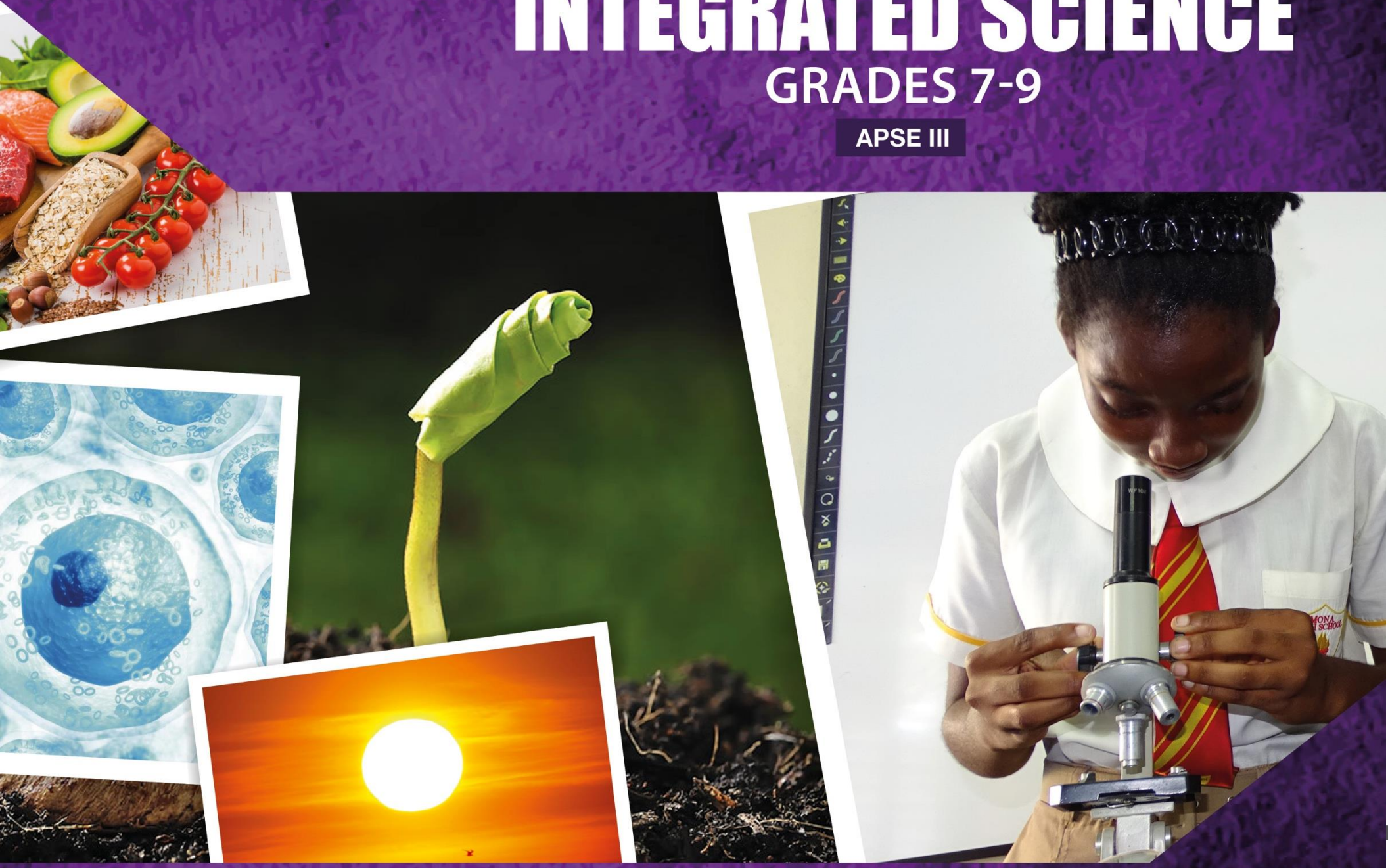
MINISTRY
OF
EDUCATION, YOUTH & INFORMATION
Every Child Can Learn, Every Child Must Learn

NATIONAL STANDARDS CURRICULUM GUIDE

INTEGRATED SCIENCE

GRADES 7-9

APSE III



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Acknowledgements

Our connection with each other is unquestionable and so at the end of this arduous yet rewarding journey, the Ministry of Education, Youth and Information gratefully acknowledges the contributions of the following individuals and institutions who generously gave of their time and resources in the planning and development of the National Standards Curriculum (NSC):

- Mrs. Sharon Neil- former DCEO, Curriculum and Support Services, who provided leadership to the process during her tenure
- Mrs. Lena Buckle Scott- former DCEO, Curriculum and Support Services, who provided leadership to the process during her tenure
- Mrs. Winnie Berry- DCEO, Curriculum and Support Services, who provided leadership to the process
- Dr. Mary Campbell- former ACEO, Core Curriculum Unit, who started the process
- Mrs. Dasmine Kennedy- former (Acting)DCEO, Curriculum and Support Services, who provided leadership to the process during her tenure
- Dr. Clover- Hamilton Flowers- ACEO, Core Curriculum Unit, who completed the task
- Professor Zellynne Jennings- Craig, Dr. Joan Spencer- Ernandez, Dr. Deon Edwards Kerr and Dr. Joan James, University of the West Indies, who led the writing process in the capacity of curriculum consultants
- Education Officers of the Core Curriculum Unit who supported the writing of the curriculum and gave oversight to the development process:
    - Miss Joan Higgins, former Acting SEO Science
    - Mr. Garfield King, former Acting SEO Science
    - Dr. Lennox Rowe, SEO Science
    - Dr. Bernadette Ranglin, former EO Biology
    - Dr. Francine Taylor Campbell, EO Chemistry
    - Miss Carrol Baker, EO Biology
    - Mr. Sadpha Bennett, National Science Coordinator

- Principals/ school administrators, lecturers, teachers and other resources persons who participated in the various curriculum consultants sessions
- Regional directors and territorial education officers who contributed to the implementation of the curriculum
- Miss Jean Hastings, former Director of the Education System Transformation Programme, and Mr Traceloy Solomon, current Programme Director who facilitated the processes of the Curriculum Units
- Mrs. Michelle Kerr, Senior Functional Education Officer and Mrs. Coleen Clarke Russell, Functional Education Officer who provided administrative leadership to the production process
- The members of the Curriculum Secretariat, the administrator and secretaries in the Core Curriculum Unit who provided administrative support during the development and implementation of the curriculum
- The team of curriculum formatters led by Mr. David Ebanks
- The various stakeholder groups, who provided valuable information on societal needs in relation to the curriculum
- All others whose names do not appear, but who contributed to the production of the NSC

MESSAGE

The curriculum of any country informs all aspects of operations and helps to shape the intellectual, social, psychological and spiritual dimensions of our society. By its design, the National Standards Curriculum (NSC) clearly conveys the knowledge, skills and attitudes deemed by our society as critical to addressing Jamaica's current realities. It is expected that as teachers and students interact efficiently with the curriculum that a culture of communication, collaboration, creativity and thinking critically will be honed.

Through the implementation of the NSC, education in Jamaica is being reframed and re-positioned as customized, diverse, relevant, equitable, outcomes-based, and inclusive. Significantly, this approach will signal the introduction of Spanish and Resource and Technology at the Primary level, the Alternative Pathways to Secondary Education (APSE), the integration of the Science Technology Engineering and Mathematics (STEM) methodology and a greater utility of Information and Communication Technology (ICT) tools to facilitate improved outcomes. Since there is no one subject that can be relied on to meet all the needs of our children as each child differs in learning style preferences, abilities, background and so on, schools are expected to use the curriculum to schedule learning episodes that allow all children to creatively express themselves through the Creative Art Forms; think critically in the context of the Exploratory Core areas; practice behaviours that lead to spiritual, physical, emotional and social well-being through Enrichment activities and demonstrate productive capabilities by working collaboratively on projects in settings with a Problem Solving/Work-Based focus, using the standards and principles of Resource and Technology.

The Ministry of Education, Youth and Information will continue to support our schools in the implementation process through the provision of continued training opportunities for school leaders and teachers, improved physical infrastructure and the provision of the necessary teaching/ learning resources to support pedagogy. We look forward to the support of all our stakeholders- members of the community, members of school boards, principals and teachers in ensuring a successful implementation of the NSC.

The Honourable, Karl Samuda, CD, MP

Minister without portfolio with responsibility for Education, Youth and Information

MESSAGE

I fully endorse the National Standards Curriculum (NSC) as being pivotal to advancing the education of our Jamaican children. The broad focus on critical thinking, collaboration, creativity and communication is indeed very critical in equipping young Jamaicans with the requisite twenty- first century skills as we seek to advance the achievement of Jamaica's Sustainable Development Goals by 2030. There is no denying that quality education is one of the most powerful and proven tools for the sustainable development of any country, and that through the realignment and re-scoping of the national curriculum, Jamaica is well on its way to ensuring that our goals are not just symbolic but are a reality lived by all Jamaicans, particularly our youth.

The NSC is on the cutting edge of curriculum design and represents the shift from a content- based focus to a competency- based one where skills and attitudes are placed at the forefront. This approach should ensure that our youth are fully equipped with a combination of the essential knowledge, skills and attitudes to be successful in every aspect of their lives. Users of the curriculum will be pleased to find the utilization of a Pathway Approach to Education with an emphasis on the integration of the Science, Technology, Engineering and Mathematics (STEM) Methodology, Information and Communication Technology (ICT), the Creative Arts and the Technical and Vocational areas. The provision of alternative pathways for our learners, supported by Learning Coaches/ Special Needs Educators is a significant achievement for the MoEYI and our ongoing support for this area concretizes our belief that every child can indeed learn.

The production of this curriculum document is not an indication that our journey has ended; rather it is a signal that we have advanced the very dynamic and obligatory process of the transformation of our education system. I anticipate the support of all our stakeholders in ensuring the curriculum implementation process is without major challenges.

The Honourable, Alando Terrelonge, MP

State Minister in the Ministry of Education, Youth and Information

It was the mandate of the Curriculum Units of the Ministry of Education, Youth and Information to spearhead the crafting of a new curriculum for the nation, in keeping with international standards, global trends in the educational landscape and societal goals and aspirations. The mandate had several facets: to establish clear standards for each grade, thereby establishing a smooth line of progression between Grades from 1 to 9; to reduce the width, complexity and amount of content; to build in generic competencies such as critical thinking across the subjects; to ensure that the curriculum is rooted in Jamaica's heritage and culture; to make the primary curriculum more relevant and more focused on skills development, and to ensure articulation between primary and secondary curricula, especially between Grades 6 and 7. To achieve this, the MoEYI embarked on an extensive process of panel evaluations of the existing curricula, consultation with stakeholders, (re)writing where necessary and external reviews of the end products.

Today, we are indeed proud that, the curriculum development teams have succeeded in crafting a curriculum which has met these expectations. Under the National Standards Curriculum (NSC) focus will be given to project-based and problem-solving learning, with an integration of Science, Technology, Engineering and Mathematics/Science, Technology, Engineering, Arts and Mathematics (STEM/STEAM) methodologies across the system. Learners will benefit from more hands-on experiences which should enhance the overall learning experience and cater to the different kinds of learners in our classroom. In addition, they will be exposed to work-based learning opportunities that will help them become productive citizens of Jamaica and the world at large.

It is anticipated that as school administrators and teachers system-wide implement the National Standards Curriculum that improvements will be evident in the general academic performance, attitude and behaviour of our students.

We anticipate the participation of all our stakeholders in this process as we work together to improve the quality of life and prospects for all the children of Jamaica and to realize our mantra that *every child can, and must, learn.*

Dr. Grace McLean

Permanent Secretary (Acting), Ministry of Education, Youth & Information

MESSAGE

Fundamental to the Ministry of Education, Youth and Information's (MoEYI) core value is the belief that all learners deserve the opportunity to achieve their full potential in all facets of their lives (spiritual, moral, cultural, intellectual and physical). With its dynamic, inclusive approaches, the National Standards Curriculum (NSC) provides a clear and robust blueprint to provide our young Jamaicans with the opportunities, responsibilities and experiences to make this a reality.

The accomplishment of this curriculum cannot be attributed to the effort of one or two individuals. The MoEYI brought together a wide cross section of our stakeholders who contributed their diverse skills in creating curriculum documents that will facilitate high standards of learning and enhance the quality of instructional delivery. Our main mandates concerning the revision of the Curriculum included better alignment of the curriculum in the lower grades secondary grades with the Caribbean Secondary Examination Certificate (CSEC) examinations syllabus used in the upper secondary grades; developing progressive standards for all subject areas; prioritizing the 21st century skills of collaboration, critical thinking, communication and creativity; integrating STEM, the Creative Arts, the Enrichment Areas and ICT in the curriculum documents. It also promotes the use of learner-centred approaches across the various disciplines and creates a more inclusive learning environment by catering to diversity in our learners.

Additionally, Civics will return to be a discrete discipline, while Technical and Vocational Education and Training (TVET), and Spanish will be formally introduced at the Primary level. The Health and Family Life (HFLE) Curriculum has been reviewed and re-scoped to ensure alignment to the philosophy of the NSC and inclusion of all the relevant life skills needed by the 21st century learner.

It is with a deep sense of gratitude that I pay tribute to all the educators who have contributed to the timely development of this National Standards Curriculum which will invariably help all learners to maximize their potential.

Mrs. Winnie Berry

Deputy Chief Education Officer, Curriculum and Support Services, Ministry of Education, Youth & Information

MESSAGE

Education is the means by which the any society can re-create itself in future generations. Cognizant of this fact, the Ministry of Education, Youth and Information (MoEYI) has positioned the National Standards Curriculum (NSC) as an important avenue through which the identity of future generations can be positively impacted. Given its very vibrant and broad-based nature, the NSC targets the holistic development of learners with a view to develop successful lifelong learners and confident and productive individuals who are deeply rooted in their culture, identity and citizenship.

In preparing the education system for the implementation of the NSC the MoEYI continues to offer ongoing training/coaching support for all the relevant stakeholders involved in the implementation, including school administrators, teachers, parents and students. We are also committed to provisioning the system with the resources needed to ensure a successful implementation, particularly in the context of the inclusive and differentiated approaches endorsed by the NSC. We will continue to work with our partners in ensuring the resources available to schools are fully aligned to the content and philosophical underpinnings of the NSC.

This is an exciting time for education in Jamaica. As we advance the curriculum implementation process, we aim to provide all our learners with access to the best education possible. However, we recognize that meaningful and sustainable progress can only be realized from the collaborative effort of all our stakeholders. So as we forge ahead with implementation we invite all our stakeholders to keep focused on our shared vision: “Every Child Can Learn; Every Child Must Learn”...

Capt. Kasan Troupe, Ed. D, JP

Chief Education Officer (Acting), Ministry of Education, Youth & Information

The National Standards Curriculum (NSC) rests on the belief that all learners are endowed with the capabilities, gifts and talents to fulfil their divine purpose. These attributes are to be further enhanced or improved in a nurturing, inspiring and inclusive environment; one that caters to the whole person (soul, spirit and body - spiritual, emotional, social, physical and mental). As learners assume their roles and responsibilities individually and as communities of learning in such an environment, they become critical-reflexive thinkers, creative problem solvers, effective communicators and natural collaborators.

A curriculum design of this nature, calls for transformative change at the societal level (Elkind, 2004)[1] and not just at the school and classroom levels. This is a call for all stakeholders, as users of the curriculum, to adopt a critical - reflective and reflexive stance and join learners in the quest for meaning, purpose and stability as they help to shape the world. By integrating principles from various disciplines and their related methodologies, learners who interact with the curriculum are provided with enriching experiences, opportunities for creative expressions and authentic exploration of problems from a classical standpoint as well as in the context of workplace learning. This is due to the fact that the NSC recognizes the importance of each discipline in the problem solving process and in development.

Assessment as an element of the curriculum becomes primarily a learning process for charting progress through self-corrective measures that are informed by feedback from peers and teacher-facilitator. By providing assessment criteria statements in the curriculum, teachers are encouraged to facilitate learners functioning as self and peer assessors. This approach should see the learner developing self-direction with the support of mentors and coaches and forming an intrinsic desire to succeed. These attributes prepare them to face high stakes assessment as problems to be confronted with courage, a sense of readiness, insight and creative prowess.

These features of the NSC have the potential to influence learners' profile as Jamaicans who are gratified by an identity of cultural excellence that embodies moral obligations, intellectual rigour, innovativeness, environmental stewardship and productivity. The curriculum echoes the sentiments of our National Anthem, National Song and Pledge and serves as rich and credible source of the values and virtues that are woven together to convey the Jamaican identity. I wish for our school administrators, teachers, students and other stakeholders much success as they work with the document.

Dr Clover Hamilton Flowers

Assistant Chief Education Officer, Core Curriculum Unit, Ministry of Education, Youth & Information

Aims

The study of Science should enable students to become:

- Willing to embrace the rapidly changing worlds of knowledge and technology and be capable of managing information with understanding and confidence to meet the personal, social and vocational needs and challenges.
- Adept in participating in decision making processes and be competent in their role of contributing to social and economic development, while being mindful of sensitive moral and ethical concerns that impact ecologically-sustainable environment.
- Proud citizen of Jamaica by embracing values that impact increased productivity and economic prosperity, and promote equity and social justice for all.

The Philosophy behind the New Science Curriculum

Science is a way of knowing about the structure and behaviour of the physical and natural world through observation and investigation.

Today's global societies have become significantly more scientific and technological, requiring an understanding of science in making many personal decisions and addressing various socio-economic, environmental and health issues. A course of study in science therefore offers students the ability to develop crucial skills and knowledge that equip them to understand the world around them, make informed decisions, and build positive life-long learning habits, behaviours and attitudes.

The Grades 1-9 Science Curriculum is predicated upon the constructivist approach to learning in that it creates, through a variety of learner-centred instructional methodologies, 'hands-on,' 'minds-on,' and 'real world' experiential opportunities for exploring, catering to multiple intelligences and, in the early years (Grades 1-3), makes the most of the pedagogy of play. The curriculum has been redesigned to have a greater emphasis on the integration and application of scientific concepts, principles and innovation. Fundamental to this new curriculum is the acquisition of the science process skills that will enable students to engage in scientific enquiry which forms a foundation for scientific programmes at advanced levels. The curriculum has also taken into consideration the national strategic objectives in education as well as the twenty first century desired outcomes which include the ability to communicate ideas, to collaborate on issues thereby building interpersonal skills, to create meaningful solutions to problems with real world applications and to exercise critical thinking skills which has implications for personal growth and development. As a result, students will become flexible and adaptable, information and technology literate, aware of health and wellness issues and globally competent.

The assessment of the science curriculum is also predicated on constructivism, and incorporates real life and performance based experiences that are student-centred and formative in nature. Learner-centred assessment relies heavily on formative assessment and requires the use of varied, multiple non-traditional assessment strategies and tools to measure students' achievement and progress throughout the school year.

These assessment strategies actively engage students and promote the involvement of students through performance tasks and student self and peer assessments.

Based on the National Standards Curriculum (NSC) Framework, the curriculum emphasizes the need for balance between the acquisition of scientific knowledge, as against the learning process and attitudes. In addition, where applicable, the technological applications, social implications and the value aspects of science are also considered. The curriculum exposes students to methodical approaches to investigation and problem solving, as the basis for evidence-based conclusions. Students will encounter the need for fair test and veracity in data derived through experimentation. They will build personal integrity and develop personal qualities such as perseverance, ingenuity, respect for the opinions of others and tolerance for diversity of opinions even when they contradict their personal beliefs. Acquisition of these qualities, along with the understanding of scientific principles and applications, when transferred to life beyond school, will not only produce astute scientists but will also impact the social, economic and political lives of graduates. Science in the curriculum also adequately equips students to choose relevant careers by making them knowledgeable about the diverse branches of science and technology and a growing number of other science-related professions; many of which have not yet been created.

In the NSC, science is linked with other subject areas such as Social Studies, Geography, Mathematics, Resource and Technology and the Arts within the context of integration through STEM. This interdisciplinary approach helps students recognize the relevance of each subject and that everything in our world is interconnected.

Range of activities

Students should be inducted into the processes of science, engage in practical inquiry and plan and conduct investigations both in groups and individually. They should develop an appreciation for the range of flora and fauna in their locality and beyond and understand how they maintain the delicate balance in the environment. Students should learn the scientific basis of the structures and functions of their bodies. They should explore the range of materials and understand their physical and chemical properties. They should also explore the different forms of energy and forces and how these impact on everyday life.

Introduction to the Science Curriculum

The New Standards Curriculum (NSC) is predicated on the science process skills and science practices. It is designed so that students develop these skills while learning the prescribed content. The process skills and science practices are addressed each year, with a particular focus at each grade level. Students use the process skills and practices of science to develop an understanding of the scientific concepts (see figure 1). The scientific attitudes and practices enable students to work like scientists.

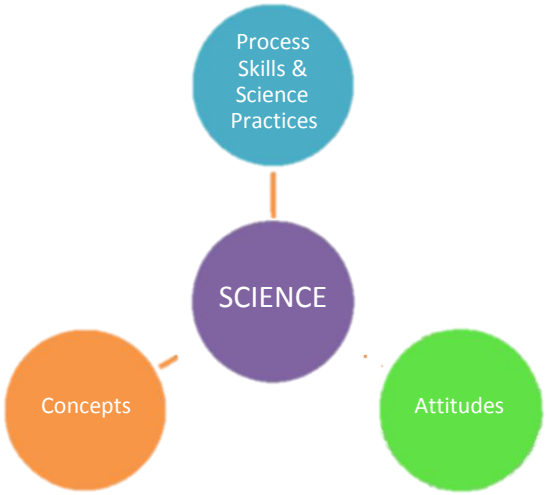


Figure 1: Elements of Science

The NSC design is based on education of the whole child and provides a well-rounded and enriching experience. Since science is about asking questions and finding answers to questions, the **Process skills** are actually the same skills that we all use in our daily lives as we try to figure out everyday questions. These skills include:

- Observing
- Communicating
- Measuring
- Classifying
- Predicting
- Inferring
- Identifying and Controlling Variables
- Define Operationally
- Formulating Hypotheses
- Interpreting Data
- Experimenting
- Creating Models

When we teach students to use these skills in science, we are also teaching them skills that they will use in the future in every area of their lives

Scientific competences do not develop incidentally - they must be deliberately and systematically included in students' educational experiences. Laboratory/practical activities positively influence the development of process skills.

The NSC emphasizes the teaching of science using process/inquiry skills in order that students:

- Acquire content
- Develop the ability to recognise problems
- Think critically about how to solve problems
- Follow logical, sequential and analytical steps in arriving at solutions

These are achieved in the NSC through the use of student-centred approaches such as inquiry-based, project-based, and problem-based learning, which are utilised in the integrative STEM/STEAM approach. From these, the science and engineering practices are fostered. The science and engineering practices, as identified by the Next Generation Science Standards (NGSS), are:

- Asking Questions or Defining Problems
- Developing and Using Models
- Planning and Carrying Out Investigations
- Analysing and Interpreting Data
- Using Mathematics and Computational Thinking
- Constructing Explanations or Designing Solutions
- Engaging in Argument From Evidence
- Obtaining, Evaluating, and Communicating Information

Activities in the NSC are investigative in nature and encourage the exploration of the natural environment. Emphases on real-world applications foster the development of the key 21st century skills commonly called the 4Cs (critical thinking, creativity, collaboration and communication) as well as scientific attitudes such as curiosity, objectivity, critical mindedness, open mindedness, inventiveness, intellectual honesty, humility and perseverance.

Assessment in the Science Curriculum

In the science learner-centred classroom, assessment is done by the teachers and students. The key aim of science at this stage, in addition to garnering knowledge and understanding about certain science phenomena considered crucial for students at this level, is to enable children to develop twenty-first century competencies through active and real life experiences which train them to 'work scientifically' and solve problems through inquiry and the engineering design process. Such an aim cannot be effectively achieved by the administration of external written tests.

Explicit links between what is intended to be learned and what is assessed have been created in the science teaching and learning units. Each science unit within a grade level outlines the assessment criteria to be used in determining the skills, knowledge and understanding students are expected to achieve, after their learning encounters within that unit. However, the teacher has the liberty to select the learner-centred assessment strategies and tools that will be most effective in measuring the targeted learning outcomes. Scientific vocabulary and factual knowledge can be assessed by using well-structured short open-ended and multiple choice tests or quizzes given at appropriate times.

Assessment of students' achievements gathered within the school is used for two main purposes.

1. Formative assessment (assessment for learning - to assist learning). These assessment activities are:
    - Aligned with the learning objectives of the science curriculum;
    - Realistic and manageable for pupils and teachers, with cited time demands;
    - For ascertaining and reporting the achievement of individual pupils, information is gathered by use of a variety of learner-centred strategies and tools; and
    - Promote the active engagement of pupils in their learning and its assessment.

2. Summative assessment (assessment of learning - to summarize and report on what has been learned, at the end of each unit or at the end of each term).

Assessment should not be an after-thought, but is an integral part of the delivery of instruction.

NATIONAL STANDARDS CURRICULUM GUIDE

INTEGRATED SCIENCE

GRADES 7

APSE III

GRADES 7 SCOPE AND SEQUENCE			
	TERM 1	**TERM 2**	**TERM 3**
GRADE 7	**Processes of Scientific Investigation** • Defining Science • Dimensions of Science • Works of selected scientists • Application of the Scientific Method & Engineering Design Process to solve problems • Scientific Process skills **Working like a Scientist** • Safety practices in the home, school & work environment • Significance of safety signs and symbols • Consequences of unsafe practices • Using safety equipment • Correct use of selected laboratory apparatus	**Cells & Organisms** • Examining cells under a microscope • Drawing generalized plant and animal cells • Relating cell structures to their functions • Differentiating between plant and animal cells • Functions of specialized cells • Hierarchical relationship between cells, tissues, organs and organ-systems **Physical Health and Well-being** • Identifying ways of keeping surroundings clean • Importance of a clean environment to health • Importance of regular exercise • Identifying nutrients & their functions • Importance of a balanced diet • Differentiating nutritious and non-nutritious foods and snacks	**Energy forms and inter-conversion** • Differentiating energy forms and sources • Investigating energy conversions • Classifying energy forms as kinetic or potential • Energy use in different environments **Matter** • Grouping matter as solids, liquids and gases • Defining matter • Investigations showing particles in matter • Characteristics of the three states in terms of particle movement and arrangement • Investigating changes of state by heating and cooling • Processes involved in changes of state • Definitions and examples of melting, freezing, evaporation and condensation

TERM 1

UNITS OF WORK GRADE 7 TERM 1 UNIT 1: PROCESSES OF SCIENTIFIC INVESTIGATION

About the Unit

In this unit students will investigate the work of a scientist through the use of the scientific method and engineering design process. They will be exposed to science as a process of inquiry constituting three inter-related dimensions – knowledge, skills and attitudes. Students will also study the approaches taken by prominent Jamaican scientists and explore the various science associated careers.

Range of Content

- Science is a way of knowing and understanding the natural and physical world.
- Science involves three inter-related dimensions – knowledge, skills and attitudes
- Scientists solve everyday problems using the Scientific Method and the Engineering Design Process.
- T.P. Lecky and Professor Manley West are known Jamaican scientists who have contributed significantly to the development of Science.
- The Scientific Process Skills include observing, measuring, reporting, interpreting, inferring and making conclusions.

GUIDANCE FOR THE TEACHER

Science is not just a body of knowledge but also includes a set of skills and attitudes. In teaching this unit, it is therefore intended for students to encounter the whole of science through examination of the work of the scientist. It is intended for students to begin with their own understanding of science and what the scientist does and then be provided with experiences geared towards allowing him/her to broaden and complete his/her understanding of science as a process of inquiry. **It is important to teach starting from what students know and experience then move into the unknown**.

