

**NATIONAL STANDARDS CURRICULUM**  
**GRADE 8 INTEGRATED SCIENCE**

	<b>GRADES 7-9 SCOPE AND SEQUENCE</b>		
	<b>TERM 1</b>	<b>TERM 2</b>	<b>TERM 3</b>
<b>GRADE 7</b>	<ul style="list-style-type: none"> <li>• Working Like a Scientist 1</li> <li>• Matter</li> <li>• Cells &amp; Organisms</li> </ul>	<ul style="list-style-type: none"> <li>• Energy</li> <li>• Plant Reproduction</li> <li>• Sexual Maturity, Reproduction and Personal Hygiene</li> </ul>	<ul style="list-style-type: none"> <li>• Sexually Transmitted Infections and Drugs</li> <li>• Climate Change</li> </ul>
<b>GRADE 8</b>	<ul style="list-style-type: none"> <li>• Working Like a Scientist 2</li> <li>• Photosynthesis and Energy Relationships</li> <li>• More about Matter</li> </ul>	<ul style="list-style-type: none"> <li>• Human Nutrition</li> <li>• Physical and Chemical Changes</li> <li>• Forces &amp; Motion</li> </ul>	<ul style="list-style-type: none"> <li>• Respiration &amp; Gas exchange</li> <li>• Space science</li> <li>• Water and the Earth's atmosphere</li> </ul>
<b>GRADE 9</b>	<ul style="list-style-type: none"> <li>• Working Like a Scientist 3</li> <li>• Transport in Humans &amp; Plants</li> </ul>	<ul style="list-style-type: none"> <li>• Electricity and Magnetism</li> <li>• Chemical Bonding, Formulae and Equations</li> </ul>	<ul style="list-style-type: none"> <li>• Sensitivity and Coordination</li> <li>• Acids and Alkalis</li> <li>• Sexual reproduction and birth Control</li> </ul>

**UNITS OF WORK GRADE 8 TERM 1 UNIT 1: WORKING LIKE A SCIENTIST 2****About the Unit**

In this unit students will, through hands-on activities, learn how to represent experimental data in pie charts. They will identify and classify experimental variables. They will learn how to analyse and interpret data in order to arrive at meaningful conclusions. They will also learn how to annotate drawings.

**Range of Content**

- The construction of pie charts to present data;
- The classification of variables;
- The analysis and interpretation of experimental data;
- The annotation of drawings

**Guidance for the Teacher**

**Prior Learning**

Check that students can:

- Construct tables, bar graphs and line graphs to required standards
- Make labelled drawings/diagrams to required standards

**UNIT TITLE:** Working like a scientist 2

**Theme:** Science Exploration, Application and Design Practice

**Attainment Target(s)**

- Apply scientific knowledge and processes to the solution of real world problems.
- Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.
- Appreciate the influence and limitations of science with consideration for ethical issues.
- Demonstrate a positive attitude towards the use of scientific language.
- Demonstrate positive interpersonal skills in order to foster good working relationships.

**Benchmark(s):**

- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate

**Objectives**

Students will:

- Construct pie charts using findings from observations /data
- Classify variables as dependent, independent and control
- Analyse and interpret displayed data
- Annotate drawings
- Show honesty in sharing findings from investigations
- Demonstrate persistence in collecting and analysing data

<p>observations and explanations.</p> <ul style="list-style-type: none"> <li>• Demonstrate concern for safety of self and others.</li> <li>• Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.</li> <li>• Demonstrate sensitivity to others who are different.</li> </ul> <p><b>Topic:</b> Data Presentation and Analysis</p> <p><b>Duration:</b> hours</p> <ul style="list-style-type: none"> <li>🖥️ <b>COMMUNICATION AND COLLABORATION</b> - Students use technology to communicate ideas and information, and work collaboratively to support individual needs and contribute to the learning of others.</li> <li>🖥️ <b>RESEARCH, CRITICAL THINKING AND DECISION MAKING</b>- Students use digital tools to design and develop creative products to demonstrate their learning and understanding of basic technology operations.</li> <li>🖥️ <b>DESIGNING AND PRODUCING</b> – Students use appropriate digital tools and resources to plan and conduct research, aid critical thinking, manage projects, solve problems and make informed decisions.</li> <li>🖥️ <b>DIGITAL CITIZENSHIP</b> - Students recognise the human, ethical, social, cultural and legal issues and implications surrounding the use of technology and practice online safety and ethical behaviour.</li> </ul>	
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<b>Suggested Teaching and Learning Activities</b> <b>Students will:</b>	<b>Key Skills</b>	<b>Assessment</b>
As recap, use experimental data provided by the teacher to create a table, a line graph and a bar graph. As a class, review when it is most appropriate to use bar graphs/line graphs to represent data sets.	Communicate, think critically	Table, bar graph and line graph reflects required standards.
In groups/as class, examine samples of pie charts provided by the teacher. List	collaborate, assess, observe,	

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>the common features observed in the samples. Share list with class. Observe as the teacher demonstrates how to construct a pie chart to illustrate data.</p> <p>Create pie charts to represent data provided by the teacher.</p> <p>Convert the information/data from pie charts to bar graphs and tables.</p>	<p>record, communicate</p> <p>Communicate</p> <p>Think critically, communicate</p>	<p>Pie chart correctly constructed to required criteria.</p> <p>Table and bar graph correctly represents information in pie chart. Bar graph reflects criteria provided.</p>
<p>In groups, be given an experimental report to read, discuss and identify problems with the experimental method. Make suggestions on how the experiment could be improved. Share with the class problems identified and suggestions for improvements. As a class, with the aid of the teacher, identify the variables involved. In teacher led discussion, classify the variables as manipulating, responding and controlled. (<i>Teacher should introduce the terms independent and dependent variables as synonyms for the terms manipulating and responding variables respectively.</i>)</p> <p>In groups view sample experimental procedures (<i>see points to note</i>) provided by the teacher. Identify and classify the variables in the procedures as manipulating, responding and controlled. Share classifications with class.</p>	<p>collaborate, think critically, classify, communicate</p> <p>collaborate, think critically, classify, communicate</p>	<p>Variables identified and correctly classified.</p>
<p>In groups, be given data that is presented in a variety of ways (tables, bar graphs, line graphs, pie charts). Identify the trends/patterns/relationships where applicable and give simple explanations for these. Indicate any anomalies/irregularities in the data. Draw conclusions from these analyses. Report findings and conclusions to class.</p> <p>Individually, carry out analysis of data provided by the teacher.</p>	<p>collaborate, think critically, draw conclusions, communicate</p> <p>think critically, draw conclusions</p>	<p>Trends and relationships identified and explained correctly. Anomalies in data identified. Conclusions supported by data and analysis.</p>

<b>Suggested Teaching and Learning Activities</b> Students will:	<b>Key Skills</b>	<b>Assessment</b>
<p>In groups/as class, examine samples of annotated drawings provided by the teacher. Discuss the usefulness of annotations on drawings.</p> <p>Individually, make annotated drawings of familiar specimens provided by the teacher.</p>	<p>Observe, think critically, communicate</p> <p>Draw, label, annotate</p>	<p>Drawing, labelling and annotations done according to required standards.</p>

<b>Learning Outcomes</b>
<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> <li>✓ Construct pie charts accurately</li> <li>✓ Identify the different types of variables in an experiment</li> <li>✓ Assess the meaning of experimental data</li> </ul>

<b>Points to Note</b>	<b>Extended Learning</b>
<p>Students must be given as much opportunities to practise the construction of pie charts, analyse data and annotate drawings.</p> <p>Sample experimental reports.</p>	<p>Use appropriate software to generate the various pie charts and graphs that were manually created throughout the unit. Then, evaluate the computer generated and manually created pie charts and graphs.</p>
<p><b>Resources</b> Graph sheets, fictitious research report, sample experimental procedures, samples of annotated drawings , <a href="#">Computer</a>, <a href="#">Internet</a>, <a href="#">multimedia projector</a></p>	<p><b>Key vocabulary</b> Pie chart, anomalies, annotation, variables, trend, pattern, relationship</p>
<p><b>Links to other subjects</b> Mathematics - statistics</p>	

## **UNITS OF WORK GRADE 8 TERM 1 UNIT 2: PHOTOSYNTHESIS AND ENERGY RELATIONSHIPS**

### **About the Unit**

In this Unit students will learn that green plants are producers because they manufacture their own food during photosynthesis. Chloroplasts in leaf cells use the raw materials, carbon dioxide and water, in the presence of sunlight (light energy) and chlorophyll, to synthesize glucose/starch. Oxygen is released as a by-product of the process. Students will examine leaves to identify ways in which they are adapted for photosynthesis and investigate the presence of glucose and starch in leaves exposed to sunlight. They will learn that animals, as consumers, depend on green plants for their energy supply. They will explore ways in which energy is transferred from green plants directly or indirectly to animals, in food chains and webs. Students will construct food chains and webs using familiar organisms identified during their study of simple ecosystems and appreciate that humans can negatively affect terrestrial and aquatic ecosystems

### **Range of Content**

- During photosynthesis green plants use carbon dioxide and water, in the presence of sunlight and chlorophyll, to manufacture food.
- Photosynthesis takes place in chloroplasts and these are found in particular cells of the plant
- Leaves are specially adapted to carry out photosynthesis
- Energy is lost during transfer between trophic levels in food chains
- Human activities can have negative effects on food chains and webs

### **GUIDANCE FOR THE TEACHER**

Only a simple explanation of the process of photosynthesis required:

*Carbon dioxide from the air enters the leaves through the stomata; water from the soil enters the roots through the root hairs and travels up the stem to the leaves; carbon dioxide and water are used to produce glucose within the chloroplasts; oxygen is released and diffuses out of the leaves via the stomata; glucose is converted to starch and stored.*

All aspects of drawing must be done in pencil: clear, clean continuous lines of even thickness; labels to the right of the drawing, written in script and lower case; label lines drawn with ruler and do not overlap; title underlined, below drawing and in uppercase; correct magnification [calculated and written e.g. (Mag. X 100)].



**Prior Learning**

Check that students can:

describe the basic structure of plants, e.g. leaf, root, stem, flower  
recall that organisms depend on each other for survival.

know that green plants take in water through their roots and that  
the leaf plays a part in photosynthesis

state that plants are producers.

<b>UNIT TITLE:</b> Photosynthesis and Energy Chains	
<p><b>Theme:</b> Living Things, Life Processes and the Environment</p> <p><b>Attainment Target(s)</b></p> <ul style="list-style-type: none"> <li>• Understand the importance of the life processes in plants and animals, their interdependence, their interaction with the environment, and how lifestyles determine health and well-being.</li> <li>• Apply scientific knowledge and processes to the solution of real world problems.</li> <li>• Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.</li> <li>• Appreciate the influence and limitations of science with consideration for ethical issues.</li> <li>• Demonstrate a positive attitude towards the use of scientific language.</li> <li>• Demonstrate positive interpersonal skills in order to foster good working relationships.</li> </ul> <p><b>Benchmark(s):</b></p> <ul style="list-style-type: none"> <li>• Understand how plants make their food, and how this forms the basis of energy chains and webs.</li> </ul>	<p><b>Objectives</b></p> <p>Students will:</p> <ul style="list-style-type: none"> <li>• Recall that plants are producers and are the source of energy for animals.</li> <li>• Investigate the raw materials and conditions necessary for photosynthesis, controlling relevant variables.</li> <li>• Construct the word equation for photosynthesis.</li> <li>• Examine the external adaptations of the leaf for photosynthesis.</li> <li>• Formulate definitions of the terms producer, consumer, carnivore, herbivore, omnivore, food chain and habitat.</li> <li>• Construct terrestrial and aquatic food chains using familiar organisms.</li> <li>• Create food webs using the constructed food chains.</li> <li>• Explain energy flow in a food chain.</li> <li>• Assess the impact of human activities on food chains and webs.</li> </ul>

- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate care and concern for living things and the environment.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate concern for man's impact on the environment.
- Demonstrate sensitivity to others who are different.

