



# **Science in the National Curriculum**

## **Key Stage 3 (Grades 7 and 8)**



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## Foreword

May almighty Allah's bestow blessings and mercy be upon Mohammad (PBUH), the messenger of Allah, and the messenger's companions and household. The messenger personified his life as a curriculum throughout his life through the exemplary conduct and behaviours.

During the year 1979, the government of the Maldives strategized to mainstream the primary school education of the Maldives which led to the development of the first syllabi for grades 1 to 5 in the Maldives in 1980, followed by a revision in 1982. The first National Curriculum for primary grades 1 to 5 was crafted and implemented in 1984. A further revision was initiated in 1997 and completed in the year 2000. In 2006, when a second revision of the first curriculum was discussed, it was understood that the curriculum needs changes in accordance to the development achieved by the country. To address the changes a decision was made to reform the first curriculum to incorporate and address the needs and demands of the country.

The second national curriculum is developed based on the changes that have taken place in the society, from practices of the past to the current needs, with a vision for a better tomorrow. The eight competencies addressed in the curriculum are practicing Islam, self-management, critical thinking, creative thinking, human relations, healthy life styles, sustainable practices and ICT literacy. Further, through the use of variety of teaching learning approaches where students are engaged in meaningful learning experiences, the curriculum intends to produce students who possess the 21st century skills, and are healthy both physically and spiritually, to be responsible towards the progression of the Maldivian society.

Science plays a key role in our life. In an ever changing global world, the importance of science cannot be undermined. Science opens the minds of children and provides a rich context to develop critical thinking and make informed decisions.

Key stage 3 Science is focused on enabling the student acquire knowledge, skills and attitudes so as to develop an informed and critical understanding of environment, science and technological issues.

Science teaching intends to cultivate humane and responsible attitudes and an appreciation of the world in accordance with Islamic principles and values.

The curriculum envisions the use of variety of teaching learning approaches where students are engaged in meaningful learning experiences.

I hereby take this opportunity to extend my sincere gratitude and heartfelt appreciation to each and every individual for the tireless effort, commitment and dedication in developing the National Curriculum Framework and this syllabus. I pray almighty Allah to bless them for their commitment and contribution.

Last but not least, it is my sincere hope that this syllabus be beneficial for the students and teachers in the Republic of Maldives.

National Institute of Education  
Ministry of Education

## Introduction

### Rationale

The aim of Science Education in Maldives is to develop scientific literacy. Scientific and technological literacy is an evolving combination of the science-related attitudes, skills, and knowledge students need to develop inquiry, problem-solving, and decision-making abilities; to become lifelong learners; and to maintain a sense of wonder about the world around them.

To develop scientific and technological literacy, students require diverse learning experiences which provide opportunity to explore, analyse, evaluate, synthesise, appreciate, and understand the interrelationships among science, technology, society, and the environment that will affect their personal lives, their careers, and their futures.

### Environment, Science and Technology

The purpose of this key learning area is for students to explore the natural world and its phenomena through systematic and organized inquiry. It provides the opportunity for students to question, investigate, predict and explain the events of the Earth and the universe.

The aims of Environment, Science and Technology are to:

- enable the student to acquire knowledge, skills and attitudes so as to develop an informed and critical understanding of, environment, science and technological issues
- reinforce and stimulate curiosity and imagination about local and wider environments
- enable the student to play a responsible role as an individual, as a family member and as a member of local, regional, national, global communities
- foster an understanding of, and concern for, the total interdependence of all humans, all living things and the Earth on which they live
- foster a sense of responsibility for the long-term care of the environment and a commitment to promote the sustainable use of the Earth's resources through personal life-style and participation in collective environmental decision-making
- cultivate humane and responsible attitudes and an appreciation of the world in accordance with beliefs and values.

## Science in the National Curriculum

Science curriculum contributes to the development of the student in all aspects along with the other subjects in the National Curriculum. It aims to achieve the vision along with the eight principles identified, incorporating the key competencies and also relating to effective pedagogical approaches emphasized in the National Curriculum.

### The Vision

The Science curriculum is structured in such a way that it paves the road to achieve the vision of the National Curriculum.

The National Curriculum envisions the development of:

- successful individuals who are motivated to learn and explore; who are inquisitive and eager to seek, use and create knowledge.
- confident and competent individuals who have a firm belief in Islam, a strong sense of self and cultural identity, and believe in their own capabilities; and
- responsible and productive contributors to their own family, their local community and the global society.

Science learning experiences assist students to develop and understand scientific concepts along with process skills and the pedagogical approaches emphasize students to participate in practical hands-on experiences, exploring the world around them through posing questions, predicting and finding answers to these gives the student the grounds to develop themselves as successful learners who are eager to learn and explore.

Science provides ample opportunities for students to develop their scientific concepts along with necessary skills and values that would build their self-confidence and esteem. Students will be given opportunities to relate learning beyond their classroom, such as visiting and studying various field sites, opportunities to get engaged with local community members in various disciplines, opportunities to participate in various school/community organized tasks. Engagement and involvement in these ensures that student acquire the knowledge, skills and values to be competent citizens.

### The Principles

The National Curriculum identifies eight fundamental principles that need to be taken into account when designing and implementing learning and other school activities. Science curriculum is also designed taking into account these principles.

The teaching learning of Science highly emphasizes linking Science and Islam. Essentially, science provides the understanding of natural and other phenomena, events and objects through the study of inquiry, based on experiments and investigations. Facts, figures and theories contribute to the understanding of various scientific concepts. Linking these to Islam, strengthens the faith of students.

Similarly, in depth understanding of scientific concepts and processes ensures that students develop holistically, and relating these concepts and processes to their real life context ensuring relevance to students and preparing them for life.

Likewise, a range of outcomes and indicators are identified which takes into account various learning styles and cognitively differentiated such that every student has the opportunity to reach to personal excellence.

## **The Key Competencies**

The eight key competencies outlined in the National Curriculum encompass knowledge, skills, values and attitudes and dispositions to be explicitly taught in various key learning areas and through various school activities.

The Science curriculum provides a rich context in which these key competencies can be developed. The concepts in the syllabus involve a lot of opportunities for students to explore their surroundings, ask questions, use high order thinking to analyse and solve issues. In addition, the curriculum allows students to design and invent new things based on their prior knowledge and using their creative thinking. It asks students to understand abstract concepts which require high level of cognition.

The key competency, using sustainable practices is very much part and parcel of the Science curriculum which encompass many of the aspects highlighted. For instance, students are expected to explore how human activities impact the environment and identify ways to take care of the environment. In addition, many opportunities to understand issues from both developmental as well as environmental perspectives are incorporated so that students are encouraged to develop stewardship towards the environment.

At the same time, the Science curriculum provides many opportunities for students to relate with the technological advancement in various fields and how science has contributed to these advancements. In addition, students need to use technology in their learning and identify best sources to gather information; question the authenticity of the information gathered and also analyse, synthesise and evaluate the information.

Moreover, students are required to carry out several investigations throughout the years and these investigations give ample opportunities for students to develop the key competency, understanding and managing self as they have to be carried out in a systematic and organised manner. Similarly, the key competency relating to people can be addressed through science practicals, experiments and investigations.

## Structure of the Syllabus Statement

### The Strands

A strand is broad area of concepts specifically linked with each other. In this curriculum the strand refers to general areas that students need to know. Themes follow from each strand. However, for strands 'Working Scientifically' and 'Science and Technology', there will be no themes.

In this Key Stage, Science syllabus is comprised of 5 strands. They are:

#### Strand 1: Biology

In this strand, students will study structure and functions of humans and other living organisms. Students will explore the diversity and interdependence of life.

Through various themes (such as systems and biodiversity) students will acquire the necessary knowledge, skills and values related to the understanding of various roles of the organisms in the environment and measures to conserve and protect the environment.

#### Strand 2: Chemistry

In this strand students will explore the composition and properties of matter. It explores the changes the matters undergo, interactions and the energy involved. Students will develop an understanding of how various substances are made, and also will build an understanding of how everyday world are related to the molecular world.

Through various themes (such as Earth and atmosphere) students will acquire the necessary knowledge, skills and values related to the understanding of the natural environment and the human impact on it. Ultimately leading students to understand measures to conserve and protect the environment.

#### Strand 3: Physics

In this strand students will study the nature, energy and the interaction between them. Students will develop an understanding of mechanics, heat, optics, sound, electricity and magnetism.

Through themes such as energy, students would gain an understanding of ways to protect and conserve the environment.

#### Strand 4: Working Scientifically

This strand looks into ways of creating students' natural curiosity and sense of wonder about their world, as they participate in experiences that enable them to explore, predict, clarify their ideas, ask questions, test explanations and conduct their own research. They come to appreciate the complexities of the world as they compare their current ideas and beliefs with those of scientists, and construct new understanding based on scientific thinking. They learn that scientists work in many different ways, including experimental, ecological studies.

