REPUBLIC OF TRINIDAD AND TOBAGO

MINISTRY OF EDUCATION

Secondary School Curriculum

INTEGRATED SCIENCE

Forms One – Three

Curriculum Development Division

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Contents

A Message from the Director

The Curriculum Guides and Teachers Guides have been developed by educators and teachers. They are intended to facilitate the preparation of students to meet the rapidly changing demands of life in the 21st century, while ensuring that they acquire the core of general knowledge and experience essential for higher education. The revised curriculum represented is designed to guide the adoption of a more student-centred approach to instruction, and the provision of learning opportunities that are relevant and inclusive of varied learning needs and interests.

We have seen profound changes in the use of technology in education, the need for a greater focus on morals and values education and increased acquisition of life skills. There is no doubt that further shifts will take place in the coming years. The challenge for us as educators is to find ways to make our approach to teaching flexible, progressive, and responsive, so that we embrace change where it benefits learners. This entails becoming lifelong learners ourselves and creating environments that provide necessary community and stakeholder support and foster professional development.

The design of the revised curriculum documents was based on sound, contemporary educational theory, best practice, and system data. These documents will serve as foundational guides for the development of instructional programmes to be implemented at the Forms 1-3 levels.

The Curriculum Development Division is confident that the revised National Curriculum Guides and the Teachers Guides for Forms 1–3 will contribute significantly to enhanced teaching and learning experiences in our secondary schools. Accordingly, the curriculum is the main channel to educate and develop children towards being academically balanced, healthy and growing normally, well-adjusted socially and culturally, emotionally mature and happy and enabling them to achieve their full potential

John Roopchan
Director of Curriculum Development
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Part 1

The National Curriculum for Forms 1 - 3

National Curriculum Framework

Introduction

This curriculum framework is intended to outline the nature and purpose of the curriculum as well as the parameters for consistent curriculum implementation throughout secondary education in Trinidad and Tobago. The document sets out the principles that govern and guide teaching and learning. The term `curriculum' is used in this document to describe the sum total of the planned experiences which occur within that environment and was designed to foster children's learning and development. These include activities and events, with either direct or indirect impact upon the child.

A clear understanding of the nature, role and function of the national curriculum for Trinidad and Tobago is a critical part of the whole positive transformation of education to provide a seamless pathway for all students through the system of teaching and learning. For Trinidad and Tobago, the National Curriculum Framework becomes the basis for all education and curriculum decision-making, including the design, development and implementation strategies for a new system of teaching and learning covering those foundation years of education. The statement of outcomes for students are a key part of this education framework and forms the basis for all subsequent decisions about teaching and learning, content, pedagogy and assessment. These must work towards fulfilling the vision for successful students and future citizens of our nation.

In order to establish common ground and ensure that the curriculum can be implemented as designed, a set of foundational principles needs to be established. This National Curriculum Framework establishes a consistent foundation for learning that is undergirded by the Ministry of Education vision, mission and the five value outcomes for all children.

The National Curriculum must ensure that all curriculum activity, including implementation at the classroom level, functions within the guiding principles of education established by the Ministry of Education. The guiding principles of the Ministry of Education ***(Education Sector***

Strategic Plan 2011-2015 p.g. XI) were developed after extensive stakeholder dialogue and sound analysis of the current societal and national requirements.

For an effective and relevant twenty-first century process of teaching and learning, these guiding principles are an indicator that the Ministry of Education seeks to place education in Trinidad and Tobago alongside, if not ahead of international best practices. The Ministry of Education has established an ***Education Sector Strategic Plan 2011-2015*** to achieve the goals of quality, innovative, challenging, flexible education for all, and has begun an investment in human and material resources to achieve this outcome in a purposeful and timely fashion.

Foundation of the National Curriculum

Curriculum development is informed by the vision and mission of the Ministry of Education. The design of revised curriculum documents for implementation at the classroom level is therefore guided by the principles and policies of the Ministry of Education.

A forward-looking perspective on what all schools should be facilitating in terms of student achievement is guided by the national curriculum. There is equal clarity regarding a twenty-first century education system functioning to provide the highest standard of education. The regulatory and guiding principles for education provide the overarching national framework for education.

The Ministry of Education, ***Education Sector Strategic Plan: 2011-2015,*** and other policy documents, establish the design framework for all components of the new curriculum. Principal among these are the vision, mission and the five (5) value outcomes established at the national level for all students, which further guides the formulation of the desired and intended learning experiences for the classroom in the curriculum guide.

Vision of Ministry Of Education

The Ministry is leading a quality education system that responds to the diverse needs and requirements of 21st century learners, promotes inclusivity, seamlessness, equity and equality and contributes to human capital and sustainable development.

GORTT, Ministry of Education, Education Sector Strategic Plan: 2011-2015

The Mission statement is derived from the Vision of the Ministry Of Education. The Mission statement will guide the revision of the curriculum to meet the needs of the learners.

Mission of Ministry Of Education

To educate and develop children who are able to fulfil their full potential; healthy and growing normally; academically balanced; well-adjusted socially and culturally; and emotionally mature and happy.

Value Outcomes

An internal analysis of the education system, together with research conducted in international forums, has shown that the curriculum is core to the development of innovative people. This curriculum is aimed at attaining the five value outcomes of the Ministry of Education that help to define standards of attainment for all secondary school students.

The Ministry of Education's overarching goal is to educate and develop children who are:

- Able to fulfil their full potential
- Academically balanced
- Healthy and growing normally
- Well-adjusted socially and culturally
- Emotionally mature and happy

Every core curriculum subject must facilitate the achievement of these value outcomes by all students. The core curriculum subjects, their content and the suggested teaching, learning, and assessment strategies are the means to fulfil the holistic development of the student.

It is expected that by the end of secondary school education, students will achieve all five value outcomes in order to make informed choices and contribute to the needs of society.

The five value outcomes are described more fully below.

A. Children who will achieve their full potential.

1. Function with a purpose based on love, value, family life, service and aesthetic expression.
2. Understand and participate constructively in their career and vocational pathway.
3. Able to cope with daily challenges, set healthy boundaries and make wise social choices.
4. Productive achievers, role models with good work ethics.
5. Will function at their best with a strong sense of commitment to their interests and activities.
6. Optimize their God-given talents to advantage.

7. Enterprising and responsible in risk taking.

8. Recover quickly from setbacks and disappointments.

9. Achieve economic well-being and make a positive contribution to society.

B. Children who are adequately prepared educationally to fulfill their potential.

1. Prepared to participate in society as appropriate to their age.

2. Academically balanced to be productive (combination of appropriate skills and competencies).

3. Skilled in critical and creative thinking, problem-solving, visioning, thinking outside the box and receptive to new ideas.

4. Skilled in the use of current technology and the Internet (cyber wellness).

5. Proficient in a second language.

C. Children who are adequately developed socially and culturally.

1. Productive and have good self-image.

2. Enquiring, confident and strong among their peers, and emotionally secure, open, honest and emphatic in relationships.

3. Competent to interact and communicate with others, within different social settings and environments.

4. Patriotic and courageous in civic affairs and proud to be identified as members of the national and Caribbean Community.

5. Historically aware, including knowledge of our people.

6. Capable of informed participation in the democratic and political process.

7. Capable of functioning with good character and values in their culture.

8. Respectful of the law, authority, the rights of others, creative imagination in its different forms and of the right to divergent views.

9. Developed with interpersonal and language skills.

10. Environmentally aware, protective of the physical environment and demonstrates an understanding of sustainable development.

11. Able to lead, have good governance skills, are competent to respond to the challenges of new roles in multiple contexts and are able to manage conflict.

12. Humanely aware of the less fortunate and the disadvantaged and committed to contributing to the welfare of our community and country.

13. Functioning with an honest sense of family and community.

14. Proficient in dealing with daily conditions.

15. Skilled in finding a safe place to think and grow.

16. Confident in themselves, self-motivated, enterprising and pursue self-education and lifelong self-development and able to work independently and with others.

17. Capable of finding assistance if they are abused or neglected.

18. Spiritually aware with the emotional and intellectual resources to pursue their spiritual growth.

19. Appreciative of the contribution of the arts to daily life, cultural identity and diversity, locally, regionally and internationally.

20. Able to express themselves through the arts.

D. Children who are healthy and growing normally.

1. Secure and safe in their home, school, and community.

2. Physically fit, mentally alert, well nourished, and psychologically sound.

3. Active in exercise, sports, games and recreation.

4. Capable of wholesome interaction with peers.

5. Morally prepared for a productive life.

6. Adequately developed neurologically to overcome learning, speaking, hearing, focusing, and memory or mobility challenges.

E. Children who are emotionally developed, mature and happy.

1. Able to enjoy daily life, have fun and express happiness and positive emotions.

2. Participants in entertainment and celebration.

3. Established in their peer group, satisfied with their life and able to achieve meaning in their lives.

4. Mature and able to become full-fledged, productive and enterprising citizens.

*Further readings -GORTT, Ministry of Education, Education Sector Strategic Plan: 2011-*2015

Education Policies That Impact on the Curriculum

Several policies from the Ministry of Education were taken into account for the revision of the Lower Secondary School Curriculum. These include the Education Sector Strategic Plan 2011-2015, the ICT policy and National Schools Code of Conduct. Three policies that have direct impact on the development and implementation of the curriculum are discussed.

Education Sector Strategic Plan 2011-2015

The Education Sector Strategic Plan purports a vision for education premised on guiding principles which informed the curriculum design and development process. They will provide reference points to ensure that the desired attributes of education are achieved. The guiding principles, listed below, are important components in the revised curriculum.

Principle	***Elaboration***
Student Centered	The student is at the centre of everything we do.
Engaged Communities	We engage parents and families as the heart of students' lives and we support and acknowledge them as the primary guides and decision-makers for students. We engage members of local, regional and global communities as active contributors to student learning
Inclusive	We expect all students will learn in a welcoming environment regardless of place, culture, or learning needs.
Proactive	We plan for a desired future, preventing problems instead of reacting to them.
Shared	We acknowledge that education is everybody's business and therefore expect teachers, the school and education leaders to collaborate with other

Responsibility	government and community organizations to foster student learning
Innovative	We explore new learning opportunities through research, innovation and professional development to ensure continuous improvement of student learning.
Flexible	We enable meaningful and relevant learning through a range of opportunities appropriate to each student's development stage.
Equitable	We ensure that every student will have the benefit of high-quality learning opportunities.
Accountable	We explain to the citizens of Trinidad and Tobago the outcomes of our students and our use of funding.
Transformative Leadership	We believe that people with vision and passion can achieve great things. We therefore empower and inspire out staff and stakeholders to create positive and lasting changes in the education system.
Quality	We are committed to meeting our won quality standards that are driven by the requirements of our customers. Each of us takes charge to ensure that these standards are implemented in our individual areas of authority.
Teacher Empowerment	We create the environment for excellence in teaching practice that improves the learning of all students, deepens educators content knowledge, provides them with research-based instructional strategies to assist students in meeting rigorous academic standards, and prepares them to use various types of classroom assessments appropriately.

ICT in the Curriculum

The ICT Policy goals and objectives of the Ministry of Education are to:

i. Ensure all stakeholders possess the critical requisite skills and competencies to use ICT in the education system as a tool to enhance learning and teaching, communication and research, and to generate innovative processes;

ii. Encourage innovative models of ICT use such as:
- teacher education;

- teaching;
- learning; and
- curriculum materials development

iii. Harmonize activities, approaches and standards in the use of ICT within the Education System
iv. Encourage critical and creative thinking, lifelong learning and social responsibility;

ICT in education in Trinidad and Tobago would create an educational system in which students leave schools as confident, creative and productive users of new technologies, including information and communication technologies, and understand the impact of those technologies on society.

