REPUBLIC OF KENYA

# MINISTRY OF EDUCATION

# JUNIOR SECONDARY SCHOOL CURRICULUM DESIGN

# INTEGRATED SCIENCE
## GRADE 8

KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

First published in 2022





**ISBN: 978-9914-43-798-0**

Published and printed by Kenya Institute of Curriculum Development

## FOREWORD

The Government of Kenya is committed to ensuring that policy objectives for Education, Training and Research meet the aspirations of the Kenya Constitution 2010, the Kenya Vision 2030, National Curriculum Policy 2019, the United Nations Sustainable Development Goals (SDGs) and the Regional and Global conventions to which Kenya is a signatory. Towards achieving the mission of Basic Education, the Ministry of Education (MoE) has successfully and progressively rolled out the implementation of the Competency Based Curriculum (CBC) at Pre-Primary and Primary School levels. The roll out of Junior Secondary School (Grade 7-9) will subsequently follow as from 2023-2025.

The Grade 8 curriculum designs build on competencies attained by learners at the end of Grade 7. Further, they provide opportunities for learners to continue exploring and nurturing their potentials as they prepare to transit to Senior Secondary School.

The curriculum designs present National Goals of Education, essence statements, general and specific expected learning outcomes for the learning areas (subjects) as well as strands and sub strands. The designs also outline suggested learning experiences, key inquiry questions, core competencies, Pertinent and Contemporary Issues (PCIs), values, Community Service Learning (CSL) activities and assessment rubric.

It is my hope that all Government agencies and other stakeholders in Education will use the designs to plan for effective and efficient implementation of the CBC.

**PROF. GEORGE A. O. MAGOHA, EGH**
**CABINET SECRETARY,**
**MINISTRY OF EDUCATION**

**PREFACE**

The Ministry of Education (MoE) is implementing the second phase of the curriculum reforms with the national roll out of the Competency Based Curriculum (CBC) having been implemented in 2019. Grade 8 is the second level of the Junior Secondary School (JSS) in the new education structure.

Grade 8 curriculum furthers implementation of the CBC from Grade 7. The main feature of this level is a broad curriculum for the learner to explore talents, interests and abilities before selection of pathways and tracks at the Senior Secondary education level. This is very critical in the realisation of the Vision and Mission of the on-going curriculum reforms as enshrined in the Sessional Paper No. I of 2019 whose title is: *Towards Realizing Quality, Relevant and Inclusive Education and Training for Sustainable Development* in Kenya. The Sessional Paper explains the shift from a Content - Focused Curriculum to a focus on **Nurturing every Learner's potential.**

Therefore, the Grade 8 curriculum designs are intended to enhance the learners' development in the CBC core competencies, namely: Communication and Collaboration, Critical Thinking and Problem Solving, Creativity and Imagination, Citizenship, Digital Literacy, Learning to Learn and Self-efficacy.

The curriculum designs provide suggestions for interactive and differentiated learning experiences linked to the various sub strands and the other aspects of the CBC. The curriculum designs also offer several suggested learning resources and a variety of assessment techniques. It is expected that the designs will guide teachers to effectively facilitate learners to attain the expected learning outcomes for Grade 8 and prepare them for smooth transition to the next Grade. Furthermore, it is my hope that teachers will use the designs to make learning interesting, exciting and enjoyable.

**JULIUS O. JWAN, PhD, CBS**
**PRINCIPAL SECRETARY**
**STATE DEPARTMENT FOR EARLY LEARNING AND BASIC EDUCATION**
**MINISTRY OF EDUCATION**

**ACKNOWLEDGEMENT**

The Kenya Institute of Curriculum Development (KICD) Act Number 4 of 2013 (Revised 2019) mandates the Institute to develop curricula and curriculum support materials for basic and tertiary education and training. The curriculum development process for any level of education involves thorough research, international benchmarking and robust stakeholder engagement. Through a systematic and consultative process, the KICD conceptualised the Competency Based Curriculum (CBC) as captured in the *Basic Education Curriculum Framework* (BECF), that responds to the demands of the 21st Century and the aspirations captured in the Kenya Constitution 2010, the Kenya Vision 2030, East African Community Protocol and the United Nations Sustainable Development Goals (SDGs).

KICD receives its funding from the Government of Kenya to enable the successful achievement of the stipulated mandate and implementation of the Government and Sector (Ministry of Education (MoE) plans. The Institute also receives support from development partners targeting specific programmes. The Grade 8 curriculum designs have been developed with the support of the World Bank through the Kenya Secondary Education Quality Improvement Program (SEQIP) commissioned by the MoE. Therefore, the Institute is very grateful for the support of the Government of Kenya, through the MoE and the development partners for the policy, resource and logistical support. Specifically, special thanks to the Cabinet Secretary – MoE and the Principal Secretary – State Department of Early Learning and Basic Education,

We also wish to acknowledge the KICD curriculum developers and other staff, all teachers, educators who took part as panelists; the Semi-Autonomous Government Agencies (SAGAs) and representatives of various stakeholders for their roles in the development of the Grade 8 curriculum designs. In relation to this, we acknowledge the support of the –Chief Executive Officers of the Teachers Service Commission (TSC) and the Kenya National Examinations Council (KNEC) for their support in the process of developing these designs.

Finally, we are very grateful to the KICD Council Chairperson Prof. Elishiba Kimani and other members of the Council for very consistent guidance in the process. We assure all teachers, parents and other stakeholders that these curriculum designs will effectively guide the implementation of the CBC at Grade 8 and preparation of learners for Grade 9.