This strand gives ample opportunities for students to participate in discussions so that they open to new ideas, inculcate intellectual honesty and skills in critically evaluating data and preparing persuasive arguments. As students conduct scientific inquiries, they learn to question, problem solve, draw logical,

evidence based conclusions, articulate ideas and work in ways that are ethical, fair and respectful. They work individually and in teams, engaging in critical and creative thinking to solve problems and clarify ideas.

### **Strand 5: Science and Technology**

This strand looks into ways of building inquiry and investigation skills through their study of science. This strand would be integrated in all the THREE content strands.

It stresses the importance of integrating technological aspects in all the strands such that students develop understanding of the different technological advancement in various fields. They also need to appreciate how science has contributed to these advancements. Students need to be given opportunities to acquire skills in designing and making products. Emphasis is given to use technology wisely throughout the science curriculum.

### **Outcomes**

***Outcomes are statements of knowledge, understanding, skills and values expected to be achieved by most students at the end of a given stage.***

All outcomes are of equal importance. The presentation of the outcomes does not imply a sequence of teaching and learning activities.

### **Indicators**

***An indicator is an example of the behavior that students may display as they work towards the achievement of syllabus outcomes. Indicators reflect and describe aspects of knowledge, understanding, skills and values.***

An indicator may describe part or all aspects of an outcome.

Outcomes and indicators together assist teachers in identifying student's current achievement and in planning future learning experiences.

## Planning, Teaching and Assessing Science

### The Planning Stage

Careful and systematic planning is essential for the success of Science teaching. To begin with, in order to ensure that children receive a rich learning experience, it is important that Science teachers become familiar with the outcomes and indicators at each level and have an understanding of how these are translated and implemented in the classroom. The following are some key features to consider in planning science education:

### Content Selection

It is important to note that children should experience a broad and balanced programme. Teachers should draw content from the THREE content areas:

*Strand: Biology*

*Strand: Chemistry*

*Strand: Physics*

It is advisable to integrate the contents within these content areas as much as possible. The process strands, Working Scientifically and Science and Technology should be incorporated along with content strands.

In general, effective planning thus require the teachers to initially identify the big ideas/concepts behind each of the outcomes and identify ways to collate outcomes and indicators together to ensure that students receive meaningful learning.

### Development of Skills and Values

A great emphasis need to be given to develop skills and values along with the scientific concepts. The strands, Science and Technology and Working scientifically offer opportunities to develop these skills and values. Therefore it is important to integrate these two strands along with content strands in order to maximise the learning of skills and values.

### Literacy and Numeracy

Numeracy is about students having the confidence to choose and use mathematics skills they learn at school in everyday life, as well as the classroom and literacy is essential to a student's ability to learn and succeed in school and beyond.

Literacy capabilities need to be explicitly built as students' progress throughout the years in all the key learning areas. Teaching and learning in Environment, Science and Technology, students may need to write science reports after undertaking investigations or experiments. This requires specialised text and language structures, vocabulary and graphics that are specific to constructing knowledge in Science and that may not be learnt in other areas of learning. If these literacy demands are not addressed in teaching and learning, it would hinder student learning in science.

Consequently all the teachers need to ensure that literacy and numeracy teaching and learning becomes part of their daily routine.

## Integration

The use of well-planned integrated approaches, both within Science and between Science and other curricular areas plays an important role in the teaching/learning of Science at all levels.

Systematically planned integrated topics can provide contexts in which knowledge and skills may be developed in a range of areas. In this regard, the environments of the child, particularly those of a local nature, provide ideal contexts and an effective ground for the integration of learning.

Likewise, many elements from the Social studies, Mathematics, Language, Information of Communication Technology (ICT) curricula may be explored in parallel with Science, and much of the work involved will contribute to the development of the child's oral language, literacy, numeracy and communication skills. Science is best approached in a holistic manner with younger children as this respects the wholeness of their view of the world.

As children grow older they begin to recognise that there are different ways or modes of looking at the world and of organising human knowledge, so teaching strategies may vary to include a holistic approach, some cross-curricular integration and a subject-centred focus. Such an approach utilizes teaching and learning time efficiently and acknowledges that the social, emotional, attitudinal and moral development of the child is interwoven with the acquisition of knowledge and skills. It needs to be understood that each subject offers a distinctive perspective on the world and equips children with a particular range of skills; however these divisions must not undermine the effective implementation of an integrated curriculum.

## Recommended Time

The following table shows the allocated time for Science.

Key Stage	Contact Time/Weeks	Minimum Contact Time/Year
3 (Grades 7 and 8)	180 minutes (4 periods/week)	109 hours (146 periods of 45 min)

## Teaching and Learning Science

Science deals with the development of knowledge and understanding, skills and values related to the physical and biological aspects of the world. Through various classroom and outside classroom activities, students should be given the opportunity to foster these knowledge, skills and values. The activities should therefore be arranged in a manner that arouses interest and curiosity, creates a love for science, provides room for creativity and imagination, offers opportunity to reflect critically and make sense and meaning of their experiences.

In order to make sense of the world around them, students need to be active learners. Teachers act as facilitators in providing a learning experience that allows for students to construct their own learning. Thus the role of the teacher in such teaching would include:

- creating a classroom environment to support and challenge the learning and teaching of science
- designing effective learning experiences that help students to achieve designated outcomes
- stimulating and managing classroom discourse in support of student learning
- learning about, and then using, student's motivations, interests, abilities and learning styles to improve learning and teaching

- analysing student learning, the scientific tasks and activities involved, and the learning environment to make ongoing instructional decisions
- selecting teaching strategies from a wide repertoire.

Effective science learning and teaching take place in a variety of situations. Instructional settings and strategies should create an environment which reflects a constructive, active view of the learning process. Learning occurs not by passive absorption, but rather as students actively constructs their own meaning and assimilates new information to develop new understandings in terms of knowledge, skills and values and attitudes.

In addition to the above, the science curriculum emphasises the need to get involved in practical activities such as field outings, projects, experiments and investigations. One of the main purposes of these is to provide rich context for students to develop working scientifically.

### **Working Scientifically**

The Science syllabus identifies a range of practical skills that need to be acquired by the students.

Some of these basic and integrated skills include:

- a) Observing
- b) Classifying
- c) Recognising patterns
- d) Estimating and measuring
- e) Questioning
- f) Making and testing
- g) Predicting
- h) Investigating and experimenting
- i) Recording and communicating
- j) Designing and making

Likewise, the development of scientific literacy in students is a function of the kinds of tasks they engage in, the discussions in which they participate, and the settings in which these activities occur. Students' disposition towards science is also shaped by these factors.

Consequently, the aim of developing scientific literacy requires careful attention to all of these facets of curriculum and instruction. Learning experiences in science education should vary and include opportunities for group and individual work, discussion among students, as well as between teacher and students, and hands-on/minds-on activities that allow students to construct and evaluate explanations for the phenomena under investigation. Such investigations, and the evaluation of the evidence accumulated, provide opportunities for students to develop their understanding of the nature of science and the nature and status of scientific knowledge.

### **Environmental Awareness and Care**

The curriculum area of science is specifically founded on the student's relationship and interaction with the world around them. The environment, in its broadest sense, is the context for learning, and student's classroom experience will be deepened and extended by direct experience of their surroundings. The locality will provide the starting points for environmental education, and as student's knowledge and understanding grow and develop they will encompass other places and direct pupils to

other global dimensions.

One of the key aims of Science education should be to inculcate the necessary skills and values to understand environmental vulnerabilities locally as well as globally, and be informed decision makers in deciding responsible actions in maintaining and protecting the environment.

### **Assessment Practices**

Assessment is an integral part of teaching and learning. Assessment is the ongoing systematic process of gathering and using evidence of student learning to make informed decisions regarding student achievement. Thus, the main purpose of assessment is to improve student learning.

Three major types of assessment used in conjunction can be used to support student achievement

#### **Assessment for Learning (Formative Assessment)**

It is used for purposes of greater achievement. Classroom assessment should provide opportunities for students to become actively involved in their learning and achievement. In this type of assessment student know what they need to do in order to be successful and know what is considered as 'good work'.

Assessment for learning is criterion referenced where students compare their work with a criterion. The criteria are based on the outcomes and indicators mentioned in the Science Syllabi.

In addition to this, students, peers and teachers provide appropriate and ongoing feedback. Through feedback students identify their strengths and areas for improvement. This helps students to redirect their efforts and energy in making plans on ways to improve learning.

As for teachers, this provides the opportunity to change instruction in accordance with student's needs.

#### **Assessment as Learning (Formative Assessment)**

Assessment as learning is student driven whereby students actively involve in their own learning. This is done through continuous self-assessments whereby students identify areas to improve. Students are required to reflect and critically evaluate their work.

#### **Assessment of Learning (Summative Assessment)**

This is usually addressed through summative assessment. This includes topic assessment at the end of a topic and term exams. The information gathered through the summative process should be used formatively to enhance student progress.