The Ministry of Education's ICT in Education Policy (pp. 28–29) refers to Curriculum Content and Learning Resources as;

- Curriculum and content must increasingly maximize the use of ICT.
- ICT must be integrated into the development and delivery of the curriculum.
- The ICT curriculum needs to be reviewed frequently in order to maintain its relevance.
- ICT integration and ICT competency measures across the curriculum shall be driven through the development and delivery of an ICT-infused curriculum.

ICT in education would create an environment that encourages creativity, innovation, critical thinking and decision making.

Inclusive Education Policy

The Ministry of Education is committed to "support the delivery of inclusive education in all schools by providing support and services to all learners, and by taking appropriate steps to make education available, accessible, acceptable and adaptable to all learners." An inclusive curriculum is acknowledged to be the most important factor in achieving inclusive education. In

planning and teaching the school curriculum, teachers are therefore required to give due regard to the following principles:

i. The National Curriculum Guides set out what most students should be taught at lower secondary school but teachers should teach the required knowledge and skills in ways that suit students' interests and abilities. This means exercising flexibility and drawing from curricula for earlier or later class levels to provide learning opportunities that allow students to make progress and experience success. The degrees of differentiation exercised will depend on the levels of student attainment.

ii. Varied approaches to teaching, learning, and assessment should be planned to allow all students to participate fully and effectively. Account should be taken of diverse cultures, beliefs, strengths, and interests that exist in any classroom and that influence the way students learn.

Copies of these documents may be obtained from the Ministry offices or the website at http://moe.edu.tt/.

The Curriculum Development Process

The term 'curriculum' has several meanings, depending on the context and the perspective of curriculum theory that is applied to the definition. Most theories concur that there are four fundamental components within definitions of curriculum:

- Curriculum as the transmission of a body of knowledge.
- Curriculum as product - defined by the ends or achievements expected.
- Curriculum as process.
- Curriculum as praxis

This revised curriculum subscribes to an eclectic approach which is an amalgamation of the above definitions.

The foundation of the National Curriculum is also informed by a wealth of available curriculum theories and processes. The major forces that influence and shape the organization and content of the curriculum include:

1. Educational philosophy and understandings about the nature of knowledge
2. Society and culture
3. The learner and learning process
4. Learning theories
5. The nature and structure of subject matter to be learned

Thus, these areas represent the foundation on which the national curriculum is revised. These areas will inform educational goals with the aim of developing a coherent, culturally focused, and dynamically evolving curriculum.

This revised curriculum displays a learner-centred design with philosophical assumptions that are mainly constructivist. It seeks to educate and develop children who are able to fulfil their full potential; healthy and growing normally; academically balanced; well-adjusted socially and culturally; and emotionally mature and happy.

The curriculum process was developed through four stages:

Stage 1 of the curriculum development process consisted of consultations with stakeholders from a cross-section of the national community.

The Ministry of Education conducted one national consultation on the secondary education curriculum, along with 3 joint-district consultations and one in Tobago. Consultations were held with representatives from the various divisions of the Ministry of Education, Students, denominational and local school boards; members from the primary and secondary principals association, members of the business community, Unions, representatives from tertiary institutions, representatives from Non-Governmental Organizations (NGOs), parents, and special interest groups. These key stakeholders provided valuable information which helped to inform curriculum change to better prepare students to meet the needs of society.

Stage 2 of the process involved the analysis of findings from opinions, experts, relevant documents and best practices which informed the design of the revised curriculum to enable a set of desirable outcomes and essential competencies to be possessed by all students.

Data from different sources together with other policy documents were examined and a unanimous decision was taken for the following to be core:

English Language Arts, Mathematics, Science, Visual and Performing Arts (VAPA), Physical Education, Spanish and Health and Family Life Education (HFLE), Technology Education, Information and Communication Technology (ICT) and Social Sciences which comprise History, Geography, Social Studies, Religious Education.

In order to develop the student holistically, emphasis was also placed on ICT integration, Sexuality and Sexual Health Education, Health and Wellness, Literacy and Numeracy.

At **Stage 3**, subject experts produced the revised curriculum documents. For each subject, a Curriculum Guide and Teachers' Guide was developed. Teachers with specific subject or curriculum development skills from schools were also included in the creation of these curriculum documents. The outputs of this phase included learning outcomes specific to each subject that contribute to the fulfilment of the national outcomes; subject content; teaching,

learning and assessment strategies to support the outcomes. As part of the development process, the curriculum was validated by feedback solicited from Universities and other key stakeholders. Continued consultations with key stakeholders will provide feedback to inform curriculum evaluation and further validation.

These curriculum documents will provide learning opportunities, teaching and learning strategies, assessment strategies and instructional plans which will contribute to the full potential of the students.

Stage 4 involved the implementation of the revised curriculum. Implementation of the curriculum is a dynamic process, requiring collaboration of the curriculum coordinators / officers and teachers. In implementing, teachers are expected to use the formal curriculum, as described in the curriculum guides, to plan work and teach in a manner that accomplishes the outcomes described. Teachers are expected to translate those outcomes into units of study, determining the appropriate sequence and time allocation according to the learning needs of their students. Although the curriculum documents provide sample teaching and assessment strategies, it is also the role of the teacher to select and use sound teaching practices, continually assessing student learning and systematically providing feedback to curriculum teams for use in revising and improving the guides.

The revised curriculum documents will be implemented initially for Forms 1 then at the Form 2 level and finally at the Form 3 level. Curriculum officers responsible for specific subject areas will monitor and support teachers in the implementation of this curriculum through school visits.

A curriculum development system provides support for the tasks of curriculum implementation. The system advocated by the Ministry of Education involves stakeholders, specialist curriculum officers, principals, heads of departments, and teachers, each with specific roles and responsibilities. Some of these are outlined in the table below.

System Component	Members	Role
Strategic Executive Team (SET) of the Ministry of Education	Consultants, Advisors	• Advise on curriculum policy, goals, and standards.
Curriculum Development Division (Head Office and District-based)	Curriculum officers	• Plan and develop curriculum. • Provide leadership in identifying curriculum goals and determining the process for development of curriculum materials. • Lead writing teams (which include teachers). • Monitor implementation. • Provide teacher support. •Facilitate teacher professional development for curriculum implementation. • Advise on processes and materials for effective implementation and student assessment. • Evaluate curriculum.
School Curriculum Management Team	Principal/Vice Principal and Heads of Departments	• Make major decisions concerning the school curriculum, such as assigning resources. • Provide guidelines for Instructional Planning Teams.
Instructional Planning Teams/School	Teachers	• Cooperate on tasks necessary for effective implementation,

Instructional Committees		such as: yearly work plans, units of study, development of materials to individualize the curriculum, identification and development of learning materials, student assessment and evaluation.

At the school level, the curriculum refers to all the learning and other experiences that the school plans for its students. It includes the formal or written curriculum, as well as the informal curriculum, which is comprised of other developmental opportunities provided by the school, such as those offered by student clubs, societies and committees, and sporting organizations (e.g. cricket team, debating society, Guides, Cadets).

The School Curriculum Management team develops a School Curriculum that must be in alignment with the National Curriculum. The School Curriculum Management team usually consists of the Principal and/or Vice Principal and Heads of Department. The duties of the School Curriculum Management team include the development of school culture, goals, vision, and curriculum in alignment with the national curriculum and culture. It also provides support for curriculum work and performs evaluation functions.

In providing support for curriculum work, the Management team may, for instance:

- encourage teachers to identify challenges and try new ideas;
- develop timetables to allow for development of curriculum materials, for example,

year plans, units, instructional materials;

- ensure availability of learning materials;
- provide instructional leadership;
- ensure that appropriate strategies are formulated to promote student success.

- monitors the curriculum (using, for example, observation, test scores, student books, formal and informal discussions with different stakeholders);
- assesses the hidden curriculum (including discipline policies, fund allocation, physical environment);
- evaluates the school programme of studies.

The roles of instructional teams are described below:

- Develop/Revise/Evaluate work programmes
- Determine resource needs
- Identify/Develop instructional materials
- Conduct classroom action research
- Integrate and align curriculum
- Identify and develop appropriate assessment practices
- Develop reporting instruments and procedures (student and teacher performance)
- Keep records

The roles of teachers are described below:

- Develop/Revise instructional programme
- Individualize curriculum to suit students' needs and interests
- Develop/Evaluate/Revise unit plans
- Develop/Select appropriate learning materials
- Select appropriate teaching strategies to facilitate student success
- Integrate the curriculum as far as possible, and where appropriate
- Select appropriate assessment strategies
- Monitor/Assess student learning and keep records
- Evaluate student performance
- Evaluate classroom programmes
- Conduct action research
- Collaborate with colleagues

The revised lower secondary curriculum for Trinidad and Tobago provides every opportunity for the child to learn, master new important skills and develop attributes and values that are critical to their role as emerging productive, caring and responsible citizens.

The Core Curriculum Subjects

The core curriculum subjects are those for which every student is required to demonstrate achievement of the stated outcomes in Forms 1–3.

A minimum time allocation is recommended for each core subject. The principal, as instructional leader of the school, will make the final decision as to time allocation, according to the needs of the students and the resources available at any given time.

The subjects and the recommended time allocations are as follows:

The number of periods per subject is based on:

- A 5 day cycle
- 7 periods per day
- Approximately 40 minutes per period

SUBJECT	**NUMBER OF PERIODS PER WEEK**
English Language Arts (ELA)	6
Mathematics	5
Spanish	3
Science	4
Physical Education	3
Technology Education	3
Visual and Performing Arts (VAPA)	4
Information and Communication Technology (ICT)	1
Health and Family Life Education (HFLE)	2
Social Sciences (History, Geography, Religious Education, Social Studies)	4

FRAMEWORK FOR AREAS OF STUDY IN SOCIAL SCIENCES

- Social Sciences comprise of the following subjects: Social Studies, History, Geography and Religious Education.
- Four periods are dedicated to Social Sciences.
- Two periods will be dedicated for Social Studies from Forms 1-3 all terms.
- Two periods each will be dedicated to History, Geography and Religious Education according the table below.

	TERM 1	**TERM 2**	**TERM 3**
FORM 1	• SOCIAL STUDIES • HISTORY	• SOCIAL STUDIES • RELIGIOUS EDUCATION	• SOCIAL STUDIES • GEOGRAPHY
FORM 2	• SOCIAL STUDIES • GEOGRAPHY	• SOCIAL STUDIES • HISTORY	• SOCIAL STUDIES • RELIGIOUS EDUCATION
FORM 3	• SOCIAL STUDIES • RELIGIOUS EDUCATION	• SOCIAL STUDIES • GEOGRAPHY	• SOCIAL STUDIES • HISTORY

At the end of Form 3, students will be assessed for the National Certificate of Secondary Education (NCSE), Level I.

Information and Communication Technology (ICT) Infusion into the Curriculum

Information and Communication Technology (ICT) infused in the curriculum is intended to ultimately transform teaching and learning to meet the needs of twenty-first century learners and better prepare them to be global citizens. The use of ICT integration initiatives should support the development of critical skills such as knowledge construction, problem-solving, critical thinking, collaboration, communication, innovation, inquiry, digital literacy and entrepreneurship.