**Topic:** Photosynthesis

**Duration:** 13 Hours

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**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.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>In small groups, investigate the adaptations of the leaf to carry out photosynthesis. Examine the leaves as they are found attached to the plant. Make a list of the external adaptations and present to the class in a variety of ways.</p>	<p>Investigate, think critically, infer, collaborate, communicate</p>	<p>Acceptable list of external adaptations given</p>
<p>in groups, investigate:</p> <ol style="list-style-type: none"> <li>1. the presence of starch in a green leaf which was previously exposed to sunlight.</li> <li>2. that:               <ol style="list-style-type: none"> <li>i. carbon dioxide,</li> <li>ii. chlorophyll and</li> <li>iii. sunlight are necessary for photosynthesis.</li> </ol> </li> </ol> <p>Place the freshly picked/treated leaf into the boiling water (provided by the teacher) for about three minutes. Transfer the leaf to a test/boiling tube containing ethanol or alcohol and then place the test/boiling tube in the hot water in the beaker for about five minutes. <i>(Turn off the flame before placing the test tube with the alcohol in the hot water.)</i> Remove the leaf from the ethanol and dip it into the warm water. Spread the leaf on a white tile and place a few drops of Iodine solution on it and observe. Record the colour changes that occur and explain the reason for these changes.</p> <p><u><a href="#">ICT Integration</a></u>  <a href="#">View and manipulate interactive video tutorial on testing for starch in leaves.</a></p>	<p>Investigate, think critically, infer, collaborate, communicate</p>	<p>Procedures carried out accurately and safely.</p> <p>Experimental report done in acceptable format.</p> <p>Suitable observations recorded and correctly explained.</p> <p>Acceptable conclusions drawn and limitations noted.</p>
<p>Predict what will happen if a variegated leaf which was exposed to sunlight was tested for starch.</p> <p>Make an annotated drawing of a freshly picked variegated leaf. Map the areas that are green and non-green. Indicate on the drawing the areas that should have and not have starch. Explain why chlorophyll is needed for photosynthesis.</p>	<p>Predict, make annotated drawing, communicate, think critically</p>	<p>Correct drawing rules observed</p> <p>Labels correctly annotated with basic function.</p> <p>Drawing of leaf shows correct outline of the distribution of chlorophyll</p> <p>Presence/absence of starch correctly</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p><a href="#">ICT Integration</a> View and manipulate interactive video tutorial on the function of chlorophyll in photosynthesis.</p>		<p>matched to green/non-green parts of leaf Accurate conclusion that only green parts produce starch/photosynthesize, chlorophyll is necessary for photosynthesis</p>
<p>In groups, investigate the release of oxygen from actively photosynthesising pondweed (<i>Elodea</i>). Measure the total volume of gas produced or count the number of bubbles released per minute. Discuss how they could identify the gas produced and share their suggestions with the class. <i>(Teacher should help students to refine their suggestions and predict how the release of oxygen from pondweed varies with light intensity)</i></p> <p><a href="#">ICT Integration</a> View and manipulate interactive video tutorial on the production of oxygen during photosynthesis.</p>	<p>Collaborate, investigate, measure, communicate, think critically</p>	<p>Accurate measurement of the volume of gas released. Acceptable suggestions given for identification of the gas.</p>
<p>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.</p> <p>in groups use the information to construct a word equation for photosynthesis.</p>	<p>Define operationally, collaborate, communicate, think critically</p> <p>Think critically, collaborate,</p>	<p>Acceptable explanation of photosynthesis. Raw materials, conditions and products correctly identified.</p> <p>Accurate word equation for photosynthesis.</p>
<p>in groups walk around the school yard or visit a garden, pond, or a tree and observe and record, in a suitable table, the organisms seen on their tour, where they are seen and what they are feeding on. <i>(If the organisms are not feeding at the time of the trip or visit they must still be noted for later research; cameras/mobile phones can be used to capture images of organisms).</i></p> <p>Participate in a teacher-led discussion on food chains and define the terms</p>	<p>Make observations, communicate, collaborate</p>	<p>Observations appropriately recorded in a table.</p>

<b>Suggested Teaching and Learning Activities</b> <b>Students will:</b>	<b>Key Skills</b>	<b>Assessment</b>
<p>food chain, food web, producer, consumer, carnivore, herbivore, omnivore, and habitat. Classify the organisms identified from the nature walk as producers, primary, secondary or tertiary consumers.</p> <p>Construct food chains using the organisms identified. [<i>Food chain should have at least three (3) organisms.</i>] Create food webs using the food chains constructed.</p> <p><a href="#">ICT Integration</a> Use image capturing devices to capture the organisms in their habitats.</p>	<p>Collaborate, communicate, operationally define, classify, think critically</p> <p>Create, think critically</p> <p>Capture and store digital images</p>	<p>Acceptable definition of terms and classification of organisms.</p> <p>Food chains and webs constructed accurately.</p>
<p>Brainstorm and suggest whether all the energy from one organism is transferred to the organism that consumes it and justify their suggestions. Share their suggestions with the class in a teacher led discussion.</p>	<p>Think critically, communicate</p>	<p>Logical arguments given to justify suggestions.</p>
<p>Use the food chains created from the field activity and a scenario depicting a human activity that disrupts the habitat (e.g. pollution, removal of species etc.) to predict the effects that the outlined human activity will have on the food chain. Give reasons to support their predictions. Share and discuss their predictions and justifications with the class.</p> <p>view video/PowerPoint presentation/posters summarizing the topic of food chains and webs. Complete worksheet on food chains and food webs.</p>	<p>Predict, think critically, communicate, collaborate</p> <p>Think critically</p>	<p>Logical justifications given for predictions.</p> <p>Worksheet correctly completed.</p>

<b>Learning Outcomes</b>
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**Students who demonstrate understanding can:**

- ✓ Explain the process of photosynthesis
- ✓ Write a word equation for photosynthesis.
- ✓ Explain how the leaf is adapted for photosynthesis.
- ✓ Explain the terms producer, consumer, omnivore, carnivore, herbivore, food chain, food web and habitat.
- ✓ Describe energy transfer in terrestrial and aquatic food chains.
- ✓ Describe how human activities affect food chains.
- ✓ Understand, use and spell correctly specialised scientific terms.
- ✓ Use image capturing devices to capture, format and store digital images
- ✓ Use word processing, multimedia and/or digital story tools to create and present digital content

<b>Points to Note</b>	<b>Extended Learning</b>
<ul style="list-style-type: none"> <li>• Simple explanation of the process of photosynthesis limited to word equation.</li> </ul>	Explore the use of greenhouses to improve crop productivity.
<b>Resources</b> Videos/posters on food chains, computer, projector, camera, scissors, markers, masking tape, hand-outs, beaker, test tube, Bunsen burner, forceps, white tile, iodine solution dropper, alcohol/ethanol, variegated leaf, tripod stand, gauze, blank cards, food chain/web worksheet	<b>Key vocabulary</b> photosynthesis, producer, consumer, food chain, food web, chlorophyll, chloroplast, carbon dioxide, oxygen, glucose, terrestrial, aquatic, lamina, mid rib, petiole, vein, starch, primary consumer, secondary consumer, tertiary consumer, herbivore, carnivore, omnivore, habitat
<b>Links to other subjects</b> Social Studies, Geography, Agriculture	

## **UNITS OF WORK GRADE 8 TERM 1 UNIT 3: MORE ABOUT MATTER**

### **About the Unit**

In this unit, students will use the Periodic Table as the means of classifying elements into metals and non-metals.

Students will apply the Kinetic Theory of Matter to explain the movement of particles. In addition, students will perform experiments and account for their observations using the kinetic theory of matter.

Students will learn additional information (building on grade 7) about atoms as the building blocks of elements. Students are introduced to the term subatomic particles and also the location, mass and charge of each subatomic particle.

### **Range and Content**

**The key concepts, skills and knowledge students will learn in this subject:**

- The atom
- Subatomic particles -: location, charge and relative mass
- atomic number of an atom
- The Periodic Table
- Kinetic Theory
- Diffusion

### **GUIDANCE FOR THE TEACHER**

Chemical symbols are always written with capital letters if they are represented by a single letter and capital letter for the first and common letter for the second if represented by two letters.

It is sufficient to tell students that elements are grouped based on the number of outer shell electrons.

- **For diffusion activity:**
  1. Soak separate pieces of cotton wool in concentrated ammonia and hydrochloric acid and place each at opposite ends of a cylindrical glass tube and cork both ends)
  2. Place glass tube in clamp stand for students to observe
- If plasma comes up in discussion on states of matter indicate to students that it is outside the scope of the lesson.

**Prior Learning**

Check that students can:

Recall that matter exists as particles and exist in the states solid, liquid and gas. (plasma not considered)





<b>UNIT TITLE:</b> More About Matter	
<p><b>Theme:</b> Energy, Forces and Matter</p> <p><b>Attainment Target(s)</b></p> <ul style="list-style-type: none"> <li>• Understand the existence of materials such as solids, liquids and gases, the particulate nature of matter, and simple chemical reactions that change one material into another.</li> <li>• Apply scientific knowledge and processes to the solution of real world problems.</li> <li>• Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.</li> <li>• Appreciate the influence and limitations of science with consideration for ethical issues.</li> <li>• Demonstrate a positive attitude towards the use of scientific language.</li> <li>• Demonstrate positive interpersonal skills in order to foster good working relationships.</li> </ul> <p><b>Benchmark(s):</b></p> <ul style="list-style-type: none"> <li>• Understand physical and chemical changes and know that chemical changes take place through the re-arrangement of atoms.</li> <li>• Know that chemical symbols are used to represent one atom of an element which is represented on the periodic table, and how selected elements are grouped in the periodic table.</li> <li>• Know the structure of an atom.</li> </ul>	<p><b>Objectives</b> Students will:</p> <ul style="list-style-type: none"> <li>• Describe briefly, the development of the Periodic Table</li> <li>• Show that the Periodic Table is a collection of elements</li> <li>• Collect and display common everyday elements on the Periodic Table</li> <li>• Match elements to their respective symbols</li> <li>• Classify elements as metals or non-metals</li> <li>• Distinguish between some selected properties of metals and non-metals</li> <li>• Summarize uses of selected metals and non-metals</li> <li>• Categorize the groups and periods in the Periodic Table</li> <li>• Investigate the building blocks of elements (matter).</li> <li>• Cite evidence for the kinetic theory of matter</li> <li>• Use appropriate scientific language</li> <li>• Differentiate between the sub-atomic particles in terms of their position in atom, relative mass and charge.</li> <li>• Create models to represent different atoms.</li> <li>• Deduce the basis for arrangement of elements on the Periodic Table.</li> <li>• Construct a board game using the first 20 elements on the Periodic table based on their symbols and atomic number.</li> <li>• Identify by name, some special groups in the periodic table</li> <li>• Find novel ways to state conclusions from observations</li> <li>• Complete their own activity even if others have already finished theirs</li> </ul>



- Know how substances can be classified by their chemical nature and how this relates to the way they react.
- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** Elements and the Periodic Table

**Duration:** 10 hours

-  **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.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>In groups, research internet/read literature on the contribution of specified scientists to the development of the periodic table. Create a montage/digital story to represent information. Display montage and present a 5 minutes playlet (dramatization, song etc) to the class.</p> <p>In groups, read information/view video on Elements in the Periodic Table. Examine different elements provided by the teacher (e.g. aluminium, magnesium, sodium (under oil), sulphur, gold, silver, carbon). Place the selected elements on a Periodic Table and identify existing patterns. (<i>Teacher will lead students to where solids/ gases or metals/non-metals are located</i>). Describe the appearance and properties of each element and compare them. Tabulate descriptions and share with class.</p> <p>Select an element of choice and research its uses and occurrence in nature. Write a poem or jingle on its everyday uses and create a poster displaying the information (<i>the poster should have a picture/drawing of the element</i>).</p> <p>Participate in teacher led discussion on the representation of elements using symbols. Play online/offline game of <b>match the name with symbol</b> (the names of the elements and their symbols are divided among students). Try to locate the person with matching name or symbol and tag them (<i>Other versions of the game may also be used</i>). Explain their choice (<i>students may respond that P is for potassium or that Na is not a symbol for any of the elements given</i>)</p> <p>View Periodic Table with the names and symbols and revise their choices where necessary. In groups, list the first 20 elements and their associated symbols. (<i>Teacher should use Periodic Table with the elements in order of atomic number.</i>)</p>	<ul style="list-style-type: none"> <li>communicate, observe, classify, collaborate, create, think critically</li> </ul> <p>Communicate, collaborate, make observations, think critically</p> <p>Research, communicate, create, think critically</p> <p>Communicate, collaborate, think critically</p> <p>Communicate, collaborate, think critically</p>	<p>Montage correctly represents information. Presentation creative and support information on montage</p> <p>Correct observations noted Elements correctly classified.</p> <p>Model and Poster Poster contains correct information on the element chosen. Poster is clean and neat, information well organized, colourful and creative.</p> <p>Symbols and names correctly matched</p> <p>Correctly write the symbols for selected elements in periodic table</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>Participate in teacher led demonstration of sub-division of samples of elements previously identified (such as graphite), until further break up cannot take place. Discuss findings with class.</p> <p>view video/read literature on the basic unit of matter and participate in group discussion on video content. <i>(Teacher should guide students to infer that the tiny particles that make up matter are called atoms, and an element contain atoms that are the same.)</i> Formulate a definition for elements and share definition with class.</p> <p>Examine structures/ materials made from only one kind of brick and others made of several types of bricks. Produce an argument as to which structures represent elements and which do not.</p> <p>Investigate the evidence and movement of particles by the following: Diffusion through a liquid</p> <ol style="list-style-type: none"> <li>1. Place a food colouring or a few crystals of potassium permanganate (VII) in a beaker with water</li> <li>2. Observe for a few minutes and record</li> </ol> <p>Diffusion of gases</p> <ol style="list-style-type: none"> <li>1. Place a cotton wool soaked with concentrated ammonia and another soaked in concentrated hydrochloric acid on opposite ends of a glass tube</li> <li>2. Watch for the appearance of a white ring inside the tube</li> <li>3. Observe and record</li> <li>4. Note the exact position of the white ring</li> </ol> <p><i>(Teacher should extend discussion to talk about the rate of diffusion of gases based on the position of the white ring).</i></p> <p>Osmosis Experiment In groups,</p>	<p>Manipulate, think critically, communicate</p> <p>Research, communicate, operationally define, think critically, collaborate</p> <p>Manipulate, think critically, communicate</p> <p>Make observations, communicate, think critically, investigate, manipulate</p>	<p>Atoms identified as building blocks for elements. Particles identified as building blocks for matter.</p> <p>Correct definition of the term element.</p> <p>Argument supported by evidence</p> <p>Correct observations noted Movement of particles from high to low concentration stated</p> <p>Lighter gas identified Correct observations noted</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>1. Half-fill two beakers. One with water and the other with concentrated sugar solution. Measure mass of potato strips</p> <p>2. Place one strip of potato in each solution and leave for at least 30 minutes</p> <p>3. Make predictions and develop a hypothesis as to which strips would have the heavier mass</p> <p>4. Measure the mass of the two potato strips</p> <p>5. Observe and record</p> <p>6. Share results with the class</p> <p><i>(Emphasis should only be placed on the results in terms of particle movement and not on the concept of Osmosis)</i></p> <p>In groups, view video/ read literature/research internet and visit web quest on the structure of the atom and complete a teacher prepared question sheet. Discuss their answers with class. Create a table or chart, possibly <a href="#">using word processing/spreadsheet software</a>, to summarize the properties of the subatomic particles.</p> <p>View a diagram of an atom (nucleus and shells only) and correctly position the sub-atomic particles. <i>(Guide students to appreciate that the electrons are not static but are constantly moving in energy levels/ shells).</i></p> <p>In groups, use modelling clay/play dough and wire to construct models of unknown atoms given the number of the sub-atomic particles and make presentation to class. Develop checklist criteria for peer evaluations. Participate in discussion on models presented by other groups, possibly <a href="#">using online discussion forums and class wiki</a>. <i>(Students should keep models for future lesson.)</i></p>	<ul style="list-style-type: none"> <li>• Investigate, manipulate, make observations, measure, think critically, communicate, collaborate, predict and hypothesize</li> </ul> <ul style="list-style-type: none"> <li>• Communicate, collaborate, Create</li> <li>• <a href="#">Conduct electronic searches</a> <a href="#">Create word processing/spreadsheet table and chart</a></li> <li>• <a href="#">Navigate and manipulate digital content</a></li> </ul> <p>Manipulate, make observations, think critically, create, collaborate, manipulate, communicate <a href="#">Communicate information using discussion forums and social networks</a></p>	<p>Correct measurements made</p> <p>The direction of particle movement correctly traced Does the hypothesis explain why the particle movement occurred Predictions correct</p> <p>Table or chart correctly labelled/titled. Information contained in table or chart is correct.</p> <p>Position of sub-atomic particles correctly located Model correctly done. Number of sub-atomic particles correctly presented.</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>View a copy of the periodic table of elements and participate in teacher facilitated discussion on how the elements are arranged (based on atomic number). <i>(Teacher should guide students to the recognition that the differences in elements are due to the number of protons that make them up.)</i></p> <p>Plan and design a game of BINGO using the first 20 elements of the Periodic Table. (To sensitize students to the concept of groups and periods). Choose appropriate materials to construct a prototype. Develop checklist criteria for peer evaluations. Present ideas to the class with supporting arguments to justify their designs. Modify design where necessary then construct prototype. Display models.</p> <p>Conduct research to identify special named groups (metals, non-metals, alkali metals, alkali earth metal, halogens and noble gases) in the Periodic Table. Colour code and key these groups.</p>	<p><b>Manipulate digital content</b></p> <p>Make observations, communicate, think critically</p> <p>Plan and design, Create, communicate, think critically, collaborate</p> <p>Research, communicate, classify, think critically</p>	<p>Prototype contains groups, periods and elements correctly represented</p> <p>Accurately group elements into metals and non-metals Special groups correctly identified.</p>