In order to gather evidence of student learning, the following are some of the methods that can be used:

- Informal assessment – student and teachers make judgments about their learning based on discussions.
- Formal assessment – students and teachers making judgments based on success criteria that are shared by students and the teacher before the learning task is carried out.
- Observation – use of checklists, rating scales and rubrics
- Self and peer assessment

- Quizzes
- Tests
- Sample student work
- Projects
- Reports
- Journals/Logs
- Performance reviews
- Portfolios

According to assessment policy for this level, the following applies:

<b>Key Stage</b>	<b>Type of Assessment</b>	<b>Weightage</b>
Key stage 3 (Grades 7 and 8)	Assessment for learning	60%
	Assessment of learning	40%

## Scope and Sequence: KS 3 (Grades 7 and 8)

### Biology

Themes	Grade 7	Grade 8
Systematics and Biodiversity	<ul style="list-style-type: none"> <li>Classification of living things using standard classification systems.</li> </ul>	<ul style="list-style-type: none"> <li>Living things can be unicellular or multicellular.</li> </ul>
Cell Structure and Organisations	<ul style="list-style-type: none"> <li>Structure and function of plant and animal cells and hierarchical organization of cells in multicellular organisms.</li> </ul>	<ul style="list-style-type: none"> <li>Basic cell structures and their functions.</li> </ul>
Biological Molecules and Their Importance	<ul style="list-style-type: none"> <li>Major elements that constitute the main food groups.</li> <li>Issues that contribute to famine.</li> </ul>	NA
Movement of Particles	NA	<ul style="list-style-type: none"> <li>Diffusion, osmosis and active transport and their importance.</li> </ul>
Plant Nutrition	<ul style="list-style-type: none"> <li>Factors necessary for photosynthesis.</li> <li>Importance of photosynthesis to living things.</li> <li>The external structural adaptation of leaf for photosynthesis.</li> </ul>	<ul style="list-style-type: none"> <li>Factors necessary for photosynthesis.</li> <li>The internal structural adaptation of leaf for photosynthesis.</li> </ul>
Germination and Pollination	<ul style="list-style-type: none"> <li>Seed Structure and factors necessary for germination.</li> <li>Process of pollination and importance of it.</li> </ul>	NA
Nutrition and Digestive System in Humans	NA	<ul style="list-style-type: none"> <li>Different modes of nutrition in animals</li> <li>Teeth structure and functions</li> <li>Process of digestion</li> </ul>
Relationships of Organisms with One Another and with the Environment	NA	<ul style="list-style-type: none"> <li>Interactions within food chains and food webs.</li> </ul>
Ecosystems	NA	<ul style="list-style-type: none"> <li>The interactions that takes place within a specified ecosystems.</li> <li>Formation of coral reefs and human impact on coral reefs.</li> <li>Adaptation in organisms to their environment.</li> </ul>

## Chemistry

Themes	Grade 7	Grade 8
Matter	<ul style="list-style-type: none"> <li>Measuring physical quantities (temperature, volume and mass).</li> </ul>	NA
Heating and Cooling Curve/Kinetic Theory	<ul style="list-style-type: none"> <li>Changes of states in matter in terms of kinetic theory (heating and cooling not applicable).</li> </ul>	<ul style="list-style-type: none"> <li>Energy changes involved in changes of state of matter and diffusion in relation to kinetic theory.</li> </ul>
Atoms, Elements, Mixtures and Compounds	<ul style="list-style-type: none"> <li>Basic structure of matter as atoms and molecules.</li> <li>Differences among elements, mixtures and compounds.</li> </ul>	<ul style="list-style-type: none"> <li>Basic structure of matter as atoms and molecules in terms of electron configuration.</li> <li>Formation of anions and cations.</li> </ul>
Methods of Purification and Analysis	<ul style="list-style-type: none"> <li>Separation and purification of substances by using various techniques and its importance.</li> </ul>	<ul style="list-style-type: none"> <li>Separation and purification methods and their importance.</li> <li>Identification of pure substances using melting and boiling points.</li> </ul>
Acids and Bases	<ul style="list-style-type: none"> <li>Characteristic properties of acids and alkalis.</li> </ul>	NA
Atmosphere and Environment	<ul style="list-style-type: none"> <li>Gases present in air (oxygen, nitrogen and carbon dioxide) and ways to reduce air pollution.</li> </ul>	
Periodic Table	NA	<ul style="list-style-type: none"> <li>Periodic table and the trends across periods and groups.</li> </ul>
Water	<ul style="list-style-type: none"> <li>Water purity and how climate change affects availability of water.</li> </ul>	NA
Bonding	NA	<ul style="list-style-type: none"> <li>Formation of bonding: covalent, ionic and metallic.</li> <li>Deducing formula of ions and compounds using the periodic table and constructing simple chemical equations.</li> </ul>
		<ul style="list-style-type: none"> <li>Calculation of the relative atomic mass and molecular mass.</li> <li>Calculation of the percentage mass of an element in a given compound.</li> </ul>

## Physics

Themes	Grade 7	Grade 8
Physical Quantities, Units and Measurements	<ul style="list-style-type: none"> <li>• Properties of light and shadow formation.</li> <li>• Transmission of light through different materials.</li> <li>• Law of reflection and its application.</li> </ul>	<ul style="list-style-type: none"> <li>• Measurement of a variety of lengths using tapes, rulers, Vernier calipers and micro meter screw gauge, thermometer and scales.</li> <li>• Identifying least count of measuring instruments.</li> <li>• Construction and working of a simple pendulum.</li> </ul>
Kinematics	<ul style="list-style-type: none"> <li>• Classification of physical quantities into scalars and vectors.</li> <li>• Speed and the difference between speed and velocity.</li> </ul>	<ul style="list-style-type: none"> <li>• Patterns of movement of a moving object and its speed.</li> <li>• Rate of change of velocity of a moving body as its acceleration or retardation.</li> <li>• Plot and interpret distance - time graph (s-t graph) and velocity time graphs (v-t graphs).</li> </ul>
Dynamics (Force)	<ul style="list-style-type: none"> <li>• Investigating forces.</li> <li>• Friction, factors affecting the force of friction and the use of friction.</li> <li>• Air resistance of drag and the importance of reducing resistance.</li> </ul>	<ul style="list-style-type: none"> <li>• Newton's first law of motion.</li> <li>• Newton's second law of motion.</li> <li>• Newton's third law of motion.</li> </ul>
Mass, Weight and Gravitational Fields	<ul style="list-style-type: none"> <li>• Meaning of the physical quantities, mass, weight and volume.</li> </ul>	<ul style="list-style-type: none"> <li>• Densities of solids and liquids.</li> </ul>
Deformation	NA	<ul style="list-style-type: none"> <li>• Effect of applied force on the shape and size of an object.</li> <li>• Hooke's law and its application in real life.</li> </ul>
Pressure	NA	<ul style="list-style-type: none"> <li>• Solid pressure.</li> </ul>

Themes	Grade 7	Grade 8
Energy and Thermal Physics	<ul style="list-style-type: none"> <li>Forms of energy and ways to reduce consumption of energy.</li> <li>Energy transfers and law of conservation of energy.</li> </ul>	<ul style="list-style-type: none"> <li>Types of energy and transformation of energy.</li> <li>Energy, work done and power.</li> </ul>
Transfer of Thermal Energy	<ul style="list-style-type: none"> <li>Transfer of heat in solids.</li> </ul>	<ul style="list-style-type: none"> <li>Heat transfer: conduction and convection.</li> </ul>
Measurement of Temperature	<ul style="list-style-type: none"> <li>Scales of temperature and working of liquid thermometer.</li> </ul>	<ul style="list-style-type: none"> <li>Working and types of liquid thermometers.</li> </ul>
Waves	NA	<ul style="list-style-type: none"> <li>Motion of waves.</li> <li>Seismic waves and their impact.</li> </ul>
Light	<ul style="list-style-type: none"> <li>Properties of light and shadow formation.</li> <li>Transmission of light through different materials.</li> <li>Law of reflection and its application</li> </ul>	<ul style="list-style-type: none"> <li>Reflection of light and plane mirrors.</li> </ul>
Sound	NA	<ul style="list-style-type: none"> <li>Characteristics of sound.</li> </ul>
Magnetism and Electromagnetism	<ul style="list-style-type: none"> <li>Properties of magnets and their application.</li> <li>Magnetic properties of the Earth.</li> </ul>	<ul style="list-style-type: none"> <li>Magnetism, temporary and permanent magnets.</li> <li>Magnetising and demagnetising methods.</li> </ul>
Electricity	<ul style="list-style-type: none"> <li>Electrical conductors and insulators.</li> <li>Simple electric circuits.</li> <li>Electrical hazards.</li> </ul>	<ul style="list-style-type: none"> <li>Static electricity.</li> <li>Electric current as the rate of flow of charges.</li> <li>Series and parallel circuits and their application.</li> </ul>

## Working Scientifically

Themes	Grade 7	Grade 8
	<ul style="list-style-type: none"> <li>• Posing questions and making predictions.</li> <li>• Planning and carrying out investigations.</li> <li>• Gathering, processing and analysing data.</li> <li>• Communicate trends, patterns and relationships.</li> </ul>	<ul style="list-style-type: none"> <li>• Posing questions and making predictions.</li> <li>• Planning and carrying out investigations.</li> <li>• Gathering, processing and analysing data.</li> <li>• Communicate trends, patterns and relationships.</li> </ul>