**PROF. CHARLES O. ONG'ONDO, PhD, MBS**
**DIRECTOR/CHIEF EXECUTIVE OFFICER**
**KENYA INSTITUTE OF CURRICULUM DEVELOPMENT**

## TABLE OF CONTENTS

**LESSON ALLOCATION**

| | **Subject** | **Number of Lessons Per Week (40 minutes per lesson)** |
|---|---|---|
| 1. | English | 5 |
| 2. | Kiswahili/KSL | 4 |
| 3. | Mathematics | 5 |
| 4. | Integrated Science | 4 |
| 5. | Health Education | 2 |
| 6. | Pre-Technical Studies | 4 |
| 7. | Social Studies | 3 |
| 8. | Religious Education (CRE/IRE/HRE) | 3 |
| 9. | Business Studies | 3 |
| 10. | Agriculture | 3 |
| 11. | Life Skills Education | 1 |
| 12. | Physical Education and Sports | 2 |
| 13. | Optional Subject | 3 |
| 14. | Optional Subject | 3 |
| | **Total** | **45** |

## NATIONAL GOALS OF EDUCATION

Education in Kenya should:

**i) Foster nationalism and patriotism and promote national unity.**

Kenya's people belong to different communities, races and religions, but these differences need not divide them. They must be able to live and interact as Kenyans. It is a paramount duty of education to help young people acquire this sense of nationhood by removing conflicts and promoting positive attitudes of mutual respect which enable them to live together in harmony and foster patriotism in order to make a positive contribution to the life of the nation.

**ii) Promote the social, economic, technological and industrial needs for national development.**

Education should prepare the youth of the country to play an effective and productive role in the life of the nation.

**a) Social Needs**

Education in Kenya must prepare children for changes in attitudes and relationships which are necessary for the smooth progress of a rapidly developing modern economy. There is bound to be a silent social revolution following in the wake of rapid modernization. Education should assist our youth to adapt to this change.

**b) Economic Needs**

Education in Kenya should produce citizens with the skills, knowledge, expertise and personal qualities that are required to support a growing economy. Kenya is building up a modern and independent economy which is in need of an adequate and relevant domestic workforce.

**c) Technological and Industrial Needs**

Education in Kenya should provide learners with the necessary skills and attitudes for industrial development. Kenya recognizes the rapid industrial and technological changes taking place, especially in the developed world. We can only be part of this development if our education system is deliberately focused on the knowledge, skills and attitudes that will prepare our young people for these changing global trends.

iii) **Promote individual development and self-fulfillment**

Education should provide opportunities for the fullest development of individual talents and personality. It should help children to develop their potential interests and abilities. A vital aspect of individual development is the building of character.

iv) **Promote sound moral and religious values.**

Education should provide for the development of knowledge, skills and attitudes that will enhance the acquisition of sound moral values and help children to grow up into self-disciplined, self-reliant and integrated citizens.

v) **Promote social equality and responsibility.**

Education should promote social equality and foster a sense of social responsibility within an education system which provides equal educational opportunities for all. It should give all children varied and challenging opportunities for collective activities and corporate social service irrespective of gender, ability or geographical environment.

vi) **Promote respect for and development of Kenya's rich and varied cultures.**

Education should instill in the youth of Kenya an understanding of past and present cultures and their valid place in contemporary society. Children should be able to blend the best of traditional values with the changing requirements that must follow rapid development in order to build a stable and modern society.

vii) **Promote international consciousness and foster positive attitudes towards other nations.**

Kenya is part of the international community. It is part of the complicated and interdependent network of peoples and nations. Education should therefore lead the youth of the country to accept membership of this international community with all the obligations and responsibilities, rights and benefits that this membership entails.

**viii. Promote positive attitudes towards good health and environmental protection.**

Education should inculcate in young people the value of good health in order for them to avoid indulging in activities that will lead to physical or mental ill health. It should foster positive attitudes towards environmental development and conservation. It should lead the youth of Kenya to appreciate the need for a healthy environment.

## LEARNING OUTCOMES FOR MIDDLE SCHOOL

By end of Middle School, the learner should be able to:

1. Apply literacy, numeracy and logical thinking skills for appropriate self-expression.
2. Communicate effectively, verbally and non-verbally, in diverse contexts.
3. Demonstrate social skills, spiritual and moral values for peaceful co-existence.
4. Explore, manipulate, manage and conserve the environment effectively for learning and sustainable development.
5. Practise relevant hygiene, sanitation and nutrition skills to promote health.
6. Demonstrate ethical behaviour and exhibit good citizenship as a civic responsibility.
7. Appreciate the country's rich and diverse cultural heritage for harmonious co-existence.
8. Manage pertinent and contemporary issues in society effectively.
9. Apply digital literacy skills for communication and learning.

## ESSENCE STATEMENT

Integrated science is a new subject area that enable learners to apply distinctive ways of logical valuing, thinking and working to understand natural phenomena in the biological, physical and technological world. The subject area is expected to create a scientific culture that inculcates scientific literacy to enable learners to make informed choices in their personal lives and approach life challenges in a systematic and logical manner. The integrated science learning area is therefore a deliberate effort to enhance the level of scientific literacy of all learners and equip them with the relevant basic integrated scientific knowledge, skills, values and attitudes needed for their own survival and/or career development. Concepts in integrated science are presented as units within which there are specific strands that build on the competencies acquired in science and technology at upper primary level. The emphasis of science education at lower secondary levels is to enhance learners' scientific thinking through learning activities that involve the basic science process skills.

It provides the learner with the basic requisite skills, knowledge, values and attitudes necessary for specialization in STEM pathway at senior school level. The rationale for inclusion of integrated Sc. is anchored in The Kenya Vision 2030, Sessional Papers No. 14 of 2012, and No. 1 of 2019, which all underscore the importance of Science, Technology and Innovation in education and training.

Integrated science is taught through inquiry-based learning approaches with emphasis on the 5Es: engagement, exploration, explanation, elaboration and evaluation.

## SUBJECT GENERAL LEARNING OUTCOMES

Integrated Science provides the learner with opportunities to:

1. Acquire sufficient scientific knowledge, skills, values and attitudes to make informed choices on career pathways at senior school and for everyday use, further education and training.
2. Select, improvise and safely use basic scientific apparatus, materials and chemicals effectively in everyday life.
3. Explore, manipulate, manage and conserve the environment for learning and sustainable development.
4. Practice relevant hygiene, sanitation and nutrition skills to promote good health.
5. Apply the understanding of body systems with a view to promote and maintain good health.
6. Develop capacity for scientific inquiry and problem solving in different situations.
7. Appreciate and use scientific principles and knowledge in everyday life.
8. Apply acquired scientific skills and knowledge to construct appropriate scientific devices from available resources.

## STRAND 1.0: MIXTURES, ELEMENTS AND COMPOUNDS

| Strand | Sub Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| **1.0. Mixtures, Elements and Compounds** | 1.1 **Properties of matter in the different states**<br><br>(6 Hours) | By the end of the sub strand the learner should be able to:<br>a) describe properties of the different states of matter.<br>b) demonstrate diffusion in liquids.<br>c) distinguish between temporary and permanent changes in substances.<br>d) appreciate the applications of change of state of matter in day-to-day life. | The learner is guided to:<br>• Perform simple experiments on properties of the different states of matter (volume, shape, density, compressibility and ability to flow)<br>• perform experiments to demonstrate diffusion in liquids (use of water and potassium manganate (VII)).<br>• Carry out simple experiments to demonstrate physical changes, temporary chemical changes and permanent changes of substances.<br>• Discuss the applications of change of state of matter in day-to-day life (refrigerators, ice-cream vendors among others).<br>• Where necessary, use digital devices to search, play and observe videos and animations showing the properties of different states of matter (in relation to volume, shape, density, compressibility and ability to flow) | How do particles move in the different states of matter? |

**Core competencies to be developed**

- Critical thinking and problem solving: as learners discuss the properties of the different states of matter.
- Learning to learn: as learners gain knowledge by manipulating apparatus and materials as they carry out simple experiments.
- Digital literacy: as learners search, play and observe videos on properties of different states of matter.

**Pertinent and Contemporary Issues (PCIs)**

- Life skills as they apply the knowledge on the change of state of matter in day to day life (*example, preparation of ice cubes, make candles*).
- Financial literacy: as learners develop the economic awareness of the applications of change of state of matter in the locality.

**Values:**

- Unity: as the learners carry out simple experiments in groups.
- Respect: As learners respect each other's opinion when discussing the applications of change of state of matter in day to day.
- Responsibility: As learners handles experimental equipment while perform simple experiments on properties of the different states of matter

**Links to other subjects:**

- Home science: in the preservation of foods by applying the knowledge of change of state of matter.
- Physical education: when ice cubes are used to relieve muscle pain in case of sprain.

| Assessment Rubric | | | | |
|---|---|---|---|---|
| **Indicator** | **Exceeds expectation** | **Meets expectation** | **Approaches expectation** | **Below expectation** |
| Ability to describe the properties of the different states of matter. | Correctly and consistently describes the properties of the different states of matter. | Correctly describes the properties of the different states of matter. | Correctly describes some of the properties of the different states of matter. | With prompts describes the properties of the different states of matter. |
| Ability to demonstrate diffusion in liquids. | Correctly and consistently demonstrates the patterns of movement of particles in the different states of matter with illustrations. | Correctly demonstrates the patterns of movement of particles in the different states of matter. | Correctly demonstrates the patterns of movement of particles in some states of matter. | With prompts demonstrates the patterns of movement of particles in the different states of matter. |
| Ability to distinguish between temporary and permanent changes of substances. | Correctly and consistently distinguishes between temporary and permanent changes in substances. | Correctly distinguishes between temporary and permanent changes in substances | Correctly differentiates some temporary and permanent changes in substances. | With prompts distinguishes between temporary and permanent changes in substances. |

| Strand | Sub Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| **1.0 Mixtures, Elements and Compounds** | 1.2 **Elements and Compounds** (7 Hours) | By the end of the sub strand the learner should be able to:<br>a) distinguish between an element and a compound.<br>b) relate common elements to their symbols.<br>c) explain the applications of common elements in day-to-day life.<br>d) appreciate the information on packaging labels of commonly consumed substances. | The learner is guided to:<br>● Discuss the difference between elements and compounds.<br>● Assign appropriate symbols to common elements and compounds (copper, aluminium, iron, silver, table salt, and water).<br>● discuss the names of common elements and their symbols (the first 13 elements of the periodic table and commonly used metals such as zinc, lead, tin,gold, mercury and limited to the latin names only where applicable).<br>● Discuss the importance and market value of common elements and compounds in the society (jewellery, iron, toiletries, food, medals among others)<br>● Sample labelled containers of different substances indicating the common elements as part of the ingredients. | 1. How are symbols assigned to elements?<br>2. What is the value of elements in day-to-day life? |

**Core competencies to be developed**

- Learning to learn: as learners observe labels on containers indicating the common elements as part of the ingredients.
- Communication and collaboration**:** as learners assign symbols to common elements and compounds.

**Pertinent and Contemporary Issues (PCIs)**

- Financial literacy: as learners discuss the importance and market value of common elements and compounds in the society.

**Values**

- Respect and love: as they work in groups to assign symbols to common elements and compounds.
- Responsibility: as they sample containers with labels while taking care of the environment.

**Links to other subjects**

- Home science: when using ingredients and items made from the common elements and compounds.
- Business studies: as learners study the market value of common elements and compounds.

**Assessment Rubric**

| Indicator | Exceeds expectation | Meets expectation | Approaches expectation | Below expectation |
|---|---|---|---|---|
| Ability to distinguish between an element and a compound. | Correctly and consistently distinguishes between an element and a compound. | Correctly distinguishes between an element and a compound. | Correctly gives some differences between an element and a compound. | Needs assistance to distinguish between an element and a compound. |
| Ability to relate common elements to their symbols. | Correctly and consistently relates common elements to their symbols. | Correctly relates common elements to their symbols. | Correctly relates some of the common elements to their symbols. | Needs assistance to relate common elements to their symbols. |
| Ability to explain the applications of common elements in society. | Correctly and consistently explains the applications of common elements. | Correctly explains the applications of common elements. | Correctly explains some of the applications of common elements. | Needs assistance to explain the applications of common elements. |

| Strand | Sub Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| 1.0 **Mixtures, Elements and Compounds** | 1.3 **Structure of the atom**<br><br>(7 Hours) | By the end of the sub strand the learner should be able to:<br>a) describe the structure of an atom and electron arrangement of elements.<br>b) determine atomic number and mass number of elements.<br>c) classify elements into metals and non-metals.<br>d) Describe the physical and chemical properties of oxygen in day-to-day life.<br>e) explain the role of oxygen in combustion and spread of fire.<br>f) identify classes of fire and their control measures.<br>g) appreciate the application of fire control measures in day-to-day life.<br>h) develop curiosity about rights to safety and access | The learner is guided to:<br>• Discuss the meaning of the atom and illustrate its structure (components of the nucleus and energy levels).<br>• Draw and discuss the electron arrangements of elements and classify them into metals and non-metals<br>• ( first 13 elements of the periodic table).<br>• Discuss and illustrate the atomic number and mass number of elements (first 13 elements of the periodic table)<br>• Discuss the role of oxygen in combustion and the spread of fire.<br>• Classify fire according to the cause and suggest control measures.<br>• Practice fire control measures (breaking the fire triangle and use of fire extinguishers). | 1. What is the structure of an atom?<br>2. How do atoms gain stability?<br>3. What are the different classes of fire? |

| | | | | |
|---|---|---|---|---|
| | | to information. | • Discuss rights to safety and access to information on flammable substances.<br>• Where possible, use digital devices to search, play and watch and discuss videos and animations on the different classes of fire.<br>• **Project:** model the atomic structure of selected elements of the periodic table using locally available materials. | |

**Core competencies to be developed**

- Citizenship: as learners discuss rights to safety and access to information.
- Communication and collaboration: as learners practice fire control measures.
- Learning to learn as learners discuss the role of oxygen in combustion and spread of fire.

**Pertinent and Contemporary Issues (PCIs)**

- Disaster Risk Reduction: as learners apply methods of fire control.

**Values**

- Respect and love: as they work in groups.
- Responsibility: as they care for fire extinguishers.
- Integrity: as they use digital devices.

**Links to other subjects**

- Home science: when they practise safe measures to prevent fire accidents.

- Mathematics: as they distribute electrons in the various energy levels of atoms of elements.

**Assessment Rubric**

| Indicator | Exceeds expectation | Meets expectation | Approaches expectation | Below expectation |
|---|---|---|---|---|
| Ability to describe the structure of an atom and electron arrangement of selected elements. | Correctly and consistently describes the structure of an atom and electron arrangement of selected elements with use of diagrams. | Correctly describes the structure of an atom and electron arrangement of selected elements. | Correctly describes some of the structures of an atom and electron arrangement of some selected elements. | Needs assistance to describe the structure of an atom and electron arrangement of selected elements. |
| Ability to determine atomic number and mass number of elements. | Correctly and consistently determines atomic number and mass number of elements giving examples. | Correctly determines atomic number and mass number of elements. | Correctly determines the atomic number or the mass number of some element. | Needs assistance to determine the atomic number and mass number of elements. |
| Ability to classify the selected elements into metals and non-metals. | Correctly and consistently classifies the selected elements into metals and non-metals. | Correctly classifies the selected elements into metals and non-metals. | Correctly classifies some of the selected elements into metals and non-metals. | Needs assistance to classify the selected elements into metals and non-metals. |
| Ability to explain the role of oxygen in | Correctly and consistently explains | Correctly explains the role of oxygen in | Partially explains the role of oxygen in | Needs assistance to explain the role of |

| | | | | |
|---|---|---|---|---|
| combustion and spread of fire. | the role of oxygen in combustion and spread of fire. | combustion and spread of fire. | combustion and spread of fire. | oxygen in combustion and spread of fire. |
| Ability to identify classes of fire and their control measures. | Correctly and consistently identifies classes of fire and their control measures. | Correctly identifies classes of fire and their control measures. | Correctly identifies some of the classes of fires and their control measures. | Needs guidance to identify the classes of fires and their control measures. |

## STRAND 2.0: LIVING THINGS AND THEIR ENVIRONMENT

| Strand | Sub-Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| 2.0 **Living Things and their Environment** | 2.1 **The Cell**<br><br>(18 Hours) | By the end of the sub-strand, the learner should be able to:<br>a) identify the components of a cell as seen under the light microscope and state their functions.<br>b) compare plant and animal cells as observed under a light microscope.<br>c) calculate the magnification of cells seen under the light microscope.<br>d) appreciate the use of a light microscope in magnification. | The learner is guided to:<br>• Observe, identify, draw, label and state the functions of parts of the light microscope.<br>• Practise how to use and care for a light microscope.<br>• Prepare, mount and observe plant cells under a light microscope.<br>• Observe permanent slides of animal cells under the light microscope.<br>• Discuss with others, the differences between plant and animal cells as seen under a light microscope.<br>• Calculate magnification at various objective lenses of the light microscope. | 1. Why is the light microscope important in day-to-day life?<br>2. What are the differences between plant and animal cells? |
| **Core competencies to be developed:**<br>• Citizenship: as learners work in groups to enhance social cohesion. | | | | |

- Creativity and Imagination: as learners apply knowledge and skills gained to make charts and models.
- Self-efficacy: as learners prepare and observe specimen under the light microscope.

**Pertinent and Contemporary Issues (PCIs)**

- Social cohesion: as the learners work together during experiments.
- Environmental Conservation: safe use and disposal of specimens and equipment.

**Values**

- Respect: as learners work together in groups on projects and experiments.
- Responsibility: as learners share tasks and assigned to each other.

**Links to other subjects**

- Agriculture: Role of diffusion and osmosis in plant nutrition.
- Mathematics: As learners calculate magnification of cells as seen under a light microscope.

**Assessment Rubric**

| Indicator | Exceeds expectation | Meets expectation | Approaches expectation | Below expectation |
|---|---|---|---|---|
| Ability to identify the components of a cell as seen under the light microscope and state their functions. | Correctly and consistently identifies all the components of a cell as seen under the light microscope and states their functions. | Correctly identifies all the components of a cell as seen under the light microscope and states their functions. | Correctly identifies some components of a cell as seen under the light microscope and states their functions. | Needs assistance to identify some components of a cell, as seen under the light microscope and state their functions. |

| | | | | |
|---|---|---|---|---|
| Ability to compare plant and animal cells as observed under a light microscope. | Correctly and consistently compares plant and animal cells as observed under a light microscope. | Correctly compares plant and animal cells as observed under a light microscope. | Correctly makes some comparison between plant and animal cells. | With guidance compares plant and animal cells as observed under a light microscope. |
| Ability to calculate the magnification of cells as seen under the light microscope | Calculates the magnification of cells as seen under the light microscope with precision. | Correctly calculates the magnification of cells as seen under the light microscope | Has some difficulties in calculating the magnification of cells as seen under the light microscope | Needs help to calculate the magnification of cells as seen under the light microscope |

| Strand | Sub-Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| 2.0 **Living Things and their Environment** | 2.2 **Movement of materials in and out of the cell**<br><br>(32 Hours) | By the end of the sub strand the learner should be able to;<br>a) describe the properties of the cell membrane.<br>b) explain the role of diffusion in living organisms.<br>c) demonstrate the process of osmosis in living things.<br>d) describe factors affecting osmosis.<br>e) explain the role of osmosis in living organisms.<br>f) appreciate the importance of diffusion and osmosis in living organisms. | The learner is guided to;<br>● carry out experiments to demonstrate the effects of heat, dilutes acids and alkalis on the cell membrane.<br>● carry out experiments to demonstrate diffusion using perfumes/scented flowers and discuss their roles in living things.<br>● carry out experiments on osmosis using plant materials and visking tubing.<br>● discuss with peers, the role of osmosis in living things.<br>● observe and account for the changes that occur in the plant leaves at | 1. How is diffusion and osmosis important in living organisms?<br>2. What are the similarities and differences between osmosis and diffusion? |

| | | | | |
|---|---|---|---|---|
| | | | different times of the day.<br>• search, play and watch videos and animations showing the structure and properties of the cell membrane.<br>• watch animations on factors that affect diffusion<br>• watch animations on factors that affect osmosis<br>• search, and watch videos showing how gases are exchanged in the human lungs. | |

**Core competencies to be developed:**

- Communication and collaboration- Learners work in groups to conduct experiments, prepare reports, present their findings using appropriate scientific language.
- Citizenship- Learners work in groups to enhance social cohesion.
- Digital literacy – Learners use various digital devices in learning process

**Pertinent and Contemporary Issues (PCIs)**

- Social cohesion as the learners work together during experiments.
- Environmental issues- safety while handling specimen, apparatus and equipment as well as their disposal

**Values:**

- Respect - while working with others in groups on projects and experiments.
- Responsibility- by sharing tasks and assigning each other different tasks during the course of working in groups.

- Peace and Unity – by assigning specific tasks to individuals for the benefit of the whole group while learning.

**Links to other subjects:**

- Agriculture (*Role of diffusion and osmosis*)
- Computer studies (*use of digital devices*)

**Assessment Rubric**

| Indicator | Exceeds expectation | Meets expectation | Approaches expectation | Below expectation |
|---|---|---|---|---|
| Ability to describe the structure and properties of the cell membrane. | Correctly and consistently describes the structure and properties of the cell membrane. | Correctly describes the structure and properties of the cell membrane. | Partly describes the structure and properties of the cell membrane. | Needs guidance to describe the structure and properties of the cell membrane. |
| Ability to describe factors affecting the rate of diffusion. | Correctly and consistently describes factors affecting diffusion. | Correctly describes factors affecting diffusion. | Correctly describes some factors affecting diffusion. | Needs assistance to describe factors affecting diffusion. |
| Ability to explain the role of diffusion in living organisms. | Correctly and comprehensively explains the role of diffusion in living organisms. | Correctly explains the role of diffusion in living organisms. | Partly explains the role of diffusion in living organisms. | With aid partly explains the role of diffusion in living organisms. |
| Ability to demonstrate the process of osmosis in living organisms. | Correctly demonstrates the process of osmosis in living things in a variety of ways | Correctly demonstrates the process of osmosis in living organisms. | Partially demonstrates the process of osmosis in living organisms. | Requires assistance to demonstrate the process of osmosis in living organisms. |

| | | | | |
|---|---|---|---|---|
| Ability to describe factors affecting osmosis. | Correctly and consistently describes factors affecting osmosis. | Correctly describes factors affecting osmosis. | Correctly describes some factors affecting osmosis. | Needs assistance to describe factors affecting osmosis. |
| Explaining the role of osmosis in living organisms. | Giving examples correctly explains the role of osmosis in living organisms. | Correctly explains the role of osmosis in living organisms. | Partly explains the role of osmosis in living organisms. | With assistance explains the role of osmosis in living organisms. |

## STRAND 3.0: FORCE AND ENERGY

| Strand | Sub Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| **3.0 Force and Energy** | **3.1 Static charges**<br><br>(9 Hours) | By the end of the sub strand the learner should be able to;<br>a) explain the origin of charges on a material,<br>b) Describe detection of static charges on bodies,<br>c) Describe the distribution of charges on metallic conductors,<br>d) explain the application of static charges in day to day life,<br>e) outline the necessary safety measures against lightning,<br>f) appreciate applications of static charges in day to day life. | The learner is guided to:<br>• Discuss with peers the origin of charges on materials and SI unit of charge (*atom, nucleus, neutrons, protons, electrons* and *coulomb*) and the law of conservation of charge.<br>• Describe the features, charging and discharge/earthing of a leaf electroscope and uses in electrostatics (*contact and induction*) (*testing for presence, type, quantity and conduction and insulation of materials*)<br>• Perform simple experiments using proof plane and leaf electroscope or using digital gadgets to investigate the distribution of charges on metallic conductors (*spherical, wedge shaped, pear shaped and sharp conductor*)<br>• Search for information from reference materials, resource persons or videos, animations and simulations from | 1. How do lightning arrestors work?<br>2. How do materials get charged? |

| | | | | |
|---|---|---|---|---|
| | | | digital devices describing real life effects of electrostatics and describe the applications of electrostatics (*spray gun, lightning arrestor and associated safety measures*)<br>• Construct a simple leaf electroscope using locally available materials. | |

**Core competencies to be developed:**

- Digital literacy developed as learners search, play and observe videos and animations showing the origin of charges.
- Communication and Collaboration developed as learners discuss with peers the origin of charges on materials and SI unit of charge.
- Citizenship enhanced as learners identify necessary safety measures for themselves and others during lightning.

**Pertinent and Contemporary Issues (PCIs)**

- Disaster risk reduction as the learners learn on safety measures during lightning
- Education for Sustainable Development as learners **c**onstruct a simple leaf electroscope using locally available materials

.**Values:**

- **Responsibility** enhanced as learners perform their different roles during the experiment to demonstrate methods of charging a conductor.
- **Unity** is promoted as the learners perform the activities in groups to discuss and explain safety measures when there is lightning

**Links to other subjects:**

- Electricity as learners discuss with peers about the origin of charges on materials and SI unit of charge

| Assessment Rubric | | | | |
|---|---|---|---|---|
| **Indicator** | **Exceeds Expectation** | **Meets Expectation** | **Approaches Expectation** | **Below Expectation** |
| Ability to explain the origin of charges on a material | Correctly explains the origin of charges on a material with supporting illustrations | Correctly explains the origin of charges on a material | Correctly explains the origin of charges on a material but omits mentioning some constituent particles | Needs help to explain the origin of charges on a material |
| Ability to describe detection of static charges on bodies | Correctly describes detection of static charges on bodies using varied methods | Correctly describes detection of static charges on bodies | Partially describes detection of static charges on bodies of either | With assistance, describes detection of static charges on bodies |
| Ability to describe the distribution of charges on metallic conductors | Correctly and accurately describes the distribution of charges on metallic conductors with illustrations | Correctly describes the distribution of charges on metallic conductors | Correctly describes the distribution of charges on some shapes of metallic conductors only | Need assistance to describe the distribution of charges on metallic conductors |
| Ability to explain the application of static charges in day to day life | Correctly and satisfactorily explains the application of static charges in day to day life | Correctly explains the application of static charges in day to day life | Correctly explains some applications of static charges in day to day life | With help, explains the application of static charges in day to day life |
| Ability to outline the necessary safety measures against lightning | Correctly and accurately outlines the necessary safety measures against lightning | Correctly outlines the necessary safety measures against lightning | Correctly outlines some necessary safety measures against lightning | Needs help to outline the necessary safety measures against lightning |

| Strand | Sub Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| **3.0 Force and Energy** | **3. 2 Electrical energy**<br><br>(10 Hours) | By the end of the sub strand, the learner should be able to:<br>a) Explain the meaning of terms used in electrical energy,<br>b) Describe the working of primary cells and secondary cells as a source of electrical energy,<br>c) Outline necessary care and maintenance of secondary cells,<br>d) Apply mathematical relationship between charge and time to determine the rate of flow of electricity.<br>e) Appreciate use of cells as an alternative source of electrical energy to fossil fuels. | **The learner is guided to:**<br>• Working together with peers, discuss the meaning of terms associated with electrical energy supply (*electric current, electric potential difference, electromotive force*)<br>• Describe the measurement of electric current and electric potential difference (*use of ammeter and voltmeter*)<br>• Make a rectangular shape using straw and a beaker of coloured water to demonstrate the flow of charge in an electric circuit.<br>• Discuss with peers the direction of electric current in a circuit the relationship between charge, electric current and time | What are alternative sources of power in your locality |

| | | | | |
|---|---|---|---|---|
| | | | $\left\{I = \frac{Q}{t}\right\}$<br>• Using reference materials, resource persons or digital materials, distinguish between primary cells and secondary cells and explain their working (*simple cell, dry leclanche cell, lead acid accumulator and alkaline accumulators*)<br>• Use common laboratory materials (*zinc plate, copper plate, dilute sulphuric acid, connecting wires and a bulb*) to investigate the working of a simple cell<br>• Discuss with peers the defects of primary cells and the maintenance of secondary cells (*local action, polarization*)<br>• Search for information from digital devices or otherwise the growing use of cells as opposed to fossil fuels as a source of electrical energy. | |

| |
|---|
| **Core competencies to be developed:**<br>• Learning to learn developed as the learner uses common laboratory materials (*zinc plate, copper plate, dilute sulphuric acid, connecting wires and a bulb*) to investigate the working of a simple cell<br>• Digital Literacy developed as the learner search for information from digital devices or otherwise the growing use of cells as opposed to fossil fuels as a source of electrical energy<br>• Communication and Collaboration developed as the learner work together with peers discuss the meaning of terms associated with electrical energy supply (*electric current, electric potential difference, electromotive force*)<br>• Citizenship developed as learners identify and explain safety measures required when dealing with electrical appliance |
| **Pertinent and Contemporary Issues (PCIs)**<br>• Safety is enhanced as learners identify and explain safety measures in place when dealing with electrical appliances |
| **Values:**<br>• Unity is enhanced as learners work in groups to identify and discuss electrical appliances in the environment and set up simple electrical circuits.<br>• Responsibility as learners perform their different roles during the experiment to set up simple electrical circuits |
| **Links to other subjects:**<br>• Pre-technical and pre-career: as learners learn to set up simple electrical circuits.<br>• Electricity as learners identify and explain safety in place when dealing with electrical appliances |

| Assessment Rubric | | | | |
|---|---|---|---|---|
| **Indicator** | **Exceeds Expectation** | **Meets Expectation** | **Approaches Expectation** | **Below Expectation** |
| Ability to explain the meaning of terms used in electrical energy, | Correctly explains the meaning of terms used in electrical energy, their symbols and SI units | Correctly explains the meaning of terms used in electrical energy, | Correctly explains the meaning of some terms used in electrical energy, | Needs help to correctly explain the meaning of terms used in electrical energy, |
| Ability to describe the working of primary cells and secondary cells as a source of electrical energy, | Correctly and systematically describes the working of primary cells and secondary cells as a source of electrical energy | Correctly describes the working of primary cells and secondary cells as a source of electrical energy | Correctly describes the working of primary cells and secondary cells as a source of electrical energy without clear distinction between them | With assistance, correctly describes the working of primary cells and secondary cells as a source of electrical energy |
| Ability to outline necessary care and maintenance of secondary cells | Correctly and systematically outlines necessary care and maintenance of secondary cells | Correctly outlines necessary care and maintenance of secondary cells | Correctly outlines necessary care and maintenance of secondary cells | Needs help to correctly outline necessary care and maintenance of secondary cells |
| Ability to apply mathematical relationship between charge and time to determine the rate of flow of electricity. | Correctly and consistently applies mathematical relationship between charge and time to determine the rate of flow of electricity | Correctly applies mathematical relationship between charge and time to determine the rate of flow of electricity | Correctly applies mathematical relationship between charge and time sometimes to determine the rate of flow of electricity | With help, applies mathematical relationship between charge and time to determine the rate of flow of electricity |

| Strand | Sub-Strand | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|---|
| **3.0 Force and Energy** | **3.3 Transformation of energy**<br><br>(9 Hours) | By the end of the sub strand, the learner should be able to;<br>a) identify forms of energy in nature.<br>b) explain energy transformations in nature.<br>c) identify appliances whose working relies on energy transformation.<br>d) identify strategies to mitigate dangers associated with energy transformation.<br>e) appreciate the applications of energy transformation in day to day life. | The learner is guided to:<br>• discuss with peers and identify forms of energy found in the environment.<br>• demonstrate and explain types of energy transformations using locally available materials.<br>• discuss the energy transformation processes<br>• search, play and observe videos and animations showing applications of energy transformation processes in day-to-day life<br>• identify and explain applications of energy transformation in day to day life (Electrical to heat, Mechanical to electrical, Electrical to light, Electrical to sound and Potential to kinetic). | 1. How can energy be transformed from one form to another?<br>2. How can energy transformation be applied in day to day life?<br>3. What are the energy transformation processes that occur in our environment? |

| | | | | |
|---|---|---|---|---|
| | | | • Discuss with others and identify dangers associated with energy transformation.<br>• identify and explain the applications of energy transformation in day to day life (bulb, diodes, moving microphone, electric heater, solar panel, dynamo, motor).<br>• search, play and observe videos and animations showing dangers associated with energy transformation and strategies of mitigation them (relate to road accidents; K.E to P.E through action and Reaction Forces; accidents caused by fire, electricity, health hazard from bright light) | |

**Core competencies to be developed:**

- Digital Literacy: developed as learners search, play and observe videos and animations showing energy transformations and their applications.
- Communication and collaboration developed as learners work in groups to identify and discuss types of energy transformation in the environment.

**Pertinent and Contemporary Issues (PCIs)**

- Education for Sustainable Development enhanced as learners identify and explain the applications of energy transformation in day to day life.
- Life Skills and Value Education: as learners identify the applications of energy transformation in day to day life.

**Values:**

- Respect: as learners respect each other's opinion when working in groups to discuss the energy transformation processes.
- Responsibility: As learners demonstrate types of energy transformations using locally available materials.

**Links to other subjects:**

- Home science: as learners learn about applications of energy transformation processes in day to day life

**Assessment Rubric**

| Indicator | Exceeds expectation | Meets expectation | Approaches expectation | Below expectation |
|---|---|---|---|---|
| Ability to identify forms of energy in the environment. | Correctly and consistently identifies forms of energy in the environment | Correctly identifies forms of energy in the environment | Correctly identifies some forms of energy in the environment | With help, identifies forms of energy in the environment |
| Ability to explain energy transformations in the environment | Correctly and consistently explains energy transformations in the environment | Correctly explains energy transformation processes that occur in the environment | Correctly explains some energy transformation processes that occur in the environment | With help, explains energy transformation processes that occur in the environment |
| Ability to identify appliances whose | Correctly and consistently identifies | Correctly identifies appliances whose | Correctly identifies some appliances whose | With assistance, identifies appliances |

| | | | | |
|---|---|---|---|---|
| working relies on energy transformation | appliances whose working relies on energy transformation | working relies on energy transformation | working relies on energy transformation | whose working relies on energy transformation |
| Ability to identify strategies to mitigate dangers associated to energy transformation | Correctly and consistently identifies strategies to mitigate dangers associated to energy transformation | Correctly identifies strategies to mitigate dangers associated to energy transformation | Correctly some identifies strategies to mitigate dangers associated to energy transformation | With assistance, identifies strategies to mitigate dangers associated to energy transformation |

## COMMUNITY SERVICE-LEARNING PROJECT

### Introduction

In Grade 8, focus is on making preparations to undertake a CSL activity of their own choice. They will be required to identify a community problem through research, plan and come up with solutions to solve the problem. The preparations will be carried out in groups. Learners will build on CSL knowledge, skills and attitudes acquired during Life Skills Education as well as other subjects.

### CSL Skills to be Covered:

i) **Leadership**: Learners develop leadership skills as they undertake various roles during preparation.

ii) **Financial Literacy and Entrepreneurship Skills:** Learners will gain skills on wise spending, saving and investing for sustained economic growth. They could consider ways of generating income as they undertake the CSL project through innovation ways. Moreover, they could identify business ideas and opportunities as well as resources to meet the needs of the community.

iii) **Research:** Learners will be expected to identify a problem or pertinent issue in the community and indicate how the problem will be solved. They will also acquire skills on how to report their findings.

iv) **Communication:** Learners indicate reporting mechanisms to be used during the actual project e.g., how they intend to communicate with members of the community, either online or offline.

v) **Citizenship:** As learners engage in the CSL activities for this Grade, they will be vested with the rights, privileges and duties of a citizen, hence giving them a sense of belonging and attachment to the nation. They will also be empowered to engage and assume active roles in shaping a more peaceful, tolerant and inclusive society.

vi) **Life Skills Education:** Learners will be equipped with life skills including decision making, assertiveness, effective communication, problem solving and stress management. This will enable them to manage interpersonal relationships, develop leadership skills as well as discover and grow their talents.

vii) **Community Development:** Learners will be empowered with skills necessary to effect relevant change including building stronger and more resilient communities.

| Suggested PCIs | Specific Learning Outcomes | Suggested Learning Experiences | Key Inquiry Questions |
|---|---|---|---|
| • Environmental degradation<br>• Life style diseases<br>• Communicable and non-communicable diseases<br>• Poverty<br>• Violence in community<br>• Food security issues<br>• Conflicts in the community<br><br>**Note:**<br>The suggested PCIs are only examples. Teachers should allow learners to identify PCIs as per their context and reality. | By the end of the CSL project, the learner should be able to:<br>a) identify a problem in the community through research<br>b) plan to solve the identified problem in the community,<br>c) design solutions to the identified problem,<br>d) appreciate the need to belong to a community. | The learner is guided to:<br>• brainstorm on pertinent and contemporary issues in their community that need attention in groups<br>• choose a PCI that needs immediate attention and explain why in groups<br>• carry out research using digital devices print media/interactions with members of the community/resource persons in identifying a community problem to address in groups<br>• discuss possible solutions to the identified issue in groups<br>• propose the most appropriate solution to the problem in groups<br>• discuss ways and instruments they can use to collect data on the problem (questionnaires, interviews, observation schedule, etc)<br>• develop instruments for data collection<br>• identify resources needed for the CSL project (human, technical, financial)<br>• discuss when the project will begin and end<br>• prepare a programme/timetable of the entire project execution | 1. How does one determine community needs?<br>2. Why is it necessary to make adequate preparations before embarking on a project? |

| | | | |
|---|---|---|---|
| | | • Assign roles to be carried by all group members<br>• reflect on how the project preparation enhanced learning. | |

**Key Component of CSL developed**

a) Identification of a problem in the community through research
b) planning to solve the identified problem
c) designing solutions to the identified problem

**Core competencies to be developed**

- **Communication and collaboration**: Learners will make the preparations in groups and conduct discussions on best ways of carrying out the project.
- Self efficacy: Learners develop the skills of self awareness and leadership as they undertake the CSL project
- Creativity and Imagination: Learners will come up with creative ways of solving the identified community problem
- Critical Thinking and Problem Solving: Learners will demonstrate autonomy in identifying a community need, exploring plausible solutions and making necessary preparations to address the problem.
- Digital Literacy: Learners can use technology when as they research on a community problem that they can address.
- Learning to Learn: Learners gain new knowledge and skills as they identify a community problem to be addressed and make preparations to carry out the project.
- Citizenship: This is enhanced as learners choose a PCI that needs immediate attention in the community.

**Pertinent and contemporary Issues**

- Social cohesion as learners discuss possible solutions to the identified issue.
- Critical thinking as learners discuss possible solutions to the identified issue.

**Values**

- Integrity as learners carry out research using digital devices and print media as they identify a community problem to address.

- Respect as learners brainstorm on pertinent and contemporary issues in their community that need attention

**Assessment Rubric**

| Indicator | Exceeds Expectation | Meets Expectation | Approaches Expectation | Below Expectation |
|---|---|---|---|---|
| Ability to identify a problem in the community through research | Correctly and precisely identifies a problem in the community through research | Correctly identifies a problem in the community through research | Partially identifies a problem in the community through research | Partially identifies a problem in the community through research with assistance |
| Ability to plan to solve the identified problem | Accurately and systematically plans to solve the identified problem | Accurately plans to solve the identified problem | Plans to solve the identified problem leaves out some details | With assistance plans to solve the identified problem but leaves out many details |
| Ability to design solutions to the identified problem | Correctly and elaborately designs solutions to the identified problem | Correctly designs solutions to the identified problem | Partly designs solutions to the identified problem | Partly designs solutions to the identified problem with prompting |

## APPENDIX: LIST OF ASSESSMENT METHODS, LEARNING RESOURCES AND NON-FORMAL ACTIVITIES

| Assessment Methods in Science | Learning Resources | Non-Formal Activities |
|---|---|---|
| • Reflections<br>• Game Playing<br>• Pre-Post Testing<br>• Model Making<br>• Explorations<br>• Experiments<br>• Investigations<br>• Conventions, Conferences, and Debates<br>• Applications<br>• Teacher Observations<br>• Project<br>• Journals<br>• Portfolio<br>• Oral or Aural Questions<br>• Learner's Profile<br>• Written Tests<br>• Anecdotal Records | • Laboratory Apparatus and Equipment<br>• Textbooks<br>• Software<br>• Relevant reading materials<br>• Digital Devices<br>• Recordings | • Visit the science historical sites.<br>• Use digital devices to conduct scientific research.<br>• Organizing walks to have live learning experiences.<br>• Developing simple guidelines on how to identify and solve some community problems.<br>• Conducting science document analysis.<br>• Participating in talks by resource persons on science concepts.<br>• Participate in science clubs and societies<br>• Attending and Participating Science and Engineering fairs<br>• Organizing and participating in exchange programs.<br>• Make oral presentations and Demonstrations on science issues. |