REPUBLIC OF KENYA

MINISTRY OF EDUCATION

JUNIOR SCHOOL CURRICULUM DESIGN

INTEGRATED SCIENCE

FOR

LEARNERS WITH HEARING IMPAIREMENT

GRADE 9

KENYA INSTITUTE OF CURRICULUM DEVELOPMENT

A Skilled and Ethical Society

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FOREWORD

The Government of Kenya is committed to ensuring that policy objectives for Education, Training and Research meet the aspirations of the Constitution of Kenya 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, Primary and Junior School levels.

The implementation of Competency Based Curriculum involves monitoring and evaluation to determine its success. After the five-year implementation cycle, a summative evaluation of the primary education cycle was undertaken to establish the achievement of learning outcomes as envisaged in the Basic Education Curriculum Framework. The Government of Kenya constituted a Presidential working Party on Education Reforms (PWPER) in 2022 to address salient issues affecting the education sector. PWPER made far reaching recommendations for basic education that necessitated curriculum review. The recommendations of the PWPER, monitoring reports, summative evaluation, feedback from curriculum implementers and other stakeholders led to rationalisation and review of the basic education curriculum.

The reviewed Grade nine curriculum designs for learners with hearing impairment build on competencies attained by learners at Grade eight. Emphasis at this grade is the development of skills for exploration and making informed decision on pathways based on careers.

The curriculum designs present National Goals of Education, essence statements, general and specific expected learning outcomes for the 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, 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.

HON. EZEKIEL OMBAKI MACHOGU, CBS
CABINET SECRETARY,
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PREFACE

The Ministry of Education (MoE) nationally implemented Competency Based Curriculum (CBC) in 2019. Grade seven is the first grade of Junior school while Grade 9 is the final grade of the level in the reformed education structure.

The reviewed Grade nine curriculum furthers implementation of the CBC from Grade eight. The curriculum provides opportunities for learners to focus in a field of their choice to form a foundation for further education and training and/or gain employable skills. 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 nine curriculum designs for learners with hearing impairment 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. They 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 nine and prepare them for smooth transition to Grade Senior School. Furthermore, it is my hope that teachers will use the adapted designs to make learning interesting, exciting and enjoyable.

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ACKNOWLEDGEMENT

The Kenya Institute of Curriculum Development (KICD) Act Number 4 of 2013 (Revised 2019) mandates the Institute to develop and review 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)2017, that responds to the demands of the 21st Century and the aspirations captured in the Constitution of Kenya 2010, the Kenya Vision 2030, East African Community Protocol, International Bureau of Education Guidelines and the United Nations Sustainable Development Goals (SDGs).

KICD receives its funding from the Government of Kenya to facilitate 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 revised Grade nine curriculum designs for learners with hearing impairment were developed and adapted with the support of the World Bank through the Kenya Primary Education Equity in Learning Programme (KPEELP); a project coordinated by MoE. Therefore, the Institute is very grateful for the support of the Government of Kenya, through the MoE and the development partners for policy, resource and logistical support. Specifically, special thanks to the Cabinet Secretary-MoE and the Principal Secretary – State Department of Basic Education,

I also wish to acknowledge the KICD curriculum developers and other staff, all teachers, educators who took part as panellists; the Semi-Autonomous Government Agencies (SAGAs) and representatives of various stakeholders for their roles in the development and adaptation of the Grade nine curriculum designs for learners with hearing impairment. In relation to this, I 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 and adapting these designs. Finally, I am very grateful to the KICD Council Chairperson and other members of the Council for very consistent guidance in the process.

I assure all teachers, parents and other stakeholders that this curriculum design will effectively guide the implementation of the CBC at Grade nine and preparation of learners with hearing impairment for transition to Senior school.

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TABLE OF CONTENTS

LESSON ALLOCATION

S/ No.	Learning Area	No. of Lesson
1	English for Learners with Hearing Impairment	5
2	Kiswahili for Learners with Hearing Impairment /Kenyan Sign Language	4
3	Mathematics for Learners with Hearing Impairment	5
4	Religious Education	4
5	Integrated Science for Learners with Hearing Impairment	5
6	Agriculture for Learners with Hearing Impairment	4
7	Social Studies for Learners with Hearing Impairment	4
8	Creative Arts and Sports for Learners with Hearing Impairment	5
9	Pre- technical Studies for Learners with Hearing Impairment	4
10.	Pastoral/ Religious Instruction Programme	1
	Total	**41**

NATIONAL GOALS OF EDUCATION

1. **Foster nationalism, patriotism, and promote national unity**

   Kenya's people belong to different communities, races and religions and should be able to live and interact as one people. Education should enable the learner to acquire a sense of nationhood and patriotism. It should also promote peace and mutual respect for harmonious coexistence.

2. **Promote social, economic, technological and industrial needs for national development**

   Education should prepare the learner to play an effective and productive role in the nation.

   a) Social Needs

   Education should instil social and adaptive skills in the learner for effective participation in community and national development.

   b) Economic Needs

   Education should prepare a learner with requisite competencies that support a modern and independent growing economy. This should translate into high standards of living for every individual.

   c) Technological and Industrial Needs

   Education should provide the learner with necessary competences for technological and industrial development in tandem with changing global trends.

3. **Promote individual development and self-fulfilment**

   Education should provide opportunities for the learner to develop to the fullest potential. This includes development of one's interests, talents and character for positive contribution to the society.

4. Promote sound moral and religious values

Education should promote acquisition of national values as enshrined in the Constitution. It should be geared towards developing a self- disciplined and ethical citizen with sound moral and religious values.

5. Promote social equity and responsibility

Education should promote social equity and responsibility. It should provide inclusive and equitable access to quality and differentiated education; including learners with special educational needs and disabilities. Education should also provide the learner with opportunities for shared responsibility and accountability through service learning.

6. Promote respect for and development of Kenya's rich and varied cultures

Education should instil in the learner appreciation of Kenya's rich and diverse cultural heritage. The learner should value own and respect other people's culture as well as embrace positive cultural practices in a dynamic society.

7. Promote international consciousness and foster positive attitudes towards other nations

Kenya is part of the interdependent network of diverse peoples and nations. Education should therefore enable the learner to respect, appreciate and participate in the opportunities within the international community. Education should also facilitate the learner to operate within the international community with full knowledge of the obligations, responsibilities, rights and benefits that this membership entails.