ICT covers all the technologies used for the handling and communication of information. These technologies include:

- Computers/laptops
- Storage devices (e.g. flash drives, CDs)
- Mobile devices/handheld devices
- Satellite communication
- Audio & Audio visual systems
- Cloud computing
- Email/messaging

In addition to the above named technologies, there is a generation of Web 2.0 tools that facilitate a more engaging and interactive learning experience in the classroom. The following is a small sample that may be useful to teachers and students:

- Social networking sites (including educational social networking platforms like Edmodo)
- Blogs, wikis, forums
- Photo and Video sharing tools (e.g. Flickr, Instagram, Youtube)
- Cloud storage (e.g. Skydrive, Dropbox, Deego)
- Digital Story telling tools (e.g. Story Maker)
- Social bookmarking and annotation tools (e.g. Diigo)
- Inspirational tools and lessons (e.g. TED Talks/Ed)

- Screen casting/screen capture tools (e.g. Jing)
- Word cloud generators (e.g. Wordle)

The process of integrating ICT into the curriculum requires that administrators and teachers find ways to incorporate ICTs into teaching and learning to maximize educational outcomes, making learning relevant and meaningful. This integration can only be successful if it is carefully planned, managed, monitored, evaluated. Additionally, appropriate measures should be devised to provide support wherever needed according to the context of the school environment.

It is hoped that educators continue to be creative and resourceful, making full use of the resources that are available to them as they plan instruction.

Literacy across the Curriculum

Literacy is about more than reading and writing – it is about how we communicate in society. It is about social practices and relationships, about knowledge, language and culture. Literacy … finds its place in our lives alongside other ways of communicating. Indeed, literacy itself takes many forms: on paper, on the computer screen, on TV, on posters and signs. Those who use literacy take it for granted – but those who cannot use it are excluded from much communication in today's world. Indeed, it is the excluded who can best appreciate the notion of "literacy as freedom". (UNESCO, Statement for the United Nations Literacy Decade, 2003–2012)

The revised lower secondary curriculum addresses the literacy needs of all learners as they interact with a variety of texts across the different subject disciplines. Research indicates that students who struggle have significant difficulty navigating mathematics, science and social sciences texts in which the language is expository, dense and full of difficult vocabulary (Allen 2000). This underscores the need for all teachers to support students' literacy development since literacy skills are needed if students are to access the entire curriculum.

Teachers of English address students' literacy by teaching the skills of listening, speaking, reading and writing in an explicit and systematic manner. The goal of literacy instruction is to improve learning by building students' comprehension and communication skills. Teachers of other content areas have the responsibility of extending students' literacy instruction by teaching the subject-specific literacy of their respective subject areas. Literacy is embedded in every subject so teachers must create literacy-rich activities for students that will strengthen and support subject-specific learning.

The table below illustrates generic literacy activities that content area teachers and students can engage in to build the core skills of listening, speaking, reading, writing and representing as the curriculum is enacted in all subjects.

Table 1: BUILDING LITERACY SKILLS ACROSS ALL SUBJECT AREAS

LITERACY SKILLS	STUDENT ACTIVITY IN ALL SUBJECTS	TEACHER SUPPORT
Listening and Speaking Aesthetic Listening Efferent Listening Critical Listening	Engage in collaborative discussions Make oral presentations that include use of ICTs Express ideas, perceptions and feelings about what is being learnt	Set ground rules for discussions Listen attentively Facilitate discussions and explanations

	Listen to videos, film clips, audio tapes, DVDs, CDs Engage in discussions related to their learning and to their multicultural environment Engage in critical listening to process information and solve problems Engage in critical reflection on ethical issues related to subject	Source audio texts of related content for discussion Help students interpret and analyse what they listen to Develop students' presentation skills
Reading Textbooks E-books Reports Interviews Surveys Newspapers Magazines Multi-media texts	Engage in individual, peer and group reading Extract details relevant to learning Make inter-textual references Access and read e-books and online information Critically reflect on and interpret ideas presented in multi-media texts Identify problems and discuss solutions Read for information and enjoyment	Model reading of subject content to students Model the Think Aloud strategy Engage students in reading as a process Explain technical terminology and subject-specific vocabulary Indicate features of text and internal organization in subject-specific materials Provide graphic organisers/ concept map templates for student use Help students interpret, analyse and evaluate subject-specific content Help students connect subject content to the world beyond the classroom
Writing Expository Persuasive Technical	Use graphic organisers to plan and record ideas Engage in individual and shared writing	Infuse technology when modelling writing of subject content Explore subject-specific

Reflective	Create descriptions, songs, raps, narrations, explanations Create comics and story boards Engage in reflective thinking when writing Use ICTs to produce and publish pieces	vocabulary and language use Explain internal organization of subject-specific texts Provide graphic organizers/ concept map templates Create blogs for collaboration Encourage emailing of student responses Help students interpret, analyse and evaluate what they write
Representing	Present work learnt through role play, movement, monologues, tables, graphs, maps, songs, posters, diagrams, letters, brochures, written paragraphs, essays, reports, cartoons, comics, models, digital presentations	Encourage a range of presentation types/modes Infuse ICTs when teaching subject content Encourage use of ICTs in students' presentations

Failure to acquire literacy skills for learning across subject disciplines is a major risk which the revised curriculum seeks to address. Literacy lies at the heart of student understanding and achievement. For the curriculum to be enacted in a meaningful manner that benefits all students, effective subject-specific literacy teaching is critical. Each content area requires skills for effective reading and studying of text materials.To support literacy development, content area teachers must know how to teach the skills so that students can bridge existing gaps. Literacy skills are essential for good communication, critical thinking and problem-solving at school and for success in life beyond school.

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PART 2

The Integrated Science Curriculum

Introduction

At the Lower Secondary level, the revised Integrated Science curriculum focuses on established global practices that inform the study of Science, as well as elemental concepts in the study of Biology, Chemistry and Physics. This curriculum builds on the Science curriculum taught at the primary level and also prepares students for further study at the Caribbean Secondary Education Certificate (CSEC) level. Learning outcomes in this curriculum were developed based on research and study of international best practices in addition to feedback provided by all relevant stakeholders. They are what are globally accepted as relevant and current to meet the needs of the 21st century learner. This revised curriculum also places emphasis on scientific inquiry and linking scientific concepts to technological applications. It also integrates the use of Information Communication Technology (ICT) into teaching, learning and assessment practices.

Subject Philosophy

Science is the systematic study of man and the interactions with his environment for its use and preservation through observation and experimentation. It requires the use of the scientific method which fosters 21st century skills such as:

- Critical thinking and problem solving
- Creativity and innovation
- Communication and collaboration
- ICT (Information, Communications and Technology) literacy
- Life and career skills

This curriculum allows for students to acquire conceptual understanding of scientific principles as they are directly involved in activities designed for them to acquire the knowledge and skills which will enable them to function effectively in a global environment.

Rationale for Teaching and Learning Science

It is recognized that Science helps us to understand ourselves as well as our environment. Currently in Trinidad and Tobago, there is the need for citizens to be both scientifically and technologically competent to function effectively both in their personal and professional lives.

Science education can provide a sustainable basis for a knowledge driven economy to better position our citizens for global competitiveness. Using an inquiry-based approach to the teaching of Science can develop students who are analytical thinkers and problem solvers, empowering them to contribute to scientific knowledge and research for the improvement of society. This perspective can naturally transfer to the development of the healthy, safe, and progressive interdependence of all people.

Goals

The goals of this Science curriculum are directly aligned to the Ministry of Educations' value outcomes. It will enable students to:

- Appreciate Science as an enjoyable activity, which enables them to achieve their full potential in a technology-driven society.
- Explore their natural curiosity, and inspire them to learn Science as they develop socially and culturally and demonstrate responsiveness to social realities and natural phenomena.
- Recognize Science as a means of guiding them how to lead healthy and safe lives and make informed and responsible choices as they develop and mature both emotionally and physically.
- Become academically balanced through the development of literacy, numeracy, Information Communication Technology (ICT), interpersonal and intra-personal skills and positive attitudes to work.

General Intended Learning Outcomes

The following general intended learning outcomes are expected of students upon completion of the study of Integrated Science in the lower secondary school:

1. Understand the nature of Science.
2. Stimulate students' curiosity and creativity.
3. Investigate scientific issues and communicate their findings.
4. Demonstrate the ability to make appropriate and informed choices using their knowledge of the role of Science in addressing the complex social issues.

5. Use technology as a tool to research, organize, evaluate and communicate information.
6. Work effectively in diverse teams.

These outcomes can best be attained through scientific inquiry where students assume an active role in their learning. All activities suggested in the implementation of the curriculum prepare students to deal with the challenges of everyday life.

Structure of the Curriculum Document

The Integrated Science curriculum is designed to ensure that students progress smoothly as they develop knowledge, skills and attitudes as they study Science. Students are introduced to the main concepts associated with the Natural Sciences. Content in Biology, Chemistry and Physics is distributed throughout Forms One, Two and Three, to set the foundation for study at the higher levels. As students are taught, they should be continuously assessed and appropriate feedback always provided in a timely manner. These assessments can also be used to guide further planning for instruction.

Teachers can be guided by the content scope outlined and can make appropriate adjustments to the sequencing of topics. However, all listed learning outcomes should be covered over the three-year period. Teachers are requested to use all appropriate teaching strategies in their teaching according to the:

- Learning outcomes being taught
- Needs and learning styles of the students

Some teaching strategies that can be used for the implementation of this curriculum are as follows:

- Demonstrations
- Drill and practice
- Lecture
- Questioning technique
- Circus/workstations
- Conducting experiments

- Field observations
- Field trips
- Jigsaw
- Role playing
- Think, pair, share
- Discussion – group, panel
- Debates
- Case studies
- Problem-based learning
- Project-based learning
- Computer assisted instruction
- Portfolio
- Games
- Model building
- Simulations
- Storytelling
- Peer instruction
- Concept mapping

Assessment must be ongoing and varied, and the approach used must be reliable and valid. It should include an appropriate scoring rubric that is unambiguous and transparent. As far as possible, teachers of classes at the same level should conduct common assessments. Marking and feedback should also be an integral part of the assessment process.

Some assessment strategies that can be used for the implementation of this curriculum are as follows:

- Examinations – Final and mid - term
- Pen/pencil and paper test
- Essays
- Research reports
- Quizzes

- Questioning
- Field reports
- Written presentations
- Oral presentations
- Simulations
- Role play
- Formal and informal observations
- Debates
- Projects
- Laboratory work
- Group work
- Models
- Songs, jingles
- Poems
- Stories
- Videos
- Laboratory report
- Exhibitions
- Portfolios

National Certificate of Secondary Education (NCSE)

The continuous assessment component of the NCSE must be completed each term effective from Form One onward and the score should be derived from a minimum of the following per term:

- Two practical activities
- One project
- Pencil and paper tests

Computing Final Marks for NCSE

<table>
<tr><th>Form</th><th colspan="2">End of year continuous marks</th><th colspan="2">Contribution to final marks for certification</th></tr>
<tr><td rowspan="2">Form 1</td><td>Course Assessments</td><td rowspan="2">100%</td><td rowspan="2">15%</td><td rowspan="4">60%</td></tr>
<tr><td>Internal School examinations</td></tr>
<tr><td rowspan="2">Form 2</td><td>Course Assessments</td><td rowspan="2">100%</td><td rowspan="2">30%</td></tr>
<tr><td>Internal School examinations</td></tr>
<tr><td rowspan="2">Form 3</td><td>Course Assessments (up to Term 2)</td><td>100%</td><td>15%</td></tr>
<tr><td colspan="3">National Examinations</td><td>40%</td></tr>
</table>

PART 3

Curriculum Content

Framework for Topics for Integrated Science Curriculum

Form 1	Form 2	Form 3
• Science and Scientific Processes • Scientific Measurement and International System (SI) of units • Safety in Science • Characteristics of Living Things • Classify Life According to Cellular Structure • Levels of Organization in Living Things • Processes in cellular structures • Properties of Matter • Atoms, Elements and Compounds • Compounds and Mixtures • Forces • Energy transformations	• Diet and Health • Human Body Systems: The Circulatory System • Human Body Systems: Respiratory System • Physical and Chemical Processes • Separating Mixtures • Motion • Thermal Energy • Energy in Ecosystems	• Human Body Systems: The Reproductive System • Communicable Diseases of the Reproductive System • Environmental Impact of Human Activities • Electricity • Magnetism • Light • Chemical Bonding • Acids and Alkalis

Framework for Learning Outcomes for Integrated Science Curriculum

Key For Numbering:

First Number: Year Second Number: Topic Third Number: Objective

Example: 1.1.1 – Year One, Topic One, Objective One.