## Science and Technology

Themes	Grade 7	Grade 8
	<ul style="list-style-type: none"> <li>• Plan and develop a design brief and criteria.</li> <li>• Communicate design ideas.</li> <li>• Produce solutions to test the suitability of materials.</li> <li>• Develop a plan and specification to guide production.</li> <li>• Evaluate to identify the strengths and weaknesses.</li> </ul>	<ul style="list-style-type: none"> <li>• Plan and develop a design brief and criteria.</li> <li>• Communicate design ideas.</li> <li>• Produce solutions to test the suitability of materials.</li> <li>• Develop a plan and specification to guide production.</li> <li>• Evaluate to identify the strengths and weaknesses.</li> </ul>

**GRADE 7**  
**Outcomes and Indicators**

## Strand: Biology

### Theme: Systematics and Biodiversity

**Outcome:**

**BI1.1: Classify living things using the standard classification systems.**

**Indicators:**

This is evident when the student:

- Classifies living things into five kingdoms.
- Uses present classification systems to classify a variety of organisms.
- Classifies living thing into vertebrates and invertebrates.
- Classifies invertebrates into 4 main classes (arthropods, annelids, coelenterates and molluscs).
- Classifies plants into flowering and non-flowering/monocotyledon and dicotyledon.

### Theme: Cell Structure and Organisation

**Outcome:**

**BI1.2: Examine the basic structure and function of plant and animal cells and describes the hierarchical organisation of cells in multicellular organisms.**

**Indicators:**

This is evident when the student:

- Observes the structure of cells (e.g. cell wall, cell membrane, cytoplasm, vacuole, nucleus and chloroplasts) and identifies the functions of the organelles.
- Observes and identifies visible similarities and differences between plant and animal cells.
- Uses a compound/light microscope to observe prepared slides and make sketches.
- Relates the structure and function of specialized cells (e.g. Root hair cells – large surface area to absorb water/Red blood cell – Presence of hemoglobin for effective absorption of oxygen)
- Recognises that division of labour are found in multicellular organism for efficient functioning.

### Theme: Biological Molecules and Their Importance

**Outcome:**

**BI1.3: Describe the major elements that constitute the main food groups and recognise the issues that contribute to famine.**

**Indicators:**

This is evident when the student:

- Identifies the elements that make up carbohydrates, proteins and fats.
- Distinguishes among monosaccharides, disaccharides and polysaccharides.
- Discusses the issues that contribute to famine (unequal distribution of food, drought and flooding, increasing population).

**Note:** Food and food groups, deficiency diseases will be included in Health & Physical Education

**Theme: Plant Nutrition****Outcome:**

**BI1.4: Investigate the factors necessary for photosynthesis and relates the importance of photosynthesis to living things.**

**Indicators:**

This is evident when the student:

- a) Identifies the importance of plant as the primary producer.
- b) Describes the process of photosynthesis and identifies the raw materials required for photosynthesis.
- c) Investigates to find out that light, chlorophyll and carbon dioxide are necessary for photosynthesis.
- d) Experiments to show that oxygen is released during photosynthesis.
- e) Appreciates plants as environment purifier (uses carbon dioxide and releases oxygen during day time).
- f) Appreciates the creations of Allah for such blessings.

**Outcome:**

**BI1.5: Examine the external structural adaptation of leaf for photosynthesis.**

**Indicators:**

This is evident when the student:

- a) Observes the external features of a leaf and make sketches.
- b) Describes the external adaptation of leaves to suit for the process of photosynthesis.

**Theme: Germination and Pollination****Outcome:**

**BI1.6: Examine the seed structure and investigate the factors necessary for germination.**

**Indicators:**

This is evident when the student:

- a) Identifies the three main parts of a seed.
- b) Designs and conducts experiments to find out whether water and light is necessary for seed germination.
- c) Identifies factors necessary for germination.

**Outcome:**

**BI1.7: Examine the external features of a flower, describe the process of pollination and recognise the importance of it.**

**Indicators:**

This is evident when the student:

- a) Identifies the structures of a dichotomous flower and states the function of main parts: sepal, petal, stamen and carpel.
- b) Describes the process of both self and cross pollination.
- c) Compares from fresh specimens of wind and insect pollinated flowers.
- d) Observes and makes sketches of pollen grains from wind pollinated and insect pollinated flower.
- e) Discusses the importance of pollination.

## Strand: Chemistry

### Theme: Matter

**Outcome:**

**CH1.1: Measure physical quantities of matter such as temperature, volume and mass.**

**Indicators:**

This is evident when the student:

- Measures physical quantities such as temperature, volume and mass.
- Relates the process of evaporation, condensation, solidification to changes of state in matter.
- Identifies melting point of ice and boiling point of water.

### Theme: Kinetic Theory

**Outcome:**

**CH1.2: Explain the changes of states in matter in terms of kinetic theory.**

**Indicators:**

This is evident when the student:

- Describes the energy changes within the states of matter (kinetic theory of matter).
- Describes the solid, liquid and gaseous states of matter and explains their inter-conversion in-terms of the kinetic particle theory and energy changes involved.
- Relates the changes in state of matter to changes in energy.
- Investigates on the various changes of state and makes observations and infers that temperature remains constant during a change of state.

### Theme: Atoms, Molecules, Mixtures and Compounds

**Outcome:**

**CH1.3: Describe the basic structure of matter as atoms and molecules.**

**Indicators:**

This is evident when the student:

- Identifies that atoms are basic unit of matter.
- Describes with the aid of diagrams, the structure of an atom as containing protons and neutrons (nucleons) in the nucleus and electrons arranged in shells.
- Defines proton (atomic) number and nucleon (mass) number
- Interprets and uses symbols.

**Outcome:**

**CH 1.4: compares the differences among elements, mixtures and compounds.**

**Indicators:**

This is evident when the student:

- a) Describes the differences among elements, mixtures and compounds diagrammatically.
- b) Distinguishes among mixtures, elements and compounds.
- c) Identifies that properties of a compound are different from its constituent elements.

**Theme: Methods of Purification and Analysis****Outcome:**

**CH1.5: Explore various techniques of separation and purification methods and recognise the importance of purification.**

**Indicators:**

This is evident when the student:

- a) Experiments and describe methods of separation and purification for the components of mixtures, (using a suitable solvent, filtration and crystallisation or evaporation, sublimation and distillation.)
- b) Discusses the importance of purification how purification methods are applied in real life.

**Theme: Acids and Bases****Outcome:**

**CH1.6: Describe characteristic properties of acids and alkalis.**

**Indicators:**

This is evident when the student:

- a) Describes characteristics of acids and alkalis.
- b) Investigates neutrality, acidity and alkalinity in terms of pH of substances measured using appropriate indicators.
- c) Describes and explains the importance of controlling acidity in the environment (air, water and soil).

**Theme: Atmosphere and Environment****Outcome:**

**CH1.7: Experiment to identify the gases present in air (oxygen, nitrogen and carbon dioxide) and study ways to reduce air pollution.**

**Indicators:**

This is evident when the student:

- a) Describes the percentage composition of air.
- b) Investigates to identify oxygen and carbon dioxide gas in air.
- c) Identifies the common sources of air pollutants such as carbon monoxide, carbon dioxide, sulphur dioxide, un-burnt hydrocarbons.
- d) Studies actions we can take to reduce air pollution.
- e) Relates how human actions have contributed to global warming and identifies ways to minimise it.

**Theme: Water****Outcome:**

**CH1.8 : Investigate pH, turbidity and presence of microorganism in water and how water gets affected due to climate change.**

**Indicators:**

This is evident when the student:

- a) Carries out tests to identify pH, turbidity and presence of microorganisms such as E-coli in water.
- b) Relates how availability of potable water gets affected due to climate change.
- c) Identifies measures we can take to use water in a sustainable way.

## Strand: Physics

**Theme: Physical Quantities, Units and Measurements****Outcome:**

**PH1.1: Categorise physical quantities as fundamental (base) and derived quantities and describes the systems of unit.**

**Indicators:**

This is evident when the student:

- a) Classifies physical quantities as fundamental (base) and derived quantities.
- b) Expresses some derived quantities in terms of fundamental quantities.
- c) Explains the metric system and the International System of Units.
- d) States some base quantities, their units and symbols.
- e) Uses the conversion formulae for some derived physical quantities.

**Outcome:**

**PH1.2: Measure physical quantities such as length, mass, time, temperature and volume.**

**Indicators:**

This is evident when the student:

- a) Expresses the measurement of the physical quantity and SI units.
- b) Describes and measures the length of an object using ruler/measuring tape.
- c) Explains and measures the mass of given objects.
- d) Measures and explains how to measure time using clocks and stopwatches.
- e) Measures temperature of a body using a thermometer
- f) Measures the volume of given objects.
- g) Measures the volume of liquids and objects (regular and irregular) using direct and indirect methods.

