark

(iv) Make predictions (2 marks)

- Uses trends to make predictions 2 marks
- Makes predictions without using trends 1 mark
- No predictions 0 mark

(v) Calculations (4 marks)

- calculations completely accurate 4 marks
- calculations with minor errors 2-3 marks
- Calculations with major errors 1 mark
- Inaccurate calculations 0 mark



- (b) **Social Attributes** **(Maximum 6 marks)**
- (i) *A group report*
- (ii) *Cooperation with others (2 mark)* *2 marks*
- *High level of cooperation* *1 mark*
 - *Limited cooperation* *0 mark*
 - *Inability to cooperate*
- (iii) *Collaborate to get consensus on decisions (2 mark)*
- *High level of collaboration with group* *1 mark*
 - *Limited collaboration with group* *1 mark*
 - *Inability to collaborate with group* *1 mark*
- (iv) *Responsibility to group and respect for others (2 marks)*
- *Ability to take responsibility for assign task and show respect for others* *2 marks*
 - *Ability to take responsibility for assign task or respect for others* *1 mark*
 - *Inability to take responsibility for assigned tasks and to show respect for others* *0 mark*
- (c) **A Reflective Piece** **(Maximum 2 marks)**
- *Description of two new things learnt and impact* *2 marks*
 - *Description of two new things learnt without impact* *1 mark*
 - Or*
 - *Description of one new thing learnt and its impact* *1 mark*
 - *No description* *0 mark*

◆ LEARNING GRID

CURRICULUM LEARNING GRID							
KEY COMPETENCY	Ref. No.	Key skills and abilities Learners will be able to:	Subjects of the Curriculum				
			Eng.	Mod. Lang.	Math.	Int. Sc.	Soc. Stud.
Ability to communicate orally and in writing	Eng. 1	▪ communicate information, orally and in writing	●	√	√	√	√
	Eng. 2	▪ read and interpret information at the literal and inferential levels	●	√	√	√	√
	Eng. 3	▪ evaluate information read and viewed	●	√	√	√	√
	Eng. 4	▪ source relevant information	●	√	√	√	√
	Eng. 5	▪ respond appropriately to information read and viewed	●	√	√	√	√
	Eng. 6	▪ write appropriately for a variety of purposes	●	√	√	√	√
Mathematical literacy	Math. 1	▪ add, multiply, subtract and divide			√		
	Math. 2	▪ use calculator to perform basic mathematical operations			●	√	√
	Math. 3	▪ convert fractions to percentages and percentages to fractions			●		
	Math. 4	▪ calculate profit, loss, percentage profit or loss, discount and discount price, installment and deposit			●		
	Math. 5	▪ calculate the amount of an investment after a period of time			●		
	Math. 6	▪ determine the cost of posting letters and parcels, locally, regionally and globally			●		
	Math. 7	▪ convert major international currencies into local and regional currencies			●		
	Math. 8	▪ calculate salaries and commissions			●		
	Math. 9	▪ calculate utility bills			●	●	
	Math. 10	▪ complete income tax forms			●		
	Math. 11	▪ make and use tally charts			●	√	●
	Math. 12	▪ extract information from pictographs, bar charts and frequency tables			●	√	●
	Math. 13	▪ determine range, mean, median and mode			●	●	
	Math. 14	▪ use data to make predictions			●	●	●
	Math. 15	▪ estimate the size of standard units of length and mass			●	●	
	Math. 16	▪ make reasonable estimates of areas and volumes			●	●	