<b>Learning Outcomes</b>
<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> <li>✓ Know that symbols are used to represent elements in the periodic table.</li> <li>✓ Recognize some familiar elements by their symbols.</li> <li>✓ Classify elements as metals and non-metals</li> <li>✓ Formulate a definition for diffusion</li> <li>✓ Describe experiments which prove evidence of the kinetic theory of matter</li> <li>✓ Describe the sub-atomic particles in terms of charge, mass and location</li> <li>✓ Place elements in the Periodic Table according to periods and groups based on atomic number.</li> <li>✓ Apply the concept of atomic structure to identify special groups on the Periodic Table</li> <li>✓ <b>Create and format word processing and spreadsheet documents and tables.</b></li> <li>✓ <b>Collaborate and communicate information using discussion forum and social network</b></li> </ul>

<b>Points to Note</b>	<b>Extended Learning</b>
<p>Mention proper way of writing symbols (capital letter for the first and common letter for the second). Simple treatment of periodic table – State only that elements are grouped based on outer shell electrons. Chemical properties should not be discussed.</p> <p>Caution to be exercised when handling concentrated solutions. If possible make use of a fume cupboard when placing soaked cotton wool into the cylindrical tube.</p> <p>Carefully add the potassium permanganate (VII) crystals to the bottom of beaker using a tweezer.</p> <p>Use the experiment on Osmosis to illustrate the movement of particles only, as the concept of Osmosis is not being taught.</p> <p><a href="#">Teacher created/supervised discussion forums and social network</a></p> <p><a href="#">Plan and conduct research, using a wide variety of electronic sources e.g. online periodicals, CDs/DVDs</a></p> <p><a href="#">Demonstrate safe, respectful, responsible and clear online communication</a></p>	<p>Research how elements got their names and symbols. Conduct further research on the relationship between the placement of elements in the Periodic Table and the number of electrons in their outer shell.</p>
<p><b>Resources</b> Periodic table, worksheet on atoms, material for montage Potassium permanganate, concentrated hydrochloric acid and ammonia, cylindrical tube, beaker, water, potato, ruler, sugar, ice, wax, Bunsen burner</p> <p><a href="#">Computers, Internet, speaker, multimedia projector, interactive video tutorials, CDs/DVDs, concept mapping software, class Wiki and social network sites, Digital story tools</a></p>	<p><b>Key vocabulary</b> Periodic table, atomic/proton number, nucleus, shells, energy levels, proton, neutron, electron, periods, groups, symbol, element, atom, metal, non-metal Kinetic theory, diffusion, concentration</p>
<p><b>Links to other subjects</b> Grade 7 (Matter), Physics (Kinetic Energy), Biology</p>	

**UNITS OF WORK GRADE 8 TERM 2 UNIT 1: HUMAN NUTRITION****About the Unit**

In this unit students will learn how food is broken down mechanically by teeth and chemically by enzymes during digestion to form products that can be used by the cells of the body. They will investigate the structure of the teeth and relate this to their functions. They will also learn about selected digestive enzymes and where they are produced. Students will use models to explore the process of digestion and perform chemical tests to identify more food nutrients.

**Range of Content**

- Chewing or mastication of food by the teeth mechanically breaks down large particles into smaller ones to prepare them for digestion
- Teeth are specially adapted to cut, tear or grind/crush food.
- Some foods (protein, fat and some carbohydrates) have molecules that are too large to be absorbed by the cells/body
- Other foods (vitamins minerals water and some sugars) can be absorbed without digestion
- Large food molecules are broken down by enzymes in the alimentary canal to smaller molecules which are absorbed by the walls of the small intestine
- Digestion is the breakdown of food into simpler substances for absorption into the blood stream.
- Some food cannot be digested and is passed out of the body as faeces during defaecation/egestion.
- Our body uses digested food products for energy, growth and repair

**GUIDANCE FOR THE TEACHER**

**Prior Learning**

Check that students can:

Identify the different nutrients in food.

Relate the main organs of the digestive system to their functions.

Recall that the digestive system is responsible for breakdown/digestion of food for subsequent use by body cells.

<b>UNIT TITLE :</b> Human Nutrition	
<p><b>Theme:</b> Living Things, Life Processes and the Environment</p> <p><b>Attainment Target(s)</b></p> <ul style="list-style-type: none"> <li>Understand the importance of the life processes in plants and animals, their interdependence, their interaction with the environment, and how lifestyles determine health and well-being.</li> <li>Apply scientific knowledge and processes to the solution of real world problems.</li> <li>Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.</li> <li>Appreciate the influence and limitations of science with consideration for ethical issues.</li> <li>Demonstrate a positive attitude towards the use of scientific language.</li> <li>Demonstrate positive interpersonal skills in order to foster good working relationships.</li> </ul> <p><b>Benchmark(s):</b></p> <ul style="list-style-type: none"> <li>Understand the intake, digestion and absorption of food in animals,</li> </ul>	<p><b>Objectives:</b> Students will:</p> <ul style="list-style-type: none"> <li>Differentiate between mechanical and chemical breakdown of food</li> <li>Relate the structural adaptations of human teeth to their role in the mechanical breakdown of food (mastication)</li> <li>Draw and label a longitudinal section of a canine tooth</li> <li>evaluate different ways of taking care of the teeth</li> <li>Describe the processes involved in human nutrition as ingestion, digestion, absorption, assimilation, and egestion.</li> <li>Investigate the presence of protein, fat, starch and simple sugars in foods</li> <li>Explain the need for proteins, fats and some carbohydrates to be broken down during digestion.</li> <li>Recognise the importance and the site of secretion of digestive juices in the alimentary canal.</li> <li>Explain the role of selected enzymes (protease, lipase and amylase) in digestion.</li> <li>Identify the final products of digestion of protein, fat and starch</li> </ul>



and how energy is released through respiration.

- Understand the importance of nutrients, their functions and food tests.
- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate care and concern for living things and the environment.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** Human Nutrition

**Duration:** 10 Hours

**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.**

- Present and interpret data in acceptable way
- Draw conclusions from observations and explain these using scientific knowledge
- Check for health and safety before and during practical work

Suggested Teaching and Learning Activities	Key Skills	Assessment
<p>Students will:</p> <p>In groups, observe a chart of the digestive system with the names of the structures represented by numbers. Take turns to select a number from a bag which contains the numbers on the chart. Identify the structure that the number represents. Sequence the numbers to show the route food travels in the alimentary canal. Construct a table showing the identified parts of the digestive system and their function(s).</p> <p>Watch a video/ <a href="#">teacher prepared power point presentation</a> about the stages involved in the process of nutrition (ingestion, digestion, absorption, assimilation, and egestion). Write a simple summary of each stage and present to the class.</p>	<p>Communicate, summarize, collaborate,</p> <p>Think critically, summarise, define operationally</p>	<p>Number sequence accurately represents path food travels in the alimentary canal Correct structures and related functions in completed table Table constructed to acceptable standard</p> <p>Acceptable summary of each stage</p>
<p>Eat a cracker. Explain to the class the process of mechanical breakdown of food in the mouth and its importance in digestion.</p> <p>Use a mirror to examine the teeth, describe each type and explain how they are adapted to perform their function. Make an annotated drawing of the longitudinal section of the canine.</p> <p>Visit / invite/interview a dentist/dental technician to obtain information on dental care and oral hygiene. In groups use the information, to role-play different ways of caring for the teeth. Critique each other's presentation.</p>	<p>communicate,</p> <p>observe, draw, annotate</p> <p>Communicate, think critically, critique</p>	<p>Drawing done to acceptable standard Structures accurately labelled and correct functions given</p>

<p>Complete a KWL chart based on the topic: digestive juices / enzymes. Write what they know and want to know about enzymes and share their ideas with the class <a href="#">or use class email and blogs to share or make comments on peer ideas/information on digestive juices/enzymes</a>. Read teacher created hand-out/<a href="#">web-post</a> on enzymes, then complete the section on what they have learnt and share information with the class. Answer questions on teacher designed worksheet.</p>	<p>Communicate, collaborate, think critically,</p>	<p>Correct responses to questions on worksheet</p>
<p>Perform tests to identify the presence of protein (Biuret), starch (Iodine), simple sugar (Benedict's) and fat (grease spot/ethanol) in common food substances. Record results in a table and make inferences.</p>	<p>Manipulate, tabulate, make inferences, think critically</p>	<p>Accurate inferences drawn from observations Table constructed to acceptable standard</p>

### Learning Outcomes

Students who demonstrate understanding can:

- ✓ Identify the main parts of the human digestive system and describe their functions.
- ✓ Differentiate between chemical and mechanical digestion
- ✓ Explain the role of selected enzymes in the process of digestion
- ✓ Identify the final products of digestion of protein as amino acids, starch as glucose (simple sugars) and fat as fatty acids and glycerol.
- ✓ Describe the stages involved in human nutrition
- ✓ Identify the types of teeth in an adult and explain how they are adapted for their function
- ✓ describe different ways of caring for their teeth
- ✓ [Use word processing software and other technology tools to create original work, to share information on digestion processes/concepts](#)
- ✓ [Conduct electronic search for different kinds of information](#)

Points to Note	Extended Learning
<p>Distinguish between the digestive system (all the <b>organs</b> involved in digestion - mouth, oesophagus, stomach, small intestine, large intestine, pancreas and liver) and the alimentary canal (the long tube extending from mouth to anus)</p> <p>Differentiate between egestion (removal of undigested food/faeces from the alimentary canal) and excretion (removal of metabolic waste from the body)</p> <p>Protein digesting enzymes are treated under the broad cover – protease. Proteases break down proteins to amino acids. The named examples of pepsin, trypsin etc. do not breakdown proteins directly to amino acids, this requires peptidases in the small intestine.</p>	<p>Visit / invite a dentist or dental technician to speak and gather Information and resources about different types of dental prosthetics such as dentures, partials, crowns, bridges and implants.</p> <p>Research on selected diseases associated with the digestive system.</p> <p>Research Insectivorous plants and describe how they digest captured insects.</p>
<p><b>Resources</b> Video/web-post/ chart on the Digestive system/digestion, worksheet/hand-out on enzymes, Benedict's Solution, Iodine, Biuret reagent (NaOH/KOH) and CuSO<sub>4</sub>, Ethanol, food materials for testing, crackers</p>	<p><b>Key vocabulary</b> Protein, fat, starch, ingestion, digestion, absorption, assimilation, egestion enzymes, digestive system , alimentary canal, digestive juice, incisors, canines, premolars and molars, mastication</p>
<p><b>Links to other subjects</b> Home Economics</p>	

**UNIT OF WORK GRADE 8 TERM 2 UNIT 2: PHYSICAL AND CHEMICAL CHANGES****About the Unit**

In this Unit students will group matter as pure and impure. Concepts of physical and chemical changes will be explored through experimentation and used to explain the formation of compounds and mixtures.