Prior Learning

Check that students can:

- Identify some scientists in their local environment
- Recognize the work of a scientist

UNITS OF WORK GRADE 7 TERM 1 UNIT 1.1

UNIT 1.1: Science as a Process of Inquiry

Theme: Exploring science and the environment

ATTAINMENT TARGETS	OBJECTIVES
• Understand the scientific process, and the impact of air and water on the environment, and on our everyday life **Topic: What a scientist does** **Duration:** 10 hours **ICT Attainment Targets:** **COMMUNICATION AND COLLABORATION –** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking **DIGITAL CITIZENSHIP –** Follow guidelines to promote the healthy use of information and communication technologies.	**Students will:** • Formulate a definition of science • Describe the three dimensions involved in the work of the scientist and their inter-relationship • Identify the stages in scientific investigation as – identifying a problem, suggesting a solution, testing solution or hypothesis by experiment, recording methods and results, drawing conclusions • Apply the scientific method and engineering design process to solve everyday problems • Show respect for another person's idea. • Communicate ideas to others in a variety of ways

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Use drawings or art work to describe own understanding of science and be given a series of pictures/videos which show the scientist in various aspects of work. Analyse and interpret the skills or attitudes that the scientist is portraying in the pictures. Share ideas, discuss and make conclusions about how the scientist works. Arrive at a definition of science and compare definition with your own previous definition. Share what you have learnt. Assess your answer and that of your peers.	• Communicate • Collaborate • Think Critically - analyse, infer, justify, draw conclusions	• Drawings depict actions of scientists • Basic scientific skills or attitudes identified • Acceptable definition of science • Art work is neat
Level 2: Design a poster depicting a scientist at work; share your poster in small groups and then with the class; explain how the poster portray, through the work of a scientist, your understanding of what science is. How does the poster show some tools which the scientist uses? What attitudes does your scientist portray as he/she works? What problem/issue is the scientist addressing; what knowledge is being sought? How does the work of your scientist portray science as a process of inquiry? Work in your small groups to arrive at a definition of science.	• Observe • Communicate • Collaborate • Think Critically – analyse, infer, justify, draw conclusions	• Poster depicts actions of scientists • Basic skills/ attitudes of scientists Identified • Acceptable definition of science • Poster is creative • Steps in scientific inquiry evident
Level 3: Read and interpret a story about the work of a scientist; describe the work of the scientist; what science equipment does the scientist use and for what purpose? From the story, identify skills and attitudes which the scientist used; identify 3 important dimensions of science and use a diagram to illustrate how they inter-connect; write a simple definition of science; share and critically discuss all ideas in small and large groups.	• Observe • Communicate • Collaborate • Think Critically – analyse, infer, justify, draw conclusions	• Scientific skills and attitudes identified from story • Accurate work of scientist noted • Correct equipment identified • Acceptable definition of science
In groups, brainstorm definitions of the term 'science'. Participate in teacher guided class discussion on what is science. In groups, describe examples of science in the home, school, community and industry (national and international) and share examples with the class in a variety of ways.	• Collaborate • Communicate • Research • Create • Think Critically - analyse	• At least two correct examples of science given for each category: home, school, community and industry

Examine a case study and/or watch video on a scientist at work. Identify the various steps, skills and attitudes displayed by the scientist. Make a presentation to the class in a variety of ways. Review works of Jamaican scientists through pictures/ videos and tabulate the contribution of each scientist.	• Communicate • Collaborate • Create • Record • Tabulate	• Steps, skills and attitudes accurately identified • Table contains accurate information on each Jamaican scientist
Be provided with a sample of spoiled milk. In groups, discuss how or why the milk became spoiled and suggest how this could be prevented. Examine milk boxes or bottles and suggest why the term 'pasteurized' milk is used. (Teacher will introduce the work of Louis Pasteur) Discuss what steps Louis Pasteur must have used to come up with the pasteurization method. Compare steps with the stages in the Scientific Method. Create displays (electronic/non-electronic) depicting the steps involved in the scientific method. Present the display to class for discussion. Mount the display in the class.	• Communicate • Collaborate • Create • Observe • Compare • Think Critically – analyse, infer, draw conclusions	• Logical reasons for spoilage/use of pasteurize given • An acceptable sequence of steps is outlined • Accurate comparison of steps with Scientific Method • Creative displays contain accurate Information
In class discussion, explore the process skills that are employed in scientific work (observe, manipulate, classify, communicate, measure, infer, predict, question etc.). In groups, examine scenarios provided by the teacher in identifying the process skill(s) being used. Share information with class.	• Think Critically – analyse, communicate, collaborate	• Process skills correctly identified in • each scenario. • An acceptable sequence of skills used to solve problems is outlined
Write down (or share orally), step by step, what they think they would do to solve a simple everyday problem. For example, if their cell phone would not turn on in the morning. In groups, share and discuss their answers to the problem posed. As a class, discuss the application of problem solving procedures in everyday situations. Compare the steps taken to solve their everyday problems with the stages in the Engineering Design Process. Create displays depicting the steps involved in the EDP method. Make presentations to the class.	• Record • Communicate • Collaborate • Create • Compare • Think Critically – analyse, apply, formulate	• Logical steps given • Acceptable solutions to problems suggested • Creative displays contain accurate • Information

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Formulate a working definition of science
- ✓ Recognize the three dimensions of Science
- ✓ Use the scientific method and engineering design process to solve selected problems
- ✓ Outline basic science process skills
- ✓ Communicate information using productivity tools (e.g. presentation software, graphic organizer, word processing)
- ✓ Conduct electronic search for kinds of information e.g. text images, audio and video

Points to Note	**Extended Learning**
• Special emphasis should be placed on the development of skills and attitudes in the process of acquiring scientific knowledge throughout the units. • Basic steps in the scientific method: Question → research →hypothesis → experiment → analyse results → communicate findings) • Basic steps in the engineering design process: Problem → research → specify requirements → generate solutions and create best one → build prototype → test and redesign if necessary → communicate results) • Recognise some of the dangers associated with internet use and demonstrate safe online behaviours.	• Find out the meaning of the science process skills and depict meanings in a variety of ways. • Select a problem in their school/community and use the engineering design process to solve it.

Resources	**Key vocabulary**	
• Series of pictures/videos depicting various aspects of the work of a scientist • Information sheets/multimedia materials containing scenarios in which science skills are used • Books, magazines, newspaper articles on Jamaican scientists, • Materials for simple science activity, • Teacher-simplified story of the work of a scientist, • Computers, internet, **m**ultimedia projector, interactive video tutorials, CDs/DVDs, multimedia	• Science • Process skills • Scientific attitude • Scientific knowledge • Scientific method • Engineering design process • Observe	• Manipulate • Classify • Communicate • Measure • Infer • Predict

- **Links to other subjects:** English Language, Visual Arts

UNITS OF WORK GRADE 7 TERM 1 UNIT 2: WORKING LIKE A SCIENTIST

About the Unit

In this unit, students will explore the relationship between the work of a scientist and science as a process of inquiry**.** Students will use simple science laboratory equipment and explore safety practices applicable to home, work and school environments

Range of Content

- Laboratory safety practices require knowledge of safety rules, signs, symbols and safety equipment.
- Safety practices should extend to activities done in the home, work and on roadways.
- Careers in science span a number of different fields including health, education, environment, engineering and manufacturing.
- Scientists carry out investigations using apparatus which measure, mass, volume, time, and length

GUIDANCE FOR THE TEACHER

Science is a body of knowledge, as well as skills and attitudes. Students need to understand, appreciate and make use of the environment in sustainable ways; to act responsibly towards it.

The inclusion of a project on Safety in the home, school or on the road will aid increased application of the safety concepts taught.

Prior Learning
Check that students can:
- Identify some safety signs in their surroundings

UNITS OF WORK GRADE 7 TERM 1 UNIT 1. 2

UNIT 1.2 : Working like a scientist	
Theme: Exploring science and the environment **Attainment Target(s):** • Understand the scientific process, and the impact of air and water on the environment, and on our everyday life. **Topic: Safety Precautions** **Duration:** 8 hours/ 3 weeks **ICT Attainment Targets:** **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	**Objectives** **Students will**: • Identify specific situations in the home, classroom and science laboratory which may be potentially dangerous • Describe ways in which potentially dangerous situations may be corrected • Use common safety signs and symbols • Predict the consequences that may result from not following safety rules • Use available safety equipment and selected science apparatus • Work collaboratively with others in small groups • Show safety consciousness for self and others when doing practical activities

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Brainstorm signs and symbols that they come across in their daily lives. Discuss the importance of these signs and symbols. Create posters with signs and symbols that relate to the school environment. Hang posters around the class/ school.	Communicate, create, think critically – analyse, justify	• Creative posters contain accurate information • Justifiable reasons given for importance of safety signs/ symbols
In groups, examine **pictures and/or online/offline video tutorials** of work areas in the home, school classroom/laboratory, on the streets and workplace to identify and record at least five possible dangers and five safe practices. Discuss and record possible outcomes of the potentially dangerous situations identified, and the benefits of carrying out the safe practices in the pictures/videos. Share and discuss the information with the class.	Collaborate, communicate, observe, record, think critically - infer **Conduct Internet search**	• At least five logical dangers and five valid safety practices identified • Possible outcomes/benefits relate to potentially dangerous situations/safe practices
In groups, examine caution/warning labels found on chemical containers, such as bleach, pesticide found in the home, laboratory and/or vehicles that transport chemicals. Make drawings and/or take pictures of the safety symbols (colour codes included) and explain what each of the safety symbols/colours mean**.** Write a paragraph on the importance of caution/warning labels. Use information to create a safety manual (electronic/non-electronic) on warning labels. As a class, develop checklist to assess the manuals created.	Collaborate, communicate, create, observe, draw, think critically - interpret **Create digital images**	• Manual contains accurate information on caution/warning labels • Checklist useful in evaluating safety manuals
Be introduced to the safety equipment available in the class/ school (or online/ offline). Investigate how to operate a fire extinguisher, safety shower, eye wash station, fume hood etc. Write a report on their investigations, including pictures of use by students.	Observe, record, manipulate, communicate, report, think critically – analyse, draw conclusions	• Operate the safety equipment according to given guidelines • Report contains accurate information

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
After observing teacher demonstration on the use of some apparatus (e.g. measuring cylinder, balance, thermometer), in groups, use the apparatus to measure the relevant quantities for various objects provided by the teacher. Share measurements with class. Draw, label and describe the use of selected apparatus **and/or use digital drawing tools to draw and label images**. Complete a teacher prepared worksheet.	Draw, measure, manipulate, communicate, collaborate Create digital images	Instruments correctly used Measurements correctly stated with units Accurate drawings of apparatus and correct labelling

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Recognize common safety signs and symbols
- ✓ Use available safety equipment
- ✓ Measure various quantities using appropriate instruments.
- ✓ Carry out a given activity in a safe, clean, tidy and systematic way.
- ✓ Show respect for another person's idea.
- ✓ Communicate and share information with others

Points to Note	**Extended Learning**
• Special emphasis should be placed on the development of skills and attitudes throughout the units • The charts made by student should be prominently displayed in the class/laboratory for constant reference. • Balance the sample of apparatus to include those related to biology, chemistry and physics. • **Recognise some of the dangers associated with internet use and demonstrate safe online behaviours.**	Identify persons who implement rules e.g. police officers, traffic wardens, food inspectors. Explain why these persons are important and how they help to improve the quality of life for people.

Resources Pictures/videos depicting safe/unsafe scenes, various laboratory instruments: balance, thermometer, measuring cylinder, ammeter, clock, metre rule **Computers, Internet, speaker, multimedia projector, interactive video tutorials, CDs/DVDs**	**Key vocabulary** Safety, rules, precaution, safety symbols, signs, apparatus
Links to other subjects Visual Arts, Technical & Vocational Education and Information Technology	

TERM 2

UNITS OF WORK GRADE 7 TERM 2 UNIT 2.1: THE CELL AS THE BASIC UNIT OF ORGANISMS

About the Unit

In this unit, students will explore the cell as the basic unit of life and the hierarchical organisation of organisms which facilitates crucial life processes. Students will engage in a variety of simple hands-on activities to develop conceptual understanding about typical plant and animal cells and the ways in which these cells become structurally adapted to perform life sustaining functions in the organism. The opportunity will be provided for students to observe actual cells, create models, use technology and create reflective journals as a means of reinforcing knowledge, reading and comprehension skills and positive scientific attitudes and values.

Range of Content

The key concepts, skills and knowledge students will learn in this unit are:

- Hierarchical arrangement of cells in human body systems and plants systems
- The cell as the basic structure and function of human organ Systems
- Modification of cells to carry out specialised functions
- Use of scientific vocabulary
- Methods of scientific investigation
- Development of collaborative and communication skills and, scientific attitudes and values

GUIDANCE FOR THE TEACHER

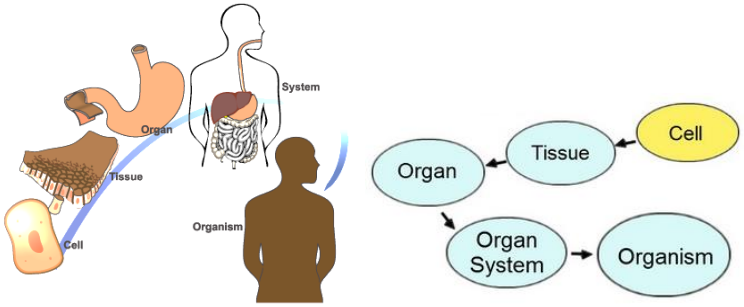
Only simple explanations of the life processes are required, and students should be able to accurately connect organ systems to the life processes. Students should be afforded opportunities to use and further develop the cognitive and science process skills of inquiry for the purpose of acquiring knowledge. They should be encouraged to work both individually and in groups and be guided in developing scientific attitudes and values.

Prior Learning
Check that students can:
- Use science process skills such as observing and investigation
- Communicate ideas in small and large groups

UNITS OF WORK GRADE 7 TERM 2 UNIT 2. 1

UNIT 2.1: The Cell as the Basic Unit of Organisms	
Theme: Living things and life processes	
Attainment Target: • Demonstrate an understanding of the hierarchical pattern of human body systems and their role in the life processes **Topic: Cell structure and life processes** **Duration:** 12.5 hours/5 weeks **ICT Attainment Targets:** 💻 **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. 💻 **RESEARCH, CRITICAL THINKING AND DECISION-MAKING –** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. 💻 **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. 💻 **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	**Objectives** **Students will:** • List the different life processes • Describe the hierarchical relationship between cells, tissues, organs, organ-systems and organisms • Define the cell as the basic unit of structure and function of living organisms • View projected slides of plant and animal cells and list their parts and functions *(nucleus, cytoplasm, cell membrane, cell wall, vacuole, chloroplasts)* • Construct a model of a typical animal cell to show its structure • Identify the sperm, nerve and root hair cells as examples of specialized cells • Explain how specialised cells are structurally adapted to perform their functions • Work collaboratively in groups • Use various methods of scientific inquiry • Develop scientific habits and values

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: • Watch the video: **https://www.youtube.com/watch?v=ZRFykdf4kDc** about the organization of living things. In groups, use evidence from the video to explain what is meant by the cell being the basic structure and function of all living things. Explain the life processes in a teacher lead discussion. Identify one plant organ system *(shoot or root system)* and one animal organ system and analyse to show organization as: **system → organ → tissue → cell**. Share findings with class. In groups, use Legos to demonstrate the organization of living things. Take pictures of creations and place in personal journals.	• Collaborate, communicate, observe, record, explain using scientific language, work effectively individually, think critically - create models, reflect	• Accurate definition/explanation of cells • Simple explanation of life processes • Correct identification of organ systems and their organization • Effective use of Legos to demonstrate organization of living things
• Watch the video: **https://www.youtube.com/watch?v=b2fWKhtkfnI** about animal cells. In a teacher prepared table, write the names of each cell part and simple function *(e.g. nucleus – controls the cell).* Write each word on a flashcard or strip of paper and learn the pronunciation and spelling of each word. Place flashcards on classroom wall and in personal journal *(include a picture of animal cell in journal)*. Make a model of a typical animal cell and display in classroom. View plant cells *(onion/elodea*) under the microscope. Compare the animal cell with a typical plant cell. In a teacher prepared table, list the differences between the typical animal and plant cells.	• Collaborate, communicate, observe, tabulate, work effectively individually, think critically - make models, compare, reflect	• Tables correctly filled out with relevant information • Proper pronunciation and correct spelling of science words • Accurate and representative models of typical animal cell
• Collect pictures of specialized plant and animal cells *(sperm and root hair cells)* and *c*ompare with typical plant and animal cells. Identify the ways in which the specialized cells are different in structure from the typical cells and state how they are modified to suit the function they perform. Share information with class. Place pictures of the specialised cells in their personal journals and label.	• Collaborate, communicate, label, observe, think critically - analyse, compare, research	• Accurate comparison of typical and specialised cells • Journals indicate the development of cognitive skills e.g. reflective and creative thinking; attitudes and values •

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 2: Watch the video: **https://www.youtube.com/watch?v=ZRFykdf4kDc** about the organization of living things. In groups, use evidence from the video to explain what is meant by the cell being the basic structure and function of all living things. Explain the life processes in a teacher lead discussion. Identify one plant organ system *(shoot or root system)* and one animal organ system and analyse to show organization as: **system** ⟶ **organ** ⟶ **tissue** ⟶ **cell**. Share findings with class. In groups, make posters or charts to illustrate the organization of living things. Take pictures of posters and place in personal journals.  	• Collaborate • Communicate • Observe • Record • Explain using scientific language • Work effectively individually • Think Critically - Create, Reflect	• Accurate definition/explanation of cells • Simple explanation of life processes • Correct identification of organ systems and their organization • Posters/charts accurately illustrate organization of living things and satisfy given criteria
Watch the video: **https://www.youtube.com/watch?v=b2fWKhtkfnI** about animal cells. Make a drawing of the typical animal cell and label each cell part. Add simple annotations about the function of each labelled part. *(simple functions e.g. nucleus – controls the cell).* View plant cells *(onion/elodea*) under the microscope. Compare the animal cell with a typical plant cell. In a table, list the similarities and differences between the typical animal and plant cells. Share information with class. Learn the pronunciation and spelling of each part of the cells.	• Collaborate • Communicate • Observe • Tabulate • Annotate • Draw • Work effectively individually Think Critically - Compare, Reflect	• Accurate and representative drawings of typical animal cell; drawings satisfy most important guidelines for making biological diagrams • Suitable table to display information created; table accurately lists similarities and differences between cells • Proper pronunciation and correct spelling of science words

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Collect pictures of specialized plant and animal cells *(sperm, epithelium and root hair cells)* and compare with typical plant and animal cells. Identify the ways in which the specialized cells are different in structure from the typical cells and state how they are modified to suit the function they perform. Share information with class. In groups, make a model of any one of the specialised cells. Display the models in the class. Take pictures of the models of the specialised cells, annotate and place in their personal journals.	• Collaborate • Communicate • Annotate • Observe • Think Critically - analyse, compare, create, research, reflect	• Accurate comparison of typical and specialised cells • Accurate and representative models of specialised animal cell • Journals indicate the development of attitudes and values; cognitive skills e.g. reflective and creative thinking
Level 3: Watch the video: **https://www.youtube.com/watch?v=ZRFykdf4kDc** about the organization of living things. In groups, use evidence from the video to explain what is meant by the cell being the basic structure and function of all living things. Explain the life processes in a teacher lead discussion. Identify one plant organ system *(shoot or root system)* and one animal organ system and analyse to show organization as: **system** → **organ** → **tissue** → **cell**. Share findings with class. Create a foldable for the organisation of living things. Place foldable in personal journal.  **Foldable**	• Collaborate • Communicate • Observe • Record • Explain using scientific language • Work effectively individually • Think Critically - Create, Reflect	• Accurate definition/explanation of cells • Simple explanation of life processes • Correct identification of organ systems and their organization • Foldable accurately illustrates organization of living things and satisfy given criteria
Watch the video: **https://www.youtube.com/watch?v=b2fWKhtkfnI** about animal cells. Make a drawing of the typical animal cell and label each cell part. Add simple annotations about the function of each labelled part. *simple functions e.g. nucleus – controls the cell).* View plant cells *(onion/elodea*) under the microscope. Compare the animal cell with a typical plant cell. In a table, list the similarities and differences between the typical animal and plant cells. Share information with class. Learn the pronunciation and spelling of each part of the cells.	• Collaborate • Communicate • Observe • Tabulate • Annotate • Draw • Work effectively individually Think Critically - Compare, Reflect	• Accurate and representative drawings of typical animal cell; drawings satisfy most important guidelines for making biological diagrams • Suitable table to display information created; table accurately lists similarities and differences between cells • Proper pronunciation and correct spelling of science words

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Use the computer to view pictures of specialized plant and animal cells *(sperm, palisade and root hair cells)* and *c*ompare with typical plant and animal cells. Identify the ways in which the specialized cells are different in structure from the typical cells and state how they are modified to suit the function they perform. Share information with class. In groups, make a three-dimensional model of one of the specialized cells and display in class. Take pictures of the models of the specialised cells on display, annotate and place in their personal journals.	• Collaborate • Communicate • Annotate • Observe • Think Critically - Analyse, Compare, Create, Research, Reflect	• Accurate comparison of typical and specialised cells • Accurate and representative 3D models of specialised cell • Journals indicate the development of attitudes and values; cognitive skills e.g. reflective and creative thinking
Learning Outcomes **Students who demonstrate understanding can:** ✓ Make accurate models or diagrams to illustrate the basic parts of a cell and relate the organelles to their function ✓ Explain the differences between plant and animal cells ✓ Relate specialised cell structure to function ✓ Demonstrate understanding of cell organization into tissues, organs and systems		

Points to Note	Extended Learning
• Students must be given ample opportunities to make presentations in small groups and to the class; to ask and answer questions and contribute to discussions; agree and disagree and reach a consensus. • To help students make foldable, view the video: **https://www.youtube.com/watch?v=Qccs9wcpcTg** *(Note: each strip of paper should also represent the varying sizes of the structures e.g. cells – smallest strip; organism – largest strip).* • Ensure that students use suitable and representative materials to create models of typical animal cell *(encourage research)*. • When discussing function of cell parts, take care to make the connection between these functions and the life processes. • All diagrams should meet the requirements for examination standards – done in pencil; clean continuous lines of even thickness; labels to the right of drawing; label lines drawn with ruler and do not overlap; labels written in lower case only; title of diagram included. • Review students' journals regularly and provide feedback, needed aid and commendations to students. • Encourage students to reflect on their work, performance, achievements, plans for improvement and, record reflections in their journals.	• Find out which organs make up the transport system in plants by placing a soft plant such as the balsam in a solution of red food colouring for a few hours. • Do research on tissue culture and discuss the importance of tissue culture.
Resources	**Key vocabulary**
• Prepared slides of plant and animal cells • Microscope • Computer, internet, videos, gadgets for taking and printing pictures • Paper for making foldable and flashcards • Materials for making journals • Markers/coloured pencils	• Nutrition • Egestion • Selectively permeable • Vacuole • Nucleus • Chloroplast • Organ • Life processes • Respiration • Growth • Excretion • Plant transport system • Cell membrane • Cell wall • Cytoplasm • Tissue • System • Movement and locomotion • Sensitivity • Reproduction
Links to other subjects Language Arts, Information Technology, Arts and Craft	

UNITS OF WORK GRADE 7 TERM 2 UNIT 2.2: PHYSICAL HEALTH AND WELL-BEING

About the Unit

In this unit, students will develop knowledge and understanding of the ways by which they can acquire and maintain good health. They will appreciate the great role and responsibility an individual has in ensuring own healthy state through the practice of good personal hygiene and the choice of healthy foods. They will identify the various food groups, recognise foods which are good sources for each group and understand the difference between a meal or snack that is nutritious or not. Through hands-on activities they will discover proof that some foods may have greater quantities of certain nutrients than others and that these foods are grouped accordingly to form the food groups. They will appreciate the need for rest, exercise, and a healthy community to ensure healthy living and increased longevity for all.

Range of Content

The key concepts, skills and knowledge students will learn in this unit are:

- Personal hygiene, rest, exercise and a balanced diet as important contributory factors for the maintenance of good health
- The nutrients, function of the nutrients, identifying the food groups and determining healthy food choices
- Science process, critical and creative thinking and inter-personal skills and positive attitudes such as perseverance

GUIDANCE FOR THE TEACHER

1. Students' creative works can be exhibited as a mini exposition in which all Grade seven classes showcase their work.
2. A micro projector or multimedia projector may be used to support teaching of cleanliness of community, personal hygiene, exploration of balanced meal and, manipulative skills in the simple sugar test in cases where classes are too large or too crowded.
3. Students' entries in their personal journals may be assessed for writing skills, vocabulary development, creative thinking and general academic progress and inter-personal development.
4. Be aware of opportunities to move students from one Level to the next.

Prior Learning
Check that students can:
- Recall the characteristics of living things
- Recall the Scientific Method

UNITS OF WORK GRADE 7 TERM 2 UNIT 2. 2

UNIT 2.2: Physical Health and Well-being	
Theme: Living Things and Life Processes	
Attainment Target: Demonstrate an understanding of the importance of hygiene and diet in maintaining good health and well-being. **Topic: Hygiene, Exercise and the Diet** **Duration:** 10.5 hours/4weeks **ICT Attainment Targets:** **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	**Objectives** **Students will:** • Investigate ways of keeping self and surroundings clean • Explain the importance of keeping self and surroundings clean as a means of maintaining good health • Explain the importance of regular exercise and rest to good health • List the nutrients and describe their functions • Investigate the food groups • Explain a balanced diet • Differentiate between nutritious and non-nutritious meals and snacks

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: In small groups, explore the school environment to identify instances of good and poor hygienic practices *(e.g. garbage pile-up, clearly marked disposal bins, disposal bins in classrooms etc.).* Use a checklist to record observations and offer suggestions for solving hygiene problems and/or maintaining the good practices noted. Share information with class.	• Observe • Record • Communicate • Collaborate • Think Critically – investigate, analyse, problem solve, reflect	• Checklist properly used • Practical suggestions provided
Watch the video: **https://www.youtube.com/watch?v=jQ2e0KH5WrI** about personal hygiene. In groups, create a 10-point checklist for good personal hygiene (e.g. wash hair – wet hair and apply shampoo etc.) or a personal care plan. Share checklists or plans with class and insert a copy of either in personal journal. Communicate ideas on how personal hygiene practices are linked to good health and explain why it is important to keep our surroundings clean in a teacher led class discussion.	• Collaborate • Communicate • Think Critically – research, create, reflect	• Checklist/plan contains accurate information about personal hygiene and, satisfies given criteria
Sit quietly for 3 minutes. In groups of threes, take turns to count the number of breaths taken by each member in a minute by observing the movement of the chest. Repeat two more times and find the average number of breaths per minute. Answer the following questions: • Do you think jogging on the spot will affect your heart rate? • How do you think different exercises will affect your heart rate? Take turns to jog vigorously on the spot for 5 minutes then immediately count the number of breaths taken in a minute. Repeat with a different exercise. Record observations and results before and after exercise in a simple table. Answer the following questions: • Which exercise increased your heart rate the fastest? • What can you conclude about the effect of exercise on the body and in maintaining good health? Share information and personal experiences with class and suggest how the lack of sufficient rest could impact behaviour and health.	• Collaborate • Observe • Record • Tabulate • Measure time • Think Critically – analyse, draw conclusions	• Accurate record of observations and findings • Satisfactory answers to questions provided • Logical conclusions

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Watch the video: **https://www.youtube.com/watch?v=Q413VcqOlyU** about food nutrients. Make a list of the nutrients, examples of the foods in which they are found in large amounts and the purpose each serve inside the body. In groups, research the six Caribbean food groups. Collect pictures of a variety of foods and arrange to show the different food groups. Label each food group with its name and the nutrient(s) that are abundant in each group. Present information to class. Brainstorm ideas about a balanced diet. Demonstrate on Styrofoam plates, the concept of a 'balanced meal'. Share plates with class and explain why the meal is balanced. Write a simple definition for 'balanced diet'.	• Observe • Label • Communicate • Collaborate • Think Critically -research, classify, demonstrate, reflect	• Correct listing of nutrients, their simple function and food sources • Accurate identification and representation of the six Caribbean food groups • Accurate demonstration of understanding of a balanced diet and balanced meal
Level 2: In small groups, explore the school environment to identify instances of good and poor hygienic practices *(e.g. garbage pile-up, clearly marked disposal bins, disposal bins in classrooms etc.).* Use role-play to depict an interview between a health maintenance manager and a reporter about poor hygienic practices noticed around his/her school compound and proposed suggestions for solving these problems.	• Observe • Record • Communicate • Collaborate • Think Critically – investigate, analyse, problem solve	• Role-play depicts accurate information about poor hygiene practices, cites practical suggestions for their solution and satisfies other given criteria (e.g. well organised, creative)
Watch the video: **https://www.youtube.com/watch?v=jQ2e0KH5WrI** about personal hygiene. In groups, create a poster/chart on one aspect of personal hygiene *(e.g. How to wash the hands)* or picture story about, 'My Beauty [*or Handsome]* Routine' or poster/chart about, 'Hygiene Fun Facts' *(e.g. Using and caring for soap)*. Share and display work in class. Communicate ideas on how personal hygiene practices are linked to good health and explain why it is important to keep our surroundings clean.	• Collaborate • Communicate • Think Critically – research, create, reflect	• Poster/chart contains accurate information about selected aspect of personal hygiene and, satisfies other given criteria
Sit quietly for 3 minutes. In groups of threes, take turns to count the number of breaths taken by each member in a minute by observing the movement of the chest. Repeat two more times and find the average number of breaths per minute. Answer the following questions. • Do you think jogging on the spot will affect your heart rate? • How do you think different exercises will affect your heart rate? Take turns to jog vigorously on the spot for 5 minutes then immediately	• Collaborate • Observe • Record • Tabulate • Measure time • Think Critically – analyse, draw conclusions, reflect	• Accurate record of observations and findings • Satisfactory answers to questions provided • Logical conclusions

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
count the number of breaths taken in a minute. Repeat with a different exercise. Record observations and results before and after exercise in a simple table. Answer the following questions. • Which exercise increased your heart rate the fastest? • What can you conclude about the effect of exercise on the body and maintaining good health? Share information and personal experiences with class and suggest how lack of sufficient rest could impact behaviour and health.		
Watch the video: **https://www.youtube.com/watch?v=Q413VcqOlyU** about food nutrients. Make a list of the nutrients, examples of the foods in which they are found in large amounts and the purpose each serve inside the body. In groups, research the six Caribbean food groups, tabulate findings and create a class display. Invite other members of the school community to view display. In groups, place a drop of iodine solution on a white tile and record its colour. Put a drop of iodine solution on a piece of white bread and record observations *(test for starch)*. Repeat using starch or white flour. Record observations. Place a drop of oil on a piece of grease or brown paper and record observations *(grease spot test for fats)*. Repeat the test using butter or margarine. Record observations. Draw conclusions about the iodine solution tests and the grease spot tests and, the food groups to which these foods belong. Share findings with class. Brainstorm ideas about a balanced diet. Demonstrate on Styrofoam plates, the concept of a 'balanced meal'. Share plates with class and explain why the meal is balanced. Write a short paragraph in their journals about the importance of a balanced diet.	• Observe • Record • Communicate • Collaborate • Tabulate • Think Critically - research, classify, create, investigate, draw conclusions, demonstrate, reflect	• Correct listing of nutrients, their simple function and food sources • Accurate identification and representation of the six Caribbean food groups and interesting display • Observations accurately recorded and communicated • Accurate conclusions drawn about the tests for starch and fats and their food sources • Accurate demonstration of understanding of a balanced diet and balanced meal • Information communicated clearly both orally and in written format in journals
Level 3: In small groups, explore the school environment to identify instances of good and poor hygienic practices *(e.g. garbage pile-up, clearly marked disposal bins, disposal bins in classrooms etc.).* Select a poor hygienic	• Observe • Record • Communicate	• Plan accurately identifies a poor hygienic practice and offers a logical solution to the