CURRICULUM LEARNING GRID

KEY COMPETENCY	Ref. No.	Key skills and abilities Learners will be able to:	Subjects of the Curriculum				
			Eng.	Mod. Lang.	Math.	Int. Sc.	Soc. Stud.
Ability to function in a foreign language	Mod. Lg. 1	▪ convert short, meaningful conversation into Spanish or French		•			
	Mod. Lg. 2	▪ respond appropriately to brief instructions given in Spanish or French		•			
	Mod. Lg. 3	▪ read, understand and respond appropriately to material written in Spanish or French		•			
	Mod. Lg. 4	▪ have meaningful dialogue with a native speaker of Spanish or French		•			
Science Literacy	Int. Sc. 1	▪ use appropriate equipment to measure length, weight, density, volume and temperature			•	•	
	Int. Sc. 2	▪ observe precautions related to the use of drugs				•	•
	Int. Sc. 3	▪ observe precautions related to diseases including sexually transmitted diseases				•	√
	Int. Sc. 4	▪ take care of bodily organs including skin, breast, testes, lungs and teeth				•	√
	Int. Sc. 5	▪ adhere to a nutritionally- balance diet				•	√
	Int. Sc. 6	▪ care for the natural environment				•	√
Social and citizenship skills	Soc. St. 1	▪ cope with stressful situations					•
	Soc. St. 2	▪ behave in a socially-acceptable manner					•
	Soc. St. 3	▪ use strategies to manage conflict					•
	Soc. St. 4	▪ differentiate between fact and opinion					•
	Soc. St. 5	▪ relate positively to family, friends and groups					•
	Soc. St. 6	▪ conduct a healthy life-style				√	•
	Soc. St. 7	▪ cope with domestic and social problems					•
	Soc. St. 8	▪ apply for a job or create a business					•
	Soc. St. 9	▪ complete all types of forms including job application forms	•		•		•
	Soc. St. 10	▪ interpret and use information pertaining to the rights and responsibilities of workers					•
	Soc. St. 11	▪ observe desirable consumer practices			•		•
	Soc. St. 12	▪ contribute to national goals and aspirations					•
	Soc. St. 13	▪ prepare a budget	√		√		•
	Soc. St. 14	▪ cope with changes brought about by globalisation and trade liberalisation	√				•
	Soc. St. 15	▪ cope with peer pressure resulting from the youth culture					•
Technological Literacy	TL 1	▪ use modern technologies to conduct research and solve problems	√	√	•	•	•
	TL 2	▪ use modern technologies to conduct consumer transactions			•		•
	TL 3	▪ use computer technology to access and evaluate	•	•	•	•	•

CURRICULUM LEARNING GRID							
KEY COMPETENCY	Ref. No.	Key skills and abilities Learners will be able to:	Subjects of the Curriculum				
			Eng.	Mod. Lang.	Math.	Int. Sc.	Soc. Stud.
		information					
	TL 4	<ul style="list-style-type: none"> ▪ cope with the changes brought along by the use of new technologies in medicine, agriculture, transportation, manufacturing, energy and communication 	√	√	√	•	•

KEY TO GRID

Eng = English Mod. Lang. = Modern Languages Math. = Mathematics Int. Sc. = Integrated Science Soc. Stud. = Social Studies TL = Technological Literacy

- indicates the subject that specifically engages the learner in the development of the competency
- √ indicates the related subjects that engage the learner in the development of the competency

◆ CARIBBEAN SCIENTISTS AND THEIR AREA OF WORK

Names	Birth Territory	Area(s) of work
Dr. Avril Siung – Chung Dr. Compton Seaforth Cheryl Bowes Dr. Maura Imbert	Trinidad and Tobago Trinidad and Tobago Trinidad and Tobago Trinidad and Tobago	Oyster production and Marine pollution Identified the toxic substance in ackees Security products from herbs and other plants Caribbean plants for insecticides and pesticides
Prof. Nazeer Ahman Dr. Arleigh Petters Dr. Avery August Dr. Aeron Lewis Dr. Robert Trench Dr. Frantz Smith	Guyana Belize Belize Belize Belize Belize	Social Science Physics/Mathematics MIT Cancer research Physics Oceanography UNESCO Young Scientist Award 2005
Richard Hil Dr. Thomas P. Lecky Drs. Marley West and Calvin Lockhart	Jamaica Jamaica Jamaica	Naturalist “Birds of Jamaica’/Making Saltfish New Species of cattle called “Jamaica Hope’ Drugs ‘canasol’ – from cannabs in marijuana to treat glaucoma and ‘casamol’ to treat asthma Diabetes
Dr. Errol Morrison	Jamaica	
Dr. Oliver Headley Prof. Ramsey McDonald Saunders	Barbados Trinidad	Solar energy devices Processing of optical signals by the brain/machine to correct abnormal curvature of the backbone.
Dr. Jeffrey W. Dellimore Prof. Harrison B. Prosper	St. Vincent and the Grenadines Dominica	Behaviour of red blood cells under special conditions High Energy Physics

- Sources: 1. Andy Bailfy and Michael Bradshaw “Scientists at Work” Longman (1999)
2. Anthony Johnson “Great Jamaican Scientists, Book I”, Teejay Ltd. (2000)

Western Zone Office
13 June 2012



CCSLC/IS/02/12



CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN CERTIFICATE OF SECONDARY LEVEL COMPETENCE

INTEGRATED SCIENCE

SPECIMEN PAPER AND KEY

MULTIPLE CHOICE QUESTIONS

75 Minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

This specimen paper consists of 50 items.

Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.

Sample Item

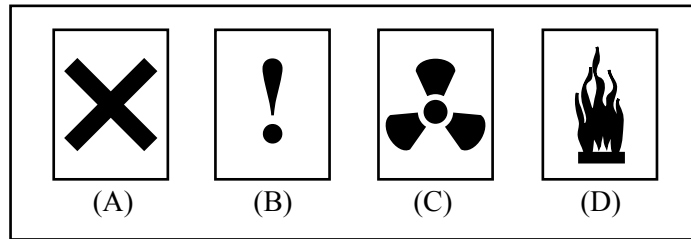
The amount of space taken up by an object is BEST described as its

- (A) mass**
- (B) length**
- (C) weight**
- (D) volume**

The best answer to this item is “volume”, so you should choose suggested answer (D).

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

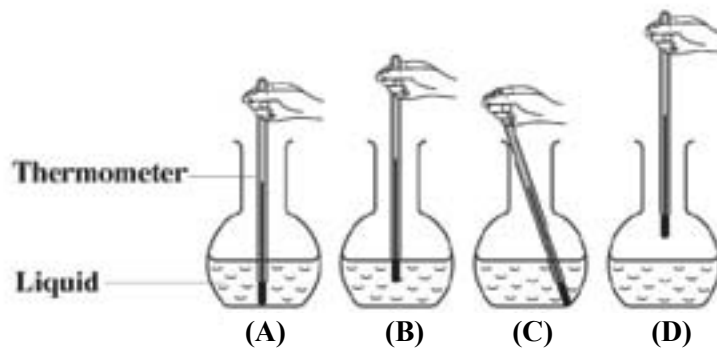
1. Which of the symbols shown below indicates that a substance is radioactive?



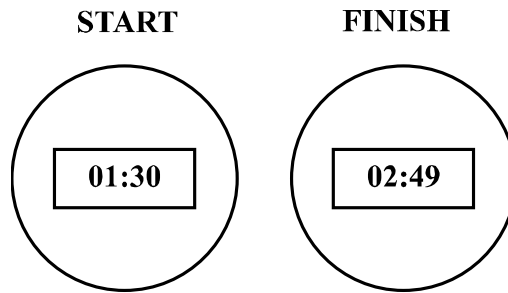
2. Which of the following natural disasters affect the Caribbean region MOST frequently?

- (A) Floods
- (B) Tsunamis
- (C) Hurricanes
- (D) Earthquakes

3. Which of the flasks below show the BEST position of the thermometer to determine the temperature of a liquid in a round-bottom flask?



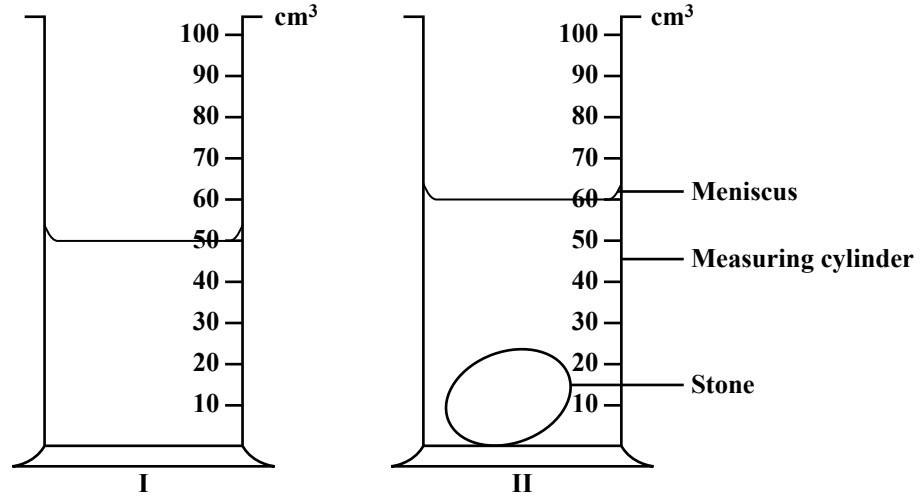
Item 4 refers to the following diagrams of clocks showing the start and finish times for an athlete in a long distance race.



4. How long did it take the athlete to complete the race?
- (A) 1 hour 30 minutes
 - (B) 1 hour 19 minutes
 - (C) 2 hours 49 minutes
 - (D) 4 hours 19 minutes

Item 5 refers to the diagram and information below.