**Theme: Kinematics****Outcome:**

**PH1.3: Recognise that physical quantities can be classified into scalars and vectors.**

**Indicators:**

This is evident when the student:

- a) Defines vectors and scalars and gives examples of vectors and scalars.
- b) Explains the difference between distance and displacement and classifies distance as scalar and displacement as vector.

**Outcome:**

**PH1.4: Investigate speed and recognise the difference between speed and velocity.**

**Indicators:**

This is evident when the student:

- a) Defines the terms speed and velocity and differentiates between them.
- b) Derives the formula to find speed and velocity.
- c) Calculates speed.
- d) Defines terms instantaneous speed and average speed.
- e) Plans and carries out an investigation to find the speed of a moving object.

**Theme: Dynamics****Outcome:**

**PH1.5: Explore the meaning of force and investigates forces.**

**Indicators:**

This is evident when the student:

- a) Identifies force as an agent resulting from the object's interaction with another object which changes or tends to change the state of rest, of uniform linear motion and physical condition of a body.
- b) Uses phrases such as speeding up, slowing down and change in direction of motion of an object in everyday conversation and relate them to force.
- c) Identifies different types of forces such as force of friction, gravitational force, applied force, magnetic force, electrostatic force, up thrust or buoyant force, weight, tension, force of reaction and air resistance.
- d) Observes and investigates the effect of forces on a (i) moving object and (ii) stationary object.

**Outcome:**

**PH1.6: Explain friction, factors affecting the force of friction and how friction influences our day to day activities.**

**Indicators:**

This is evident when the student:

- a) Identifies two types of friction (static and dynamic).
- b) Investigates the factors affecting force of friction.
- c) Describes how force of friction influences our day to day activities.
- d) Discusses the latest technology used to maximise and minimise friction (e.g., explore the technology of designing footwear with particular reference to sports shoes).

**PH1.7: Describe air resistance of drag and discusses the importance of shapes of vehicles / vessels to reduce air /fluid resistance.**

**Indicators:**

This is evident when the student:

- a) Identifies factors affecting air resistance.
- b) Explains how vehicles /vessels are designed to reduce air /fluid resistance.
- c) Designs a vessel/vehicle and describes the features that are used to reduce air/fluid resistance.

### Theme: Mass, Weight and Gravitational Fields

**Outcome:**

**PH1.8: Explain the meaning of the physical quantities of mass and weight.**

**Indicators:**

This is evident when the student:

- a) Measures masses and describes how a balance is used to measure mass.
- b) Recognises that the Earth is the source of a gravitational field.
- c) Defines weight as a force of attraction between two objects.
- d) Explains weight as the product of mass of the object and acceleration due to gravity and do calculations related to weight.
- e) Differentiates between mass and weight and explains how weight differs in different planets.

### Theme: Sources of Energy and Transformation of Energy

**Outcome:**

**PH1.9: Describe the common forms of energy and ways to reduce the amount of energy used.**

**Indicators:**

This is evident when the student:

- a) Defines and explains the common forms of energy.
- b) Distinguishes between renewable and non - renewable energy sources.
- c) Explains the need to depend more on renewable energy.
- d) Studies how electrical energy can be obtained from fuel, water, waves and geothermal resources and Sun and discuss the environmental impact of these.
- e) Discusses ways to reduce the usage of energy.

**Outcome:**

**PH1.10: Identify energy transfers occurring around us and justifies the law of conservation of energy.**

**Indicators:**

This is evident when the student:

- a) Explores the energy transfer taking place in various situations, appliances and gadgets (e.g., flash light, television, electric stove, bulb).
- b) Represents the process of energy transfer with the help of energy transfer diagrams.
- c) States and explains the law of the conservation of energy with the help of examples.

### Theme: Transfer of Thermal Energy

**Outcome:**

**PH1.11: Explain how heat is transferred in solids.**

**Indicators:**

This is evident when the student:

- a) Identifies conduction as the mode of heat transfer in solids.
- b) Describes conduction, the mode of heat transfer in solids based on kinetic theory.
- c) Categorises solids as conductors and insulators.
- d) Experiments to demonstrate the properties of good and bad conductors.

### Theme: Measurement of Temperature

**Outcome:**

**PH1.12: Recognise the two scales of temperature and describe the working of liquid thermometer.**

**Indicators:**

This is evident when the student:

- a) Explains the two scales of temperature namely Celsius and Kelvin and derives the relation between the two scales of temperature.
- b) Converts temperature from one scale to another.
- c) Illustrates how expansion of liquids with temperature is used for the measurement of temperature.
- d) Discusses the real life application of liquid thermometers.

### Theme: Light

**Outcome:**

**PH1.13: Describe the properties of light.**

**Indicators:**

This is evident when the student:

- a) Explains our dependence of light to see objects around us
- b) Explains the rectilinear propagation of light through an application
- c) Experiments to find out how shadows are formed.

**Outcome:**

**PH1.14: Explore the transmission of light through different materials.**

**Indicators:**

This is evident when the student:

- a) Explains that light is partly absorbed, reflected or transmitted through an optical medium.
- b) Explains reflection as one of the phenomena that makes things visible.
- c) Defines reflection of light and scattering of light.
- d) Categorises the types of reflection as specular and diffuse reflection.
- e) Describes how we see luminous and non-luminous objects.
- f) Investigates reflection of light using everyday materials and how they are used in real life.

**Outcome:**

**PH1.15: Explore and experiment to verify the law of reflection.**

**Indicators:**

This is evident when the student:

- a) States the law of reflection.
- b) Experiments to verify the law of reflection.
- c) Discusses some applications of reflection.

### Theme: Magnetism and Electromagnetism

**Outcome:**

**PH1.16: Explore the properties of magnets.**

**Indicators:**

This is evident when the student:

- a) Classifies materials into magnetic and non-magnetic materials based on the property of magnets.
- b) Gives examples of magnetic and non-magnetic materials.
- c) Researches on one of the application of magnets in real life.

**Outcome:**

**PH1.17: Describe magnetism associated with the Earth.**

**Indicators:**

This is evident when the student:

- a) Compares the magnetic properties of the Earth to that of a huge magnet.
- b) Differentiates between geographical and magnetic poles.
- c) Recognises evidences for earth's magnetic field.

**Theme: Electricity****Outcome:**

**PH1.18: Explore the difference between conductors and insulators.**

**Indicators:**

This is evident when the student:

- a) Identifies conductors and insulators through the use of simple circuits.
- b) Defines conductors and insulators.
- c) Investigates the electrical conducting property of water.

**Outcome:**

**PH1.19: Construct simple circuits, measures current and identify some electrical hazards.**

**Indicators:**

This is evident when the student:

- a) Identifies the circuit symbols of various components
- b) Designs a simple electric circuit board.
- c) Creates simple circuits.
- d) Measures current in a circuit.
- e) Identifies some of the electrical hazards such as damaged insulation, overheating of cables, damp connections.
- f) Discusses the role played by fuses.

**Strand: Working Scientifically****Outcome:**

**WS1.1: Pose questions to clarify a problem and make predictions on investigations.**

**Indicators:**

This is evident when the student:

- a) Poses questions to clarify practical problems or to carry out a scientific investigation.
- b) Predicts the findings of an investigation.
- c) Applies experience from similar situations in the past to predict what might happen in a new situation.

**Outcome:**

**WS1.2: Plan appropriate investigation methods to carry out investigations.**

**Indicators:**

This is evident when the student:

- a) Plans appropriate investigation methods (surveys, fieldwork, research and fair tests) to test or solve a problem.
- b) Identifies variables (dependent and independent) in fair tests.
- c) Selects suitable methods for gathering data from first hand and reliable secondary sources.

**Outcome:**

**WS1.3: Conduct investigations using appropriate methods to answer questions or solve problems.**

**Indicators:**

This is evident when the student:

- a) Uses appropriate equipment and materials safely by checking observations and measurements.
- b) Conducts a range of appropriate investigations including fair tests either individually or in groups.
- c) Accurately observes, measures and records data as appropriate and repeat them where necessary.
- d) Adopts humane practices in conducting investigations.
- e) Follows safety procedures in conducting investigations.
- f) Uses formal units and abbreviations for measuring and recording data appropriately.
- g) Suggests improvements to the methods used in carrying out investigations.

**Outcome:**

**WS1.4: Process and analyse data and information using appropriate means and methods.**

**Indicators:**

This is evident when the student:

- a) Constructs and uses a range of appropriate representations (tables, line graphs, bar graphs and labeled diagrams) of data.
- b) Analyses data and information using numerical techniques such as calculating means and percentages of small sets of data.
- c) Practices integrity in processing and analysing data.
- d) Draws conclusions and provide explanations based on data and information gathered.
- e) Compares gathered data with predictions as evidence and develops explanations of events and phenomena.
- f) Reflects on their gathered evidence in relation to various aspects such as processing and analysing data and information.