Students will use experiments to determine the differences in properties of elements, mixtures and compounds.

In addition, students will investigate ways of separating impure matter particularly mixtures.

**Range of Content**

- Physical and Chemical Changes
- Elements, compounds and mixtures

**Guidance for the Teacher**

**Prior Learning**

Check that students can:

- Show that matter is made up of particles
- Explain the difference between reversible and irreversible changes.
- State that elements are made of atoms

**UNIT TITLE:** Elements, Compounds and Mixtures

**Theme:** Energy, Forces and Matter

**Attainment Target(s)**

- Understand the existence of materials such as solids, liquids and gases, the particulate nature of matter, and simple chemical reactions that change one material into another.
- Apply scientific knowledge and processes to the solution of real world problems.
- Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.
- Appreciate the influence and limitations of science with consideration for ethical issues.
- Demonstrate a positive attitude towards the use of scientific language.
- Demonstrate positive interpersonal skills in order to foster good working relationships.

**Benchmark(s):**

- Understand physical and chemical changes and know that chemical changes take place through the re-arrangement of atoms.
- Know that chemical symbols are used to represent one atom of an

**Objectives:**

- Classify substances as pure and impure
- Explain the differences between physical and chemical changes in terms of composition, reversibility and properties
- Perform investigations to distinguish physical and chemical changes
- Infer that chemical changes lead to formation of compounds and physical changes lead to formation of mixtures
- Collect and display information
- Set up simple comparative and fair tests
- Develop a logical argument for classifying substances
- Differentiate between elements, mixtures and compounds
- Investigate methods that can separate mixtures
- Predict how a given mixture can be separated based on solubility, particle size and structure
- Use appropriate scientific language
- Value individual effort and team work

<p>element which is represented on the periodic table, and how selected elements are grouped in the periodic table.</p> <ul style="list-style-type: none"> <li>• Know the structure of an atom.</li> <li>• Know how substances can be classified by their chemical nature and how this relates to the way they react.</li> <li>• Analyse and interpret experimental data to determine similarities and differences in findings.</li> <li>• Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</li> <li>• Appreciate the importance of scientific methods.</li> <li>• Demonstrate objectivity by seeking data and information to validate observations and explanations.</li> <li>• Demonstrate concern for safety of self and others.</li> <li>• Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.</li> <li>• Demonstrate sensitivity to others who are different.</li> </ul> <p><b>Topic:</b> Elements, Compounds and Mixtures</p> <p><b>Duration:</b> 5 hours</p>	
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<b>Suggested Teaching and Learning Activities</b> <b>Students will:</b>	<b>Key Skills</b>	<b>Assessment</b>
In groups, recap that elements are made of the same atoms making them pure substances. Given samples of substances, identify the pure substances (elements) from the collection. Sort the remaining substances as impure substances. Formulate a definition for pure and impure substances based on the properties of the substances.	Make observations, think critically, classify, define operationally, collaborate	Substances correctly classified as pure and impure. Elements correctly identified as pure substances.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>In groups, view video/read literature <a href="#">online/offline</a> /visit web quest outlining the differences between physical and chemical changes and formulate a definition for physical and chemical change. In groups, compose a jingle, <a href="#">possibly using audio recording software</a>, to distinguish physical changes and chemical changes and record it on a CD-ROM.</p> <p>In groups perform the following investigations to determine which are chemical or physical changes. Tabulate observations and compare physical and chemical change based on composition, properties, reversibility, change in mass of substance. Draw conclusions as to which ones are physical and which are chemical. Give a reason in each case.</p> <p><b>Investigation # 1 (Physical Change)</b></p> <ol style="list-style-type: none"> <li>1. Add one spatula of salt into a beaker.</li> <li>2. Add 5ml of water into the beaker and stir.</li> <li>3. Wait 15 seconds. Do <u>not</u> taste!</li> <li>4. Record your observations.</li> <li>5. Heat solution to dryness and record observations</li> <li>6. Draw conclusions</li> </ol> <p><b>Investigation # 2 (Chemical Change)</b></p> <ol style="list-style-type: none"> <li>1. Add one spatula of baking soda into a beaker.</li> <li>2. Add 5ml of vinegar into the beaker.</li> <li>3. Wait 15 seconds. Do <u>not</u> taste!</li> <li>4. Record your observations.</li> </ol>	<p>Research, define operationally, collaborate, think critically, create, communicate</p> <p>Collaborate, think critically, Make observations, classify, communicate, investigate</p> <p>Measure, manipulate Communicate, collaborate, think critically, make observations</p> <p>Measure, manipulate, communicate, collaborate, think critically, make observations</p>	<p>Correctly define physical and chemical change Correctly outline the differences between physical and chemical change. Jingle contains correct information and shows a clear understanding of the topic and can be easily remembered</p> <p>Correctly identifies which changes are physical and which changes are chemical. Accurate explanation given for each change identified. Giving explanation for each choice.</p> <p>Accurate observations made Correct conclusions arrived at</p> <p>Accurate observations made Correct conclusions arrived at</p>



Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>5. Draw conclusions</p> <p><b>Investigation # 3 (Physical Change)</b></p> <p>Add 2 antacid tablets to a cup of water, followed by 3 or 4 raisins. Record your observation. Or</p> <p>Add 3 or 4 raisins to a cup of cream soda/ sprite. Record your observations. Draw conclusions</p> <p><b>Investigation # 4 (Physical)</b></p> <p>Place four ice cubes in a dish and leave for five minutes. Record observations. Draw conclusions</p> <p><b>Investigation # 5 (Chemical)</b></p> <p>Place some copper sulphate solution in a test tube and add a strip of magnesium ribbon or zinc strip. Record observations. Draw conclusions.</p> <p><b>Investigation # 6</b></p> <ol style="list-style-type: none"> <li>1. Place large crystals of ammonium dichromate on a sand tray and then on a tripod.</li> <li>2. Heat with a Bunsen flame until crystals begin to change.</li> <li>3. Record observations.</li> <li>4. Draw conclusions</li> </ol>	<p>Measure, manipulate, communicate, collaborate, think critically, make observations</p> <p>Measure, manipulate, communicate, collaborate, think critically, make observations</p> <p>Measure, manipulate, communicate, collaborate, think critically, make observations</p> <p>Measure, manipulate, communicate, collaborate, think critically, make observations</p>	<p>Accurate observations made Correct conclusions arrived at</p> <p>Accurate observations made Correct conclusions arrived at</p> <p>Accurate observations made Correct conclusions arrived at</p> <p>Accurate observations made Correct conclusions arrived at</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>Other investigations include heating wax or iodine, mixing vinegar and chalk, burning wood or paper and rusting of iron.</p> <p>Use <b>digital drawing tools to create</b> flow chart to show the various chemical and physical changes that occur when flour is sifted, made into dumplings and cooked.</p>	<p>Communicate, think critically</p>	<p>Flowchart correctly shows changes in the correct sequence.</p>
<p>View teacher demonstration/video showing the heating of the elements iron and sulphur to form the compound iron (II) sulphide, then record and discuss their observations in groups. Share findings with class and participate in teacher-led class discussion (<i>Teacher guide students to realise that a new substance was formed and that this new substance is an example of a compound</i>). Alternately, burn magnesium in air to form magnesium oxide (although oxygen cannot be seen). <i>Teacher should guide students that oxygen is used up</i>. Formulate a definition for compounds.</p> <p>View video/research on compounds and develop a graphic organizer showing information on:</p> <ul style="list-style-type: none"> <li>• how a compound is formed (definition)</li> <li>• examples of compounds</li> <li>• uses of selected compounds</li> </ul> <p>Present graphic organiser to class.</p> <p>Research a list of common compounds and prepare a table with the following headings: common names, chemical names, chemical elements</p> <p>Collect labels of ten substances found in the home. From the ingredients given on each label, identify and record the names of two compounds present. Produce a display board with the labels and information extracted. Set up display in science corner.</p>	<p>Make observations, think critically, communicate, collaborate</p> <p>Define operationally</p> <p>Research, communicate, create</p> <p>Research, classify, communicate, think critically</p> <p>Make observations, classify, create, communicate, think critically</p>	<p>Accurate information reported on the process observed.</p> <p>Correct definition of compound given.</p> <p>Graphic organizer has an appropriate title and contains accurate information.</p> <p>Table contains correct information under appropriate headings.</p> <p>Display is neat with appropriate headings/ title and correct information.</p>

<b>Suggested Teaching and Learning Activities</b> <b>Students will:</b>	<b>Key Skills</b>	<b>Assessment</b>
<p>In groups, label two beakers A and B. Place a mixture of iron and sulphur in beaker A, and the compound Iron (II) sulphide in beaker B, make observations (particle size, colour, attraction to a magnet etc.) then mix each beaker with water, make observations and record findings. Report on findings including written explanations of results, displays or presentations and use the results to suggest improvements and predictions for setting up further tests. After class discussion, formulate a definition for mixtures and state at least two differences between mixtures and compounds.</p> <p>Given picture/video/list of different substances, construct a table with appropriate headings to group the substances as elements, mixtures and compounds, suggesting reasons for the classification.</p>	<p>Collaborate, make observations, investigate, communicate, think critically, report, compare and contrast, define operationally</p> <p>Think critically, communicate, classify, create</p>	<p>Report contains accurate information on observations. Correct definition for mixtures given. Two correct differences between mixtures and compounds given.</p> <p>Substances correctly classified as elements, mixtures and compounds</p>
<p>In groups, carry out separation techniques including filtration and evaporation, paper chromatography, simple distillation, sublimation, centrifuging and separating funnel. E.g. sand and gravel by sifting, sulphur and iron using a magnet, sand and salt by dissolving and filtering, salt solution by simple distillation; oil and water using separating funnel and the colours in black marker/purple kool aid using paper chromatography. In a teacher led discussion, students will use their results to draw simple conclusions about how the method used to separate a mixture depends on the properties of the components of that mixture and make predictions for setting up further investigations.</p>	<p>Collaborate, make observations, manipulate, communicate, think critically</p>	<p>Properly labelled diagrams of separation techniques</p> <p>Techniques correctly predicted</p>

**Learning Outcomes**

Students who demonstrate understanding can:

- ✓ Recognize substances as pure and impure
- ✓ Distinguish between physical and chemical changes.
- ✓ Explain the difference between elements, mixtures and compounds
- ✓ Carry out investigations to distinguish physical and chemical changes

- ✓ Deduce that chemical changes lead to formation of compounds and physical changes lead to formation of mixtures
- ✓ Carry out simple comparative and fair tests
- ✓ Explore methods that can separate mixtures
- ✓ Predict suitable separation techniques
- ✓ Work cooperatively in groups
- ✓ Discuss and question what they are learning and how it is relevant
- ✓ [Capture, edit and record audio using audio editing software](#)
- ✓ [Collaborate and communicate ideas and information using class wiki/blogs and webquest](#)
- ✓ [Collaborate and communicate ideas and information using word processing and multimedia software](#)

Points to Note	Extended Learning
<p>De-ionized water can be purchased at gas stations/ stores. It is best if the deionised water is boiled <i>e.g.</i> in a kettle, as close to the start of the lesson as possible and supplied warm to the students. Ensure that the room is well ventilated when sulphur is being burned.</p> <p>Teachers should provide students with criteria for construction of display board, taking into account available space for displays.</p> <p><a href="#">Participate in online discussions using resources designed for student collaboration and knowledge building</a></p> <p><a href="#">Use word processing software and other technology tools to create original work for a specific purpose and audience.</a></p>	<p>Research the separation of crude oil. Investigate the melting and boiling points of pure and impure matter.</p>
<p><b>Resources</b> Salt, water, vinegar, beaker, copper sulphate, magnesium ribbon, ice, antacid tablets, raisins, wax, iodine, ammonium dichromate, chalk, wood, paper. Iron(II) sulphide, sulphur, iron, internet, multimedia</p>	<p><b>Key vocabulary</b> Pure substance, impure substance, physical change, chemical change, rusting, bonds, reactants, products, atoms, elements, mixtures and compounds, atom, miscible and immiscible, solvent and solute, solution, colloids, chromatography,</p>

<p>projector Samples of different mixtures, materials for making poster, multimedia material on mixtures, elements and compounds, video on the heating of the elements iron and sulphur to form the compound iron (II) sulphide.</p> <p>computer, speakers, Internet, multimedia projector, video CDs/DVDs, word processing, multimedia and graphic software tools, audio capturing software, web quest site</p>	<p>filtration, evaporation, distillation, separating funnel, centrifuging, sublimation</p>
<p><b>Links to other subjects</b> Grade 6 (Mixtures) Grade 7(Matter)</p>	

**UNITS OF WORK GRADE 8 TERM 2 UNIT 3: FORCES AND MOTION****About the Unit**

In this Unit students will investigate motion and forces. They will describe motion in one dimension and perform simple calculations involving distance, displacement, speed, velocity and acceleration. They will be able to identify various forces. They will investigate the origin and behavior of common forces in everyday experience and explore how knowledge of these forces can be utilized.