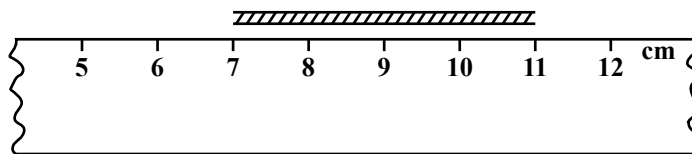
Sami poured water into a measuring cylinder as shown in Diagram I below. After a few minutes, she placed a stone in the measuring cylinder. The new volume is shown in Diagram II.



5. The volume of the stone is

- (A) 10 cm³
- (B) 20 cm³
- (C) 50 cm³
- (D) 60 cm³

Item 6 refers to the following diagram which shows part of a ruler and a piece of string.



6. The length of the string, in cm, is

- (A) 4
- (B) 5
- (C) 7
- (D) 11

GO ON TO THE NEXT PAGE

Item 7 refers to the following units of measurement which were used in an experiment.

°C	g	cm	ml
----	---	----	----

7. Which of the following instruments was NOT used in this experiment?
- (A) Ruler
 - (B) Balance
 - (C) Stopwatch
 - (D) Thermometer
8. George plants crops on two similar plots of land, A and B. He provides shade on Plot A but not on Plot B. George believes that the plants on Plot A will grow much faster than those on Plot B. George's belief is called
- (A) a variable
 - (B) a hypothesis
 - (C) an expectation
 - (D) an observation

Items 9 – 10 refer to the following information.

A group of students want to investigate which ball had the most bounce and was therefore most suitable for playing tennis. They took four balls, each of diameter 6 cm, and bounced them in the car park. They bounced each ball five times from the same height and recorded the average rebound height.

9. What variable OTHER THAN height was kept constant?
- (A) Size
 - (B) Weight
 - (C) Colour
 - (D) Texture
10. The results for the experiment above are shown in the following table:

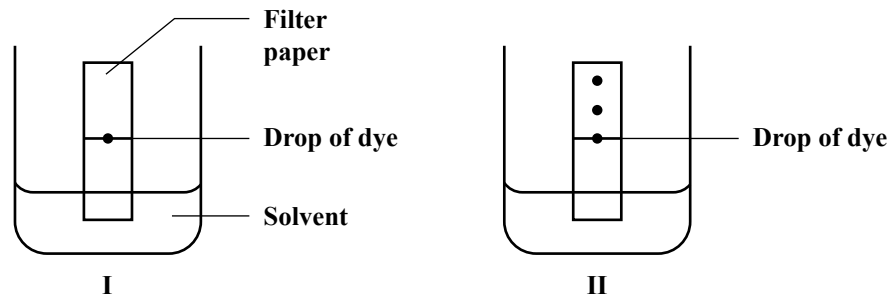
Ball	Average Rebound Height (cm)
W	15
X	25
Y	45
Z	75

Which ball has the HIGHEST bounce?

- (A) W
- (B) X
- (C) Y
- (D) Z

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Item 11 refers to the experiment set up as shown in Diagram I below. The separation of the dye after several hours is shown in Diagram II.



11. The process demonstrated above is
- (A) extraction
 - (B) sublimation
 - (C) distillation
 - (D) chromatography
12. The freezing point of water is
- (A) 0 °C
 - (B) 10 °C
 - (C) 100 °C
 - (D) 1 000 °C
13. Which of the following substances can cause water pollution?
- I Fertilizers
 - II Pesticides
 - III Detergents
 - IV Crude oil
- (A) I and II only
 - (B) II and III only
 - (C) I, II, and III only
 - (D) I, II, III and IV
14. The chemical symbol for calcium is
- (A) C
 - (B) Ca
 - (C) Cl
 - (D) Cu

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Items **15 – 16** refer to the information below.

Four cylinders of potato, each of length 5.0 cm, were placed in an unknown liquid and left for 30 minutes. The cylinders were removed, blotted dry, and measured. The results are shown in the table below.

Cylinder	Initial length (cm)	Final length (cm)
1	5.0	5.4
2	5.0	5.5
3	5.0	5.5
4	5.0	5.6

15. The process responsible for the change in length of the cylinders is

- (A) diffusion
- (B) osmosis
- (C) mass flow
- (D) active transport

16. The unknown liquid is MOST likely

- (A) alcohol
- (B) sugar solution
- (C) salt solution
- (D) pure water

GO ON TO THE NEXT PAGE

Items **17 – 18** refer to the following information.

Students conducted an experiment to place materials into the categories of metals and non-metals. The results are shown below.