LEARNING OUTCOMES		
FORM ONE	**FORM TWO**	**FORM THREE**
1.1.1 Differentiate between Science and technology.	2.1.1 Recognize the importance of a balanced diet	3.1.1 Outline the structure of the human male and female reproductive systems and the function of the parts.
1.1.2 Demonstrate the use of the scientific method	2.1.2 Outline the basic structure of the digestive system and functions of each part.	3.2.1 Identify the different types of Communicable Diseases of the Reproductive System
1.1.3 Recognize a scientific report as a means of communicating information from scientific investigations.	2.1.3 Explain how humans obtain nutrients from food	3.2.2 Explain the transmission of HIV infection and other communicable sexually transmitted diseases
1.2.1 Discuss the importance of the International System (SI) of units	2.1.4 Relate diet to weight gain and loss	3.2.3 List strategies for protecting oneself against HIV infection
1.2.2 Demonstrate the correct procedures for use of common measuring instruments.	2.2.1 Outline the basic structure of the circulatory system.	3.3.1 Explain the impact of human activities on the local and global environment
1.3.1 Demonstrate safe practices when conducting investigations	2.2.2 Relate the main parts of the circulatory system to its functions in the human body	3.4.1 Distinguish between electrical insulators and conductors.

LEARNING OUTCOMES		
FORM ONE	**FORM TWO**	**FORM THREE**
1.4.1 Describe the characteristics of living things	2.2.3 Investigate the relationship between exercise and pulse rate	3.4.2 Construct simple circuits
1.5.1 Compare plant and animal cells according to their structure and function.	2.2.4 Identify health conditions associated with the circulatory system.	3.4.3 Represent simple circuits using diagrams
1.6.1 Recognize the relationships between specialized cells, tissues, organs and organ systems	2.3.1 Outline basic structure of respiratory system	3.5.1 Demonstrate the effects of magnetic forces.
1.7.1 Describe how substances move into and out of cells	2.3.2 Distinguish between breathing and respiration in humans	3.5.2 Describe the magnetic effect of current.
1.7.2 Describe the process of photosynthesis	2.3.3 Relate increase in physical activity to increase in breathing rate	3.6.1 Investigate the transmission of light
1.8.1 Differentiate among the three states of matter	2.4.1 Distinguish between physical and chemical changes	3.7.1 Explain how atoms combine to form molecules
1.8.2 Relate the properties of matter to the arrangement of particles	2.4.2 Distinguish between physical and chemical properties	3.8.1 Distinguish between substances that are acids and alkalis
1.8.3 Explain how temperature causes changes in states of matter	2.4.3 Distinguish between types of mixtures.	3.8.2 Describes chemical reactions involving acids and bases
1.9.1 Describe the structure of the atom	2.4.4 Discuss the formation of different types of solutions	
1.9.2	2.4.5 Describe heterogeneous mixtures	

LEARNING OUTCOMES		
FORM ONE	**FORM TWO**	**FORM THREE**
State the chemical symbols of elements 1 -20.		
1.9.3 Illustrate the atomic structure of elements of atomic numbers 1-10	2.5.1 Explain methods of separating mixtures	
1.9.4 Distinguish among atoms, elements and molecules	2.6.1 Investigate motion of a body	
1.10.1 Distinguish between compounds and mixtures	2.6.2 Apply Newton's laws to explain motion of solid objects	
1.11.1 Determine the resultant of two or more parallel forces acting on a solid object	2.6.3 Discuss factors that affect the moment of a force	
1.11.2 Discuss the importance of gravitational forces acting on bodies	2.6.4 Discuss factors that affect the stability of objects	
1.11.3 Investigate the relationship between an applied force and pressure.	2.7.1 Distinguish between temperature and heat	
1.12.1 Distinguish amongst various forms of energy	2.7.2 Compare methods of heat transfer for various media	
1.12.2 Investigate the conversion of energy from	2.7.3 Distinguish between thermal insulators and conductors	

LEARNING OUTCOMES		
FORM ONE	**FORM TWO**	**FORM THREE**
one form to another	2.8.1 Illustrate energy flow from the sun to plants and animals	

Curriculum Content

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 1.1 Science and Scientific Processes			
1.1.1 Differentiate between Science and Technology.	• Science - the systematic study of the structure and behavior of the physical and natural world through observation and experiment. • Technology – Applications of knowledge, tools and processes to address specific human needs and solve problems • Scientific understandings, discoveries and inventions are used to solve problems that directly affect peoples' lives. • Scientific knowledge is used to inform	• Teacher and student discussions: Students research using the internet and compile a list of practical examples of using scientific knowledge to make decisions: Driving slowly on wet roads, opening a jam bottle with a metal cover, removing stains using lime juice, storage of foods, personal hygiene. Students	• Student group project: power point presentation/video using movie maker/ information leaflet (publishing software) to be shared with the school body via a school blog or wiki: Important Scientific discoveries that affect everyday life: Discovery of gravity, electricity, evolution, penicillin, x-rays, DNA. Products

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	personal and community decisions. • Scientific knowledge is not complete but can be built on through research and investigations.	compile a table of internet links to practical examples of real world applications on a word document.	shared with student body. Projects to be marked using teacher-created rubric.
1.1.2 Demonstrate the use of the scientific method.	Introduction to problem solving using the scientific method: • Questioning (brainstorming) and hypothesizing • Planning and Conducting • Data collection • Recording and Reporting • Processing and analyzing data and information	• Using multimedia, teacher presents students with scenarios that can be investigated and understood using the scientific method. Teacher allows students to brainstorm and discuss the following statements: ○ Ants walk up the trunk of a tree in a straight line.	• Students select one scientific development or discovery and summaries the main steps followed by the scientist from identification of the problem to inferences from data collected. • Students review documentary of a scientific discovery and prepare a synopsis of

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		○ Tall people hold their breath longer than short people.	how the main skills scientists use was employed.
1.1.3 Recognize a scientific report as a means of communicating information from scientific investigations.	• Scientific format (headings and appropriate content): ❖ Aim ❖ Apparatus and materials (including diagrams) ❖ Method/Procedure ❖ Results/Observations (annotated drawings) ❖ Analysis ❖ Discussion ❖ Conclusion	• Teacher presents video of students conducting practical activity. • Teacher will provide a sample lab report and discuss all the relevant headings and its requirements.	• Teacher creates worksheets to assess students' understanding of scientific format. • In groups, students will perform a practical activity and prepare a lab report. • Teacher created rubric should include the following criteria: ○ Aim

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
			○ Apparatus and materials (include diagrams) ○ Method/Procedure ○ Results/Observations (annotated drawings) ○ Analysis ○ Discussion ○ Conclusion • Using rubric students engage in peer assessment and provide relevant feedback to each other.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 1.2 Scientific Measurement and SI system			
1.2.1 Discuss the importance of the International System (SI) of units.	• Measurement is global and needs to be standardized. • Reasons for the importance of measurements: ❖ Accuracy. ❖ Standardization ❖ Unreliability of senses. • Identification of the International System of Units (SI) symbol and its conversion when measuring length, mass, volume, time, and temperature: ❖ Length – metre (m); kilometre (km); centimetre (cm); millimetre	• Teacher and student discussion exploring non-conventional methods of measuring e.g.: pinch of salt, hand span. • Teacher and student discussion about the unreliability of senses and the need for measuring instruments along with a practical activity e.g. students comparing the temperature of warm/cold water using	• Create Mnemonic or acrostics or rhymes to aid memorization of the order of prefixes in the metric system, for every power of ten from 6 to -6, is: Megametre, Kilometre, Metre, Decimetre, Centimetre, Millimetre, Micrometre, • Multiple Choice items

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	(mm) ❖ Mass – grams (g); kilograms (kg) ❖ Volume – cubic centimetre (cm^3); litre (l); millilitre (ml) ❖ Time – seconds (s); minutes (min); hours (hr) ❖ Temperature – degree Celsius (ºC) and degree Kelvin (ºK) ❖ Express multiples and submultiples of units using appropriate prefixes and scientific notation. • Repetition, estimation with linear scale, no- parallax, zeroing.	touch.	
1.2.2	• There are standard instruments used for	• Students use instruments to measure length, mass,	• Circus of measurement tasks for which each

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Demonstrate the correct procedures for use of common measuring instruments.	measurement in science: ❖ Length – metre rule, caliper, tape ❖ Mass – balance ❖ Volume – measuring cylinder, beaker ❖ Time – stop watch ❖ Temperature – thermometer • Some limitations in using instruments: ❖ Error: zero/end error, parallax ❖ Range ❖ Precision – estimation of scale	volume, and time. • Students record in a word table the units used in each instrument and the abbreviated term used in measurement. • Students are given a variety of quantities to measure and prepare a report on difficulties incurred following classroom discussion. • Measurements should be recorded in a properly headed table.	student must record their readings in appropriate tables. A checklist is used to assess proper use of instruments. • Student project: ○ Describe the measurement requirements to prepare a cake using a recipe as outlined in the directions on the package/box- identifying necessary measurements: mass, volume, time, temperature. ○ Students review recipe

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	readings		with appropriate substitutions for use with standard lab. measuring instruments.
Topic 1.3 Safety in Science			
1.3.1 Demonstrate safe practices when conducting investigations.	• Careful handling of apparatus and material. • Potential safety hazards in the laboratory • Precautionary measures to ensure personal safety. • Common safety symbols.	• Teacher and student discussion with the use of a suitable video, on general rules for using laboratory safely, personal protective equipment available in the laboratory. • Use "Think, Pair, Share" with students to discuss observations about	• Students prepare chart of laboratory rules using collage- making software to be attached to notebooks. Chart to be marked using teacher-created rubric. • Students prepare poster using collage-making software showing chemical symbols and

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		laboratory safety from appropriate video that highlight: eyewash fountain, shower, fire blanket, washing spilled chemicals from skin. • Teacher display devices and containers bearing symbols commonly found on laboratory chemicals: corrosive, toxic, radioactive, flammable, explosive, harmful, irritating, oxidizing.	their corresponding hazards to be displayed in labs. • Students' role play on careful handling of apparatus and material and precautions to ensure personal safety.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 1.4 Characteristics of Living Things			
1.4.1 Describe the characteristics of living things.	Characteristics of living things: • Growth • Respiration • Irritability • Movement • Nutrition • Excretion • Reproduction	• Teacher uses pictures, specimens to elicit responses from students about characteristics that all living things display.	• Students use jigsaw approach to prepare a wall chart illustrating each of the terms represented by the acrostic GRIMNER
Topic 1.5 Classify Life According to Cellular Structure			
1.5.1 Compare plant and	• A cell is the smallest structural unit of living things that can perform all the	• Teacher guides students in use of a light microscope to view	• Students construct a table to summarize structure and function of parts of