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
practice noticed and design a plan for solving this problem. Present the plan to the class using a variety of ways (PowerPoint presentation, posters etc.)	• Collaborate • Think Critically – investigate, analyse, problem solve	problem
Watch the video: **https://www.youtube.com/watch?v=jQ2e0KH5WrI** about personal hygiene. In groups, create a poster, chart or digital presentation that exposes and dispels myths about personal hygiene. Share and display work in class. Communicate ideas on how personal hygiene practices are linked to good health and explain why it is important to keep our surroundings clean.	• Collaborate • Communicate • Think Critically – research, create, analyse, reflect	• Poster/chart/digital presentation contains accurate information about personal hygiene, myths about personal hygiene and, satisfies other given criteria (e.g. neat, clean, creative)
Find pulse in wrist by using two fingers of one hand to feel for the pulse on the opposite wrist. *(Tip: the pulse is located at the base of the thumb)*  Sit quietly for 3 minutes. In groups of threes, measure their heart rate while at rest by taking turns to count the number of pulse beats for each member in one minute. Answer the following questions. • Do you think jogging on the spot will affect your heart rate? • How do you think different exercises will affect your heart rate? Take turns to jog vigorously on the spot for 5 minutes *(use a stop watch or timer)* then immediately count the number of pulse beats in a minute. Repeat with a different exercise. Record observations and results before and after exercise in a simple table. Answer the following questions. • Which exercise increased your heart rate the fastest? • What can you conclude about the effect of exercise on the body and maintaining good health? Share information and personal experiences with class and suggest how	• Collaborate • Observe • Record • Tabulate • Measure time • Think critically – analyse, draw conclusions, reflect	• Accurate record of observations and findings • Satisfactory answers to questions provided • Logical conclusions

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
the lack of sufficient rest could impact behaviour and health.		
Watch the video: **https://www.youtube.com/watch?v=Q413VcqOlyU** about food nutrients. Make a list of the nutrients, examples of the foods in which they are found in large amounts and the purpose each serve inside the body. Research the six Caribbean food groups, tabulate findings and share with class. In groups, place a drop of iodine solution on a white tile and record its colour. Put a drop of iodine solution on a piece of white bread and record observations *(test for starch)*. Place a drop of oil on a piece of grease or brown paper and record observations *(grease spot test for fats)*. Draw conclusions about the iodine solution test and the grease spot test and, the food groups to which these foods belong. Share findings with class. In groups, predict whether starch or fat is present in samples of foods from at least two different food groups *(e.g. cheese and Irish potato*). Use the scientific method to test the foods for starch and fats. State whether their prediction was correct and write a brief conclusion supported by evidence. Brainstorm ideas about a balanced diet. Demonstrate on Styrofoam plates, the concept of a 'balanced diet'. Share plates with class and explain why the meal is balanced. View a selection of pictures/slides of meals or snacks and determine whether they are balanced or not.	• Observe • Record • Communicate • Collaborate • Tabulate • Think Critically - research, classify, create, investigate, predict, draw conclusions, demonstrate, reflect	• Correct listing of nutrients, their simple function and food sources • Accurate identification and tabulation of the six Caribbean food groups • Observations accurately recorded and communicated • Accurate conclusions drawn about the tests for starch and fats and their food sources • Logical predictions • Adherence to the scientific method during investigations • Accurate conclusions supported by evidence • Accurate demonstration of understanding of a balanced diet and balanced meal • Information communicated clearly

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Explain the importance of keeping self and surroundings clean
- ✓ Make the connection that rest and exercise are important imperatives for maintaining good health
- ✓ Name the nutrients and state their function in the body in simple terms
- ✓ Identify the six Caribbean food groups
- ✓ Explain what is a balanced diet and choose or identify meals that are balanced
- ✓ Collect, edit and organize images to represent information
- ✓ Organize data in tables and charts for presentation to class
- ✓ Create multimedia presentation to communicate information
- ✓ Spell and use new scientific words related to the topic in simple sentences

Points to Note	**Extended Learning**
• Allocate time in each lesson for students to share and discuss their observations, findings, creations and presentations. • Ensure safety as students carry out food tests. • Do simple sugar test as a teacher- demonstration for identification of foods containing glucose. • Ensure that students use the scientific method and write a laboratory report when they conduct investigations *(prepared templates may be used with students where needed).* • Ensure that students learn the main science vocabulary in each unit.	• Research deficiency diseases and treatment in Jamaica. • Create posters to educate the community on the importance of proper disposal of garbage and the need for collaborative community efforts to keep drains in the community free of blockage and other ways to ensure the maintenance of a clean and healthy community/environment.
Resources	**Key vocabulary**
• Various food samples • Iodine solution • Benedict's solution • Copper-sulphate • Sodium hydroxide • Heat source • Computer, multi-media projector • Scientific method templates	• Health • Internet • Videos • Nutrient • Balanced diet • Exercise • Rest • Personal hygiene
Links to other subjects Mathematics, language Arts, Food and Nutrition	

TERM 3

UNITS OF WORK GRADE 7 TERM 3 UNIT 1: ENERGY FORMS AND INTERCONVERSIONS

About the Unit

In this unit, students will learn about the various forms of energy and their sources. They will learn that the Sun is the main source of energy for the earth and its life forms. Through investigation they will explore energy conversions through a variety of hands-on activities.

Range of Content

- Energy is the ability to do work.
- Energy exists in different forms and can be obtained from different sources. The Sun is the main source of energy for the Earth.
- Kinetic energy represents moving energy (in action) while potential energy refers to stored energy.
- Energy cannot be created or destroyed but can be changed from one form to another. This is called energy transformation.

GUIDANCE FOR THE TEACHER

Allow students to explore the effects of energy on objects and materials. Opportunities need to be provided for students to investigate these forms of energy and demonstrate their inter-conversions, using devices that allow for these inter-conversions.

Prior Learning

Check that students can:

- Recall that energy is stored from both plant and animal sources.

UNITS OF WORK GRADE 7 TERM 3 UNIT 3.1

UNIT 3.1: Forms of Energy	
Theme: **Energy and Matter**	
Attainment Target: • Understand the importance of energy and the inter-conversions of energy and the states of matter in our everyday life. **Topic : Forms of energy and its inter-conversion** **Time:** 12 Hours/ 5 weeks **ICT Attainment Targets:** 💻 **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. 💻 **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. 💻 **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. 💻 **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	**Objectives** **Students will:** • Define energy as the ability to do work; • State an example of each form of energy; • Perform practical activities using various devices to investigate the forms of energy and their inter-conversions; • Classify energy into two types – kinetic and potential; • Identify and discuss how energy is used in the home, school, office and factory.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Define energy; identify six forms of energy and collect pictures which illustrate each form of energy; use the picture to explain what each form of energy is about; For each form of energy, identify sources from everyday situations; classify identified sources of energy as Kinetic and Potential and justify your classification; Identify and illustrate using pictures and /or drawings how energy is used in your home, community and/or school for mechanical work(moving things); heating and cooling.. Collect pictures of electrical gadgets and explain how in using energy they change it from one form to another. Use common household appliances/gadgets to illustrate the transformation of energy from one form to another (e.g. flashlight, hotplate electric iron etc.). Communicate ideas through small group and whole class discussions.	• Communicate • Collaborate • Define operationally • Create • Observe • Think Critically – plan and design, analyse, classify, justify	• Accurately define energy as the ability to do work; • Accurate explanation and illustration of the forms and types of energy • Accurately demonstrate how selected gadgets convert energy from one form to another; • Logical conclusions drawn about the importance of energy
Level 2: Define 'energy.' Identify events, situations and objects, from everyday experiences, which use energy. Illustrate in any one of various ways – models, diagrams, pictures, collage – how energy is used in these various contexts. Summarize the importance of energy; communicate your ideas in small groups and to the class; Explain how energy can be grouped into two general forms - potential and kinetic; using an elastic band, demonstrate the difference between these two forms of energy; explain why energy is classified as potential and kinetic; identify types of potential energy as: Chemical, mechanical, nuclear, gravitational, and electrical; identify types of kinetic energy as light, heat, motion, and sound. Investigate the sources of these types of energy and demonstrate the inter-conversion of these forms of energy. Share findings in small groups and communicate with the whole class.	• Communicate • Collaborate • Define operationally • Create • Observe • Think Critically – Plan and Design, Analyse, Classify	• Acceptable definition of energy as the ability to do work; • Models/diagrams/pictures/collage • correctly depict variety of ways energy is used in different contexts; • Accurate demonstrations of inter-conversions of energy forms; • Correct identification of sources of energy.

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Level 3: Define energy as the ability to do work; illustrate definition using gadgets such as spring toys, and simple household electrical appliances; Observe and identify a variety of forms of energy- light, heat, sound, mechanical, chemical and electrical and magnetic; use drawings or pictures to describe/depict these forms of energy; Explain each form of energy and its use in everyday situations; Devise and carry out tests to demonstrate the inter-conversions between kinetic and potential energy; construct/collect gadgets and use to explain how energy conversions occur in everyday life situations; Share findings in small groups and communicate with the whole class	• Communicate • Collaborate • Define operationally • Create • Observe • Think Critically – Plan and Design, Analyse, Classify	• Acceptable definition of energy as the ability to do work; • Correct identification of the sources, forms and types of energy; • Accurate explanation of each form of energy; • Correct demonstration and explanation of the inter-conversion of the forms of energy and the uses of energy in a variety of everyday situations.
Learning Outcomes **Students who demonstrate understanding can**: ✓ Recognize that energy is the ability to do work ✓ Identify different forms of energy, using examples of objects and events from everyday situations ✓ Relate different sources of energy to their respective energy forms ✓ Classify energy as potential and kinetic. ✓ Research and explain how energy is used in a variety of authentic situations. ✓ Plan and conduct research, using a wide variety of electronic sources e.g. online media		

Points to Note	Extended Learning
• Simple devices such as flashlight, radio, light bulb, iron and electric kettle can be investigated to identify one step energy conversions. • Encourage use of ICT tools for creating and making presentations where possible. • Provide guidelines for safe and healthy use of ICT tools	• Explain renewable and non-renewable sources of energy and discuss ways by which energy can be conserved in the home, school, office and factory; • Research the use of solar energy e.g. solar panels in homes and factories; solar calculators which make electricity from solar energy; • Discuss widespread harvesting of wind energy; • Find out where petroleum is found in the Caribbean and how it is extracted and refined.
Resources	**Key Vocabulary**
• Flashlights • Radios • Iron electric kettle and other energy conversion devices • Computer • Internet • Multimedia projector	• Energy • Potential energy • Kinetic energy • Various forms of energy – light, heat, mechanical, electrical, chemical, solar and nuclear.
Links to other subjects Technical Vocational Education, Physics, Chemistry	

UNITS OF WORK GRADE 7 TERM 3 UNIT 2: STATES OF MATTER

About the Unit

In this Unit, students will explore the concepts of solids, liquids and gases. Students will also investigate the various ways by which particles in solids, liquids and gases are arranged, which help to distinguish these states of matter, one from the other. Investigations will also include inter-conversions of the states of matter and explanation and labelling of the processes involved.

Range of Content

- Matter is made up of tiny particles, has mass and occupies space.
- The three states of matter (solid, liquid and gas) differ in terms of arrangement and movement of particles.
- Matter can change state from one to another depending on the absorption or release of heat energy.
- Processes involved in changing the state of matter include melting, freezing, evaporation and condensation.

GUIDANCE FOR THE TEACHER

Science is a body of knowledge, as well as skills and attitudes that help humans to understand and appreciate the environment.
Allow students to collaborate, working in groups to investigate important concepts, garner evidence for themselves, analyse and interpret evidence and share ideas in open dialogue to arrive at shared, meaningful, accurate, scientific understandings of the relevant key concepts addressed in this unit of work. This is in keeping with the methods and nature of science as a process of inquiry.

Prior Learning

Check that students:

- Know that matter is all around them
- Can recognize the different forms of water

UNITS OF WORK GRADE 7 TERM 3 UNIT 3.2

UNIT 3.2: States of Matter	
Theme: Energy and Matter	
Attainment Target: • Understand the importance of energy and the inter-conversions of energy and the states of matter in everyday life **Topic: States of matter - Solids, Liquids and Gases** **Duration:** 10 hours/ 4 weeks **ICT Attainment Targets:** 💻 **COMMUNICATION AND COLLABORATION –** Use technology to communicate ideas, information and understandings for a variety of purposes. 💻 **RESEARCH, CRITICAL THINKING AND DECISION MAKING-** Use technology to develop a logical process for decision making and problem solving 💻 **DESIGNING AND PRODUCING –** Use technology to design and produce multimedia products to demonstrate their creative thinking. 💻 **DIGITAL CITIZENSHIP –** Follow guidelines to promote healthy use of ICT tools	**Objectives** **Students will:** • Describe the characteristics of solids, liquids and gases in terms of particle spacing, shape and volume • Give examples of solids, liquids and gases from everyday experiences; • Classify non-living things (at room temperature) as solids, liquids and gases; • Investigate the processes by which matter is converted from one state into another. • Show respect for another person's idea • Work cooperatively in groups

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Identify examples of matter from the surroundings. In groups, examine the shape and size of a tennis ball (or other solid object). Place ball in containers of different shapes and sizes. Answer the following questions; 'What is the shape of the object?', 'Did the shape and size change when placed in different containers?' Note observations and draw conclusions about the shape and volume of a solid. Repeat the activity for a fixed quantity of liquid water. Note the volume and shape of the water in the container. Place the water in containers of different shapes and sizes. Note any changes in volume or shape. Arrive at a conclusion about the shape and volume of liquid water. Test your findings using other liquids. Observe and record the shape of a crystal of iodine in a test tube; heat the crystal and observe and record your observation. Place the iodine vapour into a large gas jar. Record observations and make inference about the shape and volume of gases. Use findings to classify matter as solids, liquids and gases in a table. Research the arrangement of particles in solids, liquids and gases and present findings in creative ways (e.g. models, power point) in small groups and to the class. Investigate, discuss and provide examples from everyday experiences of the inter-conversion of the states of matter; name the processes by which matter changes from one state to another.	• Collaborate • Communicate • Manipulate • Measure • Record • Observe • Predict • Tabulate • Think Critically – analyse, infer, draw conclusions	• Correct observations made about the shape and volume of solids, liquids and gases • Logical conclusions made about the differences between the states • Table correctly constructed with correct information • Correct representation of the way particles are arranged in solids, liquids and gases • Creative presentation with accurate information • Correct examples used for changes in state of matter

Review the terms 'solid', 'liquid' and 'gas'. Be presented with a range of materials to classify as solid, liquid and gas. (*Teacher should include some materials that students will find difficult to classify, e.g. paper, sand, petroleum jelly, jam, toothpaste.*)	• Think critically – analyse, classify, justify	• Materials correctly classified. • Plausible reasons given for classification
In groups, grind a stick of chalk into dust and use a hand lens to view the powder and record observations. Observe dust particles in a beam of light. Discuss and make inferences from their observations. Write simple explanations. Share their observations and explanations with the class in a variety of ways.	• Manipulate • Communicate • Collaborate • Observe • Record • Think Critically – analyse, infer, draw conclusions	• Explanations infer that solids and liquids are made up of tiny particles
Organize/ position objects or class mates to represent the arrangement and movement of particles in solids, liquids and gases. Create a game where pupils move into positions when each state of matter is mentioned.	• Observe • Draw • Create • Communicate • Think Critically – analyse, infer, apply, draw conclusions	• Accurate representations of the states made in diagrams and object arrangements. • Game accurately differentiates the three states. • Logical conclusions drawn about movement and energy of particles in the three states
Observe samples/videos of ice, water and steam. Record observations and share information with the class using the videos to aid the presentation. Participate in teacher led discussion on the visible features/properties of solid, liquids and gas.	• Communicate • Observe • Record • Report	• Correct visible features of solids, liquids and gases identified

Level 2: Identify examples of matter from your surroundings; compare the materials and formulate a working definition for matter. Examine samples of matter then predict and arrive at conclusions, based on evidence, about the shape and volume of solids, liquids and gases; share ideas in small groups and communicate to whole class for further discussions. Investigate, discuss and provide examples from everyday experiences of the inter-conversion of the states of matter; name the processes by which matter changes from one state to another. Research the arrangement of particles in solids, liquids and gases and present findings in creative ways (e.g. models, power point) in small groups and to the class.	• Collaborate • Communicate • Manipulate • Record • Think Critically – predict, compare, classify, define operationally, draw conclusions • Plan and conduct research • **Create multimedia content**	• Acceptable working definition • Accurate everyday examples identified • Logical conclusions about the volume and shape of solid, liquids and gases • Everyday examples are related to the correct change of state • Creative presentation with accurate information
In groups, be given three balloons: one filled with water, one filled with marbles/stones, and one filled with air. Each member of the group will feel the balloons, find the mass and discuss their observations. Describe the materials in each balloon and compare their observations. Record whether the material inside is a solid, liquid or gas. [*Teacher should emphasize that most gases are invisible however they may be felt and their effects seen when trapped.*] Tabulate the properties of solids, liquids and gases.	• Collaborate • Manipulate • Measure • Communicate • Make observations	• Materials correctly identified as solid, liquid and gas • Properties listed for each state are correct • Correct mass of objects found
Use a KWL chart to arrive at a definition for matter. View a video on matter to complete the L-column of the KWL chart. Share and discuss findings with class to arrive at a common understanding of what is matter. Record what they understand the term matter to mean. (*Teacher should emphasize that matter is made of tiny particles, occupies space, and has mass.*	• Collaborate • Communicate • Think Critically – analyse, define, synthesize	• Acceptable working definition of matter.

Heat a substance such as ice or wax from the solid to the gaseous state and participate in class discussion on the movement and energy of particles. Ask pupils to make annotated diagrams to describe the arrangement and movement of particles in solids, liquids and gases.	• Observe • Draw • Create • Communicate • Think Critically – analyse, infer, apply, draw conclusions	• Accurate representations of the states made in diagrams and object arrangements. • Logical conclusions drawn about movement and energy of particles in the three states
Level 3: Define 'matter' and identify examples of matter from your surroundings; in groups, investigate the volume and shape of the three states of matter; classify matter as solids, liquids and gases and state the criteria used. Predict, investigate, observe and interpret findings related to the volume of liquids and arrive at logical conclusions about the principle of conservation of the volume of liquids. Investigate, discuss and provide examples from everyday experiences of the inter-conversion of the states of matter; name the processes by which matter changes from one state to another; research the arrangement of particles in solids, liquids and gases and demonstrate findings for others to understand.	• Collaborate • Communicate • Manipulate • Observe • Record • Think Critically – analyse, infer, draw conclusions, define operationally, compare	• Acceptable definition of matter and examples from everyday experiences; • Logical, evidence-based conclusions about the differences in volume and shape among solids, liquids and gases • Accurate and clear demonstrations showing the different arrangements of particles in solids, liquids and gases.
Participate in a class discussion to recap the forms in which water exists. Through teacher led class discussion, identify ice, water and steam as solid, liquid and gas respectively. View pictures, videos of different materials and group materials under the following: solid, liquid, gas.	• Communicate • Classify • Observe	• Materials correctly classified as solids, liquids and gases • Toys created satisfy stipulated guidelines
As recap, view videos showing how matter changes from one state to another. List and provide a working definition for the processes involved in the various state changes (freezing, evaporation, melting, and condensation). Represent the processes on a diagram	• Observe • Define operationally • Communicate • Create • Think Critically – design, analyse, synthesize	• Acceptable working definitions. • Diagram correctly represents processes.

Learning Outcomes:

Students who demonstrate understanding can:

- ✓ Group materials as solid, liquid and gas
- ✓ Distinguish between the three states of matter in terms of shape and volume
- ✓ Identify the processes condensation, sublimation, evaporation, melting and freezing occurring in everyday life situations
- ✓ Show curiosity in exploring matter in the surroundings and question what they find
- ✓ Plan and conduct research, using a wide variety of electronic sources e.g. online periodicals, CDs

Points to Note	**Extended Learning**
• Demonstration to investigate sublimation should be carried out in a well-ventilated laboratory. • Caution should be taken when heating substances in the laboratory • Assessment tasks can be demonstrated in students' preferred ways of learning – posters, written and verbal explanations, models, use of computer software. • Recognise some of the dangers associated with internet use and demonstrate safe online behaviours	• Identify and discuss situations from everyday experiences where change of state take place
Resources	**Key vocabulary**
• Tape measure • Tennis ball • Containers of different shapes and sizes • Water • Variety of solids, liquids and gases • Iodine crystals • Test-tube • Heat source • Multi-media projector • Computer with internet access • Word processing and multimedia software	• Solids • Liquids • Gases • Internet • Inter-particulate forces • Sublimation • Evaporation • Condensation • Melting • Dissolving • Freezing • Particle • Gas jars
Links to other subjects Information Technology, English Language, Mathematics	

NATIONAL STANDARDS CURRICULUM GUIDE

INTEGRATED SCIENCE

GRADE 8

APSE III

	GRADE 8 SCOPE AND SEQUENCE		
	TERM 1	**TERM 2**	**TERM 3**
GRADE 8	**Weather and Climate** • Defining weather and climate • Investigating elements of weather and climate • Constructing models of weather instruments • Making simple predictions/ weather forecasts from data • Recognizing features of main climate types • Identifying effects of climate change • Investigating the greenhouse effect • Impact of human activities on global warming and climate change **The Carbon Cycle** • Determining fraction of carbon dioxide in air • Chemical test for carbon dioxide • Relating properties of carbon dioxide to its uses • Illustrating the processes in the carbon cycle • Modelling the carbon cycle • Impact of human activities on the balance of carbon dioxide in the atmosphere	**Human Nutrition** • Functions of main organs in human digestive system • Processes involved in human nutrition • Identifying digestive juices & their functions • Investigating enzymes • End products of protein, fat & carbohydrate digestion • Importance of a healthy digestive system **Energy from food** • Structure & function of the human respiratory system • Investigating the mechanism of breathing Tracing the path oxygen travels from atmosphere to alveoli • Respiration as energy release • Requirements for aerobic respiration • Word equation for aerobic respiration • Distinguishing between respiration and breathing • Importance of energy to organisms	**Energy Transfer in the ecosystem** • Exploring inter-relationships among organisms in an ecosystem • Sun as the ultimate energy source • Defining consumer, herbivore, carnivore, producer • Investigating food chains and webs • Creating food webs from food chains • Energy flow in food chains **Physical and Chemical Changes** • Comparing physical and chemical changes • Investigating physical and chemical changes • Everyday examples of physical and chemical changes • Separating mixtures as examples of physical changes

TERM 1

UNITS OF WORK GRADE 8 TERM 1 UNIT 1: WEATHER AND CLIMATE

About the Unit

In this unit students will, through hands-on activities and other forms of scientific investigations, learn how to use scientific methods to acquire knowledge of the natural environment. They will learn how to analyse and interpret data in order how to arrive at meaningful conclusions and apply these conclusions to explain environmental issues such as greenhouse effect and global warming. They will also learn how to use annotations to communicate information through a combination of pictures and simple notes.

Range of Content

- Weather is the conditions of the atmosphere for a few hours of a day or few days but climate is the average weather conditions over many years e.g. thirty years.
- Elements of weather include temperature, rainfall, sunshine, air pressure, humidity, wind speed and direction and these are measured by weather instruments such as the thermometer, rain gauge, wind gauge (anemometer), wind vane and barometer.
- Climate change refers to significant changes in climate (which is affected by temperature, precipitation, wind patterns etc.) over a long period. Human activities such as burning of fossil fuels, deforestation, gaseous emissions from industries and agricultural practices have contributed to climate change.
- Global warming refers to the steady increase in average surface temperatures of the Earth due to higher concentrations of greenhouse gases such as carbon dioxide, methane and water vapour that trap heat in the atmosphere like a greenhouse.
- Greenhouse effect is the trapping of heat in the atmosphere by greenhouse gases. Reducing greenhouse gas emissions, using clean energy and promoting lifestyle changes are some initiatives that can lessen the impact of climate change.

GUIDANCE FOR THE TEACHER

Efforts should be made to increase individual and collective ownership of the issue of climate change, so that each student will take personal responsibility for the introduction of initiatives that can reduce its effect.
Increased awareness of this issue should be promoted throughout the school with the help of environmental and science clubs.

Prior Learning
Check that students can:
- Recognize some elements of weather.

UNITS OF WORK GRADE 8: UNIT 1. 1

UNIT 1.1: Weather and Climate

Theme: Exploring science and the environment

Attainment Target:
- Understand the scientific process, and the impact of air and water on the environment, and on our everyday life.