8. Good health and environmental protection

Education should inculcate in the learner the value of physical and psychological well-being for self and others. It should promote environmental preservation and conservation, including animal welfare for sustainable development.

LEVEL LEARNING OUTCOMES FOR JUNIOR SCHOOL

By end of Junior 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 enables learners to apply distinctive ways of logical valuing, thinking and working to understand natural phenomena in the biological, physical and technological world. The emphasis of science education at junior school levels is to enhance learners' scientific thinking through learning activities that involve the basic science process skills. To achieve this for learners with hearing impairment, visual cues are majorly used and these include captioned videos, simulations, pictures, models and illustrations. 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.

It provides the learner with the basic requisite skills, knowledge, values and attitudes necessary for specialisation in the STEM pathway at senior school level. Short and clear signed instructions or procedures are provided when conducting experiments, demonstrations and projects. Teachers are encouraged that during facilitation they guide the learners to develop signs that are not present in the sign dictionary. The rationale for inclusion of integrated Science 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. The subject area is to be taught through inquiry-based learning approaches.

The design suggests the use of visual cues such as pictures, animations, models, captioned video clips, simulations, charts and illustrations to simplify the abstract concepts. Additional assessment methods suitable for learners with Hearing Impairment such as; use of signed questions, observation are included. Science and Engineering fair has also been included as part of non-formal activities. Teachers are encouraged to come up with signs for various concepts and terminologies that could be missing in the science specific dictionary, and to provide short and clear signed instructions or procedures when conducting experiments, demonstrations and projects. To cater well for both categories of learners who are Hard of Hearing and learners who are Deaf, the teacher should use proper articulation of signs with correct mouth movement when facilitating learning.

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. Practise 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 resource

Strands	**Sub Strands**	**Suggested Number of Lessons**
1.0 Mixtures, Elements and Compounds	1.1. Structure of the atom	14
	1.2. Metals and Alloys	16
	1.3. Water hardness	14
2.0 Living things and the Environment	2.1. Nutrition in plants	18
	2.2. Nutrition in animals	16
	2.3. Reproduction in plants	20
	2.4. The interdependence of life	18
3.0 Force and Energy	3.1. Curved Mirrors	18

	3.2. Waves	16
Total Number of Lessons		**150**

Note

The suggested number of lessons per sub strand may be less or more depending on the context.

STRAND 1.0: MIXTURES, ELEMENTS AND COMPOUNDS

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Mixtures, Elements, and Compounds	**1.1 Structure of the atom** **(14 lessons)** ● *Structure of the atom (protons, electrons, neutrons)* ● *Atomic number and mass number of elements* ● *Electron arrangement of elements*	By the end of the sub-strand the learner should be able to: a) sign words related to the structure of the atom for effective communication, b) describe the structure of the atom, c) determine the mass number of elements, d) draw the electron arrangement in atoms using dot or cross diagrams, e) classify elements into metals and non-metals, f) Show interest in classifying elements	● In groups, learners are guided to search for the meaning and sign of the words related to the structure of the atom from print and digital media. ensure learners observe proper cyber ethics while conducting online searches, ● in pairs, learners practise fingerspelling and signing of the identified words. in case a sign is missing, learners are guided to create and harmonise meaningful signs for communication purposes, ● in groups, learners are guided to describe the structure of the atom. ensure learners are seated in an appropriate arrangement that supports the use of bilingual communication,	1. Why is the study of the structure of the atom important? 2. Why is it important to learn signs of words related to the structure of the atom? 3. How does understanding the mass number contribute to knowledge about atomic structure?

	• *Energy level diagrams (cross or dot)* • *Metals and non –metals* Note: (use *the first 20 elements of the periodic table; do not introduce the periodic table at this level)*	into metals and non-metals.	• in groups, learners are guided to illustrate the structure of the atom by making drawings on charts and displaying them in class for peer review, • in purposive groups, learners are guided step by step to work out the mass number of an element with peers, • in groups, learners are guided to observe demonstrations of how electrons are arranged in atoms from print or digital media, • in groups, learners are guided to write the electron arrangements of elements and share their work with peers, • in groups, learners are guided to draw the electron arrangement in atoms using dot or cross diagrams and display them in class for peer review, • in groups, learners are guided to use electron arrangement to classify elements into metals and non-metals.	

			Project: Model the atomic structure of selected elements of the periodic table using locally available materials. HINT: For experiments, guide the learner to: ● identify and assemble reagents, apparatus, and chemicals to be used in the experiment. ● observe a demonstration from a captioned or signed video or animations on how to conduct the experiment. ● conduct the experiment, making observations and recording them. ● in pairs or groups, discuss the observations and draw inferences from them.	

Core competencies to be developed

- Communication and collaboration: The learner develops teamwork skills while working in groups to describe the structure of the atom.
- Creativity and imagination: The learner develops networking skills while experimenting and developing models of atoms of selected elements from locally available materials.

Pertinent and Contemporary Issues:
Socio-economic issues (cyber security): The learner observes cyber security measures when using digital media to observe animations or videos on the structure of an atom and electron arrangement.

Values
- Unity: The learner respects others' opinions while having group discussions
- Integrity: The learner displays honesty while using digital devices to search for relevant information on the structure of an atom, electron arrangement, atomic number, and mass number of elements.

Links to other subjects
Mathematics: The learner works out the mass number of elements (*first 20 elements of the periodic table*) similar to basic operations in mathematics

Suggested learning resources.
- Digital Devices
- Print media (charts, pictures, journals, magazines)
- Laboratory Apparatus and Equipment
- Course books
- Science specific signs dictionary

STRAND 1.0: MIXTURES, ELEMENTS AND COMPOUNDS

Strand	Sub strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0 Mixtures, Elements and Compounds	**1.2 Metals and Alloys (16 lessons)** ● *General physical properties of metals (state, ductility, malleability, electrical and thermal conductivity)* ● *Composition of alloys (steel, stainless steel, bronze, brass and duralumin)*	By the end of the sub-strand, the learner should be able to: a) sign words related to metals and alloys for effective communication, b) describe the physical properties of metals, c) describe the composition of alloys, d) identify the uses of metals and alloys in day-to-day life, e) explain the effects of rusting of metals, f) appreciate the importance of common alloys in day-to-day life.	● In groups, learners are guided to search for the signs of the words related to metals and alloys from digital and print media. Ensure learners observe proper cyber ethics while conducting online searches. ● in pairs, learners practise fingerspelling and signing the identified words. Where a sign is missing, learners are guided to create and harmonise meaningful signs for communication purposes, ● in groups, learners are guided to identify metals and non-metals available in	1. How are alloys important in day-to-day life? 2. How does understanding rusting contribute to the preservation and maintenance of metal objects?