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
animal cells according to their structure and function.	functions necessary for life. • All cells possess basic structures regardless of cell specialization. • There are a number of structures/organelles common to both plant and animal cells: nucleus, chromosomes, cytoplasm, cell membrane, and mitochondria. • There are a number of structures found in plant cells that distinguish plant cells from animal cells: cell walls, large central vacuole, chloroplasts, and starch grains. • Each part of the cell performs a specific function.	prepared slides of plant and animal cells. • Students prepare slides with typical plant and animal cells for viewing using light microscope e.g. Onion cells and human cheek cells. • Teacher uses diagrams or drawings of a typical plant and animal cells. Students will compare and record the observations in a table.	the cell from prepared slide. • Students conduct research using the internet and present findings in the form of a model of a plant and animal cell.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Relating the structures and functions of mitochondria and chloroplasts and nucleus to the overall function of the cell to include cellular respiration and photosynthesis.		
Topic 1.6 Levels of Organization in Living Things			
1.6.1 Recognize the relationships between specialized cells, tissues, organs and organ systems.	• Cells vary widely in form and function. • Specialized cells perform specific functions in living organisms, e.g., neuron, blood cells, sperm, ovum, smooth muscle, palisade, guard cells, root hair. • Unicellular e.g. Yeast, Amoeba and multicellular organisms e.g. Humans and flowering plants. • Cells → Tissues → Organs → Organ	• Guided by the teacher, students will prepare a table listing some specialized cells and their roles in plants and animals. • Student view video clips or power point presentation of organ systems.	• Student construct plasticine models of organs and/or organ systems (no details of organs required). • Students refer to a model/jigsaw of the human and plant body to identify organs and organ systems that carry out different functions.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	systems. • The body of a large, complex organism is composed of organ systems that carry out different functions. • Basic functions of the following human body systems: Circulatory, Digestive, Respiratory, Excretory, Skeletal, Muscular and Reproductive • The main organs in a plant: root, stem, leaf, flower, fruit.		
Topic 1.7 Processes in cellular structures			
1.7.1 Describe how substances move into	• The cell communicates with its environment by taking in and releasing materials. • Diffusion is the movement of particles	• Teacher demonstrate examples of diffusion e.g., smelling perfume, and relate to gaseous	• Students conduct investigation of osmosis in living things, e.g., cucumber/potato/raisin

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
and out of cells.	from a region of higher concentration to a region of lower concentration. • Osmosis is the movement of water particles from a region of higher water concentration to a region of lower water concentration through a selectively permeable membrane. Osmosis and diffusion are two processes by which this exchange takes place.	exchange in organisms. • Demonstrate the application of osmosis, e.g., in rehydrating dried fruits, potato strip	and compose laboratory report.
1.7.2 Describe the process of photosynthesis	• Annotated drawing showing structure of a leaf noting the following: chloroplast and stomata. • Necessary conditions and raw materials for photosynthesis.	• Teacher demonstrates use of the light/stereo microscope to view stomata and chloroplast. • View video clips of	• Students draw annotated diagrams of a simple leaf. • Students conduct an experiment to demonstrate the

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Products of photosynthesis. • Photosynthesis sustain life: produces food and oxygen and controls the levels of carbon dioxide in the atmosphere	photosynthesis. • Teacher demonstrates an experiment to test a leaf for starch.	evolution of oxygen in *Elodea* and prepare a lab reports. • Students compose and perform song/rap based on photosynthesis.
Topic 1.8 Properties of Matter			
1.8.1 Differentiate among the three states of matter.	• Matter has mass and occupies space • Mass is measured in kilograms or grams • Scientific and common use of terms – mass and weight (use in vending and diet) • The ratio of the amount of matter to the	• Brainstorm scientific terms that have different meanings when used in everyday situations: range, weight, scale. • Classroom discussion with students on the different states of matter with reference to	• Students match pictures illustrating matter in different states with the physical property they best demonstrate in the scenario • Students prepare tree map showing the differences in each of the

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	space it occupies is defined as density. • Matter can exist in different forms called states. • Matter can be classified as solid, liquid, or gas according to their physical properties – shape, compressibility, volume, density, flow	everyday applications, e.g.: ○ Compressibility: compressed natural gas (CNG), liquefied petroleum gases (LPG.) ○ Density: anchors, hot air balloons. • Students view video on states of matter.	three main states of matter (see teachers' guide)
1.8.2 Relate the properties of matter to the arrangement of	• Properties of the states of matter are determined by the arrangement of particles. • The arrangement of particles	• Draw diagrams to show arrangement of particles in solids, liquids, and gases	• Students construct models using plasticine/marbles • Students complete

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
particles.	(movement, spacing, ordering and forces) gives rise to the general properties of solids, liquids, and gases.	• Simulate behaviors for each state using tray and marbles, placed on a vibrating surface.	worksheet with cloze items based on the relationship between particle arrangements and the properties of each state of matter
1.8.3 Explain how temperature causes changes in states of matter.	• Change in temperature has an effect on the arrangement of particles in matter. • Changes in temperature bring about: ❖ Melting ❖ Freezing ❖ evaporation/vaporization ❖ condensation/liquefaction ❖ sublimation	• Students draw diagrams showing changes in state due to temperature. • Use a video or simulation to relate changes in states of matter to the water cycle. • Teacher explores the environmental impact of global warming on the	• Students conduct practical activity and prepare a lab report on changes in states due to changes in temperature using everyday examples e.g. ice, water and steam, dry ice, ammonium chloride.

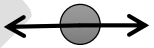
FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• These processes are reversible.	melting polar ice caps and rising sea levels through relevant videos and research article.	
Topic 1.9 Atoms, Elements and Molecules			
1.9.1 Describe the structure of the atom.	• Atoms are the smallest indivisible particle of matter that can exist on its own. • An atom consists of a central nucleus with electrons orbiting it. • The nucleus consists of protons and neutrons. • Electrons orbit nucleus in fixed 'shells' while protons and neutrons are fixed and located in the central nucleus.	• Teachers use the solar system as an analogy to describe the structure of the atom. • Teachers use video clips of atomic structure showing movement of sub-atomic particles.	• Students construct models of the atom using plasticine/other suitable materials. • Demonstrate structure of the atom using role play. • Students conduct research using the internet and prepare table of comparison of properties of sub-atomic

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Electrons, protons and neutrons are referred to as sub-atomic particles.		particles.
1.9.2 State the chemical symbols of elements 1 -20	• List of elements include: H, He, Li, Be, B, C,N,O, Fl, Ne, Na, Mg, Al, Si, P, S, Cl, K, Ca	• Students sing-a-long to songs or complete acrostic using symbols of commonly found elements as shared by teacher.	• Teacher provides students with a scientific article that included chemical symbols. Students replace symbols with the names of elements.
1.9.3 Illustrate the atomic structure of elements of atomic numbers 1-10.	• Relationship between sub-atomic particles: For neutral atom ❖ p = e ❖ Atomic number is number of p=e	• Guided by teacher students prepare plasticine to construct models of atoms of different elements. • Teacher project simulations of model of	• Students create table listing name, symbol and numbers of each sub-atomic particle for elements 1-10. • Students use Microsoft word to illustrate atomic

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	❖ Mass number is sum of p and n ❖ Elements vary because their atoms contain different numbers of electrons, protons and neutrons. ❖ Electronic configuration of elements indicates distribution of electrons amongst the 'shells': H→1, C→ 2:4, O→ 2:6 Ne → 2:8	the atom showing numbers and location of each component	structures of elements 1 to 10.
1.9.4 Distinguish among atoms, elements, and molecules.	• Elements are made up of atoms of the same kind. Molecules are made up of two or more atoms of the same (oxygen) or different (water) elements.	• Students view video clip, simulation or power point presentation of elements, molecules, and compounds	• Students complete worksheets or prepare table of comparison of atoms, elements and molecules.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 1.10 Compounds and Mixtures			
1.10.1 Distinguish between compounds and mixtures.	• Compounds: ○ consists of atoms of two or more different elements ***bonded together***, ○ can be broken down into a simpler type of matter (elements) by chemical means (but not by physical means), ○ has properties that are different from its component elements, and always contains the same ratio of its component atoms. • Mixtures: ○ consists of two or more different elements and/or compounds physically intermingled or combined, ○ can be separated into its components by	• Teachers demonstrate to students, mixtures and compounds using iron filings and sulphur. Students observe the activity and identify differences in properties between mixtures and compounds.	• Students prepare a table of identified differences between compounds and mixtures using MS word. • Teacher projects pictures or displays samples of compounds or element, disclosing each in random order. Students identifies each and gives reason (s), recording each case in writing

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	physical means, and ○ often retains many of the properties of its components		
Topic 1.11 Forces			
1.11.1 Determine the resultant of two or more parallel forces acting on a solid object.	• A force changes or tends to change the shape, state of rest, direction and motion of a body in a straight line. • Some common forces are: gravitational, contact (friction), magnetic, and electrostatic. • A force has magnitude and direction. • Forces are measured in Newton. • Force can be represented by an arrow head- The size or magnitude of the force is represented by the length of	• Students demonstrate the effects of application of a force (tug-of –war, vehicular movements, walking on different surfaces, bungee jumping) and brainstorm additional examples. • Use scale drawings or number line to determine resultant force: ○ Use two forces acting	• Students use force diagrams drawn to scale to solve problems involving combining forces of various types • Student complete graphic organizer to identify 5 or more types of forces.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	the arrow and the direction is given by the arrow. • The resultant of two or more forces can be determined using a scale drawing or calculated using a number line.	on an object, pointing towards each other or same direction.  • Use other combinations with two or more forces: pointing in different directions, but along the same line of action.	
1.11.2 Discuss the importance of gravitational forces acting on bodies.	• Weight is the force acting on an object due to gravity. • Weight is dependent on the "gravity" acting on a body and as such will vary from planet to planet. • Weight = Mass x gravitational pull	• View videos of motion in outer space and discuss using "Think, Pair, Share", the concept of weightlessness. • Compare how mass and weight vary on Earth and	• Problem sheets on formula: W=mg (express mass in either kg or g to practice unit conversion also vary the unknown to practice transposing of variables)

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	(W= mg) and therefore though weight varies, mass does not • Gravity enables all physical bodies to be attracted to each other.	the Moon from calculations or video clips of first landing on moon.	
1.11.3 Investigate the relationship between an applied force and pressure.	• Particles and objects exert forces on the surface they are in contact with. • The ratio of the applied force to the surface area of contact is defined as pressure. • Unit of pressure: Newton per square metre or Pascal.	• Compare footprints of persons of various weight, or of one person wearing different footwear (sneakers, wedged-heel shoe, stiletto-heel shoe). • Discuss everyday examples of pressure-water flow from hose at different flow rate or bore size (partial	• Structured questions involving manipulation of formula and written explanations of various situations employing changes in pressure.

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		covering of opening with finger), sharp needle tip/knife edges, suction cups, use of straw, siphon.	
Topic 1.12 Energy transformations			
1.12.1 Distinguish amongst various forms of energy.	• Energy can be classified as mechanical or non-mechanical. • Mechanical energy includes kinetic energy (the energy of a moving body) and potential energy (stored energy). • Potential energy may be classified as chemical, gravitational or elastic. • Non-mechanical energy includes light,	• Teacher provides pictures, video clips or actual devices utilising various energy forms. Students identify each form and collaborate to prepare a concept map exploring various forms of energy.	• Create a pamphlet illustrating various forms of energy commonly used at home and school • Complete energy webquest • Students compose scientific article on the importance of renewable forms of energy

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	heat, sound, electrical and nuclear. • Energy sources can be classified as renewable and non-renewable. • Non-renewable forms of energy must be conserved.	• Teacher shares power point presentation, scientific article or video on renewable and non-renewable energy sources	
1.12.2 Investigate the conversion of energy from one form to another.	• Energy enables work to be done in different situations. • Energy exists in different forms which can be converted from one form to another according to the task to be accomplished • Law of conservation of energy: Energy can neither be created nor destroyed but it can be changed from one form to another.	• Teacher provides actual examples, or video of scenarios involving multiple energy transformations • Teacher guide students to research situations where heat is a significant product of energy transformation and discuss usefulness or	• Students illustrate energy conversions in: falling stone, catapult, pendulum, radio, computer, potato/lemon battery using flow map • Students develop a proposal to mount a campaign for a bulb exchange program where each student is given a

FORM 1			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		wastage of heat. • Classroom discussion of ways to reduce energy wastage (more efficient devices, switching off lights when not in room, unplugging chargers etc.)	compact fluorescent bulb to replace incandescent bulb in use at home. They must include: ○ What benefit could be derived? ○ Which is the best room to locate the return bulb (ie fluorescent) and why? ○ What are some challenges to the project to consider and possible recommendations?