Topic: Weather and Climate
Duration: 12 hours

ICT Attainment Targets:
- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

Objectives
Students will:
- Define weather and climate;
- Explain weather and climate in terms of their elements;
- Investigate elements of weather and climate;
- Construct models of selected weather instruments
- Use weather data to make simple predictions
- Recognize features of tropical, temperate and polar climates
- Explain what is meant by climate change
- Identify some effects of climate change in the Caribbean
- Investigate 'greenhouse effect' and deduce the relationship between greenhouse effect and global warming;
- Suggest how human activities contribute to 'global warming' and climate change
- Describe at least three ways in which people can reduce the impact of climate change on their lives
- Work cooperatively in groups

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Level 1: Watch a You Tube video on weather and climate. Use video to record the differences between weather and climate. Create drawings to show the different types of weather and climate. In groups, make a model of a weather instrument and use it to explain how it functions. Analyse a series of pictures depicting the different types of climate in the world; use evidence from the pictures to describe the type of climate depicted. Examine a video on greenhouse effect. Reflect on the video and deduce why this is a problem – focus on the impact on the environment and organisms. Investigate to gather and record data about the greenhouse effect; interpret data and arrive at valid conclusion; Share and discuss in small groups and with the whole class how this problem exists in Jamaica and what are possible solutions.	• Collaborate • Communicate findings • Observe • Manipulate • Record • Create • Think Critically – analyse, infer, predict, plan and design, Interpret data, draw conclusions	• Model should accurately portray the instrument; • Correct description of how the instrument functions • Pictures correctly depict different climate types • Accurate observation and recoding of data • Valid conclusion drawn about the impact of greenhouse effect.
Observe teacher's demonstration of how to use the a) thermometer, (b) rain gauge, (c) wind vane, (d) barometer, (e) anemometer, then discuss the use of each piece of equipment. In groups, plan, design and construct a functional model of a weather instrument, assigned by the teacher. Demonstrate the use of the instrument to the class. Based on feedback from the class, implement at least one modification to the instrument prototype.	• Plan and Design • Create • Draw conclusions • Evaluate • Manipulate • Communicate • Think Critically • Collaborate • Observe	• Weather instruments functional
In groups, use research and investigative skills to design and build a model, drawing or simulation of the natural greenhouse effect. Share designs with the class to determine if any modifications are to be made. Test the model and redesign if necessary. Use the model to explain the principles governing the greenhouse effect.	• Communicate • Create • Plan and Design • Collaborate • Think Critically – Analyse, Evaluate, Apply	• Simulation/ Model works as intended • Drawing represents the greenhouse principle • Use and transfer of knowledge evident

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 2 : In groups, research weather and climate and differentiate between them through a Y-Tube video; Design posters or organ chart, with annotations to depict earth's atmosphere, weather and climate. Use posters to explain the concepts which they depict. Explain using observations, the elements of weather and types of climate. Find out what are greenhouse gases and list them; use practical activity to explain the greenhouse effect; illustrate how the earth act as a greenhouse; use evidence from a video to explain the link between greenhouse effect and global warming; discuss and find ways to communicate to others the impact of this problem on the environment; identify ways by which humans contribute to the greenhouse effect.	• Collaborate • Communicate • Create • Record • Think Critically – Analyse, Infer, Plan and Design, Interpret, Draw conclusions,	• Differences between weather and climate identified from research • Creative poster or organ chart correctly depicts concepts • Main greenhouse gases identified • Practical activity accurately depicts greenhouse effect • Relationship between greenhouse effect and global warming correctly deduced • Creative and effective ways to communicate impact of greenhouse effect presented
In groups, use the weather instruments created to collect and record data on weather elements – wind speed/rainfall/temperature/wind direction/air pressure – at the same time each day for one week period (N.B. the rain gauge should be read immediately after it rains). Analyse the week's data. Make a report on the investigation, and include the photos/videos taken, charts generated from the data, average readings and any other relevant information. Present findings to the class. Make a display of the data, pictures and findings. Discuss their findings and predict the weather conditions for the following day/week. Compare their predictions with the weather forecast.	• Manipulate • Record • Measure • Collaborate • Observe • Predict • Construct • Communicate • Compare • Think Critically	• Observations correctly recorded • Logical predictions of weather conditions based on data collected • Instruments correctly used
Visit an actual greenhouse or research offline/ online how a greenhouse operates. Make drawing of the greenhouse and identify the functions of each component. Make comparisons between the natural and manmade greenhouse effect. Present findings to the class in a variety of ways.	• Observe • Draw • Gather Evidence • Communicate • Think Critically – analyse, draw conclusions	• Accurate information presented • Logical explanations and plausible comparisons made

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Level 3: Explore the concepts of weather and climate and differentiate between weather and climate through a Y-Tube video. Create an organ folder with annotations to explain the concept of greenhouse. In groups, research and illustrate the meanings of the following: greenhouse; greenhouse gases and greenhouse effect; differentiate among these. Read and explain to others how activities in the home produce greenhouse gases; watch a video on climate change and use it to explain how a greenhouse works; use practical activity to explain how the earth acts as a greenhouse; use practical activity to explain the greenhouse effect; arrive at logical conclusion; Record, analyse and interpret findings to show how greenhouse effect leads to global warming; explain how humans contribute to greenhouse effect	• Collaborate • Communicate • Create • Manipulate • Record • Think Critically – analyse, infer, plan and design, interpret, draw conclusions	• Differences between weather and climate correctly noted • Creative poster or organ chart correctly depicts concepts • Practical activity accurately depicts greenhouse effect • Relationship between greenhouse effect and global warming deduced.
In groups, brainstorm the term 'climate change'. Write a simple working definition of climate change and report to the class. (*Teacher will guide students in formulating definition for climate change*)	• Think Critically - define operationally, Collaborate	• Acceptable simple working definition of climate change
View a video on the effects of climate change or visit **https://www.youtube.com/watch?v=08z-Hw7s54E)**. From video, observe and record information that will be used to answer the following questions: What causes climate change; how does climate change affect man, animals, plants and the environment; what can we do to prevent/reduce/eliminate climate change. Summarise findings and present to the class in a variety of ways.	• Think Critically - Analyse, Evaluate, Communicate	• Relevant information on effects of climate change recorded and presented.
In groups, formulate plans that can be implemented by School/ Environmental or Science clubs to reduce contributions to climate change (eg. Composting, recycling of plastic). Suggest lifestyle changes that individuals can practice to limit their carbon footprint (eg. Use of environmentally friendly products, less driving, more walking, using bicycles, alternative energy, cleaner forms of energy). Create drawings or cartoons with catchy slogans to encourage more environmentally friendly lifestyles or to show cause and effect relationships between lifestyle practices and climate change.	• Collaborate • Communicate • Plan and Design • Create • Think Critically – Analyse, Apply, Draw conclusions, Justify	• Plans are sound and contain accurate information • Creative drawings/ cartoons with correct information • Logical connections made

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Use examples to differentiate between weather and climate
- ✓ Construct and use various weather instruments to measure appropriate elements of weather
- ✓ Use weather data to make simple weather forecasts
- ✓ Identify some effects of climate change
- ✓ Deduce the relationship between greenhouse effect and global warming;
- ✓ Identify some human activities that contribute to 'global warming' and climate change
- ✓ Suggest ways in which people can reduce the impact of climate change on their lives
- ✓ Conduct electronic search for information

Points to Note	**Extended Learning**
• Additional information on climate change may be obtained online. Some Effects of Climate Change: 1. Rise of sea and atmospheric temperatures 2. Increase in number and intensity of storms 3. Sea level rise 4. Increased drought 5. Risk of significant loss of biodiversity through species extinction in many tropical areas	• Explain the effects of global warming. Suggest what can you do to help to solve this problem in Jamaica? • Investigate the use of environmentally-friendly products by noting labels of products in supermarkets etc. Collect data and make presentations of findings.
Resources	**Key vocabulary**
• **Animation Video on weather and climate:** www.youtube.com/watch?**v**=rGWLT8_89m8 • **Video: What is greenhouse Effect:** www.youtube.com/watch?v=BPJJM_hCFj0 • **Hands-on activity on Greenhouse Effect:** http://www.education.com/activity/article/Observe_Greenhouse_Effect/ • **Ideas on construction of weather instruments:** http://www.sciencekids.co.nz/weather.html • Computer, Materials for weather instruments, Thermometers, Stop watch, Transparent Containers/Glass Jars	• Weather • Climate • Greenhouse Effect • Global Warming • Humidity • Precipitation • Temperature • Pressure • Climate Change
Links to other subjects: Social Studies, English language	

UNITS OF WORK GRADE 8 TERM 1 UNIT 2: CARBON CYCLE

About the Unit

In this Unit, students will carry out investigations on the processes involved in the carbon cycle; photosynthesis, respiration and combustion. Students will explore the composition of air, sources of carbon in the environment and the processes which removes and replenish carbon in the atmosphere. They will model how the carbon cycle works to maintain the percentage composition of carbon dioxide in the earth's atmosphere.

Range of Content

- Air is composed of approximately 78% nitrogen, 21% oxygen with traces of carbon dioxide, water vapour and argon.
- Carbon is an important component of all living organisms and is cycled in nature as carbon dioxide in the carbon cycle. The carbon cycle maintains the amount of carbon dioxide in the air through the processes of photosynthesis, respiration and combustion.
- Carbon dioxide is used in fire extinguishers because it does not support combustion.
- Carbon dioxide is identified as the gas which turns limewater (aqueous calcium hydroxide) cloudy.

Guidance for the Teacher

In implementing this unit allow students to explore the key concepts through hands-on-minds-on activities, observations and inferences and analyses and interpretation of data from various other types of investigations including analysis of ideas presented in Y-tube videos. Opportunities should be provided for students to construct their own understandings and to validate these understanding through applications to real-life contexts as they work in small and large groups as well as individuals. Students should be guided in the techniques for learning; be provided with criteria for assessing their own performance as they learn how to learn and gradually take responsibility for own learning. It is intended for assessment to be integral to the teaching process and should also be summative.

The wise use of Earth's resources is to be reinforced at every opportunity. Have students participate in activities/ projects that require the implementation of conservation ideas.

Prior Learning
Check that students can:
- Recall that air is made up of different types of gases.

UNITS OF WORK GRADE 8: UNIT 1. 2

UNIT 1.2: Carbon Cycle

Theme: Exploring Science and the Environment

Attainment Target:
- Understand the scientific process and the impact of air and water on the environment and our everyday life

Topic: Carbon Cycle
Duration: 10 hours/ 4 weeks

ICT Attainment Targets:

COMMUNICATION AND COLLABORATION - Students use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.

RESEARCH, CRITICAL THINKING AND DECISION MAKING- Students use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.

DESIGNING AND PRODUCING – Students use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.

DIGITAL CITIZENSHIP - Students recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Objectives
Students will:
- Identify the fraction of carbon dioxide in the earth's atmosphere on a pie chart;
- Describe the chemical test for carbon dioxide
- Relate the properties of carbon dioxide to its uses
- Describe the carbon cycle in simple terms to include the processes of combustion, respiration and photosynthesis
- Explain how the percentage of carbon dioxide is kept stable through the carbon cycle;
- Make a model to illustrate the processes involved in the carbon cycle;
- Explain how human activities impact the balance of carbon dioxide in the atmosphere.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
Level 1: View a pie chart showing the percentage composition of gases in the atmosphere and identify the fraction of carbon dioxide in the atmosphere; Watch, interpret and analyse a video on the carbon cycle; working in small groups explain in your own words what the carbon cycle is all about; communicate your ideas with the class; identify the sources of carbon; investigate to provide evidence the presence of carbon in different parts of the body of a plant; explain using food chains and webs how this carbon moves from the bodies of plants to animals; investigate to provide evidence of the presence of carbon in your body; Explain fossil fuels as a source of carbon; identify and list processes which replenish the air with carbon-dioxide and photosynthesis as a process which returns it to the atmosphere; annotate a given diagram of the carbon cycle and use it to explain how the amount of carbon-dioxide in the air can be kept constant and what causes the amount to increase; recall the implications for the earth's environment of such an increase.	• Collaborate • Communicate • Record • Investigate • Manipulate • Create • Think Critically - Infer, Analyse, Interpret, Draw conclusions	• Fraction of carbon dioxide correctly located • Correct information about carbon cycle reported from video • Processes in the carbon cycle correctly identified • Accurately explain the carbon-cycle using an annotated illustration • Factors that can disrupt the carbon-cycle correctly identified • Link between increased carbon dioxide in the atmosphere and global warming correctly deduced.
View online/offline video/chart (or listen to a song/story or podcast) on photosynthesis. In groups, use information from the video/chart and the results of previous investigation to formulate a definition of the term photosynthesis. Identify the raw materials, conditions and products of the process. Present definitions to class and match with teacher prepared notecards. In groups, use the information to construct a word equation for photosynthesis.	• Define operationally • Collaborate • Communicate • Think Critically – formulate • Think Critically - formulate, Collaborate	• Acceptable explanation of photosynthesis. • Raw materials, conditions and products correctly identified. • Accurate word equation for photosynthesis.
Level 2: Interpret a pie chart showing composition of air and identify the percentage contribution of carbon-dioxide in the air; Observe, interpret and analyse a video on the carbon cycle; working in small groups, list and discuss the processes involved in the carbon-cycle; classify the processes as that which removes carbon-dioxide and those which replenish the	• Collaborate • Communicate • Record • Investigate • Manipulate	• Pie chart correctly interpreted • Accurate list of processes involved in the carbon-cycle; • Collage correctly constructed to show the processes in the carbon cycle

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
atmosphere with carbon dioxide; plan simple hands-on activities to investigate two of these processes; explain in small groups and to the class these processes of photosynthesis, animal nutrition, respiration, combustion and decomposition. Construct a collage showing the carbon cycle. Use the collage to explain how the carbon cycle in nature is intended to ensure a balance in carbon-dioxide removed and returned to the atmosphere; suggest human activities which disrupt the balancing effect of the carbon-cycle and identify the implications of this for an increase in the earth's temperature.	• Create • Think Critically - infer, analyse, interpret, draw conclusions	• Logical conclusions drawn about the processes that maintain the balance of carbon dioxide in the air • Correct suggestions made about human activities that can disrupt the cycle
In groups, half fill 3 boiling tubes with hydrogen carbonate (bicarbonate) indicator and record the colour. Immerse a pond snail/guppy (small fish) into one, a piece of *Elodea* or other water plant in the second tube, and leave the third without any organism. Stopper each tube using a rubber bung and leave all three tubes in a dark place (cupboard) for half to one hour. Record and explain any colour changes observed.	• Investigate • Observe • Manipulate • Communicate • Collaborate • Think Critically - analyse, infer, draw conclusions,	• Colour change from orange-red to yellow correctly linked to carbon dioxide produced in respiration • The role of the control correctly identified.
Level 3: Construct a pie chat to show the composition by percentage of carbon-dioxide, oxygen and nitrogen in the earth's atmosphere. Observe, interpret and analyse a video on the carbon cycle; working in small groups explain in your own words what the carbon cycle is all about; share ideas in small groups and with the class; investigate the processes of respiration and photosynthesis which remove and replace carbon-dioxide in the atmosphere, respectively; record, analyse and interpret findings and arrive at logical conclusions on how these processes could work together to keep the amount of carbon-dioxide in the atmosphere in check; identify and explain, using apt illustrations how the carbon-cycle works; investigate and explain how human activities impact the carbon cycle and the implications for global warming.	• Collaborate • Communicate • Record • Investigate • Think Critically – Analyse, Infer, Interpret, Draw conclusions	• Pie chart correctly constructed • Correct identification of the processes in the carbon cycle • Accurate illustration and explanation of how the carbon-cycle works • Logical conclusions drawn about the impact of human activities on the cycle

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment**
Watch video (or demonstrate) the production of carbon dioxide from burning fuels, factories and motor vehicles. In groups, discuss the harmful effects of releasing this gas and plan ways of reducing emissions. Peer-assess the plans to arrive at a class consensus on the best emission reduction methods. Present to class in a variety of ways.	• Collaborate • Communicate • Create • Think Critically – formulate, evaluate, • Communicate	• Carbon dioxide emission reduction plan is applicable. • Group collaboration evident
In groups, investigate the chemical test for carbon dioxide. - Carbon dioxide turns calcium hydroxide (lime water) milky or cloudy. Test for the presence of carbon dioxide in exhaled air, by blowing through a straw that is placed in lime water. Note observations and provide explanations. In groups, view a computer simulation on the carbon cycle. Use information from discussion/internet/textbooks/multimedia and/or graphic software to create a model of the carbon cycle, and present work to class. Display cycles in the science corner.	• Observe • Collaborate • Communicate • Think Critically – infer, draw conclusions • Research, collaborate, create, communicate, manipulate, think critically	• Accurate observations recorded • Model contains accurate information • Creative model displays
Learning Outcomes **Students who demonstrate understanding can:** ✓ Locate the fraction of carbon dioxide in air on a pie chart ✓ Show how the properties of carbon dioxide relate to its uses ✓ Explain the importance of the carbon cycle ✓ Use context cues to construct the carbon cycle ✓ Work cooperatively in groups ✓ Conduct electronic search to access navigate and manipulate digital content		

<table>
<tr><td colspan="2">Points to Note</td><td>Extended Learning</td></tr>
<tr><td colspan="2">• Teacher must make connections with human activities and the impact these activities have on the carbon cycle in order to sensitize on environmental concerns.

• Establish that the hydrogen carbonate indicator changes colour from orange-red to yellow, and that lime water (Calcium Hydroxide solution) changes from colourless to milky in the presence of carbon dioxide.

• Use word processing software and other technology tools to access and communicate appropriate information.
• Follow guidelines to promote healthy use of ICT tools</td><td>• Research to find out what are fossils and fossil fuels and how they are formed. Explain how use of fossil fuels contributes to the carbon-cycle.

• Research two human activities that contributes to an increase in carbon dioxide level and air pollution.</td></tr>
<tr><td colspan="2">Resources</td><td>Key vocabulary</td></tr>
<tr><td>• Videos
• Charts
• Hydrogen carbonate indicator
• Variety of invertebrates
• Elodea
• Boiling tubes
• Drinking straws
• Disinfectant
• Rubber bungs
• Jars for collected specimens</td><td>• Lime water (Calcium hydroxide)
• Computer
• Speakers
• Internet
• Multimedia projector
• Video CDs/DVDs
• Multimedia
• Word processing and graphic software tools
• Video on the Carbon cycle: https://www.youtube.com/watch?v=xFE9o-c_pKg</td><td>• Carbon cycle
• Photosynthesis
• Respiration
• Decomposition
• Combustion
• Global Warming
• Lime water</td></tr>
<tr><td colspan="3">Links to other subjects: Mathematics; Social Studies, Agriculture</td></tr>
</table>

TERM 2

UNITS OF WORK GRADE 8 TERM 2 UNIT 2.1: HUMAN NUTRITION

About the Unit

In this unit, students will explore the structure of the human alimentary canal and its associated organs and their functions in ingestion, digestion and the absorption of food. They will find out about the production and role of digestive juices in the process of digestion. Students will, through hands-on activities, simulate the process of digestion and make their own play dough for the construction of 3D models of the digestive system to demonstrate their understanding of digestion. They will use science process skills and apply their knowledge of the scientific method to explore the existence of enzymes through the investigation of enzyme activity in fruits. Students will also learn to reflect on their own learning and how what they learn affects their lives by making entries in personal journals.

Range of Content

The key concepts and knowledge students will learn in this unit are:

- Main organs in the human digestive system and their functions in the digestive process
- Path food takes along the digestive tract
- Digestive juices, organs which produce them and the food substances on which they act
- End products of the digestion of proteins, fats and carbohydrates
- Concepts of ingestion, digestion, absorption and elimination

GUIDANCE FOR THE TEACHER

Teacher should remind students that experimentation is not the only method of science. Scientists also arrive at scientific knowledge through analysis, interpretation and synthesis of information from data gained through observation. Provide opportunities for students to work collaboratively and share ideas and arrive at meaningful, shared scientific understandings of key concepts. This involves a combination of the use of small group strategies, whole class discussions and individual work. Encourage responsible use of computers and internet for garnering evidence for application in the construction of explanations.

Prior Learning
Check that students can:
- Recall the food groups and the nutrients in each food group
- Recall cells, tissues and organs

UNIT OF WORK GRADE 8: UNIT 2. 1

UNIT 2.1: Human Nutrition

Theme: Living Things and Life Processes

Attainment Target:
- Demonstrate an understanding of human body systems, their role and importance in life processes, health and well-being.

Topic: Digestion in Humans
Duration: 12.5 hours/5 weeks

ICT Attainment Targets:

COMMUNICATION AND COLLABORATION - Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team.

RESEARCH, CRITICAL THINKING AND DECISION-MAKING - Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.

DESIGNING AND PRODUCING - Use computer technology to design and produce multimedia products to demonstrate creative thinking.

DIGITAL CITIZENSHIP - Follow guidelines to promote the healthy use of information and communication technologies.

Objectives:
Students will:
- List the main organs of the human digestive system and state their role in the digestion of proteins, fats and carbohydrates
- Explain the processes of ingestion, digestion, absorption and elimination
- Identify the digestive juices and their functions in the mouth, stomach and small intestine
- State the end products of the digestion of proteins, fats and carbohydrates
- Investigate the existence of enzymes
- Explain the importance of a healthy digestive system in humans
- Work collaboratively and safely in groups

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Watch the video: **https://www.youtube.com/watch?v=ZBZWgrfZFbU** about the digestive system in humans. Make a list of the main organs in the digestive system and their function (*liver and pancreas are not a part of the digestive system but are supporting organs which contribute to digestion*). Observe a model of the human digestive system and identify each main organ. Collect pictures of each main organ and create a representative model of the digestive system in their personal journal. Create a three-dimensional model of the digestive system with play dough *(students can make no cook play dough in class).* Label on the model, the organs that secrete digestive juices, the name of the juices and the nutrient on which they act *(carbohydrates, fats, protein; the names of the enzymes in the digestive juices are not required)*. Take pictures of models and place in journals. Display models in class or in a display area within the school.	• Observe • List • Think Critically – Analyse, Synthesize, Create, Reflect	• Accurate and complete list of main organs of the human digestive system and their function • Models accurately represent the digestive system and satisfy other given criteria • Digestive juices identified and organs producing them correctly labelled
In groups or pairs, simulate the process of digestion in the human body after viewing the video: **https://www.youtube.com/watch?v=7av19YhNkhE.** Explain, in simple terms, the processes of ingestion, digestion, absorption and elimination. Research the final product/s of digestion of each food used in the simulation. Share information with class. State the end products of the digestion of carbohydrates, fats and proteins. Write simple sentences using the science terms ingestion, digestion, absorption and elimination. Answer the question: • What roles do you think the processes of diffusion and osmosis play in the small and large intestines of the digestive system? Explain the importance of the digestive system in human health and well-being and make entries in personal journal.	• Collaborate • Communicate • Explain • Think Critically – Research, Construct simple sentences, Analyse, Reflect	• Accurate simulation of digestion and explanation of terms • Digestive end products of the nutrients correctly identified • Work effectively in group

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 2: Watch the video: **https://www.youtube.com/watch?v=Og5xAdC8EUI** about the digestive system in humans. Make a list of the main organs in the digestive system and their function (*liver and pancreas are not a part of the digestive system but are supporting organs which contribute to digestion*). Observe a model of the human digestive system and identify each main organ. Collect pictures of each main organ and create a representative model of the digestive system in their personal journal. Create a three-dimensional model of the digestive system with play dough *(students can make no cook play dough in class).* Label on the model, the organs that secrete digestive juices, the name of the juices and the nutrient on which they act *(carbohydrates, fats, protein; the names of the enzymes in these juices are not required)*.	• Observe • List • Label • Think Critically – analyse, synthesize, create	• Accurate and complete list of main organs of the human digestive system and their function • Models accurately represent the digestive system and satisfy other given criteria • Digestive juices identified and organs producing them correctly labelled
In groups or pairs, simulate the process of digestion in the human body after viewing the video: **https://www.youtube.com/watch?v=7av19YhNkhE.** Explain, in simple terms, the processes of ingestion, digestion, absorption and elimination. Research the final product/s of digestion of each food used in the simulation. Share information with class. State the end products of the digestion of carbohydrates, fats and proteins.	• Collaborate • Communicate • Explain • Think Critically – research, analyse	• Accurate simulation of digestion and explanation of terms • Digestive end products of the nutrients correctly identified
In groups, explore the action of an enzyme by adding one pack of pure gelatine or 'Jell-O' each to three separate beakers or jars containing 700 ml of hot water respectively. Stir until the gelatine dissolves completely in all three beakers and allow to cool at room temperature. Cut a piece of fresh pineapple into cubes to make one cup. Add half of the cup of fresh pineapple to a pot of boiling water and boil for about 5 to 10 minutes and allow to cool. Place the cooked pineapple cubes in one beaker of gelatine and label. Place the uncooked pineapple cubes in the second beaker and label. Label the third beaker with only the gelatine as the 'control'. Place all three beakers in the refrigerator for twenty-four hours *(do not freeze)*. Remove the beakers and record observations.	• Collaborate • Communicate • Observe • Record • Explain • Think Critically – investigate, analyse, compare, draw conclusions	• Scientific processes adhered to while conducting investigation • Safety rules observe during investigation • Worked effectively within group

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Answer the questions: • Which enzyme is present in pineapple? • Why was the pineapple boiled? • What are the differences and similarities between the three beakers in the investigation? • Why did the gelatine not set in the beaker containing the cooked pineapple? • Why did the gelatine set in the beaker containing the uncooked pineapple? • Do you think all fruits contain the enzyme present in pineapples? How could you find out? Write a conclusion, based on evidence, about the effect of temperature on enzymes. Share your observations, answers and conclusion with the class. Explain the importance of the digestive system in human health and well-being and make entries in personal journal.		• Correct answers to questions supplied • Evidence-based conclusion drawn
Level 3: Watch the video: **https://www.youtube.com/watch?v=Og5xAdC8EUI** about the digestive system in humans. Make a list of the main organs in the digestive system and their function (*liver and pancreas are not a part of the digestive system but are supporting organs which contribute to digestion*). Observe a model of the human digestive system and identify each main organ. Draw a simple diagram of the digestive system and label. Create a model of the digestive system using a variety of materials. Label on the model, the organs that secrete digestive juices, the name of the juices and the nutrient on which they act *(carbohydrates, fats, protein; the names of the enzymes in the digestive juices are not required)*.	• Observe • List • Draw • Label • Think Critically – analyse, synthesize, create	• Accurate and complete list of main organs of the human digestive system and their function • Models accurately represent the digestive system and satisfy other given criteria • Digestive juices identified and organs producing them correctly labelled
In pairs, simulate the process of digestion in the human body after viewing the video: **https://www.youtube.com/watch?v=7av19YhNkhE.** Explain, in simple terms, the processes of ingestion, digestion, absorption and elimination. Research the final product/s of digestion of each food used in the simulation. Share information with class. State the end products of the digestion of carbohydrates,	• Collaborate • Communicate • Explain • Think Critically – research, analyse, reflect	• Accurate simulation of digestion and explanation of terms • Digestive end products of the nutrients correctly

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
fats and proteins.		identified
In groups, explore the action of an enzyme by adding one pack of pure gelatine or 'Jell-O' each to four separate beakers or jars containing 700 ml of hot water respectively. Stir until the gelatine dissolves completely in all four beakers and allow to cool at room temperature. Cut a piece of fresh pineapple into cubes to make one cup. Add half of the cup of fresh pineapple to a pot of boiling water and boil for about 5 to 10 minutes and allow to cool. Cut a piece of apple into cubes to make half of a cup. Place the cooked pineapple cubes in one beaker of gelatine and label. Place the uncooked pineapple cubes in the second beaker and label. Place the cubes of apple in the third beaker of gelatine and label. Label the fourth beaker with only the gelatine. Place all four beakers in the refrigerator for twenty-four hours *(do not freeze)*. Remove the beakers and record observations. Answer the questions: • Which enzyme is present in pineapple? • Why was the pineapple boiled? • What are the differences and similarities between the four beakers in the investigation? • Why did the gelatine set in the beaker containing the uncooked pineapple? • Why did the gelatine not set in the beakers containing the cooked pineapple and the apple? • Which beaker was set up as the 'control'? • Do you think all fruits contain the enzyme present in pineapples? How did the investigation help you to find this out? Write a conclusion, based on evidence, about the effect of temperature on enzymes and, the presence of enzymes in fruits. Share your observations, answers and conclusion with the class. Explain the importance of the digestive system in human health and well-being and make entries in personal journal.	• Collaborate • Communicate • Observe • Record • Explain • Think Critically – investigate, analyse, identify 'control', compare, draw conclusion, reflect	• Scientific processes adhered to while conducting investigation • Safety rules observe during investigation • Worked effectively within group • Correct answers to questions supplied • Evidence-based conclusions drawn

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Explain the processes of ingestion, digestion, absorption and elimination.
- ✓ Explain the role of the human digestive system and its associated organs in the digestion of food.
- ✓ Identify the digestive juices and their role in the digestion of the various food substances.
- ✓ State the end-products of digestion of carbohydrates, fats and proteins.
- ✓ Explore, construct and communicate ideas and information about key concepts.
- ✓ Work collaboratively within a group.
- ✓ Research and communicate ideas and information using word processing and multimedia software.

Points to Note	**Extended Learning**
• Differentiate between chemical and mechanical digestion. • Explain that mechanical digestion occurs in the mouth and stomach • Help understanding of how the breaking up of food from large pieces to small pieces allow for an exposure of a larger surface area. • Explain that proteins, fats and carbohydrates are complex food substances unlike amino acids, glucose and fatty acids. • As far as possible, create opportunities for students to use computer technology to access information as well as to communicate information (using PowerPoint for example). • Use video **https://www.youtube.com/watch?v=C2ytbSa3mPg** as a guide to making playdough or provide the recipe for making playdough and have students, under the guidance of their parents, make the dough in preparation for class. Alternatively, engage the students in making the play dough in class. • Only plant tissues should be used in the exploration of the existence of enzymes. • Take care to observe all safety measures since students will be required to use hot water.	• Research the differences between the digestive system of humans and an herbivorous animal such as the cow. • Research the characteristics of enzymes.

Resources	Key vocabulary
• Videos • Model on the human digestive system • Computer • Internet • Multimedia projector • CDs • Materials for simulation – orange juice, cream crackers, ripe banana, aluminium foil trays or large bowls, plastic cups, paper cups, plastic bags, nylon stockings • Materials for investigation – pineapple, apple, pure gelatine/Jell-O, knife, electric kettle/hot plate, pot, beakers/glass jars; play dough materials – flour, salt, food colouring, cooking oil **Study Jams:** http://studyjams.scholastic.com/studyjams/ http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/ecosystems.htm	• Digestion • Ingestion • Absorption • Digestive juices • Enzymes • Organ • System
Links to other subjects: Art and Crafts, Information Technology, Language Arts, Home Economics	

UNITS OF WORK GRADE 8 TERM 2 UNIT 2.2: ENERGY FROM FOOD

About the Unit

In this unit, students will develop an understanding of the structure and function of the human respiratory system; the path taken by inspired air from the nostrils into the lungs and the release of energy as a result of the combination of food with oxygen in the cells of the tissues. They will use created models to explore the mechanism of breathing and differentiate between breathing and respiration; carry out a fair test to provide evidence of the release of carbon dioxide from expired air; design a simple investigation to determine if exhaled air contains more carbon dioxide than inspired air and, write a word equation to represent the process of aerobic respiration.

Range of Content

The key concepts and knowledge students will learn in this unit are:

- Structure and function of the respiratory system
- The mechanism of breathing
- Path of inspired air in the lungs
- Definition of respiration as chemical release of energy from food in the cells of the tissues
- Difference between respiration and breathing

GUIDANCE FOR THE TEACHER

Teacher should remind students that air is a mixture of gases (including oxygen and carbon dioxide) and provide opportunities for the use of the scientific methods - including fair testing - to arrive at a logical conclusion, grounded in evidence that the process of aerobic respiration which takes place in the cells of the tissues releases carbon-dioxide as waste and energy as the main product. In implementing the unit, opportunities should be provided for students to work collaboratively, share ideas and arrive at meaningful, shared scientific understandings of key concepts. This involves a combination of the use of small group strategies, whole class discussions and individual work. Encourage the responsible use of computers and internet for gathering evidence for application in the construction of explanations.

Prior Learning:
Check that students can:
- Recall respiration as a process which is essential for life
- Recall that respiration is a chemical process by which energy is released from food

UNITS OF WORK GRADE 8 TERM 2 UNIT 2.2

UNIT 2.2: Energy from Food

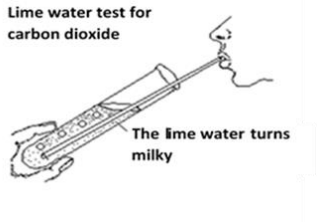
Theme: Living things and life processes

Attainment Target:
- Demonstrate an understanding of human body systems, their role and importance in life processes, health and well-being.