	• *Uses of selected metals and alloys in day-to-day life (sodium, magnesium, aluminium, copper, iron, gold, silver, brass, steel, bronze, duralumin and stainless steel)* • *Rusting (causes, effects, prevention)*		their environment, • in pairs, learners are guided to observe as the teacher demonstrates out an experiment on the physical properties of metals, • in groups, learners are guided to follow the steps followed by the teacher in order to carry out experiments demonstrating the physical properties of metals (*colour, ductility and malleability, electrical and thermal conductivity*), • in groups, learners are guided to discuss the composition of common alloys with peers, (*steel, stainless steel, bronze),* • in groups, learners are guided to identify some items from the locality that	

			have been made from alloys, ● In groups, learners are guided to search for the uses of common metals and alloys from print and digital media then make short notes. (*Sodium, magnesium, aluminium, copper, zinc, iron, gold, silver, brass, steel, bronze duralumin, and stainless steel*). ● In groups, learners are guided to make presentations on the uses of common metals and alloys. ● In groups, guide learners to discuss causes, effects and ways of controlling rusting of metals. Ensure proper seating arrangement that allows learners to have a face-to-face conversation.	

Core competencies to be developed

- Communication and collaboration: The learner develops teamwork skills while working with peers to discuss the composition of common alloys.
- Digital literacy**:** The learner develops the skill of interacting with technology as they manipulate digital devices while searching for information on the physical and chemical properties of metals and common alloys.

Pertinent and Contemporary Issues (PCIs)

Safety and security: Learner develops internet safety and security skills as a learner observes cyber ethics while searching on the internet to identify metals and non-metals in nature.

Values

- Respect: Learner accommodates others' opinions during group discussions on uses of metals and common alloys.
- Peace: The learner avoids harming others when carrying out experiments to demonstrate the physical properties of metals.

Link to other subjects

- Pre-Technical Studies: Learner learns about common metals and alloys used in workshops.
- Agriculture and Nutrition: Learners use utensils made from metals and their alloys.

Suggested Learning Resources

- Digital Devices
- Print media
- Laboratory Apparatus and Equipment
- Science specific signs dictionary
- Course books
- Sample metals

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
1.0Mixtures, Elements and Compounds	**1.3Water hardness** **(14 lessons)** ● *physical properties of water (taste, colour, odour and boiling point)* ● *hard and soft water* ● *methods of softening temporary hard water (boiling, addition of washing soda,*	By the end of the sub strand, the learner should be able to: a) sign words related to water hardness for communication, b) describe the physical properties of water, c) distinguish between hard and soft water in nature, d) apply methods softening hard water in day-to-day life, e) outline advantages and disadvantages of hard and soft water, f) appreciate the applications of soft and	● in groups, learners are guided to search for the meaning and sign of the words related to water from print and digital media, Ensure that learners observe proper cyber ethics while conducting online searches. ● in pairs, learners are guided to practise fingerspelling and signing identified words, with a learner who is hard of hearing paired with one who is deaf to enhance total communication and lip-reading skills, ● in groups, learners are guided to collect and observe water from different sources and compare them in terms of appearance, odour, taste and boiling point *(taste water from safe sources).*	1. How are the properties of water important in its various applications? 2. Why is it important to develop signs of words related to properties of water? **3.** Why is hard water preferred for drinking?

	distilling, note. avoid ion exchange) ● *advantages and disadvantages of hard water and soft water*	hard water in day-to-day life.	● in groups, learners are guided to carry out activities to compare the lathering abilities of various samples of unboiled water with soap. ● in groups, learners are guided to use print or digital media to search for the meaning of soft water and hard water, ● in groups, learners are guided to use their observations to group the samples into hard and soft water, ● in purposive groups, learners are guided to use the activities to explain the meaning of hard and soft water, ● in groups, learners are guided to discuss the advantages and disadvantages of soft and hard water, while adopting a proper seating arrangement that	

			facilitates face-to-face conversation, ● in purposive groups, learners are guided step by step to perform various activities for softening hard water e.g. boiling, addition of washing soda, distilling. *(Avoid ion exchange)* Learners are guided to use digital or print media to search for information, videos and simulations explaining the methods of softening hard water and applications of hard and soft water. **HINT**: For experiments, guide the learner to: ● identify and assemble reagents, apparatus, and chemicals to be used in the experiment,	

			● observe a demonstration, signed video, video with captions, or animations on how to conduct the experiment, ● conduct the experiment, making observations and recording them. ● in pairs or groups, discuss the observations and draw inferences from them.	

Core competencies to be developed

● Learning to learn: The learner develops the skill of reflecting on their own experiences as they apply methods of softening hard water in day-to-day life.

● Critical thinking and problem solving: The learner develops interpretation skills as they relate the lathering ability of water to hardness and softness of water.

Pertinent and Contemporary Issues (PCIs)

● Financial literacy: The learner practises how to save on soap by using soft water for laundry.

Values

● Responsibility: The learner engages in assigned roles when carrying out experiments on softening hard water.

● Respect: The learner gives each other an opportunity to air their views as they discuss in a group the differences between hard and soft water.

Link to other subjects

● Agriculture and Nutrition: The learner uses soft water in laundry work.

Suggested Learning Resources

● Digital Devices

- Print media
- Science specific signs dictionary
- Laboratory Apparatus and Equipment
- Coursebooks

Suggested Assessment Rubrics				
Level / **Indicators**	**Exceeds expectation**	**Meets expectation**	**Approaches expectation**	**Below expectation**
Ability to sign words related to metals and alloys.	The learner signs words related to metals and alloys with exceptional accuracy demonstrating signing proficiency.	The learner signs words related to metals and alloys accurately conveying the intended meaning clearly.	The learner signs words related to metals and alloys with noticeable errors and inconsistencies in articulation.	The learner signs words related to metals and alloys with minimal clarity in articulation.
Ability to describe the structure of the atom	The learner describes the structure of the atom comprehensively.	The learner describes the structure of the atom adequately.	The learner partially describes the structure of the atom.	The learner partially describes the structure of the atom, with prompt.