**Outcome:**

**WS1.5: Communicate using a range of representations to show patterns and relationships and describe observations and trends in various means including digital technologies where appropriate.**

**Indicators:**

This is evident when the student:

- a) Communicates the findings, observations, patterns using appropriate means.
- b) Communicates ideas, explanations and processes honestly and accurately using oral and written texts as appropriate by various means.

## Strand: Science and Technology

**Outcome:**

**ST1.1: Plan and develop a design brief and criteria considering function, aesthetics, social, and ethical issues.**

**Indicators:**

This is evident when the student:

- a) Identifies needs and opportunities to undertake a task using various techniques (observations, surveys, interviews and research).
- b) Develops design brief and criteria to assess the product using function, aesthetics, social and ethical issues.
- c) Plans the process considering the various limitations such as time, resources etc.

**Outcome:**

**ST1.2: Select and use various techniques to communicate design ideas.**

**Indicators:**

This is evident when the student:

- a) Selects appropriate techniques (flow charts, modeling, presentations, and digital means) for documenting and communicating the design ideas.
- b) Identifies and selects appropriate materials for the task.
- c) Applies the established criteria to modify where necessary.

**Outcome:**

**ST1.3: Produce solutions to test the suitability of materials and develop a plan and specification to guide production.**

**Indicators:**

This is evident when the student:

- a) Tests the suitability of materials using fair test methods.
- b) Develops plan and specification in a sequential manner to guide production.
- c) Selects a range of tools, equipment and related techniques to manipulate and shape materials and/or information.

**Outcome:**

**ST1.4: Evaluate to identify the strengths and weaknesses in the process used in producing a final product by using established criteria.**

**Indicators:**

This is evident when the student:

- a) Identifies the strengths and limitations of the process in producing a product.
- b) Uses established criteria to evaluate a product.

**GRADE 8**  
**Outcomes and Indicators**

## Strand: Biology

### Theme: Systematics and Biodiversity

**Outcome:**

**BI1.1: Explore the biodiversity of living organisms and classify living things.**

**Indicators:**

This is evident when the student:

- a) Identifies that living things can be multi-cellular or unicellular.
- b) Describes microscopic living things such as virus, bacteria and fungi.
- c) Compares the structural differences among virus, bacteria and fungi.

### Theme: Cell Structure and Organisation

**Outcome:**

**BI1.2: Examine basic cell structures and their functions using various means.**

**Indicators:**

This is evident when the student:

- a) Prepares cell slides and uses temporary staining techniques to examine under a microscope.
- b) States the function of the cell membrane in controlling the passage of substances into and out of the cell.
- c) Identifies from fresh preparations or on diagrams or photomicrographs, the cell membrane, cell wall, chloroplast, sap vacuole, nucleus and cytoplasm in an animal cell and a plant cell.
- d) Calculates magnification of cells observed under microscope.

### Theme: Movement of Particles

**Outcome:**

**BI1.3: Explore and investigates movement of particles and identifies their importance to living things.**

**Indicators:**

This is evident when the student:

- a) Experiments to distinguish between diffusion and osmosis.
- b) Defines the terms: flaccid, plasmolysis, isotonic, hypotonic and hypertonic.
- c) Experiments to measure the rate of diffusion.
- d) Defines active transport and discusses the importance of active transport.
- e) Describes the importance of diffusion, osmosis and active transport in living things.

### Theme: Nutrition and Digestive System in Humans

#### Outcome:

**BI1.4: Describe the process of digestion and identify different modes of nutrition.**

#### Indicators:

This is evident when the student:

- a) Identifies main modes of nutrition as Autotrophic and heterotrophic.
- b) Identifies the three types of heterotrophic nutrition as holozoic, saprophytic and parasitic.
- c) Explains why most foods must be digested.
- d) Identifies the main regions of the alimentary canal and the associated organs: mouth (buccal) cavity, salivary glands, oesophagus, stomach, duodenum, pancreas, gall bladder, liver, ileum, colon, rectum and anus.
- e) Describes the main functions of these parts in relation to ingestion, digestion, absorption, assimilation and egestion of food, as appropriate.
- f) Identifies the different types of human teeth and describe their structure and functions.
- g) States the causes of dental decay and describe the proper care of teeth.

#### Outcome:

**BI1.5: Explore the factors necessary for photosynthesis and examines how leaf is adapted for photosynthesis**

#### Indicators:

This is evident when the student:

- a) Identifies that chlorophyll traps light energy and converts it into chemical energy for the formation of carbohydrates and their subsequent storage.
- b) Describes the intake of carbon dioxide and water by plants.
- c) Explains why most forms of life are completely dependent on photosynthesis.
- d) Examines under the microscope, a cross section of a leaf and describes the how internal structures of leaf are adapted for photosynthesis.
- e) Describes the effect of a lack of nitrate and magnesium ions on plant growth.

### Theme: Relationships of Organisms with One Another and with the Environment

#### Outcome:

**BI1.6: Explore the relationship among the organisms and their environment.**

#### Indicators:

This is evident when the student:

- a) Identifies that the Sun is the principal source of energy input to biological systems and describes the non-cyclical nature of energy flow.

- b) Defines the terms producer, consumer, herbivore, carnivore, decomposer, food chain and describe the relationship of each in food webs.
- c) Analyses the relationship within a food chain/food web.

## Theme: Ecosystems

### Outcome:

**BI1.7: Examine and identify the interactions that takes place within a specified ecosystems (e.g. mangrove, beach and reefs)**

### Indicators:

This is evident when the student:

- a) Illustrates food chain/web as an important interaction within an ecosystem.
- b) Identifies the adaptation features of organism within the ecosystem.
- c) Studies how organisms depend on the environment within the ecosystem.
- d) Debates on the pros and cons of impact on development that take place in various ecosystems.

### Outcome:

**BI1.8: Study the formation of coral reefs and human impact on coral reefs**

### Indicators:

This is evident when the student:

- a) Describes the formation of coral reefs.
- b) Differentiates between barrier reefs and fringing reefs
- c) Describes the processes of atoll formation.
- d) Observes and studies ways coral reefs are affected by human actions.

## Strand: Chemistry

### Theme: Heating and Cooling Curve

**Outcome:**

**CH1.1: Explore the energy changes involved in changes of state of matter and diffusion in relation to kinetic theory.**

**Indicators:**

This is evident when the student:

- Explains the change in states using the Kinetic Theory and the energy involved.
- Experiments to identify melting point and boiling point.
- Interprets and explains the heating and cooling curves in relation to energy changes.
- Explains diffusion in terms of kinetic particle theory.
- Compares rate of diffusion in liquids and gases e.g. movement of nitrogen di oxide gas or bromine gas in air.
- Experiments to identify the effect of mass and temperature on diffusion.

### Theme: Atoms, Molecules, Mixtures and Compounds

**Outcome:**

**CH1.2: Describe the basic structure of matter as atoms and molecules in terms of electron configuration.**

**Indicators:**

This is evident when the student:

- Deduces the number of protons, neutrons and electrons in atoms from proton and nucleon numbers.
- Defines the term isotopes and state that some isotopes are radioactive.
- Writes and draws the electronic configurations of first 20 elements of the periodic table.
- Explains how cat ions and anions are formed.
- Deduces the number of protons, neutrons and electrons for ions.
- Draws electronic structure of ions.

### Theme: Methods of Purification and Analysis

**Outcome:**

**CH1.3: Recognise the importance of purification of substances in real life and explore separation and purification methods.**

**Indicators:**

This is evident when the student:

- Experiments and describes methods of separation and purification of substances using fractional distillation and paper chromatography.

- b) Describes paper chromatography and interprets chromatograms including comparison with 'known' samples and the use of  $R_f$  values.
- c) Explains the use of locating agents of colourless compounds.
- d) Deduces from the given melting & boiling points the identities of substances and their purity.
- e) Explains that the measurement of the purity in substances is used in everyday life.

### Theme: Periodic Table

#### Outcome:

**CH1.4: Explore the periodic table and identify trends across periods and groups.**

#### Indicators:

This is evident when the student:

- a) Describes the periodic table as an arrangement of elements in order of proton (atomic) number.
- b) Identifies groups, periods and describes their representation.
- c) Differences between modern and Mendeleev's periodic table.
- d) Identifies metallic to non-metallic character across the periodic table.

### Theme: Bonding

#### Outcome:

**CH1.5: Explore and describe the formation of bonding: covalent, ionic and metallic.**

#### Indicators:

This is evident when the student:

- a) Describes the formation of ionic bonds between metals and non-metals.
- b) Deduces formula of simple ionic compounds.
- c) Describes covalent bonding using dot & cross diagrams.
- d) Deduces arrangement of electrons in other covalent compounds.
- e) Explains the properties of ionic and covalent compounds.
- f) Describes the type of bonding in metals.

#### Outcome:

**CH1.6: Deduce the formula of ions and compounds using the periodic table and construct simple chemical equations.**

#### Indicators:

This is evident when the student:

- a) Deduces the formula of simple ions by using the periodic table.
- b) Deduces the formulae of ionic compounds from number of atoms and vice versa.
- c) Constructs word equations (ionic equations is not required. Balancing is not required).