**Range of Content**

- Distance, displacement, speed, velocity and acceleration
- Balanced and unbalanced forces in various media
- The effects of unbalanced forces on objects.
- Methods of reducing of resistive forces on objects

**Guidance for the Teacher**

**Prior Learning**

Check that students can:  
Identify some types of forces





<b>UNIT TITLE:</b> Forces and Motion	
<b>Theme:</b> Energy, Forces and Matter	
<p><b>Attainment Target(s)</b></p> <ul style="list-style-type: none"> <li>• Understand natural laws as they apply to motion, forces, and energy transformations.</li> <li>• Apply scientific knowledge and processes to the solution of real world problems.</li> <li>• Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.</li> <li>• Appreciate the influence and limitations of science with consideration for ethical issues.</li> <li>• Demonstrate a positive attitude towards the use of scientific language.</li> <li>• Demonstrate positive interpersonal skills in order to foster good working relationships.</li> </ul> <p><b>Benchmark(s):</b></p> <ul style="list-style-type: none"> <li>• Explore the relationships between forces and motion, and illustrate these relationships in the environment and living things.</li> <li>• Analyse and interpret experimental data to determine similarities and differences in findings.</li> <li>• Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.</li> </ul>	<p><b>Objectives:</b> Students will:</p> <ul style="list-style-type: none"> <li>❖ Distinguish between vector and scalar quantities.</li> <li>❖ Record situations in which unbalanced/balanced forces act</li> <li>❖ Conclude that only unbalanced forces cause objects to change their motion or shape</li> <li>❖ Recall that friction is the force which opposes motion</li> <li>❖ Explain why some things are able to float in water and air, identifying all the forces involved</li> <li>❖ Construct diagrams to show all the forces acting on moving objects, in given situations</li> <li>❖ Perform investigations to determine how streamlined shapes influence the degree of resistance to motion in water and air</li> <li>❖ Show curiosity in investigating forces</li> <li>❖ Suggest innovative and relevant ways to solve problems</li> </ul>

- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** Balanced and Unbalanced Forces

**Duration:** 5 hours

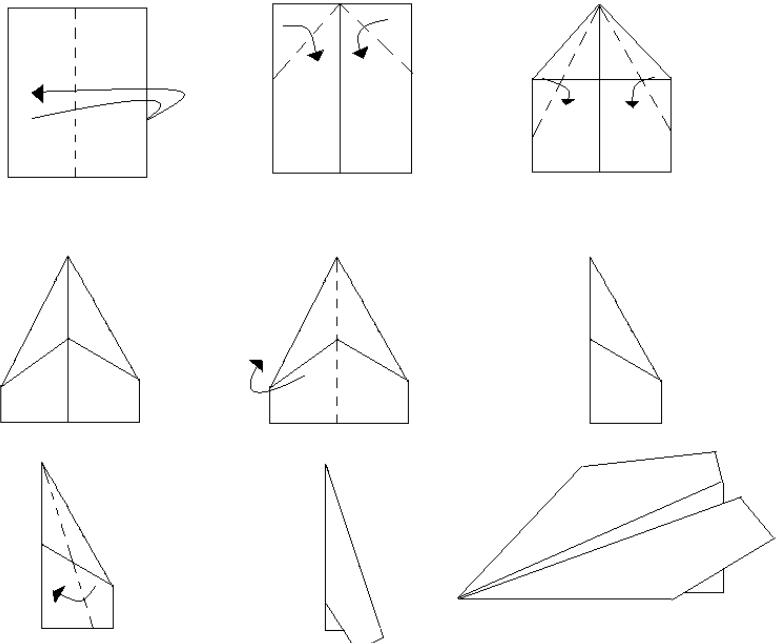
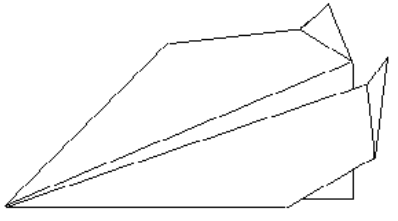
#### ICT ATs

-  **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.



Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
in groups, be given a list quantities (time, temperature, force, mass, ) to sort under the headings “Quantities with Direction and Size” and “Quantities with Size Only”, and share with the class. In a teacher-led discussion, connect the label ‘Vector Quantities’ to those quantities with direction and size, and the label with ‘Scalar Quantities’ to those quantities with size only.	Collaborate, think critically, classify, communicate	Quantities correctly classified.
As a class review forces. In groups examine a variety of situations in which forces act and identify the forces acting. Report findings to class in a variety of ways e.g., using multimedia presentations, digital story presentations.	Collaborate, communicate, record, think critically Create, communicate using digital content	Forces correctly identified.
Investigate the effects of balanced and unbalanced forces by engaging in a game of “tug of war” or “arm wrestling”. Identify and record the stages where balanced and unbalanced forces are in operation. In groups discuss and identify at least two other situations in which balanced/unbalanced forces act and report to class in a variety of ways, e.g., using multimedia presentations, using class blogs and email with attachment.	Observe, think critically, classify, record, communicate, collaborate	Correctly Identify at least two situations in which balanced forces act and two in which unbalanced forces act.
Examine a variety of situations in which forces cause a change in direction, shape or motion (example: kicking a football, blowing a balloon and batting a cricket ball) and discuss the role of unbalanced forces in these situations.	observe, think critically, record, communicate, classify	Illustrate two situations for each of the following in which forces causes a change in direction, shape or motion.
in groups carry out the following activities to investigate the balanced/unbalanced forces involved: <ol style="list-style-type: none"> <li>1. Place a tennis ball floating in a cup of water. Observe and record what happens to the ball when a pencil is used to submerge the ball and then release it. Discuss and suggest explanations for observations.</li> <li>2. Toss a tennis ball vertically upwards and record observations. Discuss what might have caused the ball to stop moving upwards and return to the ground.</li> <li>3. Drop a stone and a feather and compare their observations. Suggests reasons for differences observed.</li> <li>4. Drop a stone and observe its fall. Attach a parachute the stone, allow it</li> </ol>	Investigate, observe, think critically, communicate, manipulate, conduct fair test	Relationship between floating and upthrust Correctly identified.  Correctly conclude that the falling motion of the ball was due gravitational force.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
<p>to fall again and record their observations. Suggests reasons for differences observed.</p> <p>5. Attach a rubber band/spring to a wooden block and place the block on a rough surface. Pull on the rubber band, gradually increasing the pull, until the block begins to move. Repeat the procedure for a smooth surface. Record, compare and suggest reasons for observations.</p> <p>6. Release a small mass (e.g. a coin) from a specific height and record observations (including time to hit the ground). Attached the coin to a parachute and repeat the procedure. Compare and offer explanations for observations.</p> <p>Share and discuss their results and ideas with the class. <a href="#">This may be done using online journal sites.</a></p> <p>Using diagrams illustrate the opposing forces acting in each case. Present findings to class in a variety of ways <a href="#">including using multimedia presentation and/or digital story tools.</a> (Teacher should guide students in identifying the balanced and unbalanced forces involved in the various activities: upthrust, gravity, friction, air resistance.)</p>	<p>Communicate, think critically <a href="#">Journalize observations</a></p> <p>Construct diagrams, communicate <a href="#">Create, manipulate, communicate using digital content</a></p>	<p>Acceptable explanations given for observations.</p> <p>Correctly draw use arrows on diagrams to indicate direction of forces experienced on the floating model and the parachute</p>
<p>In groups be given a container of water and two equal clumps of plasticine “play dough” investigate sinking and floating in the water. Design and construct a model that will sink and a model that will float. Discuss how the shape of the play dough affects floating and sinking. (Teacher should guide students to the inference that shape of the play dough changes the upthrust it experiences.)</p> <p>Use plasticine to form balls. Add the balls one at a time to the floating model observing the change in depth at which it floats, until the model sinks. Discuss the relationships between the depth of floating and upthrust, and weight and sinking.</p>	<p>Collaborate, observe, think critically, communicate, manipulate, investigate</p> <p>observe, communicate, think critically, manipulate</p>	<p>Conclude that the depth at which a body floats in water is related to upthrust it experiences. shape related to upthrust and weight related to sinking</p>
<p>In groups design and construct a paper plane (as outlined in the figure 1 below) to investigate the effects of streamlining. Fly planes in groups and observe and</p>	<p>observe, investigate, communicate, think critically,</p>	<p>Comparison of flight distances of both model designs correctly</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
<p>record the horizontal distance of flight. Use word processing software/digital drawing tools for shape designs and documentation.</p>  <p>Fold back the tail of the airplane (as shown in figure 2 below) to create drag and repeat the flight process. Observe and record the horizontal distance of flight</p>  <p>Compare the difference in distances of travel for the two flight processes.</p>	<p>manipulate</p>	<p>illustrates the effects of streamlining.</p> <p>Comparison of rate of descent of both situations correctly illustrates the effects of streamlining.</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment Criteria
<p><i>(Teacher should ensure that students realise that the paper plane with the flaps experiences more air resistance due to the fact that more surface area is exposed.)</i></p> <p>Explore further using planes of different designs.</p> <p>Use a clump of plasticine “play dough” to design a solid cone. Drop the cone point first into a cylinder of water and note the rate of descent. Then drop the cone base first into a cylinder of water and note the rate of descent. Discuss and report on the observations.</p>		

Learning Outcomes
<p>Students will be able to:</p> <ul style="list-style-type: none"> <li>✓ explain the action of balanced and unbalanced forces in various situations</li> <li>✓ demonstrate the effect of streamline shapes on resistance to motion in water and air</li> <li>✓ <a href="#">Conduct electronic search for kinds of information e.g. text images and audio</a></li> <li>✓ <a href="#">Collaborate and communicate online using class blog/social network sites.</a></li> </ul>

Points to Note	Extended Learning
<p>design and construction of model parachute should be done prior to class (at home)</p> <p>teacher should introduce and explain the term drag</p> <p><a href="#">Participate in online discussions using resources designed for student collaboration and knowledge building</a></p>	<p>Research on ways of reducing friction. (include the invention of the wheel and axle and use of lubricants)</p> <p>Research the purpose of Plimsoll Lines on ships</p>

<p>Teacher created/supervised class blog/social network sites.</p> <p>Demonstrate safe, respectful, responsible and clear online communication</p>	
<p><b>Resources</b> Rope, football, balloon, cricket ball, tennis ball, rubber band, wooden block, water, cylinder, plasticine, paper</p> <p>Computers, Internet, speaker, multimedia projector, interactive video tutorials, CDs/DVDs, word processing and multimedia software, class blog/social network sites</p>	<p><b>Key vocabulary</b> Forces, upthrust, friction, drag, gravity, streamline, floating, sinking, stretching</p>
<p><b>Links to other subjects</b> Technical Vocational Education – apply solutions Mathematics – measurement</p>	

**Prior Learning**

Check that students can:  
 identify the fundamental of length and time and their units;  
 correctly construct line graphs.

**UNIT TITLE:** Forces and Motion

**Theme:** Energy, Forces and Matter

**Attainment Target(s)**

- Understand natural laws as they apply to motion, forces, and energy transformations.
- Apply scientific knowledge and processes to the solution of real world problems.
- Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.
- Appreciate the influence and limitations of science with consideration for ethical issues.
- Demonstrate a positive attitude towards the use of scientific language.
- Demonstrate positive interpersonal skills in order to foster good working relationships.

**Benchmark(s):**

- Explore the relationships between forces and motion, and illustrate these relationships in the environment and living things.
- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

**Objectives:**

Students will:





- ❖ Describe the motion of an object by its position, direction, and speed.
- ❖ Distinguish between displacement, distance, velocity, speed, and acceleration.
- ❖ Solve problems involving displacement, distance, velocity, speed, and constant acceleration.
- ❖ Work cooperatively in groups.
- ❖ Value individual effort and team work by respecting different perspectives.
- ❖ Show objectivity by using data and information to validate observations.

- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** One Dimensional Motion

**Duration:** hours

#### ICT ATs

-  **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.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>in groups, push an object (ball/toy car) from a start/reference point and describe its motion with respect to its position and direction from the reference point, and its speed (e.g. the object moved slowly 5m west of the start point). Repeat the activity several times with varying sizes of push and in different directions. Share and discuss their descriptions of the object's motion with the class. As a class, discuss the importance of stating the direction and distance from the reference point when describing the motion of objects.</p>	<p>Collaborate, communicate, manipulate, investigate, think critically</p>	<p>Descriptions of positions stated giving distance and direction.</p>
<p>In groups carry out the following:</p> <ul style="list-style-type: none"> <li>• Mark a reference point and place an object on it. Move the object in a straight line to a particular distance from the reference point, say 20 cm, in a particular direction, say East. Describe and record the new position of the object with regards to the reference point. Repeat several times, each time moving the object the same distance but in a different direction.</li> <li>• Move the object several distances in the same direction, in a straight line. Measure the distance from the reference point and describe and record the new position in each case.</li> <li>• Move the object along a looped path, starting and ending at the reference point. Measure the distance moved by the object and describe its new position.</li> </ul> <p>Answer and justify their responses to questions based on the activities. Example:</p> <ol style="list-style-type: none"> <li>1. If the distance the object moves is the same, is its final position always the same?</li> <li>2. If the object moves in the same direction, is its final position always the same?</li> </ol> <p>Share and discuss their results from the activities and answers to the questions with the class. (<i>Teacher should use relevant points raised by the students in the discussion to introduce the term displacement.</i>) Discuss the difference between distance and displacement. (<i>Note: Distance refers to how much ground an object has covered during its motion, whereas displacement refers to the distance covered in a particular direction.</i>)</p> <p>Practise finding distance and displacement (see examples below).</p> <ul style="list-style-type: none"> <li>• <i>A man walks from point A to B to C. Determine the distance he travels and his final displacement.</i></li> </ul>	<p>Investigate, communicate, collaborate, think critically, manipulate</p>	<p>Correct/acceptable answers and justifications given.</p>



Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<div data-bbox="609 325 954 472" data-label="Figure"> <p>Position in metres</p> </div> <ul style="list-style-type: none"> <li>• A cow and a chicken take different routes in moving from Point A to Point B as shown below.           <div data-bbox="589 572 976 786" data-label="Diagram"> </div> <ol style="list-style-type: none"> <li>i. What distance does the cow travel?</li> <li>ii. What distance does chicken travel?</li> <li>iii. What is the cow's displacement?</li> <li>iv. What is the chicken's displacement?</li> </ol> </li> <li>• A car travels around a 400 m track as shown below.           <div data-bbox="669 1043 904 1265" data-label="Diagram"> </div> <ol style="list-style-type: none"> <li>i. If the car travels once around the track, what distance does it travel?</li> <li>ii. If the car travels twice around the track, what distance does it travel?</li> <li>iii. If the car travels once around the track, what is its displacement?</li> </ol> </li> </ul>		
View videos of situations where speed is measured, e.g. athletics events, racing car events,	Collaborate, communicate,	Speeds correctly calculated.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>and discuss what they know about how speeds can be determined. In groups, be provided with times for a series of athletic events, e.g. men's/women's 100m, 200m, etc., and asked to deduce what they can about the speeds in the events, and to explain their answers (e.g. distance and time have to be measured). (<i>Teacher should introduce the formal relationship, <math>speed = distance \div time</math>.</i>) With the aid of teacher, use the relationship between speed, distance and time in a variety of contexts. As a class, compare speeds in different units of measurement. Carry out simple activities in which they predict the speeds of objects over a particular distance, then measure the time for the objects to travel that distance; for example, predict then determine the speed a ball travels with when dropped from a height of 2m to the ground. Calculate the speeds of the objects and compare their results to their predictions. (<i>Teachers should ensure that students make repeated measurements and conduct fair tests.</i>)</p> <p>In groups, be provided with descriptions of objects moving at various velocities (for example: a truck moving at <math>80\text{kmhr}^{-1}</math> due East; a man running at <math>10\text{ms}^{-1}</math> due North) and asked to discuss, identify and record the similarities and differences between speed and velocity, including how they are calculated. Share and discuss their views with the class. (<i>Teachers should use the discussions to clarify any misconceptions and elicit the relevant points from students.</i>) As a class, summarise the similarities and differences between speed and velocity.</p>	investigate, think critically, manipulate, conduct fair tests	Correct similarities and differences speed and velocity identified.
<p>Observe two students in a short skit depicting a driving instructor and his student (see dialogue below).</p> <p><b>Student:</b> <i>What do you use to make a car go faster?</i>  <b>Driving instructor:</b> <i>The gas pedal or accelerator.</i>  <b>Student:</b> <i>What causes the car's velocity to change from <math>40\text{kmhr}^{-1}</math> to <math>80\text{kmhr}^{-1}</math>?</i>  <b>Driving instructor:</b> <i>The gas pedal or accelerator.</i>  <b>Student:</b> <i>What do you use to go slower?</i>  <b>Driving instructor:</b> <i>The brake.</i>  <b>Student:</b> <i>What causes the odometer's needle to move from <math>80\text{kmhr}^{-1}</math> to <math>40\text{kmhr}^{-1}</math>?</i>  <b>Driving instructor:</b> <i>The brake.</i>  <b>The student:</b> <i>What do you use to change the velocity of the car?</i></p>	Collaborate, communicate, think critically	Correct answers to problems on acceleration.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p><b>Driving instructor:</b> <i>The accelerator, which is the gas pedal, or the brake.</i></p> <p>In groups, answer questions based on the skit. For example:</p> <ul style="list-style-type: none"> <li>• Does a car's velocity change when it speeds up?</li> <li>• Does a car accelerate when it speeds up?</li> <li>• Does a car's velocity change when it slows down?</li> <li>• Does a car accelerate when it slows down?</li> </ul> <p>Share and discuss their answers to the questions with the class and, as a class, formulate simple working definition for acceleration. Discuss the equation for calculating acceleration, provided by the teacher (Acceleration = <math>\frac{\text{Change in velocity}}{\text{time taken}}</math>), and the unit of acceleration.</p> <p>In groups, discuss scenarios in which objects move in a circular path and determine if the velocity and acceleration changes, providing justifications for their ideas.</p> <p>Be given simple problems in which they determine change of velocity and acceleration. For example: <i>A car moving at <math>40\text{kmhr}^{-1}</math> changes its velocity to <math>80\text{kmhr}^{-1}</math> in 10s. What is the change in the car's velocity? Find the acceleration of the car?</i></p> <p><b>(Note: students are NOT required to perform unit conversions here, nor should the equations of motion be introduced.)</b></p>		

<p>Learning Outcomes</p> <p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> <li>✓ Differentiate among the basic terms used to describe motion</li> <li>✓ describe the motion of objects using words, diagrams, numbers, graphs, and equations</li> <li>✓ Measure distance and time and calculate speed.</li> </ul>
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<b>Points to Note</b>	<b>Extended Learning</b>
If there are pupils with physical disabilities in the class, ensure that examples are used which enable them to make a positive contribution, e.g. records from the Special Olympics for people with disabilities.	Research suitable methods of measuring the speed of sound in air and, if possible, carry out this activity.
<b>Resources</b> Instruments for measuring time and length, computer, internet.	<b>Key vocabulary</b> displacement, distance, velocity, speed, acceleration
<b>Links to other subjects</b> Mathematics – measurement, graphs	

**UNITS OF WORK GRADE 8 TERM 2 UNIT 3: RESPIRATION AND GAS EXCHANGE****About the Unit**

In this Unit students will learn that all living cells require energy to function and that the energy is released from food substances during respiration. Aerobic respiration uses oxygen obtained from the atmosphere during breathing, takes place inside the mitochondria of cells and produces carbon dioxide and water as by products. In anaerobic respiration energy is released without oxygen.

**Range of Content**

- Breathing is the process of drawing air into and out of the lungs.
- During respiration energy is released from food for use by cells.
- There are two types of respiration, aerobic and anaerobic.
- In aerobic respiration oxygen is used to release energy from food.
- Carbon dioxide and water are by products of aerobic respiration.
- In anaerobic respiration energy is released in the absence of oxygen.
- Gaseous exchange is the process by which oxygen and carbon dioxide diffuse across the alveoli.

**GUIDANCE FOR THE TEACHER**

- Students should consider the welfare of and demonstrate appropriate attitudes to the care of living organisms
- Pay attention to the ways in which human activities can affect breathing
- Wash hands and wipe the bench with disinfectant after handling live materials.

**Prior Learning**

Check that students can:

- Recall the main organs of the human respiratory system and their basic functions
- Explain diffusion as the movement of particles of a substance from high to low concentration
- State the function of mitochondria
- Describe the nutrients in food
- Identify the final products of digestion
- Describe the process of photosynthesis.

<b>UNIT TITLE:</b> Respiration	
<p><b>Theme:</b> Living Things, Life Processes and the Environment</p> <p><b>Attainment Target(s)</b></p> <ul style="list-style-type: none"> <li>• Understand the importance of the life processes in plants and animals, their interdependence, their interaction with the environment, and how lifestyles determine health and well-being.</li> <li>• Apply scientific knowledge and processes to the solution of real world problems.</li> <li>• Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.</li> <li>• Appreciate the influence and limitations of science with consideration for ethical issues.</li> <li>• Demonstrate a positive attitude towards the use of scientific language.</li> <li>• Demonstrate positive interpersonal skills in order to foster good working relationships.</li> </ul>	<p><b>Students will:</b></p> <ul style="list-style-type: none"> <li>• Describe the structure and basic function of the human respiratory system</li> <li>• Trace the pathway of oxygen from the atmosphere to the alveoli</li> <li>• Describe respiration as the process in which energy is released from food either in the presence or absence of oxygen.</li> <li>• State that mitochondria are required for aerobic respiration</li> <li>• Describe the exchange of oxygen and carbon dioxide across the alveoli</li> <li>• Write a simple word equation to describe the process of aerobic respiration.</li> <li>• Explain the importance of energy to organisms</li> <li>• Distinguish between respiration and breathing.</li> <li>• Perform investigations to identify the products of aerobic respiration.</li> <li>• Compare photosynthesis and respiration and explain how they are linked.</li> <li>• Make observations and present these in a suitable format</li> </ul>

**Benchmark(s):**

- Understand the intake, digestion and absorption of food in animals, and how energy is released through respiration.
- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** Respiration

**Duration:** 10 Hours

**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.**

- Account for factors that cannot be controlled when working with living materials
- Display safety consciousness for self and others
- Keep work area tidy during practical activities

Suggested Teaching and Learning Activities	Key Skills	Assessment
<p><b>Students will:</b> View a video/diagram/poster (online or offline) of the respiratory system and trace the pathway of air from the moment it enters the nostrils until it reaches the alveoli. Write down the structures involved in sequence and share with class.</p> <p>View illustrations, models or <a href="#">digital/animated pictures</a> of the fine structure of the lungs and suggest why the alveoli have so many blood vessels around them. Use the information provided by the teacher about carbon dioxide and oxygen concentrations in the atmosphere, blood and alveoli to predict what happens to the gases in the alveoli. Annotate given diagrams with arrows to show the direction of movement of oxygen and carbon dioxide and describe gas exchange in the alveoli.</p> <p>In groups, talk about their experiences and view video clips of athletic activities. Brainstorm the meaning of the term 'breathing' and explain why breathing is important for carrying out these activities. Share ideas with the class.</p> <p>Sit quietly for 3 minutes. In pairs, 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. Take turns to run vigorously on the spot for 3 minutes then immediately count the number of breaths taken in a minute. Combine class results to construct a table to record the breathing rates before and after exercise. Plot a suitable graph using the data in the table. Explain the results. As a class, brainstorm how gender, state of health and different types of activity can affect breathing rate.</p>	<p>Collaborate, communicate</p> <p>Predict, annotate, infer, communicate</p> <p>Collaborate, communicate, think critically</p> <p>Calculate, tabulate, communicate, collaborate, make Inferences, investigate, measure, think critically</p>	<p>Pathway of air correctly traced.</p> <p>Diagrams accurately annotated to show movement of oxygen from alveoli to the blood and removal of carbon dioxide from the blood into alveoli.</p> <p>Acceptable explanation and role of breathing</p> <p>Acceptable record of data using table and graph Satisfactory summary of impact of selected factors on the rate of breathing</p>
<p>Test for the presence of carbon dioxide in exhaled air by using a straw to blow into a transparent container of lime water (Calcium Hydroxide solution).</p>	<p>Investigate, observe, infer, manipulate</p>	<p>Cloudiness of lime water accurately linked to the presence of CO<sub>2</sub></p>



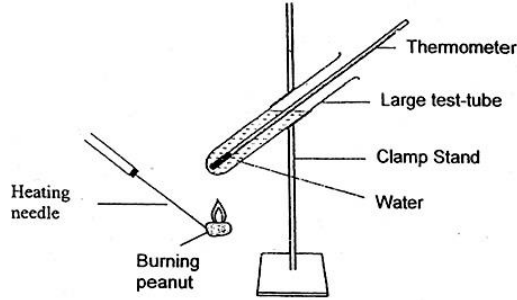
<p>Record their observations and explain their findings.</p> <p>In groups, half fill 3 boiling tubes with hydrogen carbonate indicator and record the colour. Immerse a pond snail/guppy (small fish) into one, a piece of <i>Elodea</i> or other water plant in the second tube, and leave the third without 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.</p> <p>In groups, Investigate the release of energy from food material (e.g. a peanut). Pour 20 cm<sup>3</sup> of water into a test tube and support it on a burette stand. Measure and record the initial temperature of the water. Find the mass of a peanut or cashew then stick it on the end of a pointed needle. Light the peanut/cashew and place below the test tube with the water. When the nut has completed burning, stir the water in the test tube then measure and record the final temperature. Calculate the energy released from the peanut/cashew using the following formula:  <i>Energy released (J) = Mass of Water (g) x Rise in Temperature (°C) x 4.2</i>          (Note: 1cm<sup>3</sup> water = 1g)</p> <p>Investigate the presence of water vapour in exhaled air by breathing out onto a cool mirror or glass. Observe what happens to the mirror/glass and test for the presence of water using blue cobalt chloride paper  <a href="#">Watch online/offline demonstration and interactive videos on the products respiration.</a></p> <p>In groups, brainstorm to formulate a definition then construct a word equation for aerobic respiration. Share definitions and equations with the class and generate common definition.</p> <p>Work in small groups to construct a table to compare photosynthesis and respiration.</p>	<p>Investigate, make observations, infer, think critically, manipulate, communicate, collaborate</p> <p>Investigate, manipulate, infer, communicate, collaborate, think critically</p> <p>Investigate, manipulate, infer</p> <p>Define operationally, communicate, collaborate, think critically</p> <p>Tabulate, compare, collaborate, communicate, think critically</p>	<p>Colour change from orange-red to yellow correctly linked to carbon dioxide produced in respiration          The role of the control correctly identified.</p> <p>Accurate inference drawn from observation of rise in temperature of water. The energy released from the burning peanut/cashew is correctly linked to respiration.</p> <p>Acceptable inferences made.</p> <p>Acceptable definition and word equation given</p> <p>Similarities and differences between photosynthesis and respiration correctly cited</p>
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### Learning Outcomes

Students who demonstrate understanding can:

- ✓ Define aerobic respiration.
- ✓ Trace the route taken by carbon dioxide and oxygen in the respiratory system.
- ✓ Explain the importance of respiration to living organisms.
- ✓ Describe the exchange of gases across the alveoli.
- ✓ Summarise aerobic respiration using a simple word equation.
- ✓ Perform simple experiments to identify products of aerobic respiration.
- ✓ State similarities and differences between photosynthesis and respiration.
- ✓ Distinguish between respiration and breathing.
- ✓ Recognise the need for a control in an investigation.
- ✓ Create and publish original documents using word processing software and other technology tools

Points to Note			Extended Learning															
Do not allow students to share straws because of the danger of cross infections			Research and report on how human activities contribute to diseases of the human respiratory tract.															
Teacher should initiate discussion for students to clearly distinguish between breathing and respiration, inspired and expired air.			Find out which respiratory diseases are more prevalent in Jamaica. (Relate to age, gender, occupation and lifestyle).															
<table border="1"> <thead> <tr> <th>Constituent</th> <th>Inhaled air %</th> <th>Exhaled air %</th> </tr> </thead> <tbody> <tr> <td>Oxygen</td> <td>20</td> <td>16</td> </tr> <tr> <td>Carbon dioxide</td> <td>about 0.03</td> <td>4</td> </tr> <tr> <td>Nitrogen and other gases</td> <td>about 80</td> <td>about 80</td> </tr> <tr> <td>Heat</td> <td>usually less</td> <td>about 37</td> </tr> </tbody> </table>			Constituent	Inhaled air %	Exhaled air %	Oxygen	20	16	Carbon dioxide	about 0.03	4	Nitrogen and other gases	about 80	about 80	Heat	usually less	about 37	Design a leaflet/poster/advert for teenagers aimed at informing them of the benefits of aerobic exercise and encouraging them to get fit.
Constituent	Inhaled air %	Exhaled air %																
Oxygen	20	16																
Carbon dioxide	about 0.03	4																
Nitrogen and other gases	about 80	about 80																
Heat	usually less	about 37																
			Research how aquatic organisms exchange gases.															