Ability to classify elements into metals and non-metals	The learner classifies all elements into metals and nonmetals comprehensively.	The learner classifies all the elements into metals and nonmetals.	The learner classifies most of the elements into metals and nonmetals.	The learner classifies a few elements into metals and nonmetals.
Ability to outline uses of metals and alloys.	The learner outlines uses of all metals and alloys exhaustively.	The learner outlines uses of all common metals and alloys.	The learner outlines uses of most of the metals and alloys.	The learner outlines uses of a few metals and alloys.
Ability to explain the effect of rusting on metals.	The learner explains the effect of rusting on metals in detail comprehensively.	The learner explains the effect of rusting on metals sufficiently.	The learner explains the effect of rusting on metals partially.	The learner explains the effect of rusting on metals partially leaving some key points.
Ability to outline advantages and disadvantages of hard and soft water	The learner outlines advantages and disadvantages of hard and soft water exhaustively.	The learner outlines advantages and disadvantages of hard and soft water	The learner outlines most of the advantages and disadvantages of hard and soft water.	The learner outlines a few advantages and disadvantages of hard and soft water.
Ability to apply different methods to soften temporary hard water	Applies all appropriate methods to soften temporary hard water innovatively.	Applies all appropriate methods to soften temporary hard water	Applies at least appropriate method to soften temporary hard water	Applies less than two methods to soften temporary hard water.

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 Nutrition in plants (18 lessons)** ● *Parts of a leaf (external and internal)* ● *Adaptations of the leaf to photosynthesis* ● *Structure of chloroplasts (membranes, grana and stoma)* ● *Process of photosynthesis (chemical reactions during light and dark*	By the end of the sub strand, the learner should be able to: a) sign the words related to nutrition in plants for effective communication, b) identify external and internal parts of a leaf, c) explain adaptations of the leaf to photosynthesis, d) describe the process of photosynthesis in plants, e) investigate the conditions necessary for photosynthesis in plants, f) appreciate the importance of	● In groups, learners are guided to identify the new words used in nutrition in plants and animals from print and non-print media. Learners are instructed to observe proper cyber ethics while conducting online searches. ● in groups, learners are guided to search for the meanings and signs of identified words from both print and digital media. If a sign is missing, learners are instructed to create and harmonise meaningful signs for effective communication purposes. ● in pairs, learners practise fingerspelling and signing the words. ● in pairs, learners are guided to use a hand lens to observe	1. How do plants obtain nutrients? 2. Why is photosynthesis important?

	stage are not required) ● *Conditions necessary for photosynthesis*	photosynthesis in nature.	fresh leaves of plants, draw and label the external parts. ● in purposive groups, learners observe a chart showing the external parts of a leaf. ● in groups, learners discuss the external parts of the leaf in relation to their roles in photosynthesis, while adopting a proper seating arrangement that facilitates face-to-face conversation. ● in pairs, learners are guided to draw a labelled diagram of the external parts of the leaf. ● in groups, learners are guided to use print or non-print media to search for information on the internal structure of the leaf in relation to their roles in photosynthesis, discuss and share with peers, ● in groups, learners are guided to use	

			charts/photomicrographs or non-print media to observe and discuss the internal structure of the leaf in relation to their roles in photosynthesis. ● in groups the learners are guided to watch a captioned video showing the internal structure of the leaf in relation to their roles in photosynthesis. Play the video multiple times with pauses to allow the learner to take notes and for better comprehension. ● in purposive groups, learners are guided to observe and discuss the structure of the chloroplast on charts/photomicrographs and relate it to its role in photosynthesis. ● in groups, learners are guided to use print media to search for the process and products of photosynthesis and make a	

			class presentation. *(chemical reactions during light and dark stages are not required) (Correct any mistakes made after the presentations.)* ● in groups, learners are guided to watch a demonstration on procedures of carrying out a starch test. ● in groups, learners are guided to set-up and run experiments to show that light, carbon (IV) oxide and chlorophyll are necessary for photosynthesis and share the results. *(use the starch test)* ● in purposive groups, learners are guided to utilize both print and non-print media to search for the importance of photosynthesis. They will then discuss their findings and prepare a class presentation. An appropriate seating arrangement will be adopted to facilitate face-to-face	

			conversation during these activities.	

Core competencies to be developed

- Learning to learn: Learners develop the skill of organising their learning as they study independently while using charts/photomicrographs or non-print media to observe and discuss the internal structure of the leaf to their roles in photosynthesis.
- Self-efficacy: The learner develops leadership skills while working in groups to discuss the process and products of photosynthesis.

Values:

- Responsibility: The learner observes safety precautions while carrying out experiments to show that light, carbon (IV) oxide, and chlorophyll are necessary for photosynthesis.
- Integrity: The learner displays honesty while carrying out experiments to show that light, carbon (IV) oxide, and chlorophyll are necessary for photosynthesis and presenting their own results.

Pertinent and Contemporary Issues (PCIs)

- Environmental education and climate change: The learner collects only the required number of specimens of plants to observe and discuss the external structure of the leaf in relation to their roles in photosynthesis.

Link to other subjects:

- The information on photosynthesis is linked to food production **Agriculture and Nutrition.**

Suggested Learning Resources

- Digital Devices
- Print media (charts, pictures, journals, magazines)

- Laboratory Apparatus and Equipment
- Science specific signs dictionary
- Coursebooks

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Living things and their Environment	**2.2 Nutrition in animals** **(16 lessons)** ● *Modes of nutrition in animals (parasitic, saprophytic,*	By the end of the sub strand, the learner should be able to: a) sign words related to nutrition in animals,	● In groups, learners are guided to find the meanings and signs of words related to nutrition in animals from both print and non-print media. Learners are instructed to observe proper cyber	1. How do different animals feed? 2. How is food digested in the human body?