- d) Constructs chemical equations using symbols (balancing of equation is not required).

**Outcome:**

**CH1.7: Deduce and calculate the relative atomic mass and molecular mass of given substances.**

**Indicators:**

This is evident when the student:

- a) Defines relative atomic mass and calculate the relative atomic mass of given substances
- b) Defines relative atomic mass and calculate relative molecular mass (relative formula mass as the sum of relative atomic masses).

**Outcome:**

**CH1.8: Calculate the percentage mass of an element in a given compound.**

**Indicators:**

This is evident when the student:

- a) Calculates the percentage mass of an element in a given compound.

## Strand: Physics

### Theme: Physical Quantities, Units and Measurements

**Outcome:**

**PH1.1: Measure a variety of lengths with appropriate accuracy using tapes, rulers, Vernier calipers and micrometer screw gauge.**

**Indicators:**

This is evident when the student:

- a) Measures lengths using tapes and rulers.
- b) Measures dimensions such as length, diameter (internal/external), thickness, depth of a given object using Vernier calipers.
- c) Discusses the use of Vernier calipers as a precision instrument.
- d) Explains micrometer screw gauge as a device more accurate than calipers.
- e) Measures dimensions such as diameter and thickness of a given object using micrometer screw gauge.

**Outcome:**

**PH1.2: Explain the significance of least count error in making measurements**

**Indicators:**

This is evident when the student:

- a) Defines and explains the significance of least count of simple measurement instruments like ruler, thermometers and scales.
- b) Relates least count of a measuring instrument to accuracy of measured quantity.

**Outcome:**

**PH1.3: Describe the construction and working of a simple pendulum.**

**Indicators:**

This is evident when the student:

- a) Constructs a simple pendulum and identifies its parts.
- b) Defines and explains the terms 'centre of suspension', 'centre of oscillation', 'length' and 'time period' of a simple pendulum.
- c) Describes the motion of the bob of a pendulum based on the Newton's law of motion.
- d) Experiments to determine the period of motion of a simple pendulum by varying its length.

### Theme: Kinematics

**Outcome:**

**PH1.4: Relate patterns of movement to the speed of moving objects.**

**Indicators:**

This is evident when the student:

- a) Estimates the speed of an object by analysing a series of its images captured by a camera or any other device.

- b) Analyses patterns of movement of objects travelling at different speeds (steady speed, speeding up and slowing down).

**Outcome:**

**PH1.5: Recognise the rate of change of velocity of a moving body as its acceleration or retardation**

**Indicators:**

This is evident when the student:

- Explains the term acceleration and retardation.
- Calculates acceleration and retardation from given data.

**Outcome:**

**PH1.6: Plot and interpret distance - time graph (s-t graph) and velocity time graphs (v-t graphs).**

**Indicators:**

This is evident when the student:

- Explains the slope of the distance-time graph and displacement-time graph.
- Plots distance-time graph and displacement-time graph and calculates speed and velocity respectively.
- Plots and interprets velocity time graph.

### Theme: Dynamics

**Outcome:**

**PH1.7: State and explain Newton's first law of motion.**

**Indicators:**

This is evident when the student:

- States Newton's first law of motion.
- Explains Newton's first law by applying it to everyday context.

**Outcome:**

**PH1.8: State and explain Newton's second law of motion.**

**Indicators:**

This is evident when the student:

- Describes the effect of balanced and unbalanced forces on a body.
- States Newton's second law of motion.
- Explains Newton's second law of motion by giving examples from everyday life.
- Solves numerical problems based on Newton's second law of motion.

**Outcome:**

**PH1.9: State and explain Newton's third law of motion.**

**Indicators:**

This is evident when the student:

- States Newton's third law of motion.
- Identifies the action and reaction forces in given situations.
- Discusses the application of Newton's third law of motion in everyday events.

**Theme: Mass, weight and gravitational fields****Outcome:**

**PH1.10: Determine the densities of solids and liquids.**

**Indicators:**

This is evident when the student:

- a) Describes what is meant by density.
- b) Calculates the density of regular and irregular solids (sinking as well as floating objects).
- c) Calculates density of liquids.
- d) Discusses the application of density.

**Theme: Deformation****Outcome:**

**PH1.11: Describe the effect of applied force on the shape and size of an object.**

**Indicators:**

This is evident when the student:

- a) Identifies the physical changes taking place in a body due to the application of a force, in relation to size, shape, both size and shape.
- b) Investigates to show that force can change the shape and size of a body.

**Outcome:**

**PH1.12: Explore Hooke's law and recognise the significance of limit of proportionality.**

**Indicators:**

This is evident when the student:

- a) Experiments to verify extension of a body as proportional to applied force.
- b) States Hooke's law.
- c) Recognises the meaning of the term 'proportional' by computing the ratio of elongation to the mass used.
- d) Recognises the meaning of the term 'limit of proportionality'.
- e) Interprets and defines the term elastic limit.

**Theme: Pressure****Outcome:**

**PH1.13: Explore the physical quantity, pressure and its application in daily life.**

**Indicators:**

This is evident when the student:

- a) Defines pressure.
- b) Examines the dependency of pressure on area and force.
- c) Discusses various applications of pressure in daily life.

**Theme: Energy, Work and Power****Outcome:**

**PH1.14: Describe the different types of energy and transformation of energy.**

**Indicators:**

This is evident when the student:

- a) Identifies the different types of energy.
- b) Identifies the transformation of energy taking place in various situations.
- c) Identifies kinetic and potential energy as two forms of mechanical energy.
- d) Discusses the factors affecting the potential and kinetic energy.
- e) Investigates some of the factors affecting kinetic and potential energy.
- f) Calculates kinetic and potential energy.

**Outcome:**

**PH1.15: Identify work done, energy and power and relates their use in daily applications.**

**Indicators:**

This is evident when the student:

- a) Defines the term work done and power.
- b) Calculate work done, power and efficiency.
- c) Discusses applications related to power and efficiency.

**Theme: Transfer of Heat****Outcome:**

**PH1.16: Explains how heat transfers by conduction and convection**

**Indicators:**

This is evident when the student:

- a) Experiments to show that different metals have different conductivity.
- b) Experiments to show that water is a bad conductor of heat.
- c) Identifies convection as a mode of heat transfer in liquids and gases.
- d) Demonstrates convection in liquids and gases.
- e) Discusses the applications related to power and efficiency.

**Theme: Measurement of Temperature****Outcome:**

**PH1.17: Describe the working and types of liquid thermometers.**

**Indicators:**

This is evident when the student:

- a) Explains how expansion of liquids with temperature is used for the measurement of temperature.

- b) Explains the construction of a thermometer.
- c) Discusses the upper and lower fixed points of thermometers.
- d) Demonstrates how to use a liquid thermometer.
- e) Categorises liquid thermometers as laboratory, clinical and digital thermometers.
- f) Discusses sensitivity, range and linearity of thermometers.

### Theme: Waves

#### Outcome:

**PH1.18: Explore and describe motion of waves.**

#### Indicators:

This is evident when the student:

- a) Explains how waves travel in the form of vibrations.
- b) Describes the difference between transverse and longitudinal waves and gives examples of each.
- c) Describes waves using the terminologies, speed, wavelength, frequency and amplitude.
- d) Calculates wave speeds and frequencies.

#### Outcome:

**PH1.19: Studies seismic waves and the impact of these on our livelihoods.**

#### Indicators:

This is evident when the student:

- a) Recognises how seismic waves are generated.
- b) Researches how scientists collect data on seismic waves.
- c) Discusses the impact of Tsunami on our lives.

### Theme: Light

#### Outcome:

**PH1.20: Explore and investigate reflection of light.**

#### Indicators:

This is evident when the student:

- a) Describes the position and characteristic of an optimal image formed by a plane mirror.
- b) Investigates images formed by plane mirrors.
- c) Designs and makes a periscope and evaluates its effectiveness.
- d) Explains situations where plane mirrors are used to help in the work.

**Theme: Sound****Outcome:**

**PH1.21: Explore and describe the characteristics of sound.**

**Indicators:**

This is evident when the student:

- a) Recognises sound as a result of vibration of bodies.
- b) Describes the longitudinal nature of sound waves.
- c) Describes compression and rarefaction in relation to sound.
- d) Demonstrates that a medium is required for sound to travel.
- e) Experiments to show that sound travels faster through denser medium.
- f) Describes how reflection of sound may produce an echo.
- g) Researches to find out the working of the SONAR.

**Theme: Magnetism and Electromagnetism****Outcome:**

**PH1.22: Explore magnetism and distinguishes between temporary and permanent magnets.**

**Indicators:**

This is evident when the student:

- a) Experiments to verify the law of magnetism.
- b) Defines magnetic field and magnetic field flux lines.
- c) Identifies magnetic lines of force around magnets.
- d) Explains temporary and permanent magnets.
- e) Makes temporary and permanent magnets.