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 2.1 Diet and Health			
2.1.1 Recognize the importance of a balanced diet.	• Diet includes everything that a person eats or drinks. • Food contains nutrients that are needed by all body cells. • A balanced diet contains the different nutrients (carbohydrates, proteins, fats, water, vitamins, minerals, and fiber) in the correct proportions. • Daily activities and physiological conditions can be influenced by ones diet.	• Students view video clip of balanced diets after completing "KWL". • Role play: students set up a restaurant that serves meals to persons of varying needs – babies, pregnant women, elderly persons, athletes. Students advise customers on suitable meal choices and alternatives.	• In groups, students prepare a brochure using Publisher of common foods and their nutrient content to be displayed in the school cafeteria. • Conduct research of food offerings of school cafeteria or school meals to assess whether students are offered a balance option.
2.1.2	• Basic structure of the human digestive system listing all the parts and basic	• Students label diagrams, charts or assemble	• Students prepare power point presentation

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Outline the basic structure of the digestive system and functions of each part.	functions of the parts.	models of the digestive system.	showing the different parts of the alimentary canal and their functions.
2.1.3 Explain how humans obtain nutrients from food.	• Digestion entails physical and chemical changes in the food. • Physical changes are brought about by chewing and churning of the stomach. • Chemical changes release simpler substances from the food: o Carbohydrates- simple sugars (e.g. glucose) o Proteins - amino acids. o Fats - fatty acids and glycerol.	• Teachers use a video depicting digestion in humans. • Teachers display charts showing the parts of the digestive system in the classroom. • Teacher guides students as they conduct food tests on common food items to identify main nutrient, e.g., protein, starch, and	• Conduct food tests on samples of food, students brought for lunch and deduce the most popular food group consumed. • Students plan or design investigations to test hypotheses on relating food particle size and responses to food tests etc:

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	These simple substances enter the blood stream and are taken to the body cells. • Enzymes are also involved in the breakdown of food materials (Students are only required to know general categories of enzymes involved e.g. carbohydrases, proteases and lipases. • The main nutrient components of foods can be identified using simple food tests.	glucose, fat/oils.	○ Formulate hypothesis. ○ Outline the procedure to conduct experiment: ▪ Identify applicable variables (manipulated, responding and control). ▪ Perform and record activity ▪ Describe findings and identify limitations ▪ State conclusions. • Students compose a monologue/ write a story to narrate the digestion of a sandwich.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
2.1.4 Relate diet to weight gain and loss.	• The regulation of body weight and body fat may be linked to diet, physical activity, lifestyle, and behavior. • Weight gain and loss can also be due to genetic predisposition. • Diet can be used to regulate health problems such as such as diabetes, heart disease and the health risks associated with weight gain and loss. • Health problems can also be caused by disturbed eating patterns. • Eating a balanced diet and exercising regularly is necessary for maintaining a healthy body. • Achieving and maintaining a healthy	• Teacher and student discussion on the effects of diet on weight gain, loss and one's health. • Guided by the teacher, students research, summarize and analyze information from magazines/newspaper articles and internet as it relates to diet and health. • Teacher invites community health workers for discussion and information sharing with students. • Use height - weight chart	• Student project: ○ Compile a journal/blog/wiki space/google docs. to monitor individual diet for a week to determine the components of foods consumed. Students use date collected to make informed choices. ○ The class makes a list of specific steps that can be taken to maintain a healthy body weight. ○ Interview people who

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	body weight is important.	to determine body mass index (BMI) and discuss the significance of maintaining a healthy weight.	have successfully lost weight and kept it off and discuss their strategies. • Students use the information from above activities and prepare a power point presentation on the relationship between diet and heart disease to be delivered to the student body.
Topic 2.2 Human Body Systems: The Circulatory System			
2.2.1 Outline the basic structure of the	• Components of the circulatory system: pump (heart), arteries, veins,	• Teachers use a video showing the circulatory	• Students prepare graphic organizer showing the

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
circulatory system.	capillaries, and blood	system in humans. • Teachers display charts showing the circulatory system in the classroom.	components of the circulatory system.
2.2.2 Relate the main parts of the circulatory system to its functions in the human body	• The circulatory system transports substances throughout the body. • Basic structure and functions of the heart, blood vessels (no details of the specific blood vessels are required).. • Components of the blood	• Guided by teacher students view prepared slides of relevant specimens.	• Students prepare a table listing the structures in the circulatory system and their individual functions
2.2.3 Investigate the relationship between exercise and pulse rate	• Pulse rate is directly related to heart rate. It can be measured at certain points on the body, e.g. wrist, neck, temple, ankle. • Pulse rate is related to the level of	• Teacher leads discussion of relevant statistical data. • Teacher coordinates students' participation in	• Students plan or design investigations to test hypotheses on relating height, age, gender and pulse rate etc: ○ Formulate hypothesis.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	activity.	practical activity to show the relationship between pulse rate and exercise.	○ Outline the procedure to conduct experiment: ▪ Identify applicable variables (manipulated, responding and control). ▪ Perform and record activity ▪ Describe findings and identify limitations ▪ State conclusions.
2.2.4 Identify health conditions associated with the circulatory system.	• Atherosclerosis, high blood pressure, varicose veins.	• Teacher presents relevant statistical data, article or video clip and leads discussion with students	• Students research specific conditions and prepare power point or video presentation of health conditions and causative factors.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 2.3 Human Body Systems: Respiratory System			
2.3.1 Outline basic structure of respiratory system.	• Basic structure of the human respiratory system listing all the parts and basic functions of the parts.	• Teacher refers to video, animation or simulation of respiratory system.	• Students prepare labelled diagrams and/or models of the respiratory system.
2.3.2 Distinguish between breathing and respiration in humans.	• Breathing is the process by which air moves in and out of the lungs (inhalation and exhalation). • Breathing involves the movement of muscles (intercostal muscles and diaphragm), which brings about changes in volume and pressure in the chest cavity. • Inhaled and exhaled air differs in composition.	• Students observe the changes in the body (the thorax) as students inhale and exhale. • Students demonstrate inhalation and exhalation using balloon and plastic bottle models. • Conduct interviews with visiting experts (e.	• Students prepare a table of comparison of composition of inhaled and exhaled air in various environments. • Conduct experiments to demonstrate the presence of carbon dioxide (limewater) and water vapor (mirror) in exhaled air

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Inhaled air contains more oxygen than exhaled air, which contains more carbon dioxide. • Respiration - the chemical breakdown of complex food substances, such as carbohydrates, fats and proteins, during which energy and Carbon dioxide are released. • Word equation to represent respiration: Oxygen + Food $\longrightarrow$ Energy + Carbon dioxide + Water. • Respiration takes place in the mitochondria of the cell. Respiration is the process that releases energy from food. • Health risks associated with smoke	SWMCOL, fire officers, EMA etc.) on local incidences of domestic and industrial smoke emissions and hazards associated with each.	and prepare lab report. • Student project: Students conduct research on the effects of smoking and prepare pamphlet (MS publisher) advising student body of the health risks of smoking. • Students write letters that may be submitted via email to a newspaper editor, mayor or local government representative explaining their

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	inhalation.		concerns about uncontrolled fires (landfill, backyard, agricultural lands and hills) with recommendations.
2.3.3 Relate increase in physical activity to increase in breathing rate.	• Respiratory/Breathing rate -number of breaths taken by a person within 60 seconds. • The more physical activity done, the faster the respiratory/breathing rate. • Relate breathing rate to levels of physical fitness.	• Teacher and students analyse relevant data • Presentations of experts (Sporting personal, medical practitioner, health officers)	Student Project: • Students investigate the relationship between breathing rates and physical fitness: o Working in groups, students measure breathing rates by using a watch to time 60 seconds and count the number of breaths

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
			taken within the 60 seconds. o Compare breathing rates for different scenarios (before and after physical activity, age groups, gender) o Students compile data collected using Excel and prepare reports. o Students present findings during the school assembly.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 2.4 Physical and Chemical Processes			
2.4.1 Distinguish between physical and chemical changes.	• Physical changes are readily reversible and do not produce new substances. • Chemical changes are difficult to reverse and produces new substance.	• Teacher demonstrates physical and chemical changes using: ice and water, burning magnesium ribbon. • Students identify physical and chemical changes in various activities at home (e.g., cooking).	• Students complete circus of experiments to distinguish between simple physical and chemical changes giving reasons for their answers.
2.4.2 Distinguish between physical and chemical properties.	• Substances have different physical properties such as: hardness, elasticity, texture, size of particles, colour, shape, strength, solubility, conductivity, magnetism, scent etc.	• Through classroom discussions, students relate chemical and physical properties in everyday activities. e.g. rusting, lime scale	• "Show and Tell" game: Each group of students is provided a different material which they can manipulate in any way.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Chemical properties describe how substances react. Some reactions produce heat, take in heat, decompose, produce gases, etc. • Changes in physical properties are easily reversible. • Changes in chemical properties are not easily reversible.	accumulation, browning of fruit on exposure to air, brining, dehydrating etc.	They demonstrate to rest of class identifying the property changed and whether it is physical or chemical. • Worksheets with matching, cloze or structured items.
2.4.3 Distinguish between types of mixtures	• There are different types of mixtures: ❖ Gas/gas- air (oxygen in nitrogen) ❖ Gas/liquid-carbonated drinks ❖ Liquid/liquid-vinegar in water ❖ Solid/liquid- brine ❖ Solid/solid- soil	• Students are provided a range of readily available materials in different states. They predict the outcomes of mixing the substances. Student conduct activity and record observations. (Teacher may	• Students tabulate observations and inferences on practical activity. • Students research the composition of various mixtures eg. air, crude oil etc. and prepare

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		demonstrate combinations involving gases or where safety is an issue)	table of components using MS word.
2.4.4 Discuss the formation of different types of solutions.	• Solutions are homogenous mixtures. • Solutes dissolve in solvents to form solutions. • A saturated solution is formed when no more solute can dissolve in a specific volume of solvent. • Aqueous solutions are formed when solutes are dissolved in water.	• Students prepare different types of solutions using readily available materials • Teachers use video clips to emphasize concepts involved in formation of solutions.	• Students prepare lab. report on practical activities conducted. Students can also be assessed on use of relevant apparatus. • Structured questions.
2.4.5 Describe heterogeneous	• Heterogeneous mixtures are suspensions, colloids, or mechanical mixtures.	• Students complete "KWL" about various types of mixtures. They then prepare suspensions,	• Students prepare lab. reports of practical activities.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
mixtures		colloids, and mechanical mixtures and record observations. e.g. colloids (e.g., gels, paints, glue) and make inferences about their homogeneity (make use of hand lens and microscopes.)	• Worksheets with blanks to complete or True/ False statements
Topic 2.5 Separating Mixtures			
2.5.1 Explain methods of separating mixtures	• The choice of separation method depends on the physical properties of its components: Property Method of Separation Particle Filtration, sieving, hand-	• Teacher demonstrates separation techniques (according to availability of equipment and safety). • View video clips where equipment is not available.	• In groups students select method for separating given mixture samples (e.g. soil and water, vinegar-oil emulsion, pigments in black ink/hair dye, solution of potassium

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	size picking Boiling point Distillation- significantly different boiling points. Fractional distillation- similar boiling points, but not identical Solubility Chromatography Density Decanting Separating funnel Centrifuge Sedimentation Volatility Evaporation	• Teacher may demonstrate distillation.	alum, sample of pond/rain water. o conduct activity using the selected method of separation and o each student prepares a lab report. • Research separation methods used industrially e.g. petroleum products from crude oil, water purification, vegetable oils. Prepare a flow diagram using a word document outlining the

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
			steps involve in selected separation method.
Topic 2.6 Motion			
2.6.1 Investigate motion of a body.	• Definitions of: ❖ Distance ❖ Displacement ❖ Speed ❖ Velocity ❖ Average speed ❖ Acceleration • Units for speed and velocity can be expressed as ms^{-1}, or kmh^{-1} • Acceleration results from the	• Research development of theories about motion by various scientists: Copernicus, Galileo, Newton, Kepler. • Snowball activity: each student writes a statement about a moving object and crumples paper. All students simultaneously throw paper into the air and retrieve the closest one.	• Students conduct investigations of motion of a moving object or pendulum. Prepare a lab. report. • Worksheets to practice problems with various motion parameters and conversion of units using mathematical rules (can refer to units for derived quantities

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	application of an unbalanced force to an object.	Recipient unfolds paper, read statement and decides if statement written is a hypothesis. • Online simulations of moving objects. • Problems involving moving objects.	eg density)
2.6.2 Apply Newton's laws to explain motion of solid objects.	• Definitions of: ❖ Inertia ❖ momentum • A body at rest remains at rest or if moving continues its motion in a straight line unless an external force is applied to it.	• Teacher presents on 'application of laws of motion' to explain common occurrences, using appropriate multimedia on the following: ○ Use of seat belts,	• Worksheet with structured items requiring students to explain the application of Newton's laws in a variety of everyday situations. • Problem sheets:

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• The larger the mass, the greater the momentum. • The larger the velocity, the greater the momentum. • For every action there is an equal and opposite reaction. • Body A exerts a force on a body B, body B exerts an equal and opposite force on body A.	banking of race tracks, orbiting satellites and planets. ○ Motion in billiards, collision of vehicles. ○ Rocket propulsion, walking, trampoline, recoil when gun or cannon is fired and water sprinkling system	manipulating momentum formula with reference to appropriate situations
2.6.3 Discuss factors that affect the moment of a force.	• Moment is the turning effect of a force about a fixed point. • Moments can be: Clockwise and anticlockwise. • No turning effect is observed when	• Students conduct experiment to investigate factors that affect the moment of a force. • Classroom discussion	• Students prepare report on experiment conducted. • Worksheets involving use of force diagrams

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	moments are balanced.	relating the effects of moments on the functioning of the following: door hinges, see saw, tools-spanner, manual car jack, crowbar.	to identify where a restoring moment must be applied to return an object to its equilibrium position.
2.6.4 Discuss factors that affect the stability of objects.	• Objects remain at rest or in equilibrium when they experience no net forces or moments. • The center of gravity of an object is the point at which its weight appears to be concentrated. • Three types of equilibrium: neutral, stable and unstable. • Stability is the ability to return to its	• Use simple balancing methods to locate center of gravity of objects. • Students investigate the stability of objects of different geometrical shapes after being displaced from rest. • Classroom discussion on stability of: Moko	• Students use the following materials: sheet of paper, spaghetti and marshmallow, macaroni, to construct the most stable tower or bridge. • Teacher assesses products using the

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	rest position after being displaced • The position of the center of gravity and width of its base influences its stability.	Jumbies, carnival costumes, maintaining appropriate posture for sporting activities e.g. weight lifting, catching and throwing.	following criteria: ○ Relevant application of theory ○ Most efficient use of materials. ○ Visual appeal. ○ Largest/tallest durable structure. ○ Collapse time.
Topic 2.7 Thermal Energy			
2.7.1 Distinguish between temperature and	• Definitions of heat and temperature. • Heat can be measured in Joules (J) and temperature in degree Celsius (^{0}C) and	• Students conduct experiment by measuring temperature (at regular time intervals) of a	• Students represent data graphically. • Assess graphing skills:

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
heat	Kelvin (K). • Relationship between degree Celsius (^{0}C) and Kelvin (K).	beaker of water as it is heated to a temperature of approximately 70 ^{0}C and then allowed to cool.	○ Title of graph. ○ Labelling of axes. ○ Selection of scale. ○ Correct plotting of coordinates. ○ Draw line/curve of best fit.
2.7.2 Compare types of heat transfer.	• The three types of heat transfer are conduction, convection, and radiation. • Conduction is the transfer of heat through a solid. • Convection is the transfer of heat through a fluid (liquid and gas) • Radiation is the transfer of heat through	• Classroom discussion on the types of heat transfer in the following: glowing coal, heating blanket, hot/cold pack, and surface of incandescent bulbs, cooling of room through air-conditioning. • View video of the	• Students perform practical activities involving ○ Conduction ○ Convection and prepare report. • Worksheet to identify

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	electromagnetic waves.	formation of land and sea breezes.	method of heat transfer involved varied situations (microwave oven, immersion heater, brick oven).
2.7.3 Distinguish between thermal insulators and conductors.	• Transfer of heat requires a difference of temperature. • A conductor allows heat energy to be transferred through it, while an insulator does not. • Conductors allow heat transfer due to vibrations of atoms or molecules or movement of delocalized or "sea of" electrons. • Insulators restrict the transfer of heat	• Teacher conducts demonstrations or present video clip to assess the thermal conductivity of varied materials in common used	• Students conduct experiment to classify unknown materials as good or poor conductors. • Students prepare chart on uses and or problems associated with good and poor conductors.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 2.8 Energy in Ecosystems			
2.8.1 Illustrate energy flow from the sun to plants and animals.	• Light energy from the Sun is used by plants to manufacture food. • The Sun is the original source of energy for all living things. • Plants trap light energy and convert it to chemical energy. • The food made by plants is eaten by animals (including humans) and provides energy. • Energy from plants is transferred directly or indirectly to animals through feeding. • Feeding relationships in ecosystems are represented as food chains and food	• Field trip to observe different ecosystems such as the school garden, a pond , river etc. Students identify producers and consumers and map possible feeding relationships • Feeding relationships webquest.	• Students prepare model of terrarium that demonstrates a food web involving at least 5 organisms • Students present proposal for planting a school garden or set up of other ecosystem: pond, … They must include: o Why the project is of educational benefit? o The support students would need to manage their allocation.

FORM 2			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	webs.		○ What would be some challenges and their recommendations?

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 3.1 Human Body Systems: The Reproductive System			
3.1.1 Outline the structure of the human male and female reproductive systems and the function of the parts.	• Reproduction allows for the continuation of the species. • The female reproductive system consists of ovaries, uterus, fallopian tubes, cervix, and vagina. • The male reproductive system consists of testes, scrotum, sperm ducts, and penis. • Ovaries produce ova and the testes produce sperms. These are specialized reproductive cells.	• View video clip on reproductive system. • Classroom discussions with reference to charts or "KWL"	• Students annotate diagrams to identify the structure and function of the male and female reproductive system. • Structured questions
Topic 3.2 Communicable Diseases of the Reproductive System			
3.2.1 Identify the	Herpes, Gonorrhoea, chlamydia, syphilis Human papilloma virus, HIV	• Power point on research on the various types of	• Prepare a pamphlet for distribution to student

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
different types of Communicable Diseases of the Reproductive System		communicable diseases of the reproductive system • Presentations by health officer or medical practitioner	body including highlighted international days of recognition.
3.2.2 Explain the transmission of HIV (Human immunodeficiency virus).	• HIV (Human immunodeficiency virus) infection is a chronic disease that progressively damages the body's immune system resulting in AIDS (Acquired immunodeficiency syndrome). • HIV lives only within cells and body fluids, not outside the body. • The three main routes of transmission are:	• Teacher utilizes resource personnel from the health sector to discuss communicable sexually transmitted diseases. • Use stories from newspapers, magazines, etc. to stimulate discussions and list the positive behaviors that	• Design a brochure on HIV for dissemination to the student body. • Perform a puppet show/ design a cartoon strip for use in HIV education within the school.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	❖ Specific kinds of sexual contact, especially unprotected anal or vaginal intercourse. ❖ Direct exposure to infected blood. ❖ From an HIV-infected woman to her offspring during pregnancy, childbirth, or breastfeeding.	help avoid HIV infection.	
3.2.3 Discuss strategies for protecting oneself against HIV infection.	• Making careful choices about sexual activities reduces the risk of contact with HIV. • Strategies may include : o Abstinence o Avoidance of exchange of	• Role-play situations that may be responsible for the transmission of communicable sexually transmitted diseases and highlight methods of protecting oneself.	• Compose a calypso, rap, poem, skit, etc. to reflect strategies for protecting yourself from HIV infection. • Role-play situations that show compassion when

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	body fluids. o Protected sex o Limit the number of partners o Get tested for HIV regularly o Avoid sharing needles or syringes.		dealing with persons infected with HIV
Topic 3.3 Environmental Impact of Human Activities			
3.3.1 Explain the impact of human activities on the local and global environment	• Causes of alteration of the environment: ❖ Industrialization. ❖ Urbanization. ❖ Use/misuse of genetically modified products.	• Work in groups to research a topic and do a presentation, e.g., on the effects of one of man's activities on the environment. • Dramatize the	• Design posters to educate the public on one of these worldwide environmental concerns. • Student projects: o Research agencies, policies and laws in

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	❖ The deliberate or accidental introduction/removal of endemic species to new habitats. • Consequences of alteration of the environment: ❖ Deforestation. ❖ Habitat destruction. ❖ Species depletion • Habitats can be preserved by: ❖ Establishment and protection of national nature reserves (local examples) ❖ Developing and enforcing laws to minimize adverse impact on	consequences, in 30 years, of human activities if it goes unchecked. • View photographs or a documentary on a local environmental concern and discuss how the problems can be addressed. • Organize activities to promote environmental awareness, e.g., displays, lectures by students for World Environment Day on June 5th each year. • Field trip to any site of	Trinidad and Tobago to monitor and guide conservation initiatives. ○ Debate topics related to conservation vs industrialization. ○ Prepare a speech aimed at educating the public on the value of hunting only during the fixed season, when hunting is allowed, and of not hunting the protected species. ○ Tabulate items we use on a daily basis and identify the natural resources that are used to make each

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	environment (refer to responsible agencies) ❖ Protected species in Trinidad and Tobago. • Changes in the environment have also led to worldwide phenomena egThe greenhouse effect (global warming). • Individuals can cultivate habits of: ❖ Reusing. ❖ Reducing. ❖ Recycling . ❖ Restoring the environment by replanting trees, cleaning litter on beaches, etc.	interest. • Role-play an exchange between a game warden and a poacher in a game sanctuary.	item. ○ Keep a record for one week of household garbage and group items as biodegradable or non-biodegradable, and suggest how each can be sorted and reused. ○ Students compile a portfolio to document school initiatives to aid in conservation.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 3.4 Electricity			
3.4.1 Distinguish between electrical insulators and conductors.	• Materials can be classified as conductors or insulators depending on the extent to which current or electrons flow through them. • Conductors facilitate electron flow or current electricity. • Insulators resist electron flow, such that charges can accumulate to produce static electricity. • Conductors and insulators serve various purposes. • Safety precautions for handling electrical devices.	• Teacher conducts simple demonstrations of static electricity. • View video clip/animation/ simulation of current flow. • Power point or chart on safety measures for domestic uses of electricity: handling with wet hands, child safety outlet caps, rubber-soled footwear, insulation of exposed wires or equipment, “earth” of	• Prepare report on practical activities to classify various materials as insulators and conductors. • Create cartoon strip/ posters to educate the public on the proper handling of electricity.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
		buildings and appliances.	
3.4.2 Construct simple electrical circuits.	• A circuit is a closed path through which an electric current flows. • Direction of conventional current flow is from the (+) terminal of the energy source to the (-), electrons actually move in opposite direction • Basic circuit components include: cell, switch, load (eg. lamp). • Cells supplies electrical energy and can be combined to form batteries. • Current is measure in amperes (A) with an ammeter.	• Students conduct simple experiments to investigate current flow and prepare laboratory reports as follows: ○ reverse polarity of cell ○ vary numbers of cells ○ vary position of switch in relation to circuit components ○ various loads: wire of different materials or lengths, metallic coils of different number of turns.	• Teacher assesses students' manipulation of circuit components and ammeter. Include criteria such as: ○ Tight circuit connections ○ Ammeter connected in series with source and load ○ Ammeter zeroed ○ Scale of ammeter read vertically above to avoid parallax ○ Accurate scale

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
			reading recorded Where applicable: o Selects scale of appropriate range
3.4.3 Represent simple circuits using diagrams.	• Basic circuit components are represented by appropriate symbols • Circuit components may be connected in series or parallel to each other or the source. • Series and parallel arrangements of components are illustrated using circuit diagrams • Series and parallel circuit arrangements have associated advantages and disadvantages.	• Students draw circuit diagrams of basic circuit arrangements or construct circuits according to circuit diagrams provided. • Use of circus of simple experiments to compare series and parallel circuit arrangements of cells and lamps	• Students conduct research and prepare power point presentation on everyday uses of series and parallel arrangements of circuit components (Christmas lights, domestic wiring.) • Students construct circuits as illustrated in circuit diagrams and record ammeter readings.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
Topic 3.5 Magnetism			
3.5.1 Demonstrate the effects of magnetic forces.	• Materials can be classified as magnetic or non-magnetic. • Forces exist between magnets and are concentrated at poles. • Forces of attraction exist between unlike poles (N, S) of magnets and forces of repulsion exist between like poles (N, N). • Field lines indicate the strength and direction of the magnetic force. • The direction of field lines is shown by an arrow pointing away **from** the north **to** the south pole. • The strength of the field is illustrated	• Students conduct investigation of magnetism as instructed. They may: ○ compare forces acting between magnets of like or unlike poles ○ determine whether unknown material is magnetic or non-magnetic. ○ observe pattern of magnetic field produced by bar or u-shaped magnets using iron filings or plotting	• Students plan or design investigations to test hypotheses involving magnetic force-distance relationship: ○ Formulate hypothesis. ○ Outline the procedure to conduct experiment: ▪ Identify applicable variables (manipulated, responding and control). ▪ Perform and record activity ▪ Describe findings and identify limitations ▪ State conclusions. • Students complete webquest

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	by the density or spacing of the field lines. • The magnetic field is strongest at the poles of a magnet where the field lines are most dense. • Magnetic forces act from a distance and decreases with distance from poles.	compass	on magnetism
3.5.2 Describe the magnetic effect of current.	• Current has an associated magnetic effect and can be used to produce electromagnets. • Electromagnets are produced when a magnetic material is placed in a metallic coil through which current is flowing in one direction only. • The strength of the electromagnet	• Classroom discussion or viewing of video on everyday applications of electromagnets: o moving containers on the port o sorting materials for	• Students plan or design and conduct investigation to compare strength of electromagnets when relevant factors are varied (material used, size of current) o Formulate hypothesis.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	depends on factors such as: the type of material used, the size of the current and length of time of current flow.	re-cycling ○ doorbells • Students prepare electromagnet and test its strength by observing how many paper clips or pins it attracted.	○ Outline the procedure to conduct experiment: ▪ Identify applicable variables (manipulated, responding and control). ▪ Perform and record activity ▪ Describe findings and identify limitations ▪ State conclusions. ▪
Topic 3.6 Light			
3.6.1 Investigate the transmission of light in different medium.	• Definitions of the terms ray and beam. • Three basic types of beams are: parallel, convergent and divergent.	• Conduct demonstrations of different types of beams formed using ray box and lens. • Use of pictures to	• Construct a pinhole camera and discuss the impact of the size of pinhole and its distance from the screen on the

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• Different medium causes light to be absorbed, reflected or refracted as it is transmitted. • When light is totally or partially absorbed, a shadow is formed. • Shadow formation differs for point and extended sources light sources • Ray diagrams are used to illustrate the formation of umbra and penumbra. • The Sun acts as an extended source of light. • Solar and lunar eclipses are the result of shadow formation involving sun, moon and earth at different positions	compare beams produced by common devices such as torchlight, laser light, headlights, magnifying glass. Students draw ray diagrams appropriate to each. • View videos on eclipses or demonstrate formation using models. • Discuss observations of images in pond (reflected image as well as apparent bending of partially submerged branch or apparent shallowness)	appearance of the image. • Using ray box or optical pins to locate images formed in mirror or rectangular glass block. Students' ray diagrams are assessed and the description of the images. • Conduct investigation to verify laws of reflection. Students prepare lab. report • Structured questions on formation of shadows and eclipses.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	relative to each other. • Reflection is the "bouncing" of light off a surface. The light ray does not pass through the medium. • For reflection, the angle of incidence is equal to the angle of reflection. • Reflected images formed by a mirror have certain properties related to its position, size, shape etc. • Refraction is the "bending" of light travelling from one medium to another of different optical density or refractive index • Examples of refraction of light- apparent changes in depth of submerged object, apparent bending	• Demonstrate dispersion using triangular prisms and refer to in discussion of the formation of rainbows.	

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	of partially submerged object. • Dispersion is the separation of white light into its component colors due to refraction.		
Topic 3.7 Chemical Bonding			
3.7.1 Describe how atoms combine to forms molecules	• The main reason atoms combine is to achieve a stable outermost electronic configuration (2, 2.8, 2.8.8 etc) • A stable electronic configuration can be achieved by either gain, loss or sharing of electrons • The chemical formula of molecules indicates amounts of atoms of each component element(s) that are combined.	• Students observe online simulation that demonstrate how atoms form stable configurations • Students use models of atoms made from split peas or plasticine to demonstrate the various types of bonding. • Teachers provide	• Students match word names of simple molecules to the corresponding chemical formula. • Students draw “dot and cross” diagrams to illustrate formation of molecular bonds by gain, loss or sharing of electrons.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	• The resulting types of bonding amongst atoms can be ionic, covalent and metallic • Molecules and Compounds differ in properties depending on the type bonding.	samples of substances representative of each type of bonding and students compare their properties from direct observation or simple experiments.	
Topic 3.8 Acids and Alkalis			
3.8.1 Distinguish between substances that are acids and alkalis.	• Many common substances are classified as acidic or alkaline in nature • Acidic substances are sour, corrosive, and turn blue litmus red. • Common acids include: Hydrochloric acid (stomach), sulphuric acid (acid	• Test a range of substances with different indicators to determine whether they are acids or alkalis • Students test a range of substances with pH paper	• Students prepare indicators using plant extracts from hibiscus petals, sorrel, red cabbage, etc. and use to verify acidity or alkalinity of food items or beverages.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	rain), vinegar. • Alkaline substances are caustic, soapy to the touch, and turn red litmus blue. • Common alkali include Saliva, ammonia, baking soda. • The pH scale can be used to determine whether substances are either strong or weak acids or alkalis. • The name and chemical formula of some common acids and alkalis: ❖ Hydrochloric (HCl), nitric (HNO_3) ❖ Sulphuric (H_2SO_4) ❖ Ethanoic acids (CH_3COOH),	(universal indicator) and classify as strong or weak acids or alkalis.	• Worksheet matching name to chemical formula

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	etc. ❖ Sodium (NaOH) ❖ Ammonium (NH_4OH) ❖ Calcium ($Ca(OH)_2$) ❖ Potassium (KOH) hydroxides, etc.		
3.8.2 Describes chemical reactions involving acids.	• Acids react with substances to form salts and other products: ❖ Acid + alkali → salt + water (neutralization reaction) ❖ Acid + metal → salt + hydrogen ❖ Acid + carbonate → salt + carbon dioxide + water • Word equations are used to represent	• Conduct experiments to demonstrate each type of reaction • Classroom discussion of everyday examples of reactions with acids: use of alkaline **lime, [CaO**, calcium oxide] or slaked lime [**$Ca(OH)_2$**, calcium hydroxide] in acidic soil,	• Prepare lab report of experiments conducted. • Students prepare a sample of a salt from an acid provided and present the steps taken in a flow map.

FORM 3			
LEARNING OUTCOMES	**CONTENT SCOPE**	**SUGGESTED TEACHING AND LEARNING STRATEGIES**	**SUGGESTED ASSESSMENT STRATEGIES**
	chemical reactions.	a**ntacid indigestion tablets, bee stings** (pH 5.0-5.5) can be neutralised by calomine lotion, . White spots (actually aluminum salts) can form on foil due to acidity of foods . **Bicarbonate** or [**sodium hydrogencarbonate** **$NaHCO_3$**, sodium bicarbonate, baking powder] reacts with acidic sour or buttermilk.	

Conclusion

It is envisioned that the revised Integrated Science curriculum will serve the needs of the teachers and other stakeholders and will ultimately enhance Science education in Trinidad and Tobago.

Information and resources suggested can be used as needed to inform planning and implementation in order to cater to the different needs and interests of students. Teachers are encouraged to innovatively use the information provided based on their particular situations when creating projects, carrying out investigations or any appropriate authentic learning activity. Participation in games, field trips and science fairs are recommended as it is commonly recognizing that recreational activities, natural or real life events and occurrences as well as the operations of industries can be meaningful contexts for deepening students' understanding of scientific concepts and principles, all making Science more relevant for students.

The curriculum guide is accompanied by a Teachers' Guide that provides suggested teaching and learning strategies and samples of lesson plans than can guide teachers in the implementation of the curriculum

The Curriculum Development Division (CDD) is willing to continue to render any support as necessary in the use and implementation of this curriculum guide.

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Glossary

Annotate
Add a brief note to a label.

Classify
Place into groups according to similarities and differences.

Compare
Identify similarities and differences for each feature.

Define
State concisely the meaning of a word or term.

Demonstrate
Show clearly by giving evidence.

Describe
Give detailed information of the appearance and/or arrangement of a structure or process. Descriptions may employ words, drawings and/or diagrams.

Design
(a) Plan and present an activity/item with all relevant practical detail.
(b) Plan and present an experiment applying the *scientific method*.

Draw
Construct a two dimensional illustration to show accurate likeness and proportion of a specimen, using *drawing guidelines.*

International System of Units (SI)

Le Système international d'unités) is the modern form of the metric system and is the world's most widely used system of measurement.

Investigate
Use the *scientific method* to arrive at logical conclusions.

Measurement
Involves identifying the quantity, unit, measuring instruments and using instruments correctly.

Obesity

This condition is a more serious degree of overweight and is associated with a number of health risks, e.g., impaired heart and immune function, hypertension, kidney diseases, gallbladder, arthritis, etc.

Observe

Study and examine, using appropriate senses and/or extensions of them (e.g., thermometer, microscope etc.).