Water Vapour	usually less	saturated air	
<p><i>Table showing the comparison of inhaled/exhaled air</i></p> <p>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.</p> <p>Be aware of medical conditions that affect the ability of certain students to perform exercise (e.g. asthmatics, persons who suffer from sickle cell anaemia).</p> <p>Include diagram of apparatus for energy release from food in instructions given to students.</p> 			
<p><b>Resources</b>  Videos, charts, hydrogen carbonate indicator, variety of invertebrates, <i>Elodea</i>, boiling tubes, drinking straws, disinfectant, rubber bungs, jars for collected specimens, lime water (Calcium hydroxide), peanuts/cashews, thermometers, cobalt chloride paper, transparent tape, mirror, timers, clamp and stands, water, plasticine, large pins, computer, speakers, Internet, multimedia projector, video CDs/DVDs, multimedia, word processing and graphic software tools,</p>			<p><b>Key vocabulary</b>  Respiration, glucose, aerobic, anaerobic, energy, hydrogen carbonate indicator, lime water, lung, trachea, bronchi, bronchioles, alveoli, breathing, oxygen, nitrogen, carbon dioxide,</p>
<p><b>Links to other subjects</b>  Physical Education  Home Economics</p>			

**UNITS OF WORK GRADE 8 TERM 3 UNIT 2: SPACE SCIENCE****About the Unit**

In this Unit students will study outer space and some technologies that are used in space exploration. Through fun hands-on activities and simulations, they will explore planets, stars, and the solar system. They will become familiar with the light-year as a unit of astronomical distance, and discover the role of gravity

**Range of Content**

- The solar system: the sun, the planets, moons, comets, asteroids, and meteoroids.
- Deep space: the universe, galaxies, and stars
- Space exploration
- Gravity
- The light year

**Guidance for the Teacher**

**Prior Learning**

Check that students know:

- that the gravitational attraction of the Earth on a mass causes weight
- about the planets of the solar system and that they orbit the Sun

**UNIT TITLE:** Space Science

**Theme:** Living Things, Life Processes and the Environment

**Attainment Target(s)**

- Gain an understanding of the components and structure of the universe, and how advances in science and technology have enabled space exploration.
- Apply scientific knowledge and processes to the solution of real world problems.
- Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.
- Appreciate the influence and limitations of science with consideration for ethical issues.
- Demonstrate a positive attitude towards the use of scientific language.
- Demonstrate positive interpersonal skills in order to foster good working relationships.

**Benchmark(s):**

- Understand the physical characteristics of the universe and how technology has enabled its exploration.

**Objectives:**

Students will:





- ❖ Construct a model of a technological tool/device needed for space exploration (e.g. telescope, gyroscope, robot, camera, detector, rocket)
- ❖ Determine the connections between the concepts universe, galaxy, and star.
- ❖ Recognise that some stars have planetary systems
- ❖ describe, in qualitative terms, the physical characteristics of selected components of the solar system (the sun, the planets, moons, comets, asteroids, and meteoroids)
- ❖ construct simple models and diagrams to explain eclipses of the Sun and Moon
- ❖ explain the role of gravity in determining the motions of the planets, stars, and solar system
- ❖ use the light year, as a unit of astronomical distance, in solving simple problems
- ❖ formulate relevant questions about the Universe and produce correct answers to them
- ❖ work cooperatively in groups
- ❖ show respect in responding to other persons' reports

- Analyse and interpret experimental data to determine similarities and differences in findings.
- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate sensitivity to others who are different.

**Topic:** Beyond the Earth

**Duration:** hours

#### ICT ATs

-  **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.**

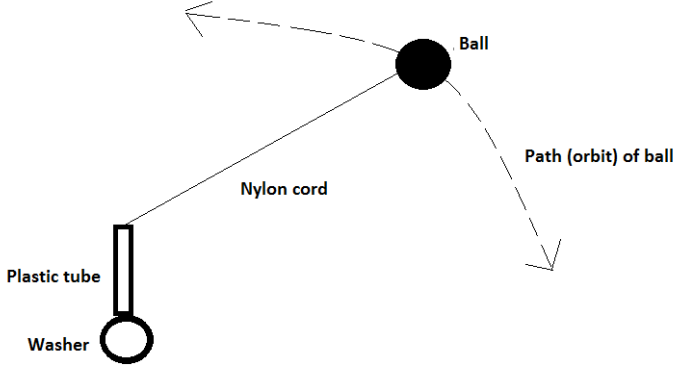
❖ Communicate scientific information

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
Recap the concepts of mass, weight, gravity and the solar system in a variety of ways, such as, crossword puzzles/worksheets/videos/simulations/games/KWL strategy. Participate in teacher-led discussion to emphasise the concepts. <i>(Teacher should emphasize the difference between mass and weight.)</i>	Think critically	Correct information provided for each concept.
<p>In groups, discuss and list tools/instruments they think would be needed to gather information about outer space. Research the instruments they have listed (online/offline). Create a mini booklet or scrapbook on 'Space Exploration Tools', including the names and pictures of instruments needed for space exploration, and a brief description of the purpose of each instrument. Share and critique booklets in a class discussion.</p> <p>In groups, plan and design a simple model of any one of the technological tools discussed. Plans should include criteria for success and constraints, and scale diagrams. Present plans to class and make necessary adjustments to their design, if necessary, based on feedback. Make the model instrument based on revised plans, and display them in the science corner.</p>	<p>Collaborate, think critically, create, research, communicate</p> <p>Collaborate, communicate, think critically, plan and design, manipulate, create</p>	<p>Mini booklet/scrapbook contains correct information on space exploration tools.</p> <p>Plans reflect the Engineering Design Process. Model of instrument constructed.</p>
In groups, be given pictures, or carry pictures, of the universe, a galaxy and stars, and separate labels with the names. Attach the labels to the pictures. Use the labelled pictures to create a flow chart showing the relationships among them (see example below).	Collaborate, think critically	Pictures correctly labelled. Flow chart reflects correct information.

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<div data-bbox="533 299 784 920" style="text-align: center;"> <pre> graph TD     U[UNIVERSE] -- contains billions of --&gt; G[GALAXIES]     G -- contains billions of --&gt; S[STARS]             </pre> </div> <p data-bbox="510 920 757 954"><i>Figure 1. Flow chart</i></p> <p data-bbox="188 994 1034 1061">Use mathematical set notation to illustrate the relationship among the concepts universe, galaxy and star (see examples below).</p> <div data-bbox="197 1108 593 1327" style="text-align: center;"> </div> <p data-bbox="680 1303 1016 1367" style="text-align: center;"><i>Star ⊂ Galaxy ⊂ Universe</i> <i>Expression 1: Set Notation</i></p> <p data-bbox="188 1337 448 1370"><i>Figure 2. Set diagram</i></p>		<p data-bbox="1594 624 1957 725">Relationship among universe, galaxy and star correctly represented in set notation.</p>
<p data-bbox="188 1377 1133 1478">Visit a virtual observatory through the internet, or watch video, or read articles on the solar system. In groups, discuss the materials viewed/read and write a brief description of each of the following: the sun, the planets, moons, comets,</p>	<p data-bbox="1164 1377 1491 1444">Collaborate, communicate, create, think critically</p>	<p data-bbox="1594 1377 2027 1478">Acceptable descriptions written for the sun, the planets, moons, comets, asteroids, and meteoroids.</p>



Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>asteroids, and meteoroids.</p> <p>As a class, share and refine descriptions, then create a poem/short story/poster (electronic/non-electronic) entitled “<i>Components of Our Solar System</i>”.</p> <p>In a class discussion, suggest what bodies they might be associated with other stars. Individually, write a fictional story about their journey to another planetary system, focusing on the types of bodies they saw.</p>		<p>Poem/short story/poster contains correct information.</p> <p>Fictional story contains acceptable suggestions about other bodies that might be in another planetary system.</p>
<p>Recap the meaning of the terms luminous and non-luminous. Group the objects in space they have looked at as luminous or non-luminous.</p> <p>In groups, in a relatively dark area, place a flashlight directly in front of a large ball (e.g. a football), at a fixed distance from it. Turn on the flashlight and slowly move a small ball (e.g. a tennis ball) across and in front of the flashlight. Record their observations using simple scientific language and labelled diagrams. Repeat the movement of the small ball in front of the flashlight at varying distances, and record their observations using simple scientific language and labelled diagrams.</p> <p>Repeat the activity above with the small ball at the fixed distance from flashlight and the large ball being moved. Record their observations using simple scientific language and labelled diagrams.</p> <p>Share observations and discuss observations with the class. Participate in teacher-led discussion on solar and lunar eclipses, relating the concepts to the activities done. (<i>Teacher should emphasize safety practices to be observed when viewing eclipses.</i>)</p>	<p>Classify, collaborate, investigate, manipulate, communicate, observe, think critically</p>	<p>Objects correctly grouped as luminous or non-luminous</p> <p>Appropriately recorded observations: diagrams illustrate solar and lunar eclipses.</p>
<p>In groups, use a wooden or foam ball with a hole bored through its centre, a plastic tube, (e.g. a 1-inch PVC pipe) nylon cord and washer to construct a simple model of a satellite system.</p> <ul style="list-style-type: none"> <li>• Tie one end of the cord to the washer.</li> </ul>	<p>Collaborate, observe, manipulate, investigate, infer, think critically</p>	<p>Summary includes all the main points from the class discussions.</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<ul style="list-style-type: none"> <li>• Pass the other end of the cord through the plastic tube and the ball, and then tie this end around the ball.</li> <li>• Hold the washer next to the bottom of the tube and rotate their fists so that the ball circles your fist, as shown in figure 3 below.</li> <li>• Take turns rotating the ball and record their observations.</li> </ul>  <p style="text-align: center;"><i>Figure 3. Model Satellite System</i></p> <p>Answer the following questions and share their responses in a class discussion.</p> <ul style="list-style-type: none"> <li>• What keeps the ball from flying off when being spun around?</li> <li>• Compare the model satellite to the motion of the Earth and the other planets around the Sun.</li> <li>• What keeps Earth and the other planets from flying off into space away from the Sun?</li> </ul> <p>As a class, watch a video or read an article on how gravity causes the motions of space bodies and discuss how gravity causes the following:</p> <ul style="list-style-type: none"> <li>• The motions of planets and stars.</li> <li>• The orbit of the solar system around the centre of the galaxy.</li> </ul> <p>Individually, write a brief summary of the main points from the class discussions.</p>		

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment										
<p>In groups, be given a timer and a metre rule/measuring tape/trundle wheel. Measure about 20 metres between two points, A and B, inside or outside the classroom. Starting from one of the points, have one member of the group walk heel-to- toe, back-and-forth between the two points for exactly one minute. Then stop and mark their position. Measure how far they walked to the nearest metre, and record this distance in the table below. Repeat the steps two more times, then calculate and record the mean average in the table.</p> <table border="1" data-bbox="309 635 1019 819"> <thead> <tr> <th>Trials</th> <th>Distance Walked/metres</th> </tr> </thead> <tbody> <tr> <td>1</td> <td></td> </tr> <tr> <td>2</td> <td></td> </tr> <tr> <td>3</td> <td></td> </tr> <tr> <td><b>Average (Student-minute)</b></td> <td></td> </tr> </tbody> </table> <p>(The average is the distance walked heel-to-toe in one minute, called a 'student-minute'.)</p> <p>In groups, use their <i>student-minute</i> to solve various problems. For example: How many metres in 5 student-minutes? How many of student-minutes are there in 8000 metres?</p> <p>Share and compare their results with the other groups. As a class, discuss the advantages and disadvantages of representing distance (metre) using time (student-minute). Suggest <i>student-time</i> units that may better cover larger distances.</p> <p>In groups, discuss and record what they think the term 'light-year' means. Discuss the similarities between student-minutes and light-year. Share their thoughts with the class. Be given the equivalent value of the light-year (<math>1 \text{ light-year} \approx 1 \times 10^{13} \text{ km}</math>) by the teacher and, as a class, discuss the importance of this unit. Use their knowledge of the light-year to complete the table below.</p>	Trials	Distance Walked/metres	1		2		3		<b>Average (Student-minute)</b>		<p>collaborate, manipulate, investigate, think critically, measure, communicate</p>	<p>Measurements taken with due precaution to minimise errors. Mean average calculated correctly. Questions correctly answered. Table correctly completed.</p>
Trials	Distance Walked/metres											
1												
2												
3												
<b>Average (Student-minute)</b>												