**Outcome:**

**PH1.23: Explore the different methods of magnetising and demagnetising.**

**Indicators:**

This is evident when the student:

- a) Describes the various ways to magnetising (stroking, electrical method).
- b) Identifies ways to demagnetise magnets.
- c) Creates something interesting (such as a toy) using magnets.

**Theme: Electricity****Outcome:**

**PH1.24: Explore static electricity.**

**Indicators:**

This is evident when the student:

- a) Demonstrates the presence of static electricity around us.
- b) Explains that charging of solids involves a movement of electrons.
- c) Identifies the presence of positive and negative charges.

- d) Experiments to show charging by friction.
- e) Explains the law of electrostatics.

**Outcome:**

**PH1.25: Describe the electric current as the rate of flow of charges.**

**Indicators:**

This is evident when the student:

- a) Differentiates between conventional and electric current.
- b) Describes electric and electric field line.
- c) States the direction of field line and its properties.
- d) Explains null points.
- e) Performs computations involving  $Q=IT$ .

**Outcome:**

**PH1.26: Explore and construct series and parallel circuits.**

**Indicators:**

This is evident when the student:

- a) Makes simple series and parallel circuits.
- b) Measures voltage and current in series and parallel circuits.
- c) Discusses the application of series and parallel circuits in real life.

## Strand: Working Scientifically

**Outcome:**

**WS1.1: Pose questions to clarify a problem and make predictions on investigations.**

**Indicators:**

This is evident when the student:

- a) Poses questions to clarify practical problems or to carry out a scientific investigation.
- b) Predicts the findings of an investigation.
- c) Applies experience from similar situations in the past to predict what might happen in a new situation.

**Outcome:**

**WS1.2: Plan appropriate investigation methods to carry out investigations.**

**Indicators:**

This is evident when the student:

- a) Plans appropriate investigation methods (surveys, fieldwork, research and fair tests) to test or solve a problem.
- b) Identifies variables (dependent and independent) in fair tests.
- c) Selects suitable methods for gathering data from first hand and reliable secondary sources.

**Outcome:**

**WS1.3: Conduct investigations using appropriate methods to answer questions or solve problems.**

**Indicators:**

This is evident when the student:

- a) Uses appropriate equipment and materials safely by checking observations and measurements.
- b) Conducts a range of appropriate investigations including fair tests either individually or in groups.
- c) Accurately observes, measures and records data as appropriate and repeat them where necessary.
- d) Adopts humane practices in conducting investigations.
- e) Follows safety procedures in conducting investigations.
- f) Uses formal units and abbreviations for measuring and recording data appropriately.
- g) Suggests improvements to the methods used in carrying out investigations.

**Outcome:**

**WS1.4: Process and analyse data and information using appropriate means and methods.**

**Indicators:**

This is evident when the student:

- a) Constructs and uses a range of appropriate representations (tables, line graphs, bar graphs and labeled diagrams) of data.
- b) Analyses data and information using numerical techniques such as calculating means and percentages of small sets of data.
- c) Practices integrity in processing and analysing data.

- d) Draws conclusions and provide explanations based on data and information gathered.
- e) Compares gathered data with predictions as evidence and develops explanations of events and phenomena.
- f) Reflects on their gathered evidence in relation to various aspects such as processing and analysing data and information.

**Outcome:**

**WS1.5: Communicate using a range of representations to show patterns and relationships and describe observations and trends in various means including digital technologies where appropriate.**

**Indicators:**

This is evident when the student:

- a) Communicates the findings, observations, patterns using appropriate means.
- b) Communicates ideas, explanations and processes honestly and accurately using oral and written texts as appropriate by various means.

## Strand: Science and Technology

**Outcome:**

**ST1.1: Plan and develop a design brief and criteria considering function, aesthetics, social and ethical issues.**

**Indicators:**

This is evident when the student:

- a) Identifies needs and opportunities to undertake a task using various techniques (observations, surveys, interviews and research).
- b) Develops design brief and criteria to assess the product using function, aesthetics, social and ethical issues.
- c) Plans the process considering the various limitations such as time, resources etc.

**Outcome:**

**ST1.2: Select and use various techniques to communicate design ideas.**

**Indicators:**

This is evident when the student:

- a) Selects appropriate techniques (flow charts, modeling, presentations, and digital means) for documenting and communicating the design ideas.
- b) Identifies and selects appropriate materials for the task.
- c) Applies the established criteria to modify where necessary.

**Outcome:**

**ST1.3: Produce solutions to test the suitability of materials and develop a plan and specification to guide production.**

**Indicators:**

This is evident when the student:

- a) Tests the suitability of materials using fair test methods.
- b) Develops and plan and specification in a sequential manner to guide production.
- c) Selects a range of tools, equipment and related techniques to manipulate and shape materials and/or information.

**Outcome:**

**ST1.4: Evaluate to identify the strengths and weaknesses in the process used in producing a final product by using established criteria.**

**Indicators:**

This is evident when the student:

- a) Identifies the strengths and limitations of the process in producing a product.
- b) Uses established criteria to evaluate a product.

## Planning, Teaching and Assessment Examples

### Sample lesson plan

Subject: Science	Grade 7	Duration: 40 min
Strand: Physics	Theme: Mass, weight and gravitational fields	<b>Materials needed:</b> <ul style="list-style-type: none"> <li>• <i>Weighing balance</i></li> <li>• <i>Measuring cylinder</i></li> <li>• <i>Water</i></li> <li>• <i>Various substances/items (regular and irregular shape)</i></li> </ul>
Key competencies: Relating to people	Shared Values: Values related to self and others	

### Outcome:

**PH1.10: Determine the densities of solids and liquids.**

### Indicators:

- a) Describes what is meant by density.
- b) Calculates the density of regular and irregular solids (sinking as well as floating objects).
- c) Calculates density of liquids.
- d) Discusses the application of density.

Duration	Teaching/Learning																									
15 min	<p><b>Introduction:</b></p> <p>Begin the session by presenting a variety of items/substances. Ask students to identify ways of distinguishing each substance.</p> <p>Collate the students' ideas on the board. Move the discussion towards mass and volume.</p> <p>Let students measure the mass and volume of the items. Let students record their measurements as given in the table format. The last two columns can be filled later</p> <table border="1" data-bbox="304 613 1445 831"> <thead> <tr> <th>Items</th> <th>Mass in (kg)</th> <th>Volume ( m<sup>3</sup>)</th> <th>Will it sink or float</th> <th>Mass/volume ratio</th> </tr> </thead> <tbody> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td><td> </td></tr> </tbody> </table> <p>Ask students to hypothesize whether each item/substance will sink or float when placed in water.</p> <p>Test the students' prediction. Discuss how well does their prediction match with the actual findings.</p> <p>Let students think whether there is any way that we could distinguish between floaters and sinkers.</p> <p>Ask students to find the mass/volume ratio. (Students should be able to identify floaters as those with mass/volume ratio &lt;1 and sinkers as those with mass/volume ratio &gt; 1.)</p> <p>Introduce the term density as mass/volume ratio of an object.</p> <p>Share the <b>learning intention</b> of the lesson:</p> <p><i>To be able to define the concept of density in your own words.</i></p> <p><i>To be able to calculate the density of various substances (regular and irregular).</i></p> <p>Negotiate the success criteria with the students.</p> <p><b>Success Criteria:</b></p> <p>You will be successful if:</p> <p><i>You could find out the density of the given materials.</i></p> <p><i>You could explain how to find the density of the irregular object provided.</i></p>	Items	Mass in (kg)	Volume ( m <sup>3</sup> )	Will it sink or float	Mass/volume ratio																				
Items	Mass in (kg)	Volume ( m <sup>3</sup> )	Will it sink or float	Mass/volume ratio																						
20 min	<p><b>Developmental activity</b></p> <p>Provide some regular and irregular objects. Let students find out the density of these objects. Ask students to record them in a table. Compare the student's answers with the original density values. Discuss the likely sources of errors in their measurements.</p>																									

Duration	Teaching/Learning
	<p>When students are doing this activity, key competency: relating to people; working in teams can be encouraged and assessed here.</p> <p>Spend some time to discuss how to find the density of irregular objects. The following questions can assist:</p> <ul style="list-style-type: none"> <li>How can we find the mass of the object?</li> <li>What would be the best way to find the volume of the object?</li> <li>How can you ensure that your measurements are accurate?</li> <li>What would you do if the items does not sink in water?</li> </ul> <p>Collect the ideas from the students. Use of diagrams will assist in their understanding.</p>
5 min	<p><b>Closure</b></p> <p>Identify a certain area of the floor, a block of 8 tiles and inform to students that this represents volume of 1 unit. Ask students to demonstrate different densities within the given volume. Teacher can provide a list of densities of various substances.</p>

**Assessment:**

Students can be assessed on:

- their ability to define density
- their ability to calculate the density of materials

Students can also be assessed on:

- their ability to work in groups

**Extension option:**

Students might want to find out the density of additional materials at home.

**Links to other key learning areas:**

Can be linked with Mathematics: Equations

**Teacher Reflection:**

Teacher can modify the lesson plan after teaching it to the students; identifying the strengths and areas to improve.