	symbiosis and holozoic) ● *Dentition in animals (homodont and heterodont; carnivorous, herbivorous and omnivorous)* ● *Types of teeth (incisors, canines, premolars and molars)* *(structure and functions)* ● *Process of digestion in human beings (ingestion, digestion, absorption, assimilation and egestion)*	b) outline modes of nutrition in animals, c) describe the structure and functions of different types of teeth, d) classify animals based on their dentition, e) describe the process of digestion in human beings**,** f) appreciate that animals have varied modes of nutrition.	ethics while conducting online searches. ● In purposive groups, learners are guided to practise to fingerspell and sign words related to nutrition in animals. In case a sign is missing, learners are guided to create and harmonise meaningful signs for communication purposes. ● In groups, learners are guided to search for information on modes of nutrition in animals from print or non-print media and make summary notes. ● In groups, learners are guided to discuss modes of nutrition in animals and deliver a class presentation, while adopting a proper seating arrangement that allows	

			learners to have a face-to-face conversation. ● In groups, learners are guided to observe a labelled chart on different types of teeth. ● In pairs, learners are guided to draw different types of teeth and display them in class for peer review. ● In purposive groups, learners are guided to prepare charts on different types of teeth and make a class presentation. ● In groups, learners are guided to discuss the functions of different types of teeth. ● In groups, learners are guided to use clay and model the dentition in different animals and display it in class for peer review.	

			● In groups, learners are guided to watch a captioned video on the process of digestion in human beings and make summary notes. ● In groups, learners are guided to discuss the process of digestion in human beings and share the findings in class make class presentations.	
Core competencies to be developed: Communication and Collaboration: The learner listens to others as they discuss the process of digestion in human beings.				

Values: ● Unity: The learner collaborates with others as they study dentition in different animals. ● Respect The learner appreciates others' opinions while discussing different modes of nutrition in animals.
PCIs: Animal welfare: The learner cares for animals as they study different types of dentitions.
Links to other learning areas: The information on nutrition in animals is linked to feeding of animals in Agriculture and Nutrition.
Suggested Resources ● Coursebooks ● Digital devices

• Models • Charts

Strand	Sub Strand	Specific Learning Outcomes	Suggested Learning Experiences	Suggested Key Inquiry Questions
2.0 Living Things and their Environment	**2.3 Reproduction in plants** **(20 lessons)** • *Functions of parts of a flower* • *Meaning and types of pollination* *(details on factor that promote/hinder*	By the end of the sub strand, the learner should be able to: a) sign words related to reproduction in plants, b) outline functions of parts of a flower, c) describe pollination in plants, d) outline the adaptations of flowers to wind and insect pollination,	• In groups, learners are guided to use print and non-print media to search for the relevant signs and meanings of the words related to reproduction in plants. (reproduction, *pollination, fertilisation, dispersal).* Ensure that learners observe proper cyber ethics while conducting online searches. • In pairs, learners practise to fingerspell and sign the various words related to reproduction in plants. In the absence of a sign, learners are guided to create and harmonise meaningful signs for communication purposes. • In groups, learners are guided to observe a labelled diagram on parts of a flower and make summary notes.	1. How does reproduction in plants occur? 2. How does the mode of dispersion contribute to the survival and distribution of plant species?

	self-pollination not required) ● *Adaptations of flowers to wind and insect pollination* ● *Fertilisation, seed and fruit formation in flowering plants* ● *Fruit and seed dispersal in plants (modes and importance*)	e) explain fertilisation and fruit formation in flowering plants, f) categorise fruits and seeds based on their mode of dispersal,	● In groups, learners are guided to discuss the role played by various parts of a flower in relation to reproduction, while adopting a proper seating arrangement that allows learners to have a face-to-face conversation. ● In groups, learners are guided to watch a simulated demonstration on pollination and make summary notes. ● In purposive groups, learners are guided to discuss the meaning of pollination, types and agents. *(details on factor that promote/hinder self-pollination not required).* ● In groups, learners are guided to use print or non-print media to search for information on adaptations of flowers to wind and insect pollination. ● In groups, learners are guided to study samples of flowers to discuss their adaptations to agents of pollination. ● In groups, learners are guided to take an excursion in the school compound to observe pollinating agents in action, record and discuss. (*the behaviour of insects and birds in relation to flowers;*	

			swaying of anthers of grasses e.g. maize in wind). ● In groups, learners are guided to discuss characteristics of flowers to agents of pollination. (*insects and wind)* ● In groups, learners are guided to use print or print media to search for information on the effect of agrochemicals on pollinating agents and their effects on reproduction in plants. ● In groups, learners are guided to watch a captioned video on fertilisation, seed and fruit formation then make summary notes. *(details of double fertilisation not required).* ● In purposive groups, learners are guided to prepare charts and deliver class presentations on fertilisation, seed and fruit formation. ● In purposive groups, learners are guided to use print and non-print media to search for information on seeds and fruits dispersal in plants, and discuss the findings with peers. ● In groups, learners are guided to use print and non-print media to search for	

			information on seeds and fruits dispersal in plants and discuss the findings. Occasionally pause the video, allowing the learner to take notes and to further elaborate on the information presented. ● In purposive groups, learners are guided to observe different fruits and seeds from the locality, discuss and relate them to their mode of dispersal. *(consider locally available and safe wild fruits).* ● In groups, learners discuss the importance of fruit and seed dispersal and make presentations to their peers. Correct any mistakes made after the presentations.	

Core competencies to be developed

● Learning to learn: Learner develops relationships while searching for information on fertilisation, seed and fruit formation from the internet and other sources and makes presentations of the findings.

● Digital literacy**:** Learner interacts with digital technology while searching for information on the effect of agrochemicals on pollinating agents and its effect on reproduction in plants using digital devices.

Values

Social Justice**:** Learner equitably shares responsibilities while taking an excursion in the school compound/neighbourhood to observe pollinating agents in action.