Topic: Aerobic Respiration in Humans
Duration: 10 hours/ 4 weeks

ICT Attainment Targets:
- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

Objectives
Students will:
- Describe the structure and basic function of the human respiratory system
- Investigate the mechanism of breathing
- Trace the pathway of oxygen from the atmosphere to the alveoli
- Describe aerobic respiration as the process in which energy is released from food in the presence of oxygen
- Write a simple word equation to describe the process of aerobic respiration
- Differentiate between respiration and breathing
- Explain the importance of energy to organisms
- Work collaboratively in groups

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Watch the video: **https://www.youtube.com/watch?v=ydX8Lw4q2Mk** on the respiratory system and answer the questions: • Why do organisms need energy? • What organs make up the respiratory system? In groups, research and make a model of the human respiratory system *(each group should create a different model).* Use the model to demonstrate the mechanism of breathing to the class. Display models. Make a list of the organs of the respiratory system and state their function *(an explanation of gaseous exchange is not required).* On a prepared diagram of the respiratory system, label the main organs and use arrows to show the path air takes from the atmosphere to the alveoli. Create a definition for aerobic respiration and write a word equation to represent the process. Tabulate the differences between breathing and respiration. Share information with class.	• Observe • Collaborate • Label • Define • Communicate • Tabulate • Demonstrate • Think Critically - infer, analyse, compare • Create	• Accurate identification of the parts of the respiratory system • Model accurately portrays the lungs, air passages and diaphragm and fit for the purpose of explaining the mechanism of breathing • Accurate demonstration of how the respiratory system works in breathing • Correct word equation to represent aerobic respiration • Accurate, labelled diagram of the human respiratory system and identification of pathway of air • Table correctly lists differences between breathing and respiration
In groups, investigate the presence of carbon dioxide in exhaled air by pouring equal amounts of tap water into one test-tube or jar and lime water (calcium hydroxide solution) into another similar test-tube or jar. Place a straw into each test-tube and exhale air into the straw in the tap water for 3 minutes. Exhale air into the straw in the lime water for 3 minutes. Use prepared worksheet to record observations and conclusion about the presence of carbon dioxide in exhaled air.  	• Observe • Record • Collaborate • Communicate • Think Critically – investigate, infer, draw conclusions	• Investigation carried out effectively • Worksheet completed accurately • Accurate record of observations • Logical conclusion

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 2: Watch the video: **https://www.youtube.com/watch?v=ydX8Lw4q2Mk** on the respiratory system and answer the questions: • Why do organisms need energy? • What organs make up the respiratory system? In groups, research and make a model of the human respiratory system *(each group should create a different model).* Use the model to demonstrate the mechanism of breathing to the class. Display models. Make a list of the organs of the respiratory system and state their function *(an explanation of gaseous exchange is not required).* On a prepared diagram of the respiratory system, label the main organs and use arrows to show the path air takes from the atmosphere to the alveoli. Create a definition for aerobic respiration and write a word equation to represent the process. Tabulate the differences between breathing and respiration. Share information with class.	• Observe • Collaborate • Label • Define • Communicate • Tabulate • Demonstrate • Think Critically - infer, analyse, compare • Create	• Accurate identification of the parts of the respiratory system • Model accurately portrays the lungs, air passages and diaphragm and fit for the purpose of explaining the mechanism of breathing • Accurate demonstration of how the respiratory system works in breathing • Correct word equation to represent aerobic respiration • Accurate, labelled diagram of the human respiratory system and identification of pathway of air • Table correctly lists differences between breathing and respiration
Predict whether exhaled air contains carbon dioxide. In groups, investigate the presence of carbon dioxide in exhaled air by pouring equal amounts of tap water into one test-tube or jar and lime water (calcium hydroxide solution) into another similar test-tube or jar. Place a straw into each test-tube and exhale air into the straw in the tap water for 3 minutes. Exhale air into the straw in the lime water for 3 minutes. Record observations and draw a conclusion about the presence of carbon dioxide in exhaled air. Answer the questions: • Why was water placed in one test-tube? • How could you find out if exhaled air contains more carbon dioxide than air that is inhaled?	• Observe • Record • Collaborate • Communicate • Think Critically – predict, investigate, infer, draw conclusion, analyse, problem solve	• Logical prediction • Investigation carried out effectively • Accurate record of observations • Logical conclusion • Logical and scientifically sound procedure given for finding out if exhaled air contains more carbon dioxide than inspired air
Level 3: Watch the video: **https://www.youtube.com/watch?v=ydX8Lw4q2Mk** on the respiratory system and answer the questions: • Why do organisms need energy? • What organs make up the respiratory system?	• Observe • Collaborate • Label • Define	• Accurate identification of the parts of the respiratory system • Model accurately portrays the lungs, air passages and diaphragm and fit for the

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
In groups, research and make a model of the human respiratory system *(each group should create a different model).* Use the model to demonstrate the mechanism of breathing to the class. Display models. Make a drawing of the respiratory system, label the main organs and annotate the labels *(an explanation of gaseous exchange is not required).* On the diagram use arrows to show the path air takes from the atmosphere to the alveoli. Create a definition for aerobic respiration and write a word equation to represent the process. Tabulate the differences between breathing and respiration. Share information with class.	• Communicate • Tabulate • Demonstrate • Draw • Annotate • Think Critically - infer, analyse, compare, create	purpose of explaining the mechanism of breathing • Accurate demonstration of how the respiratory system works in breathing • Correct word equation to represent aerobic respiration • Accurate drawing of the human respiratory system and identification of pathway of air • Table correctly lists differences between breathing and respiration
Predict whether exhaled air contains carbon dioxide. In groups, investigate the presence of carbon dioxide in exhaled air by pouring equal amounts of tap water into one test-tube or jar and lime water (calcium hydroxide solution) into another similar test-tube or jar. Place a straw into each test-tube and exhale air into the straw in the tap water for 3 minutes. Exhale air into the straw in the lime water for 3 minutes. Use the steps in the scientific method to write a report of the investigation. Draw a conclusion about the presence of carbon dioxide in exhaled air. Answer the question: • Why was water placed in one test-tube? Vary the investigation to find out if exhaled air contains more carbon dioxide than air that is inhaled. Record and report your findings to the class.	• Observe • Record • Collaborate • Communicate • Think Critically – predict, investigate, infer, draw conclusion, analyse, problem solve	• Logical prediction • Investigation carried out effectively • Accurate record of observations • Logical conclusion • Logical and scientifically sound procedure given for investigating whether exhaled air contains more carbon dioxide than inspired air • Investigation successfully carried out

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Describe the structure and function of the human respiratory system and trace the path taken by inspired air from the nostrils into the alveoli
- ✓ Describe the process of aerobic respiration as the chemical release of energy from food as a result of its combination with oxygen
- ✓ Summarise the process of respiration with a word equation
- ✓ Distinguish between respiration and breathing
- ✓ Identify and describe the fair test in the investigation to test exhaled air for carbon dioxide
- ✓ Explain why organisms need energy
- ✓ Work collaboratively in groups and follow scientific procedures

<table>
<tr><th colspan="2">Points to Note</th><th>Extended Learning</th></tr>
<tr><td colspan="2">• Encourage students to work in groups to create a model of the lungs inside the thoracic cavity.
• Allow students to use computers, tablets and SMART phones to do research.
• Guide students in discovering answers for themselves.
• Ensure that students learn to spell and use all new science words.</td><td>• Research the effects of smoking on the respiratory system.</td></tr>
<tr><th colspan="2">Resources</th><th>Key vocabulary</th></tr>
<tr><td>• Supplementary video on the Human Respiratory System: https://www.youtube.com/watch?v=pO10bTYa5R8
• Computer
• Internet
• Videos
• Multimedia projector
• CDs
• Speakers
• Test-tubes or glass jars</td><td>• Straws
• Unlabelled diagram of respiratory system
• Calcium hydroxide solution

Study Jams:
http://studyjams.scholastic.com/studyjams/
http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/ecosystems.htm</td><td>• Diaphragm
• Bronchus
• Bronchiole
• Alveoli
• Respiration
• Excretion</td></tr>
<tr><td colspan="3">Links to other subjects:
Information Technology, Language Arts</td></tr>
</table>

TERM 3

UNITS OF WORK GRADE 8 TERM 3 UNIT 3.1: ENERGY TRANSFER IN THE ECOSYSTEM

About the Unit

In this unit, students will explore the concepts linked to ecology and, in the study of food chains and food webs discover that the sun is the ultimate source of all energy in the environment. Students will employ scientific methods of investigation such as inductive and deductive reasoning and real-life observation and inferences in ways used by scientists to garner facts for the construction of all relevant knowledge; synthesise definitions for concepts linked to ecology, food chains and webs and to draw comparisons between them. They will reflect on their learning and make entries in personal journals.

Range of Content

The key concepts and knowledge students will learn in this unit are:

- Science as a process of inquiry
- Food chains and Food webs
- The sun as the ultimate source of energy in the ecosystem
- Energy flow in food chains and webs
- Description of an ecosystem
- Inter-dependence among organisms within ecosystems

GUIDANCE FOR THE TEACHER

Science is not just a body of knowledge but it also constitutes methods of investigating. These methods utilize the cognitive and science process skills and attitudes for the purpose of understanding concepts and solving authentic problems of the natural environment. In the study of this unit, opportunities should be provided for students to use science process and cognitive skills and the development of attitudes such as curiosity and persistence in acquiring meaningful understandings of concepts such as organism, population, community, habitat and ecosystem. Students should be helped to appreciate that the sun is the ultimate source of energy which sustains life on earth. Methods of teaching and assessment include co-operative and collaborative strategies, authentic problem-solving, inter-disciplinary and reflective approaches to knowledge construction and validation.

Prior Learning
Check that students:
- Know that green plants use energy from the sun to make their own food

UNITS OF WORK GRADE 8 TERM 3 UNIT 3. 1

UNIT 3.1: Energy Transfer in the Ecosystem	
Theme: Exploring science and the environment **Attainment Target:** • Apply inquiry skills and scientific processes to acquire understanding of energy flow within the natural environment. **Topic:** Food Chains and Webs **Duration:** 12.5 hours/5 weeks **ICT Attainment Targets:** **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team. **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	**Objectives** **Students will:** • Identify the inter-relationships among organisms within the ecosystem. • Infer that sunlight is the ultimate source of energy in the ecosystem. • Formulate definitions of food chain, food web, producer, consumer, carnivore, herbivore, omnivore and habitat. • Investigate food chains and webs within the environment. • Construct terrestrial and aquatic food chains and webs using familiar organisms. • Identify the producers and consumers in given food chains and food webs. • Describe the energy flow in a food chain. • Work collaboratively with others

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Watch the video: **https://www.youtube.com/watch?v=EKIJjFAyAaA.** Working in groups, brainstorm ideas from the video to construct a definition for organism, population, community and ecosystem. Use diagrams, posters, pictures, digital stories to illustrate the differences among the terms.	• Define • Explain • Observe • Record • Collaborate • Think Critically – create, research, reflect	• Accurate definitions of terms and concepts • Posters/pictures/digital stories accurately illustrate differences among term
Create a collage of either a terrestrial or aquatic ecosystem (to include an identification of the organisms, populations and communities within the ecosystem) with the features which indicate the type of terrestrial or aquatic ecosystem represented. Use their collage to explain how organisms relate with each other and with their environment. Make reflective entries in their personal journals about the collage and any thoughts or feelings they may have about ecosystems and our survival in them.	• Create • Communicate • Think Critically – analyse, reflect	• Collage depicts features of intended ecosystem and show inter-dependence
Watch the video: **https://www.youtube.com/watch?v=SWvtRf4TAO4t** on food chains and webs and write definitions for the following terms: food chain, food web, producer, consumers, herbivores, carnivores and energy pyramid. Go on a nature walk and observe organisms to find out what they are doing and what they are feeding on. Use evidence from their observations to create a scrap book on food chains and food webs. Include pictures of the producers, consumers, herbivores, carnivores observed. Illustrate a food chain and a food web using pictures and arrows.	• Observe • Communicate • Create • Think Critically - analyse	• Accurate definitions of terms • Scrapbook is well organized with accurate information and satisfies other given criteria • Illustrations show meaningful understandings of food chains, webs, producers, consumers and energy flow
Make mobiles of food chains and use these to explain what the ultimate source of energy for all life on earth is. Using cartridge paper and crayons, create a pyramid of energy to explain the energy flow within a food chain.	• Construct • Communicate	• Mobiles accurately represent food chains • Accurate explanation of the sun as the ultimate source of energy, energy flow within a food chain and, pyramid of energy

Level 2: Explore the concept of ecology through the video: **https://www.youtube.com/watch?v=EKIJjFAyAaA**. Brainstorm ideas for a list of living things and a list of non-livings things with which living things interact. Working in small groups, provide at least two examples from real-life situations for each of the following: plants depend on animals; animals depend on plants; plants and animals depend on the non-living things around them. Communicate findings to the class. Use evidence from the video to create a concept map to show the inter-relationships among the following concepts – organism, population, community, ecosystem. Construct a definition for each concept and apply the definition to provide at least one familiar example for each.	• Collaborate • Communicate • Define • Observe • Record • Draw • Explain • Think Critically - create, synthesise, research, plan and design, reflect	• Correct examples given • Concept map accurately shows the inter-relationships • Correct definitions and examples
Use the computer and internet to gather information on the different types of ecosystems. Choose one type and use materials from the surroundings to design and build a model of this ecosystem. Explain the features of the model that help to identify the type of ecosystem portrayed. Display models. Make reflective entries in their journals about ecosystems and our survival in them.	• Create • Communicate • Think Critically – analyse, reflect	• Model is representative of chosen ecosystem
Watch the video: **https://www.youtube.com/watch?v=SWvtRf4TAO4t** on food chains and webs. Make drawings/posters/postcards to illustrate their understanding of the meanings of producers, consumers, herbivores and carnivores. Go on a nature walk and observe organisms to find out what they are doing and what they are feeding on. Record observations in a suitable format. Use findings to create models of food chains and food webs which illustrate how energy passes from one organism to the next. Write a newspaper article on the sun as the ultimate source of energy for life on earth. Illustrate the energy pyramid in creative ways.	• Observe • Communicate • Create • Think Critically - analyse	• Drawings/posters/postcards show understanding of the concepts and their interdependence • Observations recorded accurately and in a suitable format • Models clearly depict food chains and webs and energy flow • Newspaper article contains accurate information and correct spelling and use of science words

Level 3: Explore the concept of ecology through the video: **https://www.youtube.com/watch?v=EKIJjFAyAaA**. Use information from the video to explain the terms - ecology, organism, population, community, and ecosystem. In small groups, use the computer and internet to gather information on the types of ecosystems and the features which help to identify these ecosystems. Choose an ecosystem and present information, including an identification of the non-living factors, their dependence on each other and an explanation of their impact on the living things in the ecosystem, about it in a variety of creative ways to the class. Work together in groups on a project to design and create one real-life aquatic ecosystem. In groups, make a presentation to class on the assigned aspect of the project. Make reflective entries in their personal journals about the project and any thoughts or feelings they may have about ecosystems and our survival in them.	• Collaborate • Communicate • Define • Observe • Record • Explain • Think Critically - create, synthesise, research, plan and design, reflect	• Correct explanation of terms given • Accurate information about ecosystem selected and presentation mode satisfies given criteria • Aquatic ecosystem constructed according to established standards and satisfies other given criteria
Watch the video: **https://www.youtube.com/watch?v=SWvtRf4TAO4t** on food chains and webs. Use evidence from the video to define the following: producers, herbivores, carnivores and decomposers. Provide examples of each from information gathered from a nature walk and construct a model of a food chain and a food web to show the inter-relationships among these organisms. Write a short paragraph to explain why a food chain is more complex than a food web. Illustrate in creative ways the: • Energy Pyramid • Sun as the ultimate source of energy on earth and how energy reduces along a food chain.		• Terms accurately defined with examples • Models clearly depict food chains and webs, energy flow and show understanding of the inter-dependence among the organisms • Written paragraph contains accurate information and correct spelling and use of science words • Illustrations satisfy given criteria

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Use the computer and internet to do research, create and present information.
- ✓ Use scientific methods of investigation to explore their environment, gather and use relevant information.
- ✓ Explain energy transfers within ecosystems.
- ✓ Demonstrate understanding that the sun is the ultimate source of energy for sustaining life on earth.
- ✓ Explain basic ecological terms (e.g. food chain, food web, producer, consumer, energy pyramid).
- ✓ Use examples to illustrate the inter-dependence among organisms within ecosystems.

Points to Note	**Extended Learning**
• Throughout this curriculum emphasis is laid on the use and development of the scientific methods of investigation and processes, cognitive skills and the inculcation of scientific attitudes. • Ensure that students take care to preserve the natural environment as they carry out their explorations. • Provide planned opportunities for students to verbally share their observations and work with the class. • Ensure that students build their science vocabulary and use scientific language to express themselves orally and in writing. • Encourage students to reflect on their learning by making regular entries in their journals.	• Investigate the role of human activities in the degradation of the earth's ecosystems and ways by which this can be eliminated or reduced.

Resources	**Key vocabulary**	
• Videos • Computer • Internet • Multimedia projector • Speakers • CDs • Materials for making aquatic ecosystem **Study Jams:** http://studyjams.scholastic.com/studyjams/ http://studyjams.scholastic.com/studyjams/jams/science/ecosystems/ecosystems.htm	• Ecosystem • Food chain • Food web • Producer • Consumer • Herbivore • Carnivore	• Omnivore • Decomposer • Organism • Population • Community • Energy pyramid • Inter-dependence
Links to other subjects: Language Arts, Visual Arts		

UNITS OF WORK GRADE 8 TERM 3 UNIT 2: PHYSICAL AND CHEMICAL CHANGES

About the Unit

In this Unit students will learn about what constitutes a physical and chemical change and how to differentiate between the two; how physical and chemical changes are responsible for the formation of mixtures and compounds respectively;

Range of Content

- Chemical change produces a new substance (compound), is usually irreversible and involves changes in heat, mass or energy.
- During a physical change (e.g. state changes), the process is reversible and no new substance is formed.
- Mixtures are formed from physical changes while compounds are formed from chemical changes

GUIDANCE FOR THE TEACHER

The entire topic lends itself to investigative Science activities which should be explored. The use of the Inquiry-based approach will serve to bring out both the skills and content knowledge needed.

In implementing the unit, opportunities need to be provided for students to work collaboratively and share ideas and arrive at meaningful, shared scientific understandings of key concepts. This involves combination of use of small group strategies, whole class discussions and analyses of videos, models, and charts to understand and explain key concepts. To these ends, opportunities also need to be provided for individual work.

Prior Learning
Check that students can:
- Recall that all matter is made up of particles

UNITS OF WORK GRADE 8 TERM 3 UNIT 3. 2

UNIT 3.2: Physical and Chemical Changes

Theme: Energy and matter

Attainment Target(s):
- Understand the scientific process, and the impact of air and water on the environment, and on our everyday life.

Topic: Physical and chemical changes
Duration: 9.5 hours/ 4 weeks

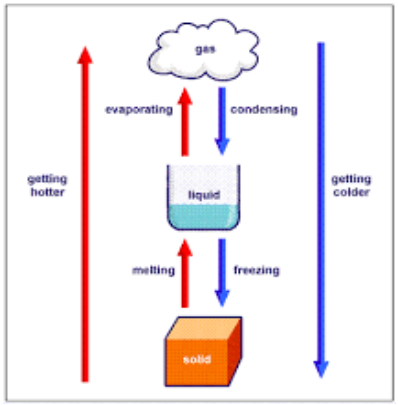
ICT Attainment Targets:

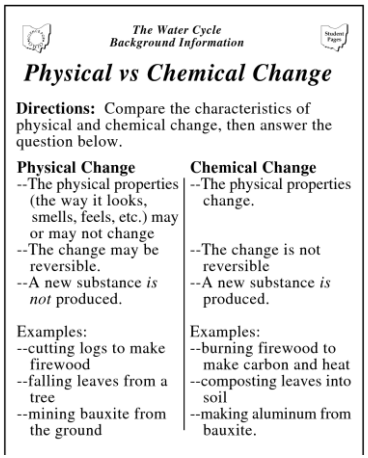
- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

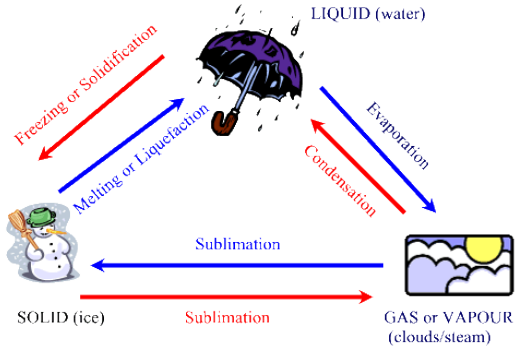
Objectives:
Students will:

- Define physical and chemical changes;
- Investigate to find out differences between physical and chemical changes in terms of composition, reversibility and properties;
- Classify everyday examples as physical or chemical changes
- Recognize changes of state as physical changes
- Collect and display information on physical and chemical changes
- Use appropriate scientific language
- Value individual effort and team work by completing investigations

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment**
Observe and record what happens when they or the teacher: – gently heat(s) a square of butter in a hot water bath then allows the butter to cool; – inflate(s) then deflate(s) a balloon; – cut(s) a sheet of paper into four pieces then put it back together; – boil(s) water and place a mirror (or other cold surface) directly above the steam. As a class, discuss the changes that occurred in each case and state whether any new materials have been formed. (*In discussions teacher should introduce the term physical change to describe changes in which no new materials are formed.*) Write a simple description of the meaning of the term 'physical change'. Share their descriptions with the class.	• Make observations • Record • Collaborate • Communicate • Manipulate • Investigate • Think Critically (analyse, draw conclusions, define operationally)	• Observations accurately recorded. • Participated in discussions • Acceptable description given for the term 'physical change'.
Observe and record what happens when the teacher: – cracks and heats a raw egg, then allows the heated egg to cool; – burns paper; – mixes vinegar and baking soda Discuss the changes that occurred in each case and state whether any new materials have been formed. (*In discussions teacher should introduce the term chemical changes to describe changes in which new materials are formed.*) Write a simple description of the meaning of the term 'chemical change'. Share their descriptions with the class.	• Observe • Record • Communicate • Think Critically (analyse, draw conclusions, define operationally)	• Observations accurately recorded. • Acceptable description given for the term 'chemical change'.

Level 1: Watch a video on physical and chemical changes. In groups, use information from the video to construct definitions of physical and chemical changes. Provide examples of these changes from the video. Interpret the following illustration of changes in the states of water. Identify, list and discuss the changes. On the basis of the definition of physical change, justify why these changes can be classified as physical changes. Identify and discuss other examples of physical changes from everyday experiences.  	• Collaborate • Communicate • Define • Interpret	• Acceptable definition of physical and chemical changes; • Correct interpretation of the water cycle and identification of the changes that take place; • Correct deductions that changes of states are physical changes
Analyse the following illustration of changes in matter; discuss the changes in small groups. On the basis of the definition of chemical change identify and list the chemical changes. Justify why these changes can be classified as chemical changes. Identify and discuss other examples of physical changes from everyday experiences.  	• Collaborate • Communicate • Think Critically – analyse, justify, draw conclusions	• Correct identification of a chemical change • Logical justifications made • Correct identification of examples of chemical changes from real life experiences

 *The Water Cycle* *Background Information* ***Physical vs Chemical Change*** **Directions:** Compare the characteristics of physical and chemical change, then answer the question below. **Physical Change** --The physical properties (the way it looks, smells, feels, etc.) may or may not change --The change may be reversible. --A new substance *is not* produced. Examples: --cutting logs to make firewood --falling leaves from a tree --mining bauxite from the ground **Chemical Change** --The physical properties change. --The change is not reversible --A new substance *is* produced. Examples: --burning firewood to make carbon and heat --composting leaves into soil --making aluminum from bauxite. In groups, analyse and discuss the above chart. Explain in your own words, the three differences between a chemical change and a physical change. For each difference, provide your own example from your everyday experiences.	•Collaborate •Communicate •Think Critically - analyse,	• Accurate interpretation of the table of differences; • Accurate explanation of differences, using examples from everyday life situations.
Level 2: Watch a video on physical and chemical changes; working in groups, use information from the video to construct definitions of physical and chemical changes. In small groups, study your definition of a physical change and identify from your definition, the characteristics which allow for a physical change to be differentiated from all other changes; provide examples of these changes from the video.	•Collaborate •Communicate •Think Critically – analyse, construct definitions,	• Correct definitions for physical and chemical changes, supported with evidence from the video

Study the following illustration and identify 6 physical changes:  On the basis of your definition, justify why these changes are classified as physical change.	•Think critically – analyse, infer, draw conclusions, justify	• Correct identification of six physical changes; • Correct justifications made for physical changes
In small groups, study your definition of a chemical change and identify from your definition, the characteristics which allow for a chemical change to be differentiated from all other changes; provide examples of these changes from the video. Analyze and interpret the following illustration and identify the chemical changes:  Justify your classifications on the basis of your definition for chemical changes. Tabulate the differences between physical and chemical changes on the basis of composition, reversibility and properties.	•Think critically – analyse, formulate, evaluate •Justify •Tabulate	• Characteristics of chemical change correctly deduced from definition • Correct identification of chemical changes; • Logical justifications made for chemical changes
Investigate the reaction between zinc and sulphuric acid. Identify the reactants and products. Provide evidence that hydrogen gas is liberated in the reaction.	• Manipulate • Observe	• Correct identification of reactants and

Tabulate the differences between physical and chemical changes.	• Think Critically – infer, draw conclusions, • Tabulate	products; • Table constructed properly with accurate information
Level 3: Watch a video on physical and chemical changes; working in groups, use information from the video to construct definitions of physical and chemical changes; provide examples of these changes from the video and from everyday experiences. Investigate physical changes using following: • Produce the following mixtures and then demonstrate how their constituents can be separated by physical means; use the findings to logically explain why these are physical changes [include composition, reversibility and properties] (a) Solutions [sodium chloride and water; copper II sulphate and water]; leave the solutions in the sun for a few days and observe what happens in each case; record observations; make inferences from observations; arrive at logical conclusions for why these are considered physical changes; (b) Suspensions [sand and water] – separate by filtration; (c) Emulsion: [Oil and water] – use separating funnel (d) Two solids [iron filings and sand] – use magnet • Investigate chemical changes using the following from everyday experiences: (a) Candle burning (water vapour and carbon dioxide form); (b) Bread rising (yeast converts carbohydrates into carbon-dioxide gas)	•Collaborate •Communicate •Create •Manipulate •Think Critically – define operationally, compare, analyse, draw conclusions,	• Correct definition of physical and chemical changes using information from the video; • Accurate identification of everyday experiences of physical and chemical changes • Suitable separation of mixtures by physical means • Correct identification of chemical changes from everyday experiences
Observe, record, infer and arrive at logical conclusions for why these are considered to be chemical changes); Watch the video again to explain, using apt examples from everyday situations, the differences in the formation of mixtures and compounds. Demonstrate this concept in the chemical reaction between zinc and sulphuric acid – test for the liberated hydrogen. Tabulate the differences between physical and chemical changes and communicate findings for others.	• Manipulate • Observe • Record • Communicate • Compare • Tabulate • Think Critically – infer, draw conclusions	• Table shows accurate information on the differences between physical and chemical changes; correct labels for columns

In groups, review the mixing of the elements iron and sulphur (by video or demonstration). Separate the mixture using a magnet. Deduce the type of change that occurred. Compare with the heating of iron and sulphur in an evaporating dish. Try to separate the components. Deduce the type of change that occurred. Provide reasons for deductions. Share findings with the class.	• Collaborate • Communicate • Observe • Manipulate • Compare • Think Critically – analyse, draw conclusions	• Correct deductions made • Logical reasons given.

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Recognize physical and chemical changes in everyday experiences
- ✓ Explain the differences between physical and chemical changes ;
- ✓ Carry out investigations on physical and chemical changes
- ✓ Access, process and use relevant information from the internet

Points to Note	**Extended Learning**
• Safety precautions should be followed when handling acids. • Demonstration involving use of acid should be done by the teacher.	• Research and explain physical and chemical changes in everyday life: • Justify why these are regarded as chemical changes [examples: photosynthesis, respiration and combustion] • Justify why these are regarded as physical changes [examples: Melting, boiling water, mixing sand and water]

Resources		**Key vocabulary**
• **www.youtube.com/watch?v=M8tyjwB42X4** (Oct 9, 2013, Mark Drollinger) • Candle • Matches • Zinc • Sulphuric acid	• Yeast • Sugar • Beaker • Stirring rod • Computer with internet access	• Physical change • Chemical change • Reversible • Irreversible • Change of state

Links to other subjects:

Technical and Vocational Education, Information Technology

NATIONAL STANDARDS CURRICULUM GUIDE

INTEGRATED SCIENCE

GRADE 9

APSE III

	GRADE 9 SCOPE AND SEQUENCE		
	TERM 1	**TERM 2**	**TERM 3**
GRADE 9	**Water Cycle** • Defining cycle • Investigating processes in the water cycle • Modelling the water cycle • Importance of water cycle • Exploring water purification methods • Creating water purification devices • Exploring water conservation methods **Air and Oxygen** • Composition of gases in air • Relating properties and uses of gases in air • Investigating properties of air • Importance of air and oxygen to organisms • Processes involved in the oxygen cycle • Comparing oxygen and carbon cycles	**Sexual Maturity and Reproduction** • Relating structure of reproductive system to their functions • Exploring processes involved in sexual reproduction in humans • Describing changes during menstrual cycle **Embryo Development** • Tracing the development of the fertilized egg into an embryo • Identifying key structures in a pregnant uterus & their functions • Importance of diet to health of mother and baby • Evaluating methods of birth control	**Acids and Alkalis** • Classifying substances as acids and alkalis • Using indicators to differentiate between acids and alkalis • Interpreting the pH scale • Measuring the pH of substances • Applications of neutralization reactions in daily life **Static and Current Electricity** • Investigating static electricity • Applications and hazards of static electricity • Defining electric current • Classifying materials as conductors & insulators • Constructing simple circuits • Representing series and parallel circuits using diagrams • Preventing electrical hazards • Safety devices

TERM 1

UNITS OF WORK GRADE 9 TERM 1 UNIT 1: WATER CYCLE

About the Unit

In this Unit, students will investigate the processes occurring in the water cycle and its importance to humans and the environment. Students will also investigate how they can protect and conserve their water resources through the use of personal conservation plans.

Range of Content

- Water is the most abundant liquid on earth, covering about 70% of the surface.
- Water is cycled in nature through the water (hydrologic) cycle which combines the processes of evaporation, transpiration, condensation and precipitation. Simple chemical tests for water include changing anhydrous copper sulphate to blue and cobalt chloride paper to pink.
- Water conservation refers to the 'wise use' of water resources and focuses on reduction, re-use and recycling of water.
- Human practices have resulted in pollution and contamination of water resources. Boiling, chlorination, filtration, aeration and desalination are some of the methods used to obtain clean water.

GUIDANCE FOR THE TEACHER

Provide students with opportunities for real life applications of concepts of water pollution, purification and conservation. This can include a project in the home or school community.

Prior Learning
Check that students:
- Know the importance of water to life

UNITS OF WORK GRADE 9 TERM 1 UNIT 1.1

UNIT 1.1: Water Cycle

Theme: Exploring science and the environment

Attainment Target(s):
- Understand the scientific process, and the impact of air and water on the environment, and on our everyday life.

Topic: Water Cycle in Nature
Duration: 5 hours/2 weeks

ICT Attainment Targets:

- **COMMUNICATION AND COLLABORATION -** Students use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.
- **RESEARCH, CRITICAL THINKING AND DECISION MAKING-** Students use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.
- **DESIGNING AND PRODUCING –** Students use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.
- **DIGITAL CITIZENSHIP -** Students recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.

Objectives:
Students will
- Define the term 'cycle'
- Investigate the processes involved in the water cycle
- Construct a model of the water cycle
- Assess the importance of the water cycle to humans and the environment
- Justify the need for water conservation
- Show interest in water conservation through personal conservation efforts
- Assess the impact of human activities on water quality
- Create a simple water purification device
- Value individual effort and team work through 'hands-on' activities

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
Level 1: In groups brainstorm definitions of the term 'cycle.' Watch a video on the water cycle. In groups, analyse the video to find the main events/processes in the water cycle; list these events in the order in which they occur. Use information from the video to explain and define each process of the water cycle. Participate in small and whole class discussions on the concept of 'cycle' and the 'water cycle.' Find a variety of situations in real-life situations where events in the water cycle occur and create a visual representation e.g. a collage of the water cycle. Imagine what could happen to the earth if the cycle should stop after any one event.	• Collaborate • Communicate • Create • Research • Think Critically – analyse, extrapolate, draw conclusions	• Main processes in the water cycle noted accurately • Accurate visual representation of the water cycle; • Logical conclusions drawn on the importance of the water cycle to the environment
Observe as teacher demonstrates the following activity (or perform the activity in groups). Place a half-full beaker with water on a tripod stand. Cover the beaker with a watch glass. Heat the water in the beaker to boiling. Note the observations. Answer questions such as, 'What happens to the water as it boils?', 'Where did the water go?', 'What did the water change to?', 'What was formed on the surface of the watch glass?' Students will provide explanations for their observations and identify the processes that are taking place. Teacher will lead students to link the processes depicted with the water cycle.	• Communicate • Manipulate • Observe • Think Critically – infer, draw conclusions	• Correct observations noted • Changes from water to water vapour (and the reverse) noted • Processes identified as part of the water cycle
Working in groups, like scientists, find out and discuss an activity – a fair test, which you can carry out at home/in the classroom to demonstrate the importance of the water cycle to the growth of seeds. Predict the results of the activity. Working in small groups, carry it out, record and analyse the results. Communicate the results to the class in a variety of ways; participate in a discussion on 'drought' and 'floods' in Jamaica and other parts of the world	• Collaborate • Manipulate • Record • Plan and Design • Communicate • Think Critically – predict, analyse, draw conclusions	• Logical conclusions drawn on the importance of water to plants
Level 2: In groups, brainstorm, the meaning of the term, cycle. Watch video on the water cycle and identify and observe the events/ processes of the	• Collaborate • Communicate	• Main processes in the water cycle identified from

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
cycle and the order in which they occur. Participate in discussions on these events with the goal to explain meanings and identify occurrences in a variety of real contexts;	• Record • Think Critically - analyse,	video • Real-life examples of the processes accurately identified
Research the link between aquifers and the water cycle and the importance of aquifers in a continuous supply of water to plants and humans and other organisms. Create a model/simulation of the water cycle and use it to explain the water cycle to members of your group and the whole class. Predict what could happen if one aspect of your model fail to function. Test your prediction; communicate results in small groups and to whole class.	• Research • Create • Collaborate • Communicate • Think Critically – analyse, predict, draw conclusions	• Accurate visual representation of the water cycle • Logical conclusions drawn about the importance of the water cycle to the environment;
In groups, pour about two teaspoons of water (10 ml) into a small transparent container (e.g. a pill container). Place the container into a mixture of salt and ice, record the temperature then allow it to stand for 10 minutes, then record the final temperature (after 10 minutes); note and record all other observations. Remove the container from the ice and salt mixture, allow it to stand for 10 minutes and record your observations, including the temperature after 10 minutes. Draw simple conclusions and present your findings to the class.	• Manipulate • Record • Observe • Measure • Communicate • Collaborate • Think Critically - draw conclusions	• Instructions followed and accurate observations recorded • Group worked cooperatively • Conclusions supported by findings
Level 3: In class discussion, explore the meaning of the term, 'cycle.' Watch a video on the water cycle and observe and explain the concept of 'cycle' in operation. Analyse the video to identify and explain the various events that constitute the cycle and the order in which they occur. Explore through practical investigations the processes involved in the water cycle (evaporation, condensation, precipitation and infiltration; write a science report for each investigation; share your findings in small groups and with the whole class; Make an annotated diagram to illustrate the water cycle; explain the importance of the water cycle to the environment; communicate	• Collaborate • Communicate • Create • Research • Plan and Design • Manipulate • Record • Think Critically – analyse, draw	• Accurate visual representation of the water cycle • Correct explanations of the processes in the water cycle • Logical conclusions drawn about the importance of

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
ideas to small group and whole class. Working in small groups, initiate and carry out a discussion on the importance of the water cycle to the environment. In a variety of ways present findings for others to understand.	conclusions.	the water cycle to the environment;
In groups, plan and design a model of the water cycle taking into account criteria for a successful working model and constraints. Construct a model using indigenous materials. Evaluate how well the model works and suggest improvements. Make a presentation of the water cycle using the model. Display model in the science corner.	• Manipulate • Create • Collaborate • Think Critically – analyse, apply	• Correct representation of the processes in the water cycle. • Model creative, to scale, correct facts represented.
In groups, use research skills to investigate issues affecting water globally (e.g. scarcity, drought, and contamination). Use pictures and videos showing areas affected by water shortage and contamination. Discuss the measures that are needed to make water safe. Investigate water purification methods used in water treatment systems (OR Visit a water treatment plant). Construct a model to represent each stage in the water treatment process. Present model with explanations of how the system works to the class	• Research • Communicate • Create • Collaborate • Think Critically – analyse, apply	• Model correctly depicts stages in water treatment system • Application and transfer of knowledge evident
In groups, plan and design a water purification device. Select appropriate materials and say why they were selected. As a class, develop the criteria for the success of the device. Participate in a teacher led discussion to decide which design is the best solution for the water purification device. Implement where possible.	• Communicate • Plan and Design • Create • Think Critically - evaluate, justify, collaborate	• Materials appropriately match the suggested design • Device works as intended to purify water
In groups, state some uses of water in the home, school and industry. Examine pie charts that show water use in these areas. Identify the activities that use the most water and why. Discuss and record findings and suggest ways in which water can be conserved. Produce a poster or leaflet on water conservation.	• Communicate • Collaborate • Think Critically – analyse, interpret, draw conclusions, create	• Analysis of data acceptable and accurate • Poster/leaflet contains correct information • Creative presentations

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment**
Create a strategy to reduce water usage in the home, school, or community. Calculate how much water is used in the home daily (check meter readings). Formulate a personal conservation plan showing individual efforts to conserve water at home. Present plan to the class using multimedia or role play.	• Create • Calculate • Communicate • Think Critically – analyse, synthesize, apply, justify	• Workable strategy developed • Plans show application and transfer of knowledge • Presentations are creative and contain rational plans
As a class, identify areas of water wastage at school. Formulate plans to reduce, re-use or recycle water used in the school. Plan and design a public education campaign to increase awareness on water conservation options (e.g. using slogans, jingles etc.). Present to the school body in a variety of ways.	• Observe • Plan and Design • Collaborate • Communicate • Create • Think Critically – evaluate, apply, justify	• Plans are sound and applicable • Campaigns are creative and contain accurate information

<table>
<tr><td colspan="3">Learning Outcomes
Students who demonstrate understanding can:
✓ Show the processes involved in the water cycle
✓ Make a model of the water cycle
✓ Suggest the importance of the water cycle
✓ Devise ways to conserve water
✓ Create a simple water purification device</td></tr>
<tr><td>Points to Note</td><td colspan="2">Extended Learning</td></tr>
<tr><td>• Teacher must make connection with human activities and the impact these activities have on both cycles in order to sensitize on environmental concerns.</td><td colspan="2">• Research areas of the world that have issues of water scarcity and contamination. Locate these areas on a map.</td></tr>
<tr><td>Resources</td><td colspan="2">Key Vocabulary</td></tr>
<tr><td>• Computers
• Internet
• Speaker
• Multimedia projector
• Interactive video on the water cycle – Thirstin’s Water Cycle - www.epa.gov/ogwdw/kids/flash/flash_watercycle.html</td><td>• Cycle
• Water cycle
• Evaporation
• Condensation
• Precipitation
• Infiltration</td><td>• Water Conservation
• Purification</td></tr>
<tr><td colspan="2">Links to Other Subjects:
Geography, Resource and Technology, Language Arts</td><td></td></tr>
</table>

UNITS OF WORK GRADE 9 TERM 1 UNIT 2: AIR AND OXYGEN

About the Unit

In this unit students will work collaboratively in small and large groups to explore the concept of air as a mixture of gases; its presence around us and its importance to the environment. Through practical approaches, they will deepen their understanding of science as a process of inquiry as they use inquiry to acquire understanding of the concept of air and its characteristics:

Range of Content

- Air is composed of approximately 78% nitrogen, 21% oxygen with traces of carbon dioxide, water vapour and argon.
- The properties of the gases in air are related to its uses: nitrogen is used in food packaging because it is unreactive; oxygen is used in burning fuels because it supports combustion; argon is unreactive hence used in light bulbs to produce an inert atmosphere; and carbon dioxide is used in fire extinguishers because it does not support combustion.
- In chemical tests for atmospheric gases: oxygen relights a glowing splint (i.e. supports combustion) and carbon dioxide turns limewater (aqueous calcium hydroxide) cloudy.

.GUIDANCE FOR THE TEACHER

In teaching this unit, it is intended for students to be provided with opportunities to practice and develop some of the science process and cognitive skills within the context of solving authentic problems related to the presence of air around us; its characteristics and importance to organisms. It is intended for assessment to be built into the teaching process to guide students in their learning and as they learn how to learn and for the teacher to adjust teaching strategies or use a variety in order to meet students' learning needs as they arise.

Prior Learning
Check that students can:
- Recognize that air and oxygen is needed for life

UNITS OF WORK GRADE 9 TERM 1 UNIT 1.2

UNIT 1.2: Air and Oxygen

Theme: Exploring Science and the Environment

Attainment Target:
- Understand the scientific process, and the impact of air and water on the environment, and on our everyday life.

Topic: Air and its importance to the Environment
Duration: 10 hours/ 4 weeks

ICT Attainment Targets:

- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

Objectives:
Students will:
- Represent the percentage composition of the gases in air on a pie chart
- Use scientific inquiry to explore the concept of air as a mixture of gases;
- Investigate the characteristics of air
- Describe the importance of air to organisms
- Relate the properties of the gases in air to their uses
- Describe the processes involved in the oxygen cycle;
- Use creative ways to illustrate the oxygen cycle;
- Compare the oxygen and carbon-cycles.
- Carry out a given activity in a safe, clean, tidy and systematic way.
- Write a report of a laboratory investigation.
- Show respect for another person's idea.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: In groups, after discussions with teacher, use a plastic bag and plastic twist (e.g. that used to seal bread bags), to determine if air is present in the atmosphere. Solve the problem by asking questions e.g. i. Where do we find air? ii. Can you feel air? Record the responses to the questions posed using simple scientific language. Produce a simple plan to show how the group will carry out the task. Execute plans, make and record observations / findings in words, diagrams, sketches or other means. Report findings to the class using oral, written or audio-visual and expressive forms	• Observe • Hypothesize • Collaborate • Manipulate • Communicate • Think Critically - investigate, infer, plan and design	• Plan produced that addresses the problem • Effective execution of plan
Recall their understanding of the concept of air and share this concept in small groups. Evaluate their concept in the light of that shared by the teacher; Interpret a pie chart to show the percentage composition of gases in air; Tabulate findings (possibly using word processing software) to show percentage composition of gases in air. Examine teacher-made reading sheets and discuss the importance of air to both terrestrial and aquatic organisms. Find examples in everyday life situations to show the importance of air to organisms and illustrate in a variety of ways – through art, flyers, cartoons). Working in small groups, find examples around you and use as evidence to explain that air is found all around us; Use findings from a teacher demonstration to show that air exerts pressure; How can you show that air occupies space; defend your choice of activity and discuss the stages in the process; carry out activity; write a report.	• Collaborate • Evaluate • Communicate • Create • Record • Tabulate • Investigate • Observe • Think Critically – analyse, infer, evaluate, draw conclusions, plan and design	• Pie chart correctly interpreted to show that air is a mixture • Table properly constructed with accurate information • Creative illustrations with accurate information • Investigations correctly depict properties of air
Interpret pie chart to **identify** percentage oxygen in air. **Analyse** a given diagram of the oxygen cycle and **identify** the processes involved and **explain** how these compare with those of the carbon cycle. Use creative ways to **illustrate** the oxygen cycle – collage, organ chart, diagram; **identify** and **discuss** the importance of the	• Communicate • Manipulate • Investigate • Observe	• Percentage oxygen in air correctly identified • Processes of respiration and photosynthesis correctly identified

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
oxygen cycle; perform a simple hands-on activity to show that air supports burning; **record, analyse** and **interpret** finding and **arrive at a logical conclusion** about air and burning; **predict** and **explain** your prediction of what could possibly happen to an insect if it is kept for a long time covered under a glass jar which contains air in which all of the oxygen was used up.	• Think Critically – analyse, infer, predict, plan and design, interpret, draw conclusions;	• Creative illustration of the oxygen cycle with accurate information • Plausible explanations of the differences between the oxygen and carbon cycles • Correct inference that oxygen supports burning
Level 2: In groups, predict, investigate and explain what happens when: a. air is blown into a balloon, b. a crumpled piece of dry paper is squeezed into the bottom of a transparent plastic cup, which is inverted and totally immersed in a container of water, (making sure that the paper remains at the bottom of the cup). Predict what will happen to the tissue. Carefully take the cup back out of the water, allowing the water on the cup to drip off, and then check if the paper remains dry. Make observations and record information obtained in a variety of ways. Repeat the investigations then draw conclusions. Report on findings.	• Manipulate • Observe • Collaborate • Communicate • Record • Think Critically - predict , infer, draw conclusions	• Explanations aligned with findings • Conclusions supported by observations
Recall own understanding of the concept of air; share this concept in small groups and the whole class and evaluate own concept in the light of that of others including that of the teacher. In groups, explore, through simple activity, the concept of a mixture and use findings to explain air as a gas-gas mixture; apply the concept of mixture to explain what could possibly happen to gases in air when air dissolves in water; explain how this ability of air to dissolve in water allows it to support aquatic life; follow instructions to carry out practical investigations to show that: (i) air exerts pressure and (ii) air occupies space. Identify the steps involved in the process of investigation and write a report on one of the two investigations.	• Collaborate • Communicate • Create • Investigate • Manipulate • Record • Report • Think Critically - analyse, evaluate, plan and design, draw conclusions,	• Logical conclusion that air is a mixture • Investigations show correct properties of air • Report contains all steps in the investigation

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Construct a table to show composition of gases in air; use table to **calculate** the what fraction of air is oxygen; **identify, discuss** and **explain** processes involved in the oxygen cycle; perform practical activity to show that oxygen supports burning; **create** an illustration of the oxygen cycle and **compare** it with the carbon cycle. **Explain** the connections between these two cycles in terms of processes which remove oxygen and carbon-dioxide from the atmosphere and those which replenish the air with these gases. Use all information to **synthesize** an explanation of the importance of the oxygen cycle to the environment	• Observe • Communicate • Create • Calculate • Investigate • Think Critically – analyse, infer, plan and design, draw conclusions	• Properly constructed table with correct information • Fraction of oxygen correctly determined; • Correct identification of the processes of photosynthesis, respiration and combustion; Accurate record of observations and inference about oxygen and burning; • Creative illustration accurately depicts the oxygen cycle; • Correct connections made between the two cycles
Level 3: Work in groups to investigate if air has mass. Blow up the balloons to the same size and tie their necks with string. Tie the balloons to each end of a clothes hanger and balance it. Predict what would happen if you burst one of the balloons. Push the pin into one of the balloons and make observations. Record findings and draw conclusions. Compare your conclusions to your predictions. Report outcomes to classmates in oral, written, visual and expressive forms.	• Manipulate • Observe • Collaborate • Communicate • Think Critically - infer, draw conclusions, make comparisons, predict	• Instructions followed and apparatus properly setup • Conclusions supported by findings

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Recall their understanding of the concept of air; share this concept in small groups and the whole class and evaluate own concept in the light of that of others including that of the teacher; Use an identified practical activity to explain the meaning of the statement "air is a mixture of gases." On the basis of the results of this activity and working in small groups, prepare a presentation, for the class to help others to understand how air supports aquatic life. Observe, report events in the environment which provide evidence that air is all around us. Plan and carry out practical activities to show that air is all around us – occupies space and exerts pressure. Write a coherent report on one of the two investigations	• Collaborate • Communicate • Create • Investigate • Manipulate • Record • Report • Think Critically - analyse, evaluate, plan and design, draw conclusions,	• Logical conclusion that air is a mixture • Investigations show correct properties of air • Report contains all steps in the investigation
Construct a table to show composition of gases in air; use table to construct a pie chart to accurately show percentage composition of oxygen; **research** to find out and **communicate** findings about the processes involved in the oxygen cycle; **explain**, using an illustration, how these processes work together in the oxygen cycle; **identify** and **discuss** the differences between these two cycles; **perform** a practical activity to **demonstrate** one identified process; **record observations** and arrive at logical inference related to oxygen and burning, respiration or photosynthesis. **Arrive at a logical conclusion** about the importance of the oxygen cycle to the living environment.	• Observe • Communicate • Create • Calculate • Investigate • Think Critically – analyse, infer, plan and design, draw conclusions	• Properly constructed table with correct information • Properly constructed pie chart • Correct identification of the processes of photosynthesis, respiration and combustion; • Correct inference about oxygen and burning; • Creative illustration accurately depicts the oxygen cycle; • Correct connections made between the two cycles Logical conclusion about the importance of the oxygen cycle made
In groups, research (online/offline) selected properties and uses of gases such as carbon dioxide, oxygen and nitrogen. Share views with class. Produce a leaflet, podcast or wiki to sensitize the school community about the gases in the air. In groups, investigate if water is present in air using the scientific	• Collaborate • Communicate • Think Critically • Create • Hypothesize	• Correct information presented • Accurate observations noted • Logical explanations given • Steps in the scientific method clearly seen

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
method. Suggest how water in air can be tested. Identify the materials needed. Set up the investigation. Carry out tests. Record and explain observations. Use a teacher-prepared template to write up and submit a laboratory report (include pictures)	• Observe • Plan and Design • Communicate • Collaborate • Manipulate • Think Critically – analyse, apply, synthesize	• Report written properly and contains accurate information
In groups, investigate the chemical tests for oxygen and carbon dioxide. • Oxygen relights a glowing splint • Carbon dioxide turns calcium hydroxide (lime water) milky or cloudy.	- Observe - Collaborate - Communicate - Think Critically	• Accurate observations recorded
Collect samples of objects that use air and discuss how the air is used in each case. Individually/in groups, create a graphic organizer (electronic/non-electronic) e.g. diagram, showing how the air is used in the samples.	• Research • Communicate • Create • Collaborate	• Graphic organiser present accurate information on airflow in devices.

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Illustrate the concept of air as a mixture of gases;
- ✓ Understand that air supports aquatic life;
- ✓ Identify and use scientific investigation to show the properties of air
- ✓ Illustrate the oxygen cycle in chosen creative ways;
- ✓ Explain the importance of the oxygen cycle;
- ✓ Identify similarities and differences between the oxygen and carbon-cycles;
- ✓ Locate relevant information on the internet by using successful search strategies;

Points to Note	**Extended Learning**
• Teacher must make connection with human activities and the impact these activities have on both cycles in order to sensitize on environmental concerns. • Help students to understand that scientific investigations can take many forms; not just experimentation but also includes observations of natural objects and events • The writing up of a simple but coherent science report also provide opportunity for a focus on the phases of the process of inquiry; • Collaborative efforts at common tasks allow for sharpening of communication and collaborative skills;	• Research to find out how oxygen from air quickly transfers to large bodies of water. • Explain using an illustration how another form of oxygen cycle exists in ponds and streams.
Resources	**Key Vocabulary**
• Water • Glass • Trough • Straw • Computer with word processing software • Materials to make a solution – a mixture, chart showing percentage composition of air, chart showing the oxygen cycle, candles, matches, glass jars	• Air pressure • Mixture • Investigation • Observation • Inference • Evidence • Data • Cycle • Photosynthesis • Respiration

Links to other subjects: Mathematics, Information Technology

TERM 2

UNITS OF WORK GRADE 9 TERM 2 UNIT 2.1: SEXUAL MATURITY AND REPRODUCTION

About the Unit

In this unit, students will, through project-based learning, understand and illustrate in a variety of ways the structure and function of the male and female reproductive systems; explain what is the menstrual cycle and the events or changes that occur in the female reproductive system during a menstrual cycle; create a visual representation of the menstrual cycle and explain ovulation, fertilization, and implantation. Opportunities will be provided for the students to plan and organise a science fair to showcase the work they produced as they explored the topic and to demonstrate their learning and collaborative skills.

Range of Content

The key concepts and knowledge students will learn in this unit are:

- Structure and functions of the male and female reproductive systems
- The menstrual cycle and the changes that occur in the female reproductive system during menstruation
- The process of sexual reproduction in humans as including ovulation, fertilization and implantation

GUIDANCE FOR THE TEACHER

In implementing the unit, opportunities need to be provided for students to work collaboratively, share ideas and arrive at meaningful, shared scientific understandings of key concepts. This involves a combination of the use of small group strategies, whole class discussions and analyses of videos, models, and charts to understand and explain key concepts. Opportunities must also be provided for individual work. Encourage the responsible use of computers and internet for garnering evidence for application in the construction of explanations of key concepts.

Prior Learning
Check that students can:
- Explain the meaning of sexual reproduction as a vital activity of organisms.

UNITS OF WORK GRADE 9 TERM 2 UNIT 2. 1

UNIT 2.1: Sexual Maturity and Reproduction

Theme: Living Things and Life Processes

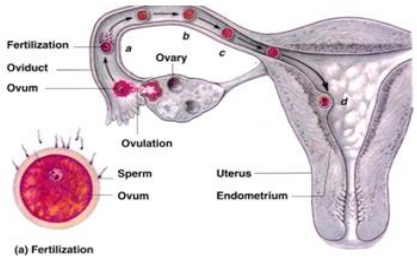
Attainment Target:
- Demonstrate an understanding of human body systems, their role and importance in life processes, health and well-being.

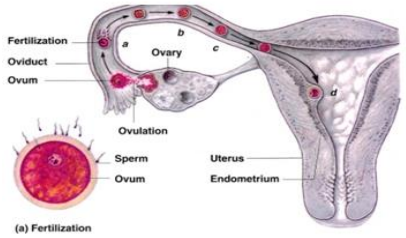
Topic: **The Human Reproductive System**
Duration: 12.5 hours/5 weeks

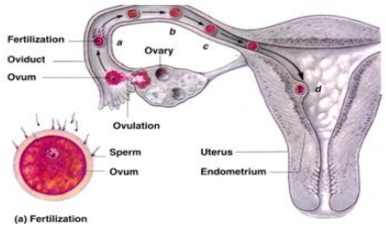
ICT Attainment Targets:

- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

Objectives:
Students will:
- Identify the main parts of the male and female reproductive system and state their function.
- Describe the menstrual cycle.
- Explain the process of sexual reproduction in humans as involving ovulation, fertilization and implantation.
- Work collaboratively in groups.
- Communicate within large group settings.
- Show respect for the views of others.

Suggested Teaching and Learning Activities **Students will**:	**Key Skills**	**Assessment Criteria**
Level 1: Watch the video: **https://www.youtube.com/watch?v=CqmW9CL80q0** of the male and female reproductive systems as part of a science project. Analyse models and charts of the male and female reproductive systems. Make a list of the major organs of these systems and state their function. Use play dough to create models to show main parts of these systems. Use models to explain the function of each organ to the class. Prepare models for display at a science fair on 'Human Sexuality and Reproduction' at the end of the unit.	• Collaborate • Explain • Think Critically - analyse, create	• Correct listing of major organs and their function • Models accurately depict the male and female reproductive systems
Watch video: **https://www.youtube.com/watch?v=vXrQ_FhZmos** on the menstrual cycle as a part of the science project. Participate in a class discussion of the events of the menstrual cycle. In groups, create an illustration of the uterus to depict the break-down of the uterine lining and use it to explain the menstrual cycle. Write definitions for ovulation, fertilization and implantation. Prepare illustrations for display at the science fair on 'Human Sexuality and Reproduction' at the end of the term. Answer questions based on the illustration *(ovulation, fertilisation, implantation)* below.  	• Collaborate • Define • Think Critically – create	• Accurate understanding of the order of events in the menstrual cycle • Illustration clearly depicts uterus and break-down of its lining • Correct definitions of the processes of ovulation, fertilization and implantation
In groups, design a poster to advertise the upcoming science fair. Place posters in appropriate places around the school. Make entries in personal journals about the science fair.	• Collaborate • Communicate • Think Critically – create, reflect	• Attractive poster which clearly sends the message about the fair; poster satisfies other given criteria
Level 2: Watch the video: **https://www.youtube.com/watch?v=CqmW9CL80q0** of the male and female reproductive systems as part of a science project. Analyse models and charts of the male and female reproductive systems. In groups, research a different organ for the reproductive systems and make three	• Collaborate • Explain • Think Critically -	• Models accurately depict the organs of male and female reproductive systems • Correct explanation of functions

Suggested Teaching and Learning Activities **Students will**:	**Key Skills**	**Assessment Criteria**
dimensional (3D) models of these organs. Use the models of organs to explain their function to the class *(assemble the various organs into the male and female reproductive systems at the end of presentations and take pictures of these).* Prepare models of the organs for display at a science fair on 'Human Sexuality and Reproduction' at the end of the term.	analyse, research, create	of the different organs
Watch video: **https://www.youtube.com/watch?v=vXrQ_FhZmos** on the menstrual cycle as a part of the science project. Participate in a class discussion of the events of the menstrual cycle. In groups, create a chart/foldable/storyboard/digital story to illustrate the events of the menstrual cycle, including break down and shedding of the uterine lining. Write definitions in notebooks and on decorative banners for ovulation, fertilization and implantation. Prepare work, including banners for display at the science fair on 'Human Sexuality and Reproduction' at the end of the term. Answer questions based on the illustration *(ovulation, fertilisation, implantation)* below.  	• Collaborate • Define • Think Critically – create	• Accurate understanding of the order of events in the menstrual cycle • Chart/foldable/storyboard/digital story clearly depicts menstrual cycle, uterus and break-down of its lining • Banners attractive and satisfies other given criteria • Correct explanation of the processes of ovulation, fertilization and implantation
In groups, research and create an introduction for the science fair (include the purpose of science fair, topics covered, illustrations, models created etc.). As a group, prepare to deliver introduction on the day of the fair. Make entries in personal journals about the science fair.	• Collaborate • Communicate • Think Critically – research, create, reflect	• Introduction presented in an acceptable format and includes all necessary information about the fair
Level 3: Watch the video: **https://www.youtube.com/watch?v=CqmW9CL80q0** of the male and female reproductive systems as part of a science project. Analyse models and charts of the male and female reproductive systems. In groups, make annotated diagrams of the male and female reproductive systems to show the main organs and their functions and, the organs which produce hormones	• Collaborate • Explain • Annotate • Draw • Think Critically -	• Drawings accurately depict the organs of male and female reproductive systems • Accurate annotation of the drawings to show function of

Suggested Teaching and Learning Activities **Students will**:	**Key Skills**	**Assessment Criteria**
responsible for changes during puberty and adolescence. Prepare drawings for display at a science fair on 'Human Sexuality and Reproduction' at the end of the term.	analyse, research	organs • Correct hormones identified
Watch video: **https://www.youtube.com/watch?v=vXrQ_FhZmos** on the menstrual cycle as a part of science project. Participate in a class discussion of the events of the menstrual cycle. In groups, create a digital story on menstrual cycle hygiene and/or on male hygiene. Present digital stories to class. Prepare digital stories for display at the science fair on 'Human Sexuality and Reproduction' at the end of the term. Answer questions based on the illustration *(ovulation, fertilisation, implantation)* below.  	• Collaborate • Communicate • Think Critically – create, research	• Accurate understanding of the order of events in the menstrual cycle • Digital story clearly depicts menstrual cycle hygiene or male hygiene • Correct explanation of the processes of ovulation, fertilization and implantation
In groups, identify persons external to the class or school as invitees to make brief presentations on selected topics related to human sexual reproduction at the science fair. Research and construct invitation letters and thank you cards for the prospective invitees. Dispatch letters of invitation and present cards to invited guests at the end of the fair. Make entries in personal journals about the science fair.	• Collaborate • Communicate • Think Critically – research, create, organise, reflect	• Appropriate topics related to human sexuality and reproduction selected and relevant persons identified as presenters • Invitation letters and thank you cards satisfy given criteria

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Describe the structure and function of the male and female reproductive systems.
- ✓ Explain the phases of the menstrual cycle.
- ✓ Define the process of reproduction as involving ovulation, fertilization, implantation and development of the embryo.
- ✓ Work collaboratively with others effectively and communicate in group settings.
- ✓ Use the computer and internet to conduct research and create products.
- ✓ Plan and organise a school event to demonstrate their knowledge and understanding of sexual reproduction in humans.