Material	Conducts heat	Ductile	Dull	Soft	Conducts electricity
I	√	√	x	x	√
II	x	x	√	√	x
III	√	x	x	√	√
IV	x	x	√	x	x

17. Which of the following are MOST likely metals?

- (A) I and II
- (B) I and III
- (C) II and III
- (D) III and IV

18. Which of the following may be used as insulators?

- (A) I and II
- (B) I and III
- (C) II and III
- (D) II and IV

GO ON TO THE NEXT PAGE

Items 19 – 20 refer to the information below.

Rashid conducted an experiment to determine the pH of several household chemicals. The results are shown below.

	Material	pH
I	Vinegar	5
II	Lemon juice	6
III	Table salt	7
IV	Sodium bicarbonate	10
V	Toothpaste	11

19. Which materials in the table above are acidic?
- (A) I and II
 - (B) I and V
 - (C) II and III
 - (D) IV and V
20. Your friend is stung by a bee at school. Which material in the table could be used to treat the bee sting?
- (A) I
 - (B) II
 - (C) III
 - (D) V
21. Groups of specialized tissues carrying out a specific task are collectively referred to as
- (A) a cell
 - (B) an organ
 - (C) a system
 - (D) an organism
22. Food production in plant cells takes place in the
- (A) nucleus
 - (B) vacuole
 - (C) chloroplast
 - (D) mitochondria

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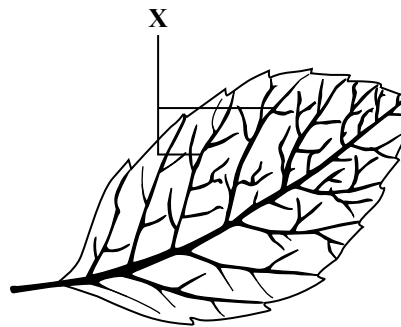
23. Some advertising signs contain light which makes them more visible and attractive. Which of the following gases produces this light?

- (A) Neon
- (B) Argon
- (C) Helium
- (D) Hydrogen

24. Which of the following soil types will have poor drainage properties?

- I. Sandy soil
 - II. Clay soil
 - III. Loam soil
- (A) I only
 - (B) II only
 - (C) I and II only
 - (D) I and III only

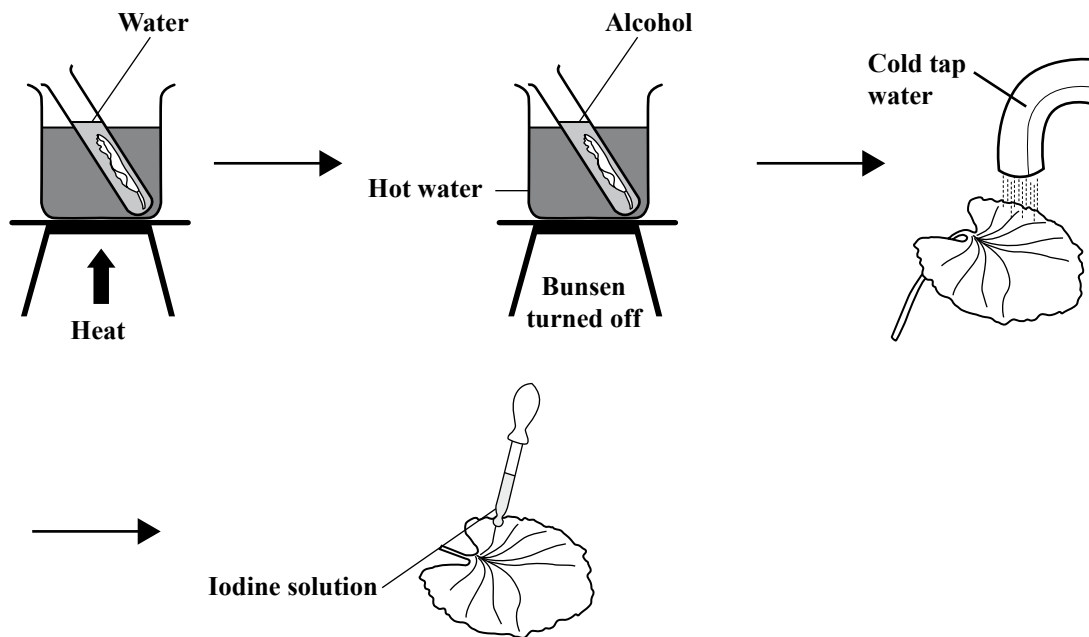
Item 25 refers to the following diagram of a leaf.