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment																					
<table border="1" data-bbox="262 408 1099 690"> <thead> <tr> <th colspan="3">Distance to other stars in the Milky Way</th> </tr> <tr> <th>Star</th> <th>Distance in Kilometres</th> <th>Distance in Light years</th> </tr> </thead> <tbody> <tr> <td>Proxima Centauri</td> <td><math>4.3 \times 10^{13}</math></td> <td></td> </tr> <tr> <td>Sirius</td> <td><math>9.0 \times 10^{18}</math></td> <td></td> </tr> <tr> <td>Betelgeuse</td> <td></td> <td>500</td> </tr> <tr> <td>Vegas</td> <td><math>2.6 \times 10^{14}</math></td> <td></td> </tr> <tr> <td>Polaris</td> <td></td> <td>6800</td> </tr> </tbody> </table>	Distance to other stars in the Milky Way			Star	Distance in Kilometres	Distance in Light years	Proxima Centauri	$4.3 \times 10^{13}$		Sirius	$9.0 \times 10^{18}$		Betelgeuse		500	Vegas	$2.6 \times 10^{14}$		Polaris		6800		
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Polaris		6800																					
<p>Be asked to think of questions to answer about the Universe, e.g.</p> <ul style="list-style-type: none"> <li>- Can any other planet support life?</li> <li>- Why do we only see other stars at night?</li> </ul>	Think critically																						

<b>Learning Outcomes</b>
<p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> <li>✓ Describe and build simple models of space exploration tools.</li> <li>✓ Explain and represent the hierarchy of organisation of the Universe in graphical and mathematical forms.</li> <li>✓ describe, in qualitative terms, the physical characteristics of selected components of the solar system</li> <li>✓ illustrate solar and lunar eclipses using models and diagrams</li> <li>✓ explain the movement of selected space bodies due to gravitational force</li> <li>✓ Explain the significance of the light-year</li> <li>✓ Convert the light-year to kilometres and vice-versa</li> <li>✓ Generate questions about the Universe</li> </ul>

<p><b>Points to Note</b></p> <p>Students should be encouraged to write their reports using ICT and to include images within it.</p> <p>Many of the concepts in this unit may be abstract, so videos, animations and appropriate websites should be used as much as is possible.</p> <p>Teacher could organise a viewing of stars, provided the school has a telescope.</p>	<p><b>Extended Learning</b></p> <p>Research and describe some uses of artificial satellites, e.g. to assist weather forecasting, TV transmissions.</p>
<p><b>Resources</b></p> <p>Various stimulus materials on space science, electronic and non-electronic. Materials for building science exploration devices.</p> <p>Materials for model satellite: nylon cord, plastic tube, washer</p> <p>Telescope</p>	<p><b>Key vocabulary</b></p> <p>Light-year, universe, galaxy, star, satellite, moon, comet, asteroid, meteoroid, astronomy, telescope, solar eclipse, lunar eclipse</p>
<p><b>Links to other subjects</b></p> <p>Mathematics – Sets</p> <p>Geography/Social Studies – Solar System</p>	

## **UNITS OF WORK GRADE 8 TERM 3 UNIT 3: WATER AND THE EARTH'S ATMOSPHERE**

### **About the Unit**

In this Unit students will explore the importance of water and air to survival. They will investigate some properties, sources, and uses of water and air. They will explore how water and carbon is cycled in the atmosphere. They will also examine the constituents of air and relate their properties to their uses. They will also explore methods of water conservation and purification.

### **Range of Content**

- Properties, uses, sources of water, and chemical tests for water
- Water cycle
- Water conservation and purification
- Properties, uses, and composition of air
- Carbon cycle

### **GUIDANCE FOR THE TEACHER**

**Prior Learning**

Check that students can:

- State the chemical composition and formula of water
- Recall that air is made up of different types of gases.

**UNIT TITLE:** Water and the Earth's Atmosphere

**Theme:** Living Things, Life Processes and the Environment

**Attainment Target(s)**

- Understand the importance of the life processes in plants and animals, their interdependence, their interaction with the environment, and how lifestyles determine health and well-being.
- Apply scientific knowledge and processes to the solution of real world problems.
- Use mathematics as a tool for problem-solving, and as a means of expressing and/or modelling scientific theories.
- Appreciate the influence and limitations of science with consideration for ethical issues.
- Demonstrate a positive attitude towards the use of scientific language.
- Demonstrate positive interpersonal skills in order to foster good working relationships.

**Benchmark(s):**

- Know the properties, sources and uses of water.
- Know the percentage composition of air and understand how carbon is cycled in the atmosphere.
- Analyse and interpret experimental data to determine similarities and differences in findings.

**Objective:**

Students will:

- Relate the properties of water to its uses
- Investigate selected properties of water
- Identify different sources of water
- Describe a chemical test for water
- Summarize various methods of water conservation
- Explain how water is cycled in nature.
- Describe common methods of water purification
- State the composition of clean air
- Use appropriate statistical graphs to represent the percentage composition of gases in air
- Describe the chemical tests for oxygen and carbon dioxide
- Relate the properties of the gases in air to their uses
- Describe the carbon cycle in simple terms to include the processes of combustion, respiration and photosynthesis
- Make a model to illustrate the processes involved in the carbon cycle
- Value individual effort and team work
- Show interest in the outcomes of investigations





- Analyse several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.
- Appreciate the importance of scientific methods.
- Demonstrate objectivity by seeking data and information to validate observations and explanations.
- Demonstrate concern for safety of self and others.
- Demonstrate curiosity, objectivity and perseverance in their approach to scientific activities.
- Demonstrate concern for the preservation of natural resources.
- Demonstrate concern for man's impact on the environment.
- Demonstrate sensitivity to others who are different.

**Topic:** Water

**Duration:** 4 hours

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**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.



Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>participate in teacher led discussion to review the properties of water. Use the KWL chart to ascertain the chemical composition and formula of water.</p> <p>view video / read literature /conduct <a href="#">online/offline research</a> and participate in teacher led discussion to highlight the properties of water. Record findings in a variety of ways.</p>	<p>Communicate, think critically</p> <p>Research, communicate, think critically</p>	<p>Correctly state the properties of water</p>
<p>in groups, place a drop of water on a glass slide; place another slide on top of it and then try to separate the slides. Discuss the observations and suggest an explanation. Report findings using simple scientific language and use results to draw simple conclusions. Share with class. (<i>Teacher should introduce the term adhesion here</i>).</p> <p>in groups pour coloured water into a beaker and place capillary tubes of different sizes in the water; record any observable change. Participate in teacher led discussion on observations made. Report findings using simple scientific language and use results to draw simple conclusions. Share with class. (<i>Teacher should introduce the term capillarity</i>).</p> <p>in groups, pour water in a beaker and gently place a paper clip or black pepper on the surface of the water; sprinkle soap powder in the beaker with the black pepper or paperclip. Record observations using simple scientific language, drawings or labelled diagrams. Use results to draw simple conclusions and share with class. (<i>Teacher should draw students attention to the concept of surface tension</i>)</p>	<p>Manipulate, make observations, think critically, communicate, collaborate</p> <p>Manipulate, make observations, think critically, communicate, collaborate</p> <p>Manipulate, make observations, think critically, communicate, collaborate</p>	<p>Correct conclusions offered</p> <p>Correct conclusions drawn</p> <p>Correct conclusions drawn</p>
<p>in groups, place a strip of blue cobalt chloride paper and a small sample (about quarter spatula) of anhydrous copper sulphate salt on separate white tiles. Record initial colour of samples. Use a teat pipette to add a few drops of water to the cobalt chloride paper and the anhydrous copper sulphate salt until there is an observable change. Tabulate observations under the following headings: substances used to test water; colour before water added; colour after water added.</p>	<p>Manipulate, make observations, communicate, collaborate,</p>	<p>Accurate observations of colour changes made</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>Research the various sources of water and categorize them as groundwater or surface water.</p> <p>In groups, state some uses of water in the home and industry. Develop a 24 hour 'Water Use' diary and present data as bar graphs, line graphs or pie charts. Analyse the data to indicate the area of maximum water usage. Discuss and record findings and suggest ways in which water can be conserved. Produce a poster, leaflet, or booklet on water conservation.</p> <p>Create a strategy to reduce water usage in the home, school, or community.</p>	<p>Communicate, classify</p> <p>Communicate, collaborate, think critically, create</p> <p>Think critically</p>	<p>Correctly classify sources of water as groundwater and surface water.</p> <p>Presentation and analysis of data acceptable and accurate Poster/leaflet/booklet contains correct information Creative presentations</p>
<p>In groups, research the water cycle and construct a model using indigenous materials. Make a presentation of the water cycle using the model. Display model in the science corner.</p> <p>In groups, research common water purification processes. Plan and design a water purification device. Select appropriate materials. Plans should include costing and reasons for material selection. 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.</p>	<p>Manipulate, create, collaborate, think critically</p> <p>Communicate, plan and design, create, think critically, collaborate</p>	<p>Correct representation of the processes in the water cycle. Model creative, to scale, correct facts represented.</p> <p>Model correctly represents the process depicted</p>
<p>in groups, research <a href="#">online/offline</a> the percentage composition of air and present data in a variety of ways (chart, pie chart, bar graph). Present information in a class display.</p> <p>in groups, investigate the percentage of oxygen in clean air by passing air repeatedly over heated copper to form copper oxide. Make observations and record findings.</p> <p>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.</p>	<p>Research, communicate, collaborate, think critically</p> <p>Make observations, collaborate, communicate, think critically</p> <p>Collaborate, communicate, think critically, create</p>	<p>Presentation contains correct information.</p> <p>Accurate calculations Correct conclusions drawn</p> <p>Correct information presented</p>

Suggested Teaching and Learning Activities Students will:	Key Skills	Assessment
<p>In groups, investigate the chemical tests for oxygen and carbon dioxide.</p> <ul style="list-style-type: none"> <li>- Oxygen relights a glowing splint</li> <li>- Carbon dioxide turns calcium hydroxide (lime water) milky or cloudy.</li> </ul>	<p>Make observations, collaborate, communicate, think critically</p>	<p>Accurate observations recorded</p>
<p>In groups, research and complete the activities in a web quest or computer simulation on the carbon cycle.</p>	<p>Research, think critically, collaborate</p>	<p>Accurate completed information</p>
<p>in groups, use information from discussion/internet/textbooks/<a href="#">multimedia</a> and/or <a href="#">graphic software</a> to create a model of the carbon cycle, and present work to class. Display cycles in the science corner.</p>	<p>Collaborate, create, think critically, communicate</p>	<p>Model contains accurate information Creative model displays</p>

<p>Learning Outcomes</p> <p>Students who demonstrate understanding can:</p> <ul style="list-style-type: none"> <li>• Show how the properties of water relate to its uses</li> <li>• Classify various sources of water</li> <li>• Cite evidence for the presence of water</li> <li>• Suggest ways of conserving water</li> <li>• Describe how water is cycled in nature</li> <li>• Investigate common methods of water purification</li> <li>• Represent the percentage composition of air using appropriate statistical graphs</li> <li>• Show how the properties of the gases in air relate to its uses</li> <li>• Cite evidence for the presence of oxygen and carbon dioxide</li> <li>• Use context cues to construct the carbon cycle</li> </ul>
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- Work cooperatively in groups
- Use word processing, multimedia/digital story software to create digital content to communicate information
- Conduct electronic search to access navigate and manipulate digital content

<p><b>Points to Note</b></p> <p>Teacher must make connections with human activities and the impact these activities have on both cycles in order to sensitize on environmental concerns.</p> <p>Use word processing software and other technology tools to create original work for a specific purpose and audience.</p> <p>Locate relevant information on the Internet by using the successful search strategies</p> <p>Follow guidelines to promote healthy use of ICT tools</p>	<p><b>Extended Learning</b></p> <p>Research water pollution and water borne diseases</p> <p>Research the fractional distillation of air</p> <p>Research two human activities that contributes to an increase in carbon dioxide level and air pollution.</p> <p>Find out how water is treated before it gets to homes.</p> <p>Research artificial aquifer recharge.</p>
<p><b>Resources</b></p> <p>Capillary tube, beaker, paper clip, black pepper, soap powder, cobalt chloride paper, anhydrous copper sulphate salt, spatula, white tile, teat pipette, charts/multimedia materials on the carbon cycle</p> <p>computer, speakers, Internet, multimedia projector, video CDs/DVDs, word processing, multimedia and graphic software tools</p>	<p><b>Key vocabulary</b></p> <p>Adhesion, capillarity, surface tension, ground water, surface water, water purification, cycles, components, composition, carbon dioxide, oxygen, fossil fuel, photosynthesis, respiration, combustion, nitrogen</p>
<p><b>Links to other subjects</b></p> <p>Social Studies (Climate)</p>	