Points to Note	**Extended Learning**
• The hormone oestrogen is produced by the ovaries. • Length of menstrual cycle varies among individuals and may be shorter or longer than the standard 28 days. This means that the days for the phases also vary. Following are the phases and the time frame for a 28 – day cycle: - Period (bleeding) – Day 1 - Repair of uterine lining: 6-13 days - Ovulation: 13-15 days – possibility of pregnancy occurring - Uterus walls thickens in preparation for a possible zygote: 15 -25 days - If no fertilization, uterus wall breaks down: 26-28 days - Day 1: Start of new cycle. • Main organs of the male reproductive system [testes, scrotum, epididymis, penis, prostate gland and seminal vesicle and urethra] and their functions; main organs of the female reproductive system [ovaries, uterus, cervix, vagina, fallopian tube, urethra]. • Students carry out the cited activities in this unit within the context of the project-based learning approach. The product at the end is the hosting of a science fair. • Ensure that students are given the responsibility to plan and organise this event under the guidance of their teachers and in collaboration with the students of grade 8 on APSE pathway II (and their teachers) who will also be studying aspects of reproduction in the last unit of term 2. These grade eight students are expected to display their work at the science fair and participate in aspects of its planning and organization.	• Research the diseases that affect the human reproductive systems – sexual transmitted diseases and their treatment and prevention. • Research how drugs affect pregnancy e.g. nicotine in cigarettes.

Resources	Key vocabulary
• Video on Puberty**: www.youtube.com/watch?v=TRyOcLSJDzk** • Models and charts of male and female reproductive systems • Computer • Internet • Multimedia projector • Speakers • CDs • Play dough (home-made play dough).	• Hormones • Reproductive Systems • Menstrual Cycle • Ovulation • Fertilization • Implantation • Embryo
Links to other subjects: Information Technology, Language Arts and Visual Arts	

UNITS OF WORK GRADE 9 TERM 2 UNIT 2.2: EMBRYO DEVELOPMENT

About the Unit

In this unit, students will, through project-based learning, use skills of gathering and interpreting information and synthesizing new understandings of the process of development of a human baby from a fertilized ovum, a zygote. They will acquire understanding of the roles of the uterine wall, placenta, amniotic sac, amniotic fluid and umbilical cord in this process of development. Students will investigate the various methods of preventing pregnancy and categorize these methods correctly as prevention of ovulation, prevention of implantation and prevention of fertilization. They will also identify and discuss advantages and disadvantages of surgical methods of birth control. Opportunities will also be provided for the students to plan and organise a science fair to showcase the work they produced as they explored the topic and to demonstrate their learning and collaborative skills.

Range of Content

The key concepts and knowledge students will learn in this unit are:

- Development of a fertilized, human ovum into a zygote and zygote into embryo.
- Role of the uterine wall, placenta, amniotic sac, amniotic fluid and umbilical cord in the development of the embryo into a foetus and then into a fully developed baby.
- Stages in the development of the foetus.
- The variety of ways by which birth control methods prevent pregnancy.

GUIDANCE FOR THE TEACHER

Provide guidance for students in the use of the internet for exploration of the various, relevant concepts and in the analysis and interpretation of the information. Students should communicate these understandings in a variety of ways through the use of concept maps, models, collages, drawings, flip charts, accordion charts and posters. Use multimedia projector and PowerPoint presentations to support students in building understandings of the importance of a healthy diet during pregnancy and provide for individual students' learning needs and styles in the presentation of content where applicable.

Prior Learning

Check that students can:

- Recall parts of the male and female reproductive system.
- Define sexual reproduction in humans.

UNITS OF WORK GRADE 9 TERM 2 UNIT 2. 2

UNIT 2.2: Embryo Development

Theme: Living Things and Life Processes

Attainment Target:

- Demonstrate an understanding of human body systems, their role and importance in life processes, health and well-being.

Topic: Pregnancy and Birth Control

Duration: 10 hours/4 weeks

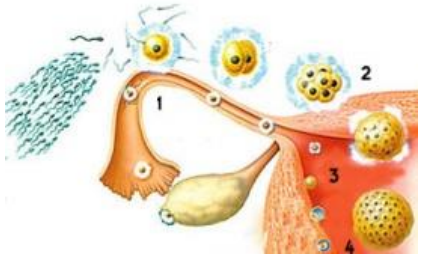
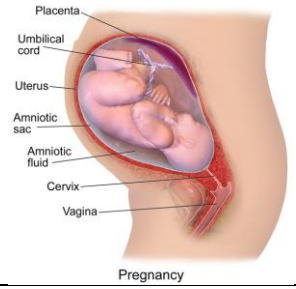
ICT Attainment Targets:

- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work efficiently with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

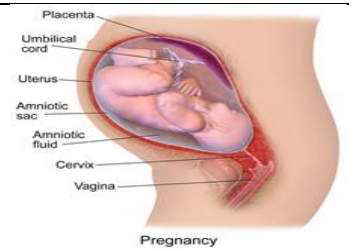
Objectives

Students will:

- Describe the development of a fertilized egg into an embryo.
- Identify the main structures of a pregnant uterus (placenta, amniotic sac, amniotic fluid, umbilical cord and uterine wall) and state their basic role in the development of the human embryo/foetus.
- Evaluate the methods of birth control in preventing pregnancy.
- Explain the importance of a balanced diet during pregnancy to ensure good health and well-being of mother and baby.
- Work collaboratively in groups.
- Respect the views of others.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Watch the videos: - **https://www.youtube.com/watch?v=vFfqLs94iHc;** - **https://www.youtube.com/watch?v=VmlcRqdDqH4;** About fertilisation, implantation and development of the embryo as part of the science project. View and discuss charts showing what happens when an egg is fertilised and the pregnant uterus.   Pregnancy	• Observe • Collaborate • Communicate • Think Critically – research, create, compare	
In small groups, prepare a scrap book with diagrams/pictures/illustrations showing the: • Pregnant uterus with the attached embryo. • Stages in the development of the embryo into a baby – with brief explanations of the role of the placenta, amniotic sac, amniotic fluid, umbilical cord and uterine wall in the development of the embryo. • Sequence of events in the birth process.		• Scrap book provides details of pregnancy and stages in the development of the embryo; • Provides clear, concise information in attractive ways, of the functions of the placenta, amniotic sac, amniotic fluid, umbilical cord and uterine wall
Research the methods of birth control, the types, how they work and their		• Posters/charts/PowerPoint

Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
advantages and disadvantages as strategies used to prevent ovulation, fertilization or implantation. Use posters, organ charts or PowerPoint presentations to report your findings/evaluations.		contains accurate information about birth control methods and their advantages and disadvantages
In groups, create a one-day diet sheet for a pregnant woman. Share diet sheet with class, giving reasons for their choice of meals.		• Diet sheet includes meals that are balanced and represent the six Caribbean food groups • Reasons support the importance of a balanced diet to ensure the healthy development of foetus, baby and in maintaining good health of mother
Prepare all relevant work completed in the unit display in the science fair on 'Human Sexuality and Reproduction' at the end of the term.		
Level 2 Students Watch the videos: - **https://www.youtube.com/watch?v=vFfqLs94iHc;** - **https://www.youtube.com/watch?v=VmlcRqdDqH4;** About fertilisation, implantation and development of the embryo as part of the science project. Create a three dimensional model of a human zygote and use it to explain to the class how it is formed. Observe a longitudinal section of a womb with a developing embryo and identify the uterine wall, placenta, amniotic sac, and umbilical cord.	• Observe • Collaborate • Communicate • Think Critically – research, create,	• Model is an accurate representation of the human zygote and explanation of its formation is correct

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
 Pregnancy	compare, evaluate, application	
Research and discuss the role of these parts in the development of the human embryo. Find suitable pictures and create a flow chart to show the embryo at different stages in its development to become a baby and the stages in the birth process. Prepare a power-point presentation to communicate to the class the different methods of birth control and their advantages and disadvantages as strategies used to prevent ovulation, fertilization and implantation.		• Accessed information is relevant and correct • Flow chart and PowerPoint presentation creative, interesting, accurately portray information about development of the human embryo; role of placenta, amniotic sac, amniotic fluid, umbilical cord and uterine wall; birth control methods and their advantages and disadvantages
In groups, create a three-day diet sheet for a pregnant woman. Share diet sheet with class, giving reasons for their choice of meals.		• Diet sheet includes meals that are balanced and represent the six Caribbean food groups; • Reasons support the importance of a balanced diet to ensure the healthy

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
		development of foetus, baby and in maintain good health of mother
Prepare all relevant work completed in the unit for display in the science fair on 'Human Sexuality and Reproduction' at the end of the term.		
Level 3: Watch the videos: - **https://www.youtube.com/watch?v=vFfqLs94iHc;** - **https://www.youtube.com/watch?v=VmlcRqdDqH4;** About fertilisation, implantation and development of the embryo as part of the science project. Develop and present a role-play of a nurse: - Using a model of the longitudinal section of the female reproductive system to explain to a group of young mothers the formation and process of implantation of the zygote. - Using a model of the longitudinal section of a womb with a developing embryo, to point out to the mothers the various parts of the womb – uterine wall, placenta, amniotic sac, amniotic fluid and umbilical cord and explain their roles in the development of the embryo.	• Observe • Collaborate • Communicate • Think Critically – research, create, compare, evaluate	• Role-play depicts correct information on the female reproductive system and provides correct explanation on the process of implantation; satisfies other given criteria
Create a flow chart to show the stages in the development of the human embryo into a baby. Write a newspaper article or internet blog to explain the need for birth control. In groups, prepare a poster to illustrate the methods of preventing ovulation, fertilization and implantation in birth control *(include an evaluation of the effectiveness of each method*). Present work to class.		• Flow chart provides details in the form of illustrations and annotations to bring out the stages of development of the human embryo and role of the placenta and other structures in this process • Information on birth control methods presented clearly in neat, attractive poster; provides information on advantages

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
		and disadvantages of these methods.
• In groups, create a one-week diet sheet for a pregnant woman. Share diet sheet with class, giving reasons for their choice of meals.		• Diet sheet includes meals that are balanced and represent the six Caribbean food groups; • Reasons support the importance of a balanced diet to the healthy development of foetus, baby and in maintaining good health of mother
• Prepare all relevant work created in the unit (*including role-play)* for display at the science fair on, 'Human Sexuality and Reproduction'.		

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Describe the development of a human baby from a zygote to a fully developed baby.
- ✓ Explain the role of the placenta, amniotic sac, amniotic fluid, umbilical cord and uterine wall in this process of development.
- ✓ Describe the various methods of birth control and state their advantages and disadvantages.
- ✓ Work collaboratively with others effectively and communicate in group settings.
- ✓ Use the computer and internet to conduct research and create products.
- ✓ Plan and organise a school event to demonstrate their knowledge and understanding of sexual reproduction in humans.

<table>
<tr><th>Points to Note</th><th>Extended Learning</th></tr>
<tr><td>
• Allow groups to share findings of their explorations and investigations with each other in inter-group and intra-group discussions.
• Collaborate with teachers of information technology and visual Arts for the preparation of information and encourage responsible use of the internet.
• Encourage students who are more able to scaffold less able students to achieve above their current levels of understandings.
1. Students carry out the cited activities in this unit within the context of the project-based learning approach. The product at the end is the hosting of a science fair.
2. Ensure that students are given the responsibility to plan and organise this event under the guidance of their teachers and in collaboration with the students of grade eight on APSE pathway II (and their teachers) who will also be studying aspects of reproduction in the last unit of term 2. These grade 8 students are expected to display their work at the science fair and participate in aspects of its planning and organization.
</td><td>
• Research and explain problems associated with teenage pregnancy and diet and pregnancy. Create a presentation on the topic and present it at the science fair.

OR

• Develop an advertisement to warn against teenage pregnancy. Present advertisement at the science fair.
</td></tr>
<tr><th>Resources</th><th>Key Vocabulary</th></tr>
<tr><td>
• Computer
• Internet
• Multimedia projector
• Speakers
• CDs
• Videos
• Home-made play dough for making models

Reference: Additional Videos -
• https://www.youtube.com/watch?v=_5OvgQW6FG4
• https://www.youtube.com/watch?v=h82ltr84_Yg
</td><td>
• Zygote
• Foetus
• Embryo
• Amniotic sac
• Amniotic fluid
• Placenta
• Uterine wall
• Pregnancy
• Birth Process
</td></tr>
<tr><td colspan="2">Links to other subjects: Visual arts, Language Arts, Information Technology</td></tr>
</table>

TERM 3

UNITS OF WORK GRADE 8 TERM 3 UNIT 1: ACIDS AND ALKALIS

About the Unit

In this Unit students will explore acids and alkalis through hands-on minds-on activities working safely in the laboratory in small groups to identify acidic and alkaline substances on the basis of their reactions with litmus paper and to differentiate between acids and alkalis on the basis of their different characteristics.

Range of Content

- Acids have a sour taste and turn blue litmus red.
- Alkalis are soluble bases, have a soapy feel and turn red litmus blue.
- During neutralization reactions, acids and bases completely react to form neutral solutions.
- Indicators (e.g. litmus and universal indicator) are substances which change colour in acids and alkalis.
- The pH scale measures the acidity and alkalinity of a substance and runs from 0 to 14 - with acids less than 7, alkalis greater than 7 and neutral solutions at 7.
- Neutralization reactions in daily life include using bicarbonate of soda toothpaste, antacids and baking power in cake making.

GUIDANCE FOR THE TEACHER

Proper laboratory safety procedures should be stressed at all times.

The tasting of all chemicals is prohibited, especially some household chemicals which can be corrosive.

Prior Learning

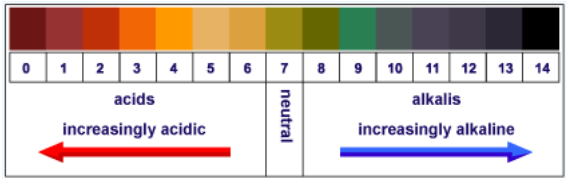
Check that students can:

- Recall how materials are classified.

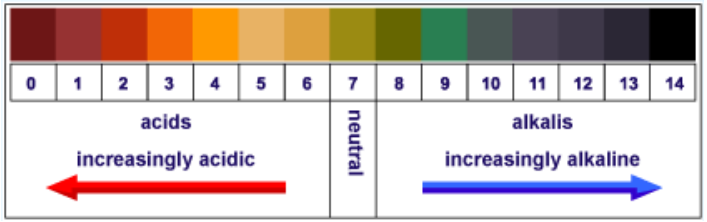
UNITS OF WORK GRADE 9 TERM 3 UNIT 3. 1

UNIT 3.1: Acids and Alkalis	
Theme: Energy and Matter	
Attainment Target: Understand the importance of energy in everyday life and classification	**Objectives:** **Students will:** • Investigate to identify characteristics of acids and alkalis; • Differentiate between acids and alkalis; • Define and give examples of acids and alkalis; • Classify substances as acids and alkalis using litmus paper and universal indicator; • Interpret the pH scale • Investigate household chemicals using acid-base indicators • Cite practical examples of neutralization in daily life • Base conclusions and suggestions on evidence • Show interest in the outcomes of experiments and investigations
Topic: Acids and Alkalis **Duration:** 10 hours/ 4 weeks **ICT Attainment Targets:** 💻 **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team. 💻 **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions. 💻 **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking. 💻 **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.	

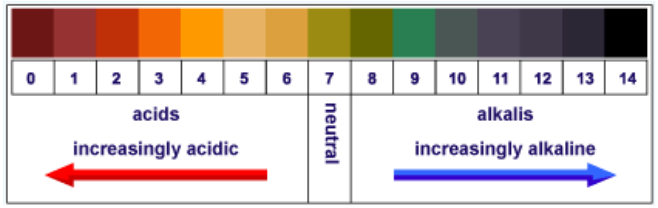
Suggested Teaching and Learning Activities **Students will:**	**Key Skills**	**Assessment Criteria**
Level 1: Students investigate an acid, to find out the characteristics which set acids apart from other liquids: - Taste a drop of vinegar. Record your observation; - Dip a piece of blue litmus paper into the vinegar. Record your observation; Examine your findings from your investigations with vinegar and state two main characteristics of acids. Use these findings to construct a definition for acids. Given a set of household substances – orange juice, lime juice, pepsi, milk, soap solution, tomato sauce, pineapple juice, grape juice, baking soda and sodium carbonate, test them using blue litmus to classify them as acidic and non-acidic.	• Investigate • Observe • Communicate • Manipulate • Record • Think Critically – analyse, infer, define operationally, draw conclusions	• Characteristics of acids correctly identified • Substances correctly grouped as acidic and non-acidic
Investigate to find out how an alkali will react with red litmus. Dip the red litmus into a solution of caustic soda and observe what happens. Record your observation; re-write the following and fill the blank: An alkali is a substance which changes the colour of litmus from ----- to ------. Test the following household substances using red litmus to find out which ones are bases: Bleach baking soda, baking powder, milk, ammonia, laundry detergent, sodium chloride, milk of magnesia.	• Investigate • Observe • Manipulate • Communicate • Record • Think Critically – analyse, infer, draw conclusions	• Accurate test for an alkali • Correct identification of alkalis
Find out what are other properties of alkalis and acids. Use the findings of these investigations to state the differences between an acid and an alkali.	• Communicate • Research • Think critically - compare	• Accurate identification of other properties of acids and alkalis • Correct comparison of these two substances

In groups, use universal indicator (pH paper and solution) to determine the pH of different household substances. Construct individual pH scales based on the pH of the household chemicals measured (write the name of the chemicals instead of the numbers on the scale). Represent findings on an enlarged diagram of the pH scale posted on whiteboard or any suitable display surface. Group household substances as acids or alkalis using the pH values obtained.	• Collaborate • Think Critically – analyse, draw conclusions, create, manipulate, communicate, make observations	• Correctly group substances based on pH scale • Accurate pH and colour changes noted • pH scale displayed and labelled appropriately
 Interpret the pH scale shown above; record your observations about the values assigned for acidity, alkalinity and neutrality; discuss in small groups and with the whole class. What is a neural substance? Give examples of neutral substances, How will these substances react with blue or pink litmus?	• Communicate • Collaborate • Think Critically - interpret, predict	• Correct identification of the values assigned to acidity, alkalinity and neutrality; • Accurate definition of a neutral substance
Observe and interpret the following and discuss the degree of acidity and alkalinity of the substances shown. The pH Scale 	• Observe • Communicate • Think Critically - interpret, draw conclusions	• Correct interpretation of the pH scale to accurately identify the degree of acidity and alkalinity of given substances;

In groups, conduct research on the application of neutralization reactions to everyday life (e.g. indigestion tablets, treatment of bee and wasp stings). Perform laboratory investigations of common neutralization reactions in the home (e.g. reacting baking powder and lemon juice). Report findings (using simple scientific language, drawings, labelled diagrams, bar charts or tables).	• Collaborate • Communicate • Investigate • Manipulate • Think Critically - analyse, infer, draw conclusions, make observations	• Accurate observations noted • Neutralization reactions identified • Suitable data presentation
Level 2: Students investigate vinegar, using the following hands-on activities to find out two characteristics of vinegar which set acids apart from other liquids: - Taste a drop of vinegar. Record your observation; - Dip a piece of blue litmus paper into the vinegar. Record your observation; Record observation and identify taste and reaction with litmus; use findings to construct a definition for acids. Given a set of household substances – orange juice, lime juice, pepsi, milk, soap solution, tomato sauce, pineapple juice, grape juice, baking soda and sodium carbonate, test them using blue litmus, to classify materials as acidic and non-acidic.	• Investigate • Observe • Communicate • Manipulate • Record • Think Critically – analyse, infer, define operationally, draw conclusions	• Accurate conclusion about the taste of vinegar and its reaction with blue litmus; • Correct definition of an acid in terms of its two characteristics observed. • Accurate use of the test for an acid to correctly identify acids;
Investigate to find out how an alkali will react with red litmus. Record observation; State the test for an alkali. Use the test to classify a set of given household substances as alkaline and non-alkaline: Bleach, baking soda, baking powder, milk, ammonia, laundry detergent, sodium chloride, milk of magnesia	• Investigate • Observe • Record • Think Critically – classify, infer	• Correct identification of the test for an alkali; • Accurate use of the test to identify a identify examples of an alkali;
Explore the internet to find out what are other properties of bases and acids. Use the findings of these investigations to state the differences between an acid and a base.	• Research • Communicate • Think Critically - compare	• Accurate comparison of acids and alkalis in terms of how they react with litmus

Use the chart below to explain the pH scale. Analyse and interpret the following pH scale.  Explain the range of values for acidity and alkalinity and demonstrate this using universal indicator on acids and alkalis of different strengths. Explain neutrality; discuss findings in small groups and with the whole class. Give examples of neutral substances, Predict and test how will these substances react with blue or pink litmus? Arrive at a conclusion.	• Communicate • Collaborate • Manipulate • Think Critically - analyse, interpret, predict, draw conclusions	• Accurate explanation of the pH scale in terms of its ranges of values for acidity and alkalinity; • Correct interpretation of the range of values and colour to differentiate acids and bases. • Correct prediction of how neutral substances react with litmus and universal indicator;
In groups, use universal indicator (pH paper and solution) to determine the pH of different household substances. Construct individual pH scales based on the pH of the household chemicals measured (write the name of the chemicals instead of the numbers on the scale). Represent findings on an enlarged diagram of the pH scale posted on whiteboard or any suitable display surface.	• Collaborate • Think Critically – analyse, draw conclusions, create, manipulate, communicate, make observations	• Accurate pH and colour changes noted • pH scale displayed and labelled appropriately
Observe and interpret the following and discuss the degree of acidity and alkalinity of the substances shown. What are neutral substances?  	• Observe • Communicate • Think Critically - interpret, draw conclusions	• Correct interpretation of the pH scale to accurately identify the degree of acidity and alkalinity of given substances;

In groups, conduct research on the application of neutralization reactions to everyday life (e.g. indigestion tablets, treatment of bee and wasp stings). Perform laboratory investigations of common neutralization reactions in the home (e.g. reacting baking powder and lemon juice). Report findings (using simple scientific language, drawings, labelled diagrams, bar charts or tables).	• Collaborate • Communicate • Investigate • Manipulate • Think Critically - analyse, infer, draw conclusions, make observations	• Accurate observations noted • Neutralization reactions identified • Suitable data presentation
Level 3: Students investigate vinegar using the following hands-on activities to find out the characteristics of acids: - Taste a drop of vinegar. Record your observation; - Dip a piece of blue litmus paper into the vinegar. Record your observation; Use the findings above to write a definition for an acid. What is the test for an acid? Given a set of household substances – orange juice, lime juice, pepsi, milk, soap solution, tomato sauce, pineapple juice, grape juice, baking soda and sodium carbonate, test them using blue litmus, to find out which ones are acidic.	• Investigate • Observe • Communicate • Manipulate • Record • Think Critically – analyse, infer, define operationally, draw conclusions	• Correct definition of an acid; • Conclusion about the test for an acid; • Effective application of the test to identify acidic substances from a number of household chemicals
Investigate to find out how an alkali will react with red litmus. Record your findings. What is the test for an alkali? How does an alkali differ from an acid? Test the following substances to identify alkalis: Bleach baking soda, baking powder, milk, ammonia, laundry detergent, sodium chloride, milk of magnesia	• Investigate • Observe • Record • Manipulate • Think Critically – analyse, infer	• Correct conclusion about the test for an alkali;
Use the electronic media to find out what are other properties of alkalis and acids. Use the findings of these investigations to state the differences between an acid and n alkali.	• Research • Think Critically - compare	• Correct differences between an acid and an alkali on the basis of litmus tests

In groups, use universal indicator (pH paper and solution) to determine the pH of different household substances. Construct individual pH scales based on the pH of the household chemicals measured (write the name of the chemicals instead of the numbers on the scale). Represent findings on an enlarged diagram of the pH scale posted on whiteboard or any suitable display surface.	• Collaborate • Think Critically – analyse, draw conclusions, create, manipulate, communicate, make observations	• Accurate pH and colour changes noted • pH scale displayed and labelled appropriately
Use electronic media to research the meaning and use of the pH scale. Discuss the use of the pH scale as a method of determining the degree of acidity or alkalinity of a substance (usually tested using a Universal indicator). Use the chart below to explain the pH scale; colours and values assigned to acidity and alkalinity and the different degrees of acidity and alkalinity.  	• Research • Communicate • Think Critically – analyse, interpret	• Meaning of pH scale clearly stated • Correct interpretation of chart to illustrate the pH scale
Identify the place on the scale where a neutral substance will fall. Identify examples of neutral substances. Predict how neutral substances will react with blue or pink litmus.	• Communicate • Think Critically - predict	• Accurate location of neutral substances on pH scale • Correct examples of neutral substances given • Accurate prediction of behaviour of neutral substances with litmus

Observe and interpret the following and discuss the degree of acidity and alkalinity of the substances shown.  	• Observe • Communicate • Think Critically - interpret	• Correct interpretation of the pH scale to accurately identify the degree of acidity and alkalinity of given substances;
In groups, conduct research on the application of neutralization reactions to everyday life (e.g. indigestion tablets, treatment of bee and wasp stings). Perform laboratory investigations of common neutralization reactions in the home (e.g. reacting baking powder and lemon juice). Report findings (using simple scientific language, drawings, labelled diagrams, bar charts or tables).	• Collaborate • Communicate • Investigate • Manipulate • Think Critically - analyse, infer, draw conclusions, make observations	• Accurate observations noted • Neutralization reactions identified • Suitable data presentation

Learning Outcomes

Students who demonstrate understanding can:

- ✓ Outline the differences between acids and alkalis;
- ✓ Use indicators to differentiate between acids and alkalis;
- ✓ Use the pH scale to determine the degree of acidity and alkalinity of given substances.
- ✓ Cite everyday examples of neutralization reactions
- ✓ Use word processing and presentation software to collaborate and communicate information

Points to Note	**Extended Learning**
• Observe safety precautions when using the sense of taste • Discuss with students the corrosive nature of some acids • Explain the need to work safely in the laboratory and to keep work areas clear and uncluttered	• Research to find out the importance of acids and alkalis in everyday situations • Research importance of pH in the food industry; manufacture of hair products and for swimming pools
Resources	**Key Vocabulary**
• Vinegar • Litmus Paper • Universal Indicator • Samples of alkaline and acidic household chemicals • Computer with internet access	• Acid • Bases • Alkali • Salt • Indicator • pH scale • Neutralization • Litmus • Universal Indicator.
Links to other subjects: Chemistry, Biology, Technical Vocational Education, English Language	

UNITS OF WORK GRADE 9 TERM 3 UNIT 2: CURRENT AND STATIC ELECTRICITY

About the Unit

In this Unit, students will develop an understanding of static electricity, and the mechanism by which it is produced, through hands-on investigations. They will explore useful applications as well as dangers associated with static electricity. They will learn to construct and diagrammatically represent electric circuits. Students will also explore materials used as conductors and insulators in real life situations.

Range of Content

- Objects can be positively charged, negatively charged or neutral (no charge).
- Static electricity exists when there is a build-up of one type of charge on an object; i.e. there is an imbalance of positive and negative charge
- Static electricity can be very dangerous. For example, it can cause lightning, it can ignite the flammable gases thus causing explosions, and it cause electric shock to living organisms. Static electricity can also be very useful. For example, it is used in photocopiers and laser printers.
- An electric current is the flow of electric charge.
- There are two types of circuits: series and parallel. A series circuit is one that has only one path through which the electricity flows. In a parallel circuit there are more than two or more paths for electricity to travel.
- Conductors are materials, e.g. metals, in which an electric current can flow freely. Insulators are materials, e.g. wood, that restrict the flow of an electric current.

GUIDANCE FOR THE TEACHER

Ensure that proper safety practices are followed in the use of electrical equipment and operation of electrical circuits.

Prior Learning
Check that students can:
- Identify electricity as a form of energy

UNITS OF WORK GRADE 9 TERM 3 UNIT 3. 2

UNIT 3.2: Static and Current Electricity

Theme: Energy and Matter

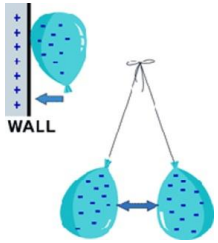
Attainment Target: Understand the importance of energy in our everyday life, and the need for grouping things

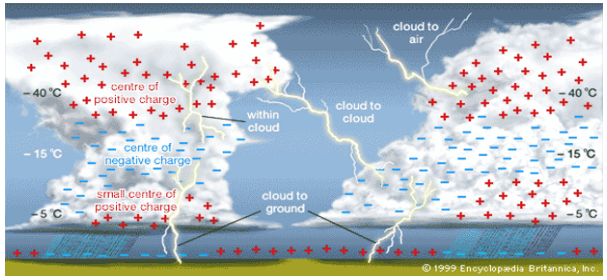
Sub Theme: Energy and Forces
Topic: Static and Current electricity
Duration: 12 Hours/ 5 weeks

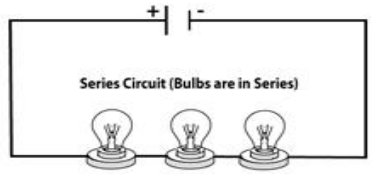
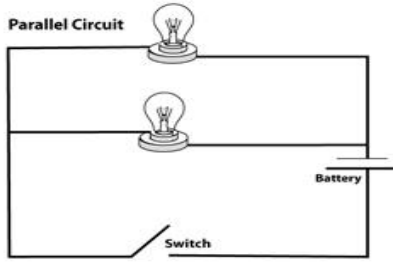
ICT Attainment Targets:

- **COMMUNICATION AND COLLABORATION -** Use technology to convey ideas and information clearly and effectively and, foster the ability to work effectively with others as a member of a team.
- **RESEARCH, CRITICAL THINKING AND DECISION-MAKING -** Use appropriate digital tools and resources to conduct research, aid in the understanding of given information, analyse findings of investigations, solve problems and make informed decisions.
- **DESIGNING AND PRODUCING -** Use computer technology to design and produce multimedia products to demonstrate creative thinking.
- **DIGITAL CITIZENSHIP -** Follow guidelines to promote the healthy use of information and communication technologies.

Objectives:
Students will:
- Investigate the production of static electricity
- Describe useful applications and hazards of static electricity
- Formulate a simple working definition for the term 'electric current'
- Classify materials/substances as insulators and conductors of electricity
- Construct simple circuits using lamps, insulated wires, dry cells, switches to distinguish between series and parallel circuit
- Conduct investigations with due regard for safety
- Work cooperatively in groups

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
Level 1: Explore the structure of various atoms in order to identify the electrons with their negative charges and protons with their positive charges. Watch a video on activities which illustrate static electricity and carefully observe the results of activities in the video. Make a model of any atom and use it to explain how the structure of the atom is related to static electricity. Recall and explain past relevant experiences with static electricity, if any.	• Observe • Communicate • Manipulate • Think Critically – analyse, infer, synthesize, apply	• Model correctly depicts structure of the atom
Working in small groups, and guided by the teacher, use all of this information given here to figure out how to explain the results of the activities which you observed in the video. How is the phenomenon of static electricity being demonstrated? Now participate in the following circus of activities that could provide experience in real ways, the phenomenon of unbalanced charges in materials, called static electricity. Explain and demonstrate how materials become positively and negatively charged and so give rise to the phenomenon of static electricity.  	• Collaborate • Investigate • Manipulate • Think Critically – analyse, infer, draw conclusions	• Accurate explanation of static electricity as accumulation of stationary charges on an object due to loss or gain of electrons when materials are rubbed together
Blow up a balloon and tie it. Rub it vigorously with woollen cloth or rub it against your hair several times, press it against the wall. Record your observation. Open the tap so that the water runs slowly. Carefully move the balloon closer to the stream of water. Observe what happens. Use the balloon to pick up bits of tissue paper; hold the balloon closely against a soda can and observe what	• Communicate • Observe • Manipulate • Record • Report • Investigate	• Accurate record of observations. • Suggestions logical and make reference to charges.

happens to the can. 	• Think Critically – analyse, draw conclusions	
Blow up another balloon and tie it in the same way as the first. Again rub both balloons vigorously in your hair or against a woollen cloth, bring the two balloons close together and observe what happens. Explain how all of these activities demonstrate static electricity.	• Communicate • Observe • Manipulate • Record • Report • Investigate • Think Critically – analyse, draw conclusions	• Accurate record of observations. • Suggestions logical and make reference to charges.
Research and report on (oral or written): - some useful applications of static electricity; - some possible hazards of static electricity.	• Research • Report • Record • Interpret	• Report reflects accurate knowledge of hazards and uses that can be applied
Current Electricity Derive a definition for current electricity; through discussion.  Carefully observe the above picture of two rain clouds. Notice the	• Observe • Communicate • Manipulate • Investigate • Think Critically – analyse, infer, draw conclusions, operationally define, compare, evaluate	• Workable definition of current electricity • Correct comparisons made between static and current electricity • Function of switches correctly determined • Constructed circuit works

static electricity within the clouds, formed as a result of the clouds rubbing against air masses within them. In this way the two clouds become charged. Notice also static electricity on the earth. Observe lightning occurring between the two clouds and between the clouds and the earth. Lightning is an example of current electricity. From this illustration, how would you define current electricity? What is the difference between current electricity and static electricity? Be led to define a circuit as the path through which electrons travel in current electricity. Construct these circuits using the following set of given materials: A battery, 4 flashlight bulbs, electric wire and a switch. Investigate different ways of connecting these materials in order to make the bulb light up. Discuss what you have learnt from this experience. What is the importance of having a switch in the circuit? Try to form a Parallel circuit and a series circuit according to the diagrams below:   • What have you found out about the difference between series and parallel circuits? • What is the advantage of having parallel circuits in the home instead of series circuits?		• Plausible explanation for use of parallel circuits
In groups investigate which material (paper, foil, cloth, aluminium, plastic, glass, water, salt water, etc.) will allow a lamp to light when used to complete a circuit. Observe and record result of the	• Investigate • Manipulate • Observe	• Differences between conductors and

investigation in a variety of ways. Present findings to class **using a multimedia presentation**. Participate in teacher led discussion to deduce that some materials allow electric current to flow while others do not (*here, teacher should introduce the terms conductors and insulators as relating to electrical conductivity*)	• Record • Think Critically • Classify • Draw Diagrams • Collaborate • Communicate	insulators correctly stated • Materials correctly classified as conductors and insulators
Level 2: Review the structure of an atom by watching a video. Review the sub atomic particles and their respective charges (Protons – positive, and electrons – negative and neutrons – no charge). In groups, build a model of an oxygen atom and use it to show the electrons with their negative charges, particularly those in the outer shell. Use information from the video to explain why the oxygen atom has no charge and how it can eventually become charged. Identify examples of static electricity from familiar, everyday situations. Watch a video on activities which illustrate static electricity. Carefully observe the results of these activities. Explain how these activities demonstrate static electricity; relate static electricity to the structure of atoms, particularly the nature of electrons and protons. Demonstrate static electricity using a plastic comb. Rub the comb into your hair. Use it to pick up bits of paper. Explain the results of this activity. 	• Collaborate • Observe • Infer • Manipulate • Investigate • Communicate • Think Critically – analyse, infer, interpret, apply	• Model correctly depicts structure of the atom • Logical explanations of static electricity, using evidence from video and from investigations;

Blow up a balloon and tie it off. Rub it several times across their hair and then press it against a wall. Record what happens. Leave the balloon in place for a while. Record how long it stays when left undisturbed. Suggest reasons for observations and share explanations with class.	• Communicate • Observe • Manipulate • Record • Report • Investigate • Think Critically	• Accurate record of observations. • Suggestions logical and make reference to charges
Research lightning and ways of reducing the dangers of lightning strikes. Create a poster/video etc. giving tips on safety practices that reduce the possibility of being struck by lightning.	• Research • Communicate • Create	• Creative poster/ video contains accurate information
Current Electricity: Explain how the following demonstrates current electricity.  In a teacher led class discussion, review the phenomenon of lightning (*Teacher should emphasize that a lightning strike is the movement of electric charges*). With the aid of the teacher, derive a definition for an electric current (*the movement of charges*). Differentiate between current and static electricity. Find out what is an electric circuit and list the components of an electric circuit**.**	• Communicate • Record • Think Critically – compare, operationally define	• Logical explanations of current electricity, using evidence from demonstration • Correct comparison of current and static electricity • Accurate and complete list of the components of an electric circuit.
In groups, given each a box containing a D-cell battery, two 12-cm insulated wires, and a bulb, explore how the bulb can be made to light. Draw the setup used in their science notebook/journal. Share setup with class by drawing it on the board. Participate in teacher led discussion to deduce the reason for the lamp lighting. Create a definition for the term circuit and discuss the connection between current and circuit.	• Manipulate • Think Critically, investigate, draw diagrams, collaborate, communicate	• The bulb is made to light. • Evidence of group collaboration

Brainstorm to identify switches as a means of controlling the flow of current in a circuit. Observe as teacher demonstrates how a switch is attached in a circuit. In groups, create simple circuits with switches. Demonstrate to class how the switch works in the circuit **and/or watch video tutorials on switches and circuits.** In groups, identify various devices/situations in which switches are involved in circuits. In class discussion identify/describe the use of switches in everyday electronic equipment.	• Observe • Manipulate • Investigate • Collaborate • Communicate • **Navigate and manipulate digital content**	• Switch correctly attached in circuit. • Switches used in everyday electronic devices correctly identified/described.
In groups investigate which material (paper, foil, cloth, aluminium, plastic, glass, water, salt water, etc.) will allow a lamp to light when used to complete a circuit. Observe and record result of the investigation in a variety of ways. Classify the materials as conductors or insulators. Construct working definitions for conductors and insulators.	• Investigate • Manipulate • Observe • Record • Think Critically – analyse, infer, draw conclusions, classify, operationally define	• Materials correctly classified as conductors and insulators • Acceptable working definitions of electrical insulators and conductors;
Be given a D-cell battery, four 12-cm insulated wires, and two bulbs, explore different ways in which both bulbs can be made light and draw the arrangements, **using digital drawing tool**. Identify the arrangement in which one lamp will not light when the other is removed. Identify the arrangement in which one lamp will remain lit when the other is removed. In groups discuss and outline the physical differences between circuits, record and share with class (. (*Here, teacher should introduce the terms series circuit – single pathway, and parallel circuit – multiple pathways.*). Explore the implications for use of these circuits in the home	• Investigate • Manipulate • Collaborate • Communicate • **Create digital drawings**	• Series arrangement constructed. • Parallel arrangement constructed. • Differences between series and parallel arrangements identified • Plausible explanations of implications for use;
Level 3: Review the structure of an atom by watching a video. Working in small groups, build a model of an oxygen atom and use it to show the electrons with their negative charges, particularly those in the outer shell. Use information from the video to explain why the oxygen atom has no charge and how it can eventually become charged. Watch a video on static electricity. Observe activities which illustrate	• Collaborate • Observe • Infer • Manipulate • Investigate • Communicate • Think Critically – analyse, infer, interpret,	• Model correctly depicts structure of the atom. • Logical explanations of static electricity, using evidence from video and from investigations • Accurate comparisons between current and

static electricity; understand stationary charges. Investigate and communicate how static electricity (stationary charges) is produced in materials, particularly in rain clouds to give rise to current electricity as in lightning. Use this understanding to define current electricity and to differentiate between current and static electricity.	apply	static electricity
Explore electrical circuits in ways to allow for a definition of an electrical circuit; insulators and conductors. In groups, given a set of materials, construct series and parallel circuits and explain the differences between these as well as the advantages and disadvantages in their use in homes. Investigate to identify insulators and conductors of electricity and classify materials as insulators and conductors.	• Investigate • Manipulate • Observe • Create • Communicate • Collaborate • Think Critically - analyse, interpret, apply, infer, classify	• Series and parallel circuits correctly differentiated • Correct construction of electrical circuits • Correct classification of materials as insulators and conductors of electricity.
As a class discuss the need for safety devices to protect humans and appliances from electrical hazards. In groups view safety devices, or online/offline videos of safety devices used to prevent/mitigate electrical hazards (e.g. fuses, insulated wires, three pin plugs and circuit breakers). Collect pictures or video these devices in use. Present information to the class in a variety of ways.	• Communicate • Investigate • Manipulate • Research • Collaborate • Think Critically	• Presentation contains correct information on safety devices.

Learning Outcomes

Students who demonstrate understanding can

- ✓ Investigate different ways of producing static electricity
- ✓ Cite useful applications and hazards of static electricity
- ✓ Differentiate between static and current electricity;
- ✓ Classify materials as insulators and conductors;
- ✓ Investigate parallel and series circuits and the use of these in the home.
- ✓ Manipulate digital content from a variety technological devices

Points to Note	**Extended Learning**
• Static electricity should be explained in terms of stationary charges useful application include: photocopier, dust extraction, painting car, crop spraying • Apply this concept to explain how clouds can become charged during a thunderstorm and how lightning results from charged clouds; • Teacher should guide students in the construction of the series and parallel circuit. The differences between both series and parallel circuit connections in terms of current flow and pathway (series- all the current flows in the one path, parallel- current splits between the various paths)	• Research animals that generate static electricity (e.g. Electric Eel, Electric Ray). • Identify applications of series and parallel circuits in the home (e.g. Christmas lights, house wiring) • Identify and list safety devices and hazards in the home and suggest ways in which you can make your home safer. • Highlight the dangers involved in the practice of illegal electrical connections

Resources		**Key Vocabulary**	
• Video on atomic structure: **www.youtube.com/watch?v=R1RMV5qhwyE**. Nov 19, 2012 - Uploaded by make me genius • Video on static electricity: **www.youtube.com/watch?v=-w-GoSJpvdw** • Materials to build model of atom – wire and Styrofoam balls • Materials that are conductors and non-conductors	• Electric wire • Switch • Comb • Plastic object • Paper • Computer with internet access • Bulb • Balloons • Woollen rag	• Current Electricity • Electric Current • Static Electricity • Lightning • Charge • Electron	• Proton • Atom • Insulator • Conductor • Series and Parallel Circuits

Links to other subjects: Physics and English Language, Technical and Vocational Education

Glossary of Science Terms

Analyse	to examine in order to explain and interpret data.
Annotated diagram	a labelled scientific drawing with brief notes within the diagram.
Annotate	to supply additional information to further explain elements in a diagram.
Assess	to evaluate or make judgements to determine value or importance.
Classify	to use observable characteristics to form groups
Compare	to state similarities and differences between two or more items
Conclusion	findings obtained through experimenting or research.
Constraints	conditions that limit or restrict.
Construct	to make or draw using data or material provided
Control	the variable that is not changed during the investigation
Criteria	pre-determined principles used to make decisions or judgements.
Deduce	use information presented to reach a conclusion
Engineering Design Process	a problem solving method that consists of a series of steps used to design a product to meet certain criteria.
Evaluate	to make judgements based on analysis.
Evidence	data obtained during an investigation.
Fair test	a scientific investigation in which one variable is changed while all other variables remain the same.
Formulate Findings	to develop a plan or strategy. the results of a scientific investigation
Hypothesis	a part of the Scientific method in which a proposed explanation is given for an observed phenomenon. It is also a testable answer to a scientific question.
Identify	name or point out specific features or structures.
Illustrate	explain using examples or diagrams.
Infer	make deductions based on observations.
Inferences	a conclusion that is based on observation and reasoning.
Investigate	to use a systematic inquiry to find answers.
Investigation	the process of research and experimentation to find answers.
Justify	provide reasons or an acceptable explanation of a phenomenon.
KWL approach/ chart	determines what I **K**now, what I **W**ant to learn and what I did **L**earn.
Laboratory report	a record of the steps in an experiment.

Manipulate	a scientific process skill that describes handling and control of scientific apparatus.
Manipulating variable	the independent variable in an investigation that is changed by the scientist.
Model	a 3-D representation of an object done on a smaller scale.
Observe	to gather information in a scientific investigation through all the senses.
Observations	information obtained through the use of all senses
Operationally define	use a given scenario (what is observed or measured) to derive the meaning of a term.
Plot	to mark a point on a chart or graph to show the relationship between two variables.
Predict	suggest a possible outcome based on information given
Problem statement	the statement that outlines the problem to be investigated.
Prototype	a small-scale model or example of the object to be built.
Prove	to show using evidence or arguments.
Responding variable	the dependent variable in an investigation that responds to changes and is measured or observed.
Scientific drawings	line drawings done in pencil with no shading
Scientific method	a series of steps used to answer questions through observation, formulating and testing hypotheses and drawing conclusions.
Suggest	to offer an explanation for observations
Test	to find out by investigating
Variable	a factor or condition that can be changed or manipulated in an experiment.

REFERENCES Online Biology Dictionary - © Macroevolution.net" "The Biology Place — Classic Edition © Pearson Education, Inc. Caribbean Examinations Council, Caribbean Secondary Education Certificate, Chemistry Syllabus Glossary, 2013. filestore.aqa.org.uk/subjects/AQA-GCSE-Science-Glossary.pdf (Retrieved November 16, 2017) filestore.aqa.org.uk/subjects/AQA-GCSE-Science-Command-Words.pdf (Retrieved November 16, 2017)

SUBJECT: Science

GRADE: 8

DATE: October 2018

DURATION: 2 x 60 minutes

TOPIC: Unit: Weather and Climate
Sub-topic: Effects of Climate Change

ATTAINMENT TARGET:

- Understand the scientific process and the impact of air and water on the environment and on our everyday life
- Gain an understanding of and apply aspects of the engineering design process
- Demonstrate positive interpersonal skills in order to foster good working relationships

BENCHMARKS:

- Be aware of some environmental problems and how to mitigate against them
- Display curiosity, objectivity and perseverance in their approach to activities

LEARNING OBJECTIVES:

- Define climate change
- Identify some effects of climate change
- Suggest how human activities contribute to climate change
- Use a model of a greenhouse to explain global warming
- Value individual effort and team work through 'hands-on' activities
- Handle the materials safely

KEY SKILLS: **C**ollaborate, communicate, create, investigate, predict, analyse

KEY VOCABULARY: climate change, global warming, carbon dioxide, reduce, reuse and recycle

MATERIALS/RESOURCES:
Videos, pictures, textbooks, plastic bags, cardboard, markers, cartridge paper, flip charts, fudge sticks, plastic bottles, glue, tape, scissors

CONTENT OUTLINE:

Human activities can affect the environment positively and negatively. One example of a negative impact is Climate Change, which refers to a change in Earth's overall average weather. An increase in the average temperature of the Earth's atmosphere has led to harsher weather conditions such as increased droughts, flooding, hurricanes and distortion of natural habitats. Through principles of conservation, recycling and reuse some of these effects can be reduced. An increase in carbon dioxide levels (from burning fossil fuels) is mainly responsible for the rise in global warming.

PRIOR LEARNING: Check that students can

- Identify human activities that affect the environment
- Relate increase in average atmospheric temperatures to global warming

LEARNING OUTCOME: Students who demonstrate understanding can:

- Identify effects of climate change
- Show the relationship between human activities and climate change
- Show good stewardship in their efforts to preserve the environment

ASSESSMENT CRITERIA:

- Workable definition of climate change
- Creative presentations/ reports with accurate information about the effects of climate change and the relationship between human activities and climate change
- Green House models how global warming is caused
- Awareness campaign contains correct concepts, is creative and original
- Environmental project focuses on issues in their immediate environs and details the expected benefits to the environment.

PROCEDURES/ACTIVITIES

Engage - *How can I get students interested in this?* Use of an interesting picture. (8 min)

- Students will be shown some images of the Earth and asked to discuss what the images represent.

- Students will then complete a pre-assessment quiz on Climate Change (effects, causes and ways to reduce its impact). *Use pictures or an incomplete organizer for students with learning challenges*.
- *Teacher will use the results to form mixed ability groups with the students and give instructions to carry out the next activity.*

Explore - *What tasks/questions can I offer to help students puzzle through this?* Use of a simple investigation. (10 min)

- Students will view a video on global warming/ Climate Change (https://youtu.be/0F3QPY83NZQ or https://www.youtube.com/watch?v=ld2maUitnTg). OR View pictures depicting effects of climate change.
- In groups, students will formulate a simple definition of climate change and compare to teacher's definition. Students will use the videos to answer the following questions:
  1. What is climate change?
  2. Identify some effects of climate change on the environment?
  3. What are the factors (human activities) that are thought to cause climate change?

  Students will then identify Climate Change effects from pictures.
  Learning disabled: Use a word bank with pictures of the different climate change effects
  Teacher observes groups and offer guidance where needed.

Explain - *How can I help students make sense of their observations?* Class presentation and discussions. (15 min)

- Students will present what they understand about the causes and effects of climate change using an activity from the Think-Tac-Toe chart shown below.

Create a flyer about the effects of Climate Change	Write and act out a skit to explain why Climate Change is harmful to you	Write lyrics and perform a song about the effects of Climate Change
Write a letter to your MP telling what you've learned about the effects of Climate Change	Take or draw pictures of 3 things you find that cause Climate Change. Write a sentence about how it causes	Write a paragraph about what you think is the leading cause of Climate Change
Create a crossword puzzle to include all the vocabulary you've learned about	Create a picture book to show different habitats affected by Climate Change	Create a poem to explain the effects of Climate Change

- Students and teacher will assess the presentations given. Students will also explain their creations and designs.
- *Delayed Readers*: Display words/ terms used on Climate Change on cards and have students decode with multiple syllables
- *Teacher notes information presented by students on the board and offers clarifications of any misconceptions held and provides additional information to students.*

Elaborate - *How can my students apply their new knowledge to other situations?* Application of what they learned. (17 min)

- In groups, students will suggest how humans can help to reduce the effects of Climate Change through different activities (e.g. Awareness campaign) OR design a model of a Green House to explain Global Warming using a teacher-prepared rubric as a guide.
- *Delayed Readers*: Students will construct sentences with the decoded words

  Teacher offers guidance to the groups and directs them to follow the rubric given.

Evaluate - *How can I help my students self-evaluate and reflect on the teaching and learning, and how can I evaluate the students learning of concepts and skills.* Assessment (10 min)

1. Students will complete the Pre-assessment activity sheet to ascertain prior knowledge and understanding of the topic 'Climate Change'. *Interviews can be used with delayed readers.*
2. Students will present their Campaigns and explain their Greenhouse designs to the rest of the class for peer-evaluation using a teacher-prepared rubric.
   OR *Learning disabled students: Have a teacher-prepared graphic organizer/concept map for students to complete*

3. An Exit Card with the question, “Show what you understand by climate change?” will be given to each student at the end of class. *Students can write, draw or present orally*.

4. A checklist will be used over several weeks to assess students’ skills/commitment in recycling/ reusing or separation of solid waste initiatives.

EXTENDED LEARNING: As a class, students will design an environmental project to care for their immediate school environment such as the reuse/ recycling of plastics or separation of solid waste on school compound.

LINKS TO OTHER SUBJECTS:

- Geography, Social Studies, Language Arts

POST-LESSON REFLECTION:

_____

_____

_____

_____

The 5Es Overview: "The 5E Learning Cycle"

What is a 5E Learning Cycle?

This model describes an approach for facilitating learning that can be used for entire programmes, specific units and individual lessons. The NSC supports the 5E constructivist learning cycle, as it places emphasis on the processes that may be used to help students to be personally involved in the learning situation as they are guided to build their own understandings from experiences and new ideas.

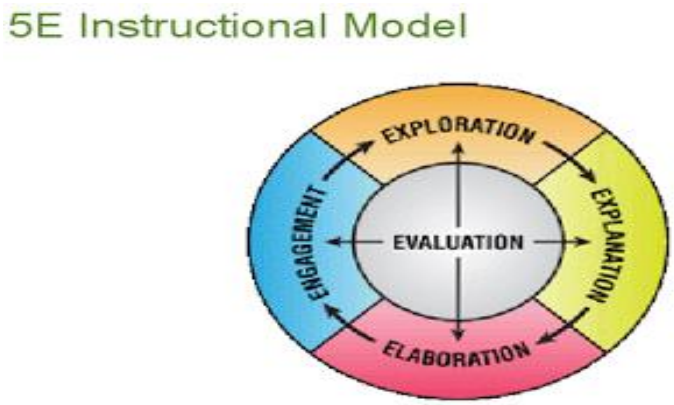


Figure 1. Illustrating one version of the 5E model that conveys the role of evaluation as an interconnecting process that is at the core of the learning experience.

Figure 2, illustrating a cyclical perspective of the model with each process being given similar emphasis in contributing to the learning experience on a whole

EXPLANATION OF THE INSTRUCTIONAL MODEL

What are the 5Es?

The 5Es represent five key interrelated processes that provide the kind of learning experiences for learners to experience the curriculum or planned learning episodes: **Engage, Explore, Explain, Extend** (or **Elaborate**), and **Evaluate.**

ENGAGE: The purpose of the ENGAGEMENT dimension is to help students to be ready intellectually, socially, emotionally etc. for the session. Attention is given to the students' interests and to getting them personally involved in the lesson, while pre-assessing prior understandings, attitudes and/or skills. During the experience, students first encounter and identify the instructional task and their roles and responsibilities. During the **ENGAGEMENT activity**, students make connections between past and present learning experiences, setting the organizational groundwork for upcoming activities. The engagement activity may be used to (a) help student unearth prior knowledge (b) arouse their curiosity (c) encourage students to ask questions as a sign that they have wonderments or are puzzled.

EXPLORE: The purpose of the EXPLORATION dimension is to get students involved in solving a real problem that is based on a selected context. EXPLORATION provides them with a chance to build their own understanding of the phenomenon being investigated and the attitude and skills involved for arriving at a workable solution. In **exploring** the students have the opportunity to get directly involved with the phenomenon and materials. As they work together in learning teams or independently, the need to share and communicate becomes necessary from the experiences. The teacher functions as a facilitator, providing materials, guarding against obstacles to learning and guiding the students to operate based on agreements. The students become inquirers and co-owners of the learning process. In exploring, they also ask questions, formulate hypothesis, search for answers or information/data, reflect with others, test their own predictions and draw conclusions.

EXPLAIN: The purpose of the **EXPLANATORY dimension** is to provide students with an opportunity to assess their thinking and to use intellectual standards as critical thinkers to communicate their perspectives and/or the meaning of the experiences. They rely on communication tools and their skills as Language users to: (a) organize their thoughts so that they are clear, relevant, significant, fair, accurate etc. (b) validate or affirm others (c) self-motivate. Reflection also occurs during the process and may cause students to adjust their perspective or justify their claims and summarise the lessons being learned. Providing explanations contributes to vocabulary building and self-corrective actions to deal with misconceptions that they become aware of from feedback of their peers and/or their facilitator.

EXTEND: The purpose of this dimension is to allow students to use their new knowledge and continue to explore its significance and implications. Students work independently or with others to expand on the concepts and principles they have learned, make connections to other related concepts and principles within and/or across disciplines, and apply their understandings in new ways to unfamiliar situations.

EVALUATE: The purpose of the EVALUATION dimension is for both students and facilitator to determine progress being made or the extent to which learning has taken place based on the stated objectives or emergent objectives. EVALUATION is treated primarily as an on-going diagnostic and developmental process that allows the learner to become aware of gaps to be treated and progress made from their efforts to acquire the competencies that were the focus of the session. Examples of competencies include understanding of concepts, principles and processes and demonstrating various skills. Evaluation and assessment can occur at different points during the learning episode. Some of the tools that assist in this diagnostic and formative process include rubrics, teacher observation log, self-inventories, peer critique, student interviews, reflective presentations, displays/expositions, portfolios, performances, project and problem-based learning products. Analysis of reflections, video recordings are useful in helping students to determine the depth of their thinking and understanding and the objectives they have or have not achieved.

Who developed the 5E model?

The Biological Science Curriculum Study (BSCS), a team led by Principal Investigator Roger Bybee, developed the instructional model for constructivism, called the "Five Es".

The Link between the 5E model and Types of Learning Activities

The five (5) types of Learning Activities purported by Yelon (1996) can be integrated with the 5E's so as to enrich the teaching and learning process. He noted that every instructional plan should include the following learning activities

1. Motivation Activities: Intended to help learners to be ready for the session
2. Orientation Activities: Inform students of their roles and responsibilities based the purpose or objectives of a learning episode.
3. Information Activities: Allow students to manipulate current knowledge, access/retrieve and generate new ideas
4. Application Activities: Allow for the use of knowledge and skills in novel situations

5. Evaluation Activities: Allow for reflection, corrective actions and sourcing of evidence to confirm/refute claims about learning.

These activities can be planned to serve one of the purposes of each dimension of the 5E model. For example, ENGAGEMENT may be comprised a Motivation Activity and an Orientation Activity. EXPLORATION and EXPLANATION require an Information Activity, while EXTEND requires an Application Activity. EVALUATION requires the kind of activity that will contribute to the collection of data for assessing and arriving at a conclusion about performance based on stated or expected purpose for which learning is being facilitated.

References

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