25. The part labelled X is the

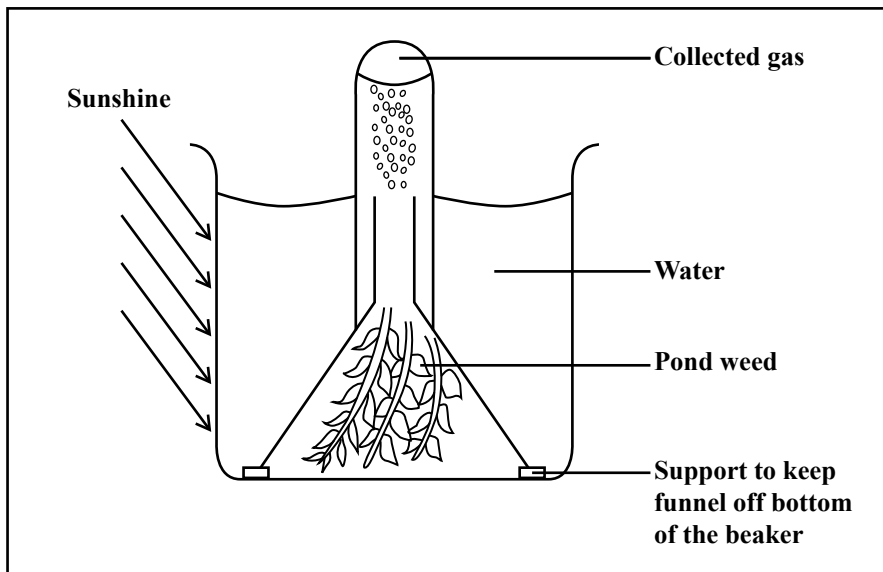
- (A) vein
- (B) stalk
- (C) lamina
- (D) midrib

Items 26 – 27 refer to the following laboratory experiment.



26. The purpose of the experiment is to test the leaf for
- (A) starch
 - (B) oxygen
 - (C) chlorophyll
 - (D) carbon dioxide
27. A positive test is shown by the changing of the iodine solution from brown to
- (A) yellow
 - (B) purple
 - (C) blue-black
 - (D) orange-red

Items **28 - 29** refer to the diagram below which shows an experiment that was set up by a class.



28. The process that the class is investigating is

- (A) digestion
- (B) excretion
- (C) respiration
- (D) photosynthesis

29. The gas collected in this experiment is

- (A) oxygen
- (B) nitrogen
- (C) hydrogen
- (D) carbon dioxide

30. A student conducted an experiment to find the best method for removing an insect pest from four small ponds which appear to be equally infested with the pest. He treated each pond in one of four different ways and then checked for the level of infestation. The results are shown in the table below.

Method	Number of live pests
Draining of water	8
Insecticide	10
Fish-eating larvae	25
Oil on the surface	15

Which method of pest control seemed MOST effective in getting rid of the pest?

- (A) Biological
- (B) Chemical
- (C) Barrier
- (D) Physical

Items 31 - 32 refer to the following types of diseases.

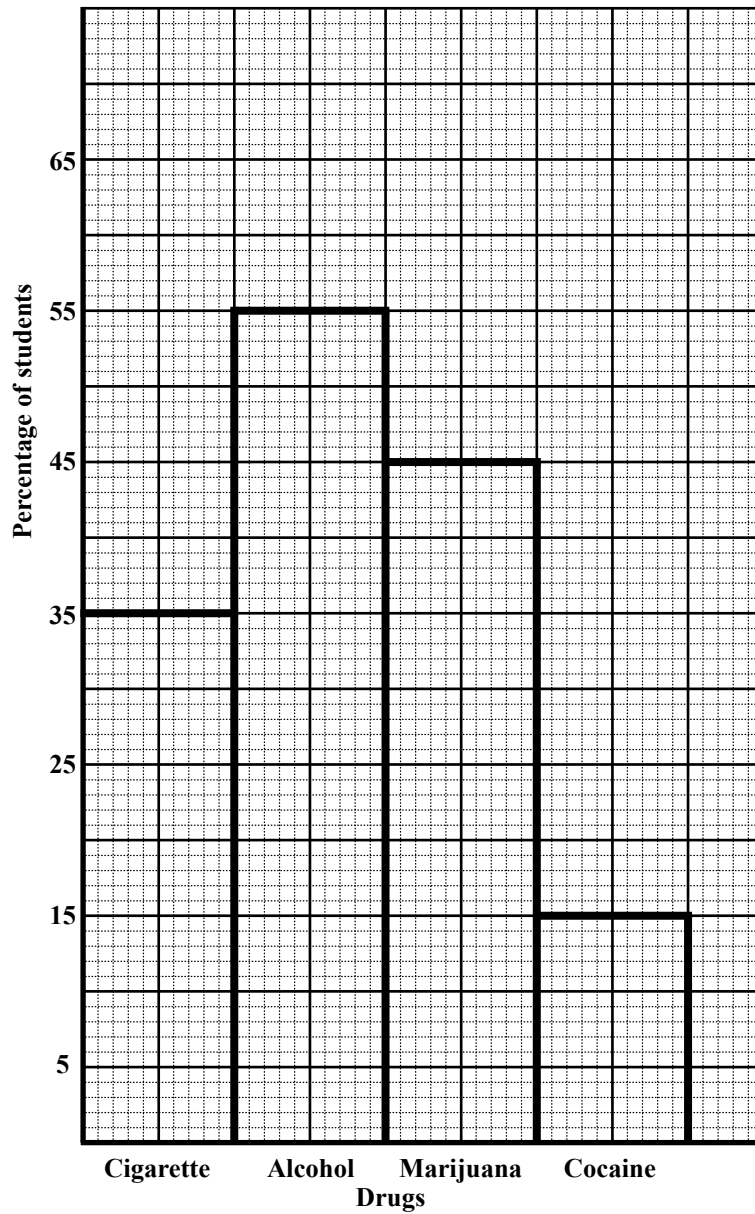
- (A) Inherited
- (B) Infectious
- (C) Nutritional
- (D) Physiological

31. To which of the above types of diseases does diabetes belong?
32. To which of the above types of diseases does haemophilia belong?
33. Which of the following blood groups is that of the 'universal recipient'?
- (A) A
 - (B) B
 - (C) AB
 - (D) O
34. Which of the following components of blood transports oxygen?
- (A) Plasma
 - (B) Platelet
 - (C) Red blood cell
 - (D) White blood cell

GO ON TO THE NEXT PAGE

35. A married couple does not want to have any children during the first two years of marriage. They belong to a religious community that promotes only natural contraceptive methods. The method that the couple should use to remain true to its religious conviction is
- (A) rhythm
 - (B) barrier
 - (C) hormonal
 - (D) sterilization
36. Which of the following medical screening examinations is regarded as necessary to test for good reproductive health in a female?
- (A) Dental
 - (B) Vision
 - (C) Prostate
 - (D) PAP smear

Items 37 - 38 refer to the graph below which shows the results of a substance abuse survey conducted at a Caribbean school.



37. Which of the following substances is used MOST by the students?

- (A) Marijuana
- (B) Cocaine
- (C) Cigarette
- (D) Alcohol

38. What percentage of students abuse cigarettes?

- (A) 15
- (B) 25
- (C) 35
- (D) 45

GO ON TO THE NEXT PAGE

Items 39 - 40 refer to the table below which shows the food groups from which the components of four different meals are taken.

	Staples	Fats	Fruits	Vegetables	Food from Animals
I	√				√
II			√	√	√
III		√			√
IV	√	√			√

39. Which meal will most likely be HIGHEST in vitamins and minerals?

- (A) I
- (B) II
- (C) III
- (D) IV

40. Which meal would be LEAST beneficial for a diabetic?

- (A) I
- (B) II
- (C) III
- (D) IV

41. The form of energy present in a stretched rubber band is

- (A) kinetic
- (B) sound
- (C) chemical
- (D) potential

42. Clothes are hung on a line to dry using heat from the sun. The process by which the heat is transferred from the sun to the clothes is

- (A) radiation
- (B) conduction
- (C) convection
- (D) evaporation

43. Which of the following is a NON-RENEWABLE energy source?

- (A) Coal
- (B) Wind
- (C) Water
- (D) Biogas

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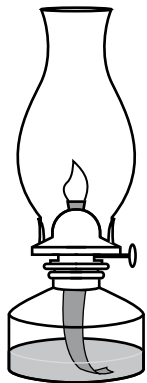
44. Which of the following situations demonstrates the 'at-a-distance' type of force?

- (A) Turning the crank on a generator to get it started
- (B) Water running over a paddle to produce electricity
- (C) Tyres on a plane making contact with the runway when landing
- (D) Hairs on the hand sticking out when passing close to the television

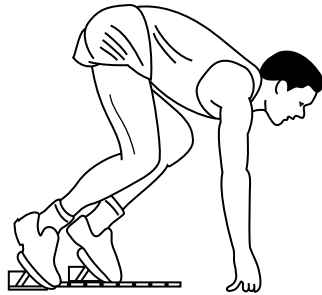
45. Heat from a flame may be transferred to the handle of a frying pan by

- (A) evaporation
- (B) radiation
- (C) conduction
- (D) convection

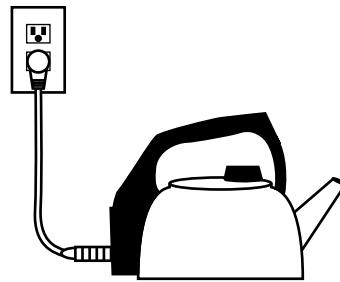
Items 46 – 47 refer to the following diagrams which show some energy changes taking place.



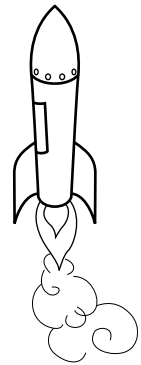
I



II



III



IV

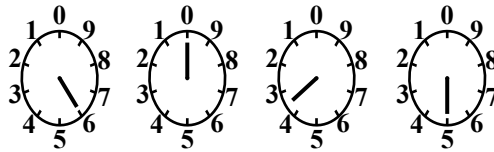
46. Which diagram shows the conversion from electrical energy to heat energy?

- (A) I
- (B) II
- (C) III
- (D) IV

47. Which diagram shows the conversion from potential energy to kinetic energy?

- (A) I
- (B) II
- (C) III
- (D) IV

Items **48 – 49** refer to the following diagram which shows the electricity meter of a home.



- 48.** The meter reading in kilowatts for the home is
- (A) 5035
 - (B) 5144
 - (C) 6035
 - (D) 6946
- 49.** The home uses 1 519 kW of electricity in June. If the electricity company charges a rate of 20 cents per kilowatt, what is the cost of electricity for this home for the month of June?
- (A) \$ 3.04
 - (B) \$ 30.38
 - (C) \$ 303.80
 - (D) \$ 3038.00
- 50.** Which of the following should NOT be done when dealing with electricity and electrical power mains?
- (A) Wear rubber-soled boots.
 - (B) Have wet hands while working.
 - (C) Make sure the main switch is turned off.
 - (D) Use the recommended tools for repairs.

END OF TEST

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN CERTIFICATE OF SECONDARY LEVEL COMPETENCE

INTEGRATED SCIENCE

SPECIMEN PAPER 2011

Question No.	Syllabus Objective	Key	Skill
1	1.A.3	C	RC
2	1.B.7	C	RC
3	1.C.13	B	MM
4	1.C.13	B	MM
5	1.C.13	A	MM
6	1.C.13	A	MM
7	1.C.12	C	MM
8	1.A.6	B	PD
9	1.A.6	A	AI
10	1.A.6	D	AI
11	2.C.16	D	RC
12	2.B.8	A	RC
13	2.B.10	D	RC
14	2.C.13	B	RC
15	2.A.4	B	AI
16	2.A.4	D	AI
17	2.D.17	B	AI
18	2.D.18	D	AI
19	2.E.21	A	AI
20	2.E.21	D	AI
21	3.A.6	B	RC
22	3.A.4	C	RC
23	3.C.18	A	RC
24	3.E.26	B	RC
25	3.B.10	A	RC

Question No.	Syllabus Objective	Key	Skill
26	3.B.11	A	AI
27	3.B.11	C	AI
28	3.B.11	D	AI
29	3.B.11	A	AI
30	3.D.24	D	AI
31	4.C.11	D	RC
32	4.C.11	A	RC
33	4.E.22	C	RC
34	4.E.18	C	RC
35	4.A.6	A	AI
36	4.A.7	D	AI
37	4.B.10	D	AI
38	4.B.10	C	AI
39	4.D.14	B	AI
40	4.D.14	D	AI
41	5.A.3	D	RC
42	5.C.6	A	RC
43	5.C.7	A	RC
44	5.E.21	D	RC
45	5.D.13	C	RC
46	5.B.4	C	AI
47	5.B.4	B	AI
48	5.D.18	C	AI
49	5.D.19	C	AI
50	5.D.14	B	AI

CARIBBEAN EXAMINATIONS COUNCIL

Caribbean Certificate of Secondary Level Competence (CCSLC)



INTEGRATED SCIENCE

Specimen Paper and Key



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