Pertinent and Contemporary Issues (PCIs)

Safety and Security: The learner takes precautions while collecting various flowers, fruits and seeds from the immediate environment.
Link to other subjects: The information on fertilisation and fruit formation is linked to crop production in Agriculture and Nutrition.
Suggested Learning Resources ● Digital Devices ● Print media (charts, pictures, journals, magazines) ● Laboratory Apparatus and Equipment ● Coursebooks ● Science specific signs dictionary ● Sample flowers ● Sample fruits

Strand	**Sub-Strand**	**Specific Learning Outcomes**	**Suggested Learning Experiences**	**Key Inquiry Questions**
2.0 Living Things and their Environment	**2.4 The interdependence of life (18 lessons)** ● Biotic(living) components of the environment	By the end of the sub strand, the learner should be able to: a) sign words related to the interdependence of life for effective communication,	● In groups, learners are guided to use print and digital media to search for the signs of the new words related to the interdependence of life. (*biotic, abiotic, predation, parasitism, symbiosis, competition and saprophytic, food web).* Ensure that learners observe proper cyber	1. How do our daily actions impact the environment and the variety of plants and

	(*predation, parasitism, symbiosis, competition and saprophytic*) ● Abiotic(non-living) components of the environment *(temperature, light, water, wind, atmospheric pressure, pH and salinity)* ● Energy flow in an ecosystem *(food chains and food webs)* ● Effect of human activities on the environment (*habitat change, hunting and*	b) explain the biotic and abiotic factors of the environment, c) construct food chains and food webs in the environment, d) describe the effect of human activities on the environment, e) appreciate the interdependence between living and non-living factors of the environment.	ethics while conducting online searches. ● In pairs, learners are guided to practise fingerspelling and sign the identified words for mastery of the signs. Where a sign is missing, learners are guided to create and harmonise meaningful signs for communication purposes. ● In purposive groups, learners are guided to use print and non-print media to investigate the biotic factors of the environment in their locality and discuss the findings. *(cover examples showing predation, parasitism, symbiosis, competition and saprophytism in action-include spiders, lizards, toads, insects).* ● In groups, learners are guided to observe captioned videos/ animations/ showing the interrelationships between biotic factors of the environment. ● In groups, learners are guided to use print and non-print media to search for information on	animals that call it home? 2. How do biotic and abiotic factors influence the health and biodiversity of ecosystems?

	poaching, introduction of new living things)		interrelationships between organisms in Kenya national parks and game reserves. ● In purposive groups, learners are guided to search and discuss the effect of abiotic factors on living organisms *(temperature, light, water, wind, atmospheric pressure, pH and salinity)* and make a class presentation. Correct any mistakes made after the presentations. ● In groups, learners are guided to watch a captioned video on the effect of human activities on the environment. *(habitat change, hunting and poaching, introduction of new living things).* ● In pairs, learners discuss the effects of human activities on the environment and make presentations to their peers, while adopting a proper seating arrangement that allows learners to have a face-to-face conversation. ● In purposive groups, learners are guided to use print or digital media	

			to search for information on food chains and food web. ● In groups, learners are guided to carry out activities to identify living organisms and what they feed on and construct food chains and food webs.	

Core competencies to be developed:

- Citizenship: The learner develops social and civic skills and a sense of responsibility to the nation while searching for information on interrelationships between organisms in Kenya national parks and game reserves.
- Critical thinking and problem solving: The learner shows open-mindedness while investigating the interrelationships between living factors of the environment in their locality and discussing the findings.

Values:

- Patriotism: The learner develops love for the country as they search for information on interrelationships between organisms in Kenya national parks and game reserves.
- Peace: The learner shows respect for diversity and heritage as they study the interdependence between living and non-living components of the environment.

Pertinent and Contemporary Issues (PCIs)

Environmental education and climate change: Learner develops interest in various animals and insects when identifying living organisms and what they feed on.

Link to other subjects

The information on the role of decomposers in an ecosystem is linked to production of manure in Agriculture and Nutrition.

Suggested learning resources:

- Digital Devices

- Print media (charts, pictures, journals, magazines)
- Laboratory Apparatus and Equipment
- Coursebooks
- Science specific signs dictionary

Suggested Assessment Rubrics				
Level / **Indicators**	**Exceeds expectation**	**Meets expectation**	**Approaches expectation**	**Below expectation**
Ability to sign words related to reproduction in plants and animals	The learner signs words related to reproduction in plants and animals with exceptional accuracy	The learner signs words related to reproduction in plants and animals accurately conveying the	The learner signs words related to reproduction in plants and animals with noticeable errors and	The learner signs words related to reproduction in plants and animals inaccurately and

	demonstrating signing proficiency.	intended meaning clearly.	inconsistencies in articulation.	lacks clarity in articulation.
Ability to investigate the conditions necessary for photosynthesis	The learner investigates all the conditions necessary for photosynthesis comprehensively.	The learner investigates all the conditions necessary for photosynthesis.	The learner investigates most of the conditions necessary for photosynthesis.	The learner investigates a few conditions necessary for photosynthesis.
Ability to describe the process of digestion in human beings.	The learner describes the process of digestion in human beings comprehensively.	The learner describes the process of digestion in human beings correctly.	The learner partially describes the process of digestion in human beings in simple terms.	The learner partially describes the process of digestion in human beings leaving out some key points.
Ability to explain pollination, fertilisation and fruit formation in flowering plants.	The learner explains all the concepts of pollination, fertilisation and fruit formation in flowering plants.	The learner explains all the concepts of pollination, fertilisation and fruit formation in flowering plants.	The learner explains at least two concepts among pollination, fertilisation and fruit formation in flowering plants.	The learner explains one concept among pollination, fertilisation and fruit formation in flowering plants.
Ability to categorise fruits and seeds based on their mode of dispersal	The learner categorises fruits and seeds based on their mode of	The learner categorises fruits and seeds based on their mode of dispersal.	The learner categorises fruits and seeds based on their mode of dispersal partially.	The learner partially categorises fruits and seeds without

	dispersal and other modes.			considering their mode of dispersal.
Ability to construct food chains and food webs in the environment	The learner constructs food chains and food webs in the environment correctly and systematically.	The learner constructs food chains and food webs in the environment correctly.	The learner partially constructs food chains and food webs in the environment correctly.	The learner constructs food chains and food webs in the environment without considering appropriate order.

STRAND 3.0: FORCE AND ENERGY

Strand	**Sub Strand**	**Specific learning outcomes**	**Suggested learning experiences**	**Suggested Key inquiry question(s)**
3.0: Force and Energy	**3.1 Curved mirrors** **(18 lessons)** ● Types of curved mirrors,	By the end of the sub strand, the learner should be able to:	● In purposive groups, learners are guided to use print and non-print media to find relevant signs related to curved reflecting surfaces.	1. How are curved mirrors

	• Locating image formed by concave and convex mirrors, • Characteristics of images formed by concave and convex mirrors, • Uses of curved concave and convex mirrors in day-to-day life, • Appreciate the applications of curved mirrors in day-to-day life.	a) sign words related to curved reflecting surfaces as used in science, b) describe types of curved mirrors, c) draw ray diagrams to locate images formed by concave and convex mirrors, d) describe the characteristics of images formed by concave and convex mirrors, e) explain the uses of concave and convex mirrors in day-to-day life, f) appreciate the applications of curved mirrors in day-to-day life.	Ensure that learners observe proper cyber ethics while conducting online searches. • In pairs, learners practise fingerspelling and signing words related to curve reflecting surfaces. In case a sign is lacking, learners are guided to create and harmonise meaningful signs for communication purposes. • In groups, learners are guided to use print or digital media to search for and discuss the various types of curved reflecting surfaces. *(concave, convex and parabolic surfaces)* Adopt a proper seating arrangement that allows learners to have a face-to-face conversation. • In groups learners observe and interact with various types of curved mirrors.	used in day-to-day life? 2. How do image characteristics impact the practical uses of curved reflecting surfaces?

			● In groups, learners are guided to discuss with peers the terms used in curved mirrors *(focal length, radius of curvature, principal focus, principal axis, centre of curvature and the pole)* ● In groups, learners observe a demonstration on how to locate the position of an image formed by concave and convex mirrors. *(performing experiment using suitable apparatus and/or simulation applications).* ● In pairs, learners practise to locate the position of the image formed by concave and convex mirrors. *(performing experiment using suitable*	

			apparatus and/or simulation applications) ● In groups, learners are guided to observe illustrations of ray diagrams of images formed by concave and convex mirrors. ● In groups, learners observe a demonstration on how to construct a ray diagram of images formed by concave and convex mirrors. ● In groups, learners are guided to construct a ray diagram of images formed by concave and convex mirrors. ● In groups, learners are guided to discuss and describe the characteristics of images formed by curved mirrors. *(Object at infinity, beyond C, at C,*	

			between C & F, at F and between F and the pole). ● In groups, learners are guided to prepare charts and make a class presentation on characteristics of images formed by curved mirrors. *(Object at infinity, beyond C, at C, between C & F, at F and between F and the pole).* ● In groups, learners are guided to use digital or print media to explore applications of curved mirrors. (*solar concentrators, car headlamps, shaving mirrors, mirrors used in supermarkets, driving mirrors, projector lamps*). ● In pairs, learners use magazines to cut-out various applications of	

			curved mirrors, developing a portfolio that is displayed in class for peer review, **HINT:** For experiments, guide the learner to: ● Identify and assemble apparatus to be used in the experiment. ● Observe a demonstration, signed video, video with captions, or animations on how to conduct the experiment. ● Conduct the experiment, making observations and recording them. ● In pairs or groups, discuss the observations	

			and draw inferences from them.	

Core competencies to be developed

- Self-efficacy: The learner develops effective communication skills as they discuss and describe the characteristics of images formed by curved mirrors in groups.
- Communication and Collaboration: Learner develops signing and writing skills while discussing in groups various types of curved reflecting surfaces.

- **Pertinent and Contemporary Issues (PCIs):**
- Safety and security: Learner observes personal safety and security while performing experiments to locate the position of the image formed by concave and convex mirrors.

Values

- Social justice: Learners exercise equity and accord equal opportunity to group members as they discuss and describe the characteristics of images formed by curved mirrors in groups.
- Responsibility: Learners exercise excellence as they locate the position of images formed by concave and convex mirrors.

Links to other subjects:

Agriculture and Nutrition: Learner learns the uses of curved mirrors for magnifying images at salons and barber shops.

Suggested Learning Resources:

- Digital Devices
- Science specific signs dictionary
- Print media (charts, pictures, journals, magazines)
- Laboratory Apparatus and Equipment
- Coursebooks

Strand	Sub Strand	Specific learning outcomes	Suggested learning experiences	Suggested Key inquiry question(s)
3.0: Force and Energy	**3.2 Waves** **(16 lessons)** ● *generation of waves in nature,* ● *classification of waves as longitudinal and transverse,* ● *characteristics of waves,* ● *remote sensing* ● *applications of waves in day-to-day life,* ● *appreciate the applications of waves in day-to day life.*	By the end of the sub strand, the learner should be able to: a) sign words related to waves in nature, b) describe generation of waves in nature, c) classify waves as longitudinal and transverse, d) describe basic characteristic of waves in nature, e) describe remote sensing platforms in nature, f) describe applications of waves in day to day life,	● In purposive groups, learners are guided to use print and non-print media to find relevant signs related to waves. *(waves, longitudinal waves, transverse waves)* Ensure that learners observe proper cyber ethics while conducting online searches. ● In pairs, learners practise fingerspelling and signing words related to waves. In the absence of some signs, learners are guided to create and harmonise meaningful signs for communication purposes. ● In purposive groups, learners brainstorm	1. How are waves applied in our day-to-day life? 2. How do remote sensing platforms enhance our ability to monitor natural environments ?

		g) appreciate the applications of waves in day -to day life.	and take summarised notes on the meaning of 'wave' as used in science. ● In groups, learners observe a demonstration on generation of waves in nature and classify them into longitudinal and transverse *(use a slinky spring, skipping rope, water in a basin, a source of sound/speaker, animations on wave)* ● In pairs, learners conduct activities to demonstrate the generation of waves in nature and classify them into longitudinal and transverse. *(use a slinky spring, skipping rope, water in a basin, a source of sound/speaker, animations on wave)*	

			● In groups, learners watch a captioned video and take summarised notes on the characteristics of waves. *(Straight line motion, reflection, bending of waves, movement around objects).* Play the video multiple times and with pauses to allow the learner to take notes and for a better comprehension. ● In groups, learners observe and discuss a labelled diagram depicting the parts of a wave."*(amplitude, wavelength, frequency, period, wave speed, phase; include wave equations; velocity=wavelength x frequency)* ● In groups, learners perform activities to demonstrate the parts of a	

			wave. *(amplitude, wavelength, frequency, period, wave speed, phase; include wave equations; velocity=wavelength x frequency)* ● In groups, learners are guided to prepare charts and deliver a class presentation on the parts of a wave. *(amplitude, wavelength, frequency, period, wave speed, phase; include wave equations; velocity=wavelength x frequency)* ● In pairs, learners carry out activities to demonstrate characteristics of waves *(straight line motion, reflection, bending of waves, movement around objects)*	

			• In pairs, learners are guided to use both print and non-print media to search for the meaning and signs of words related to remote sensing *(remote sensing, space, airborne, ground based, satellites, drones, kites, tethered balloon)* • In groups, learners watch a captioned video on remote sensing platforms in nature *(**space** - satellites or space shuttles; **airborne -** drones, kites or aircrafts; **ground-based** - hand-held cameras, tethered balloons, cranes).* Play the video with pauses for learners to take notes and to provide additional explanations. • In groups, learners prepare charts and make a	

			class presentation on remote sensing platforms in nature *(**space** - satellites or space shuttles; **airborne -** drones, kites or aircrafts; **ground-based** - hand-held cameras, tethered balloons, cranes).* • In groups, learners engage resource persons on applications of remote sensing technology (*weather forecasting, mineral explorations, forest fires, extent of earthquakes, land surveying).* Sign language interpretation should be provided if needed to enhance interaction. • In groups, learners discuss applications of remote sensing technology (*weather forecasting, mineral*	

			explorations, forest fires, extent of earthquakes, land surveying), while adopting a proper seating arrangement that allows learners to have a face-to-face conversation. Preferably, a horseshoe seating arrangement. ● In pairs, learners are guided to use magazine cut-outs to prepare a portfolio on applications of remote sensing technology and display it in class for peer review. ● In groups, learners use print and non-print media to identify the applications of waves in real life situations. *(**Medical** - ultrasound, X-rays, CT scans MRI scans, cancer therapy and laser surgery; **communication** - radar,*	

			radio, cell-phone, television, Wi-Fi and operation of drones; cooking - microwave). ● In groups, learners prepare charts and make a class presentation on the applications of waves in real life situations. *(**Medical** - ultrasound, X-rays, CT scans, MRI scans, cancer therapy and laser surgery; **communication** - radar, radio, cell-phone, television, Wi-Fi and operation of drones; cooking - microwave).* **HINT:** For experiments, guide the learner to: a) Identify and assemble apparatus to be used in the experiment.	

			b) Observe a demonstration, signed video, video with captions, or animations on how to conduct the experiment. c) Conduct the experiment, making observations and recording them. d) In pairs or groups, discuss the observations and draw inferences from them.	

Core competencies to be developed:

- Learning to learn: Learner carries out research using digital, braille or print media to search for and discuss remote sensing platforms in nature.
- Creativity and Imagination: Learner experiments when carrying out activities to demonstrate generation of waves in nature and classify them into longitudinal and transverse.

Pertinent and Contemporary Issues (PCIs)

Learner support programs: Learner is exposed to team work when working in groups to perform activities to demonstrate the parts of a wave.

Values

- Respect: Learner exercises open mindedness as they embrace discussions on different ideas on applications of waves in

day-to-day life. ● Peace: Learners care for others as they carry out activities in groups to demonstrate the characteristics of waves.
Links to other subjects: ● **Creative Arts:** as the learner related concepts of wave transmission of sound from musical instruments.
Suggested Learning Resources: ● Digital Devices ● Print media (charts, pictures, journals, magazines) ● Laboratory Apparatus and Equipment ● Coursebooks ● Science specific signs dictionary

Suggested Assessment Rubrics				
Level / **Indicators**	**Exceeds expectation**	**Meets expectation**	**Approaches expectation**	**Below expectation**
Ability to sign words related to waves in nature.	The learner signs words related to waves in nature with exceptional accuracy demonstrating signing proficiency.	The learner signs words related to waves in nature accurately to convey the intended meaning.	The learner signs words related to waves in nature with noticeable errors and inconsistencies in articulation.	The learner signs words related to waves in nature inaccurately and lack clarity in articulation.
Ability to draw ray diagrams to locate images formed by concave and convex mirrors	The learner draws ray diagrams to locate all images formed by concave and convex mirrors correctly and systematically	The learner draws ray diagrams to locate all images formed by concave and convex mirrors.	The learner draws ray diagrams to locate most of the images formed by concave and convex mirrors.	The learner draws ray diagrams to locate a few images formed by concave and convex mirrors.
Ability to describe the characteristics of images formed by concave and convex mirrors	The learner describes all the characteristics of images formed by concave and convex mirrors comprehensively.	The learner describes all the characteristics of images formed by concave and convex mirrors.	The learner describes most of the characteristics of images formed by concave and convex mirrors.	The learner describes a few characteristics of images formed by concave and convex mirrors.
Ability to explain the uses of concave and	The learner explains the uses of concave	The learner explains the uses of concave	The learner explains most of the uses of	The learner explains a few uses of concave

convex mirrors in day-to-day life	and convex mirrors in day-to-day life extensively.	and convex mirrors in day-to-day life sufficiently.	concave and convex mirrors in day-to-day life.	and convex mirrors in day-to-day life.
Ability to describe generation of waves in nature	The learner describes the generation of waves in nature comprehensively.	The learner describes the generation of waves in nature correctly.	The learner partially describes the generation of waves in nature.	The learner partially describes the generation of waves in nature partially leaving out some key points.
Ability to describe basic characteristics of waves in nature	The learner describes basic characteristics of waves in nature comprehensively.	The learner describes basic characteristics of waves in nature sufficiently	The learner describes basic characteristics of waves in nature partially.	The learner describes basic characteristics of waves in nature omitting some key points partially leaving out some key details.
Ability to describe remote sensing in relation to waves	The learner describes remote sensing in relation to waves correctly and comprehensively	The learner describes remote sensing in relation to waves correctly.	The learner describes remote sensing in relation to waves partially	The learner describes remote sensing in relation to waves partially with prompt.
Ability to describe applications of waves in day-to-day life	The learner describes applications of waves in day-to-day life exhaustively.	The learner describes applications of waves in day-to-day life sufficiently.	The learner describes most of the applications of waves in day-to-day life.	The learner describes a few applications of waves in day-to-day life.

APPENDIX 1: GUIDELINES FOR INTEGRATING COMMUNITY SERVICE LEARNING (CSL) PROJECT

Introduction

In Grade 9, learners will undertake an integrated Community Service Learning (CSL) project of choice from a single or combined subject. The CSL project will enable the learner to apply knowledge and skills from other subjects to address a problem in the community. The implementation of the integrated CSL project will take a Whole School Approach, where all members of the school community including teachers, school administration, parents/guardians/ local community and support staff. It will be a collaborative effort where the teacher of Social Studies coordinates and works with other subject teachers to design and implement the integrated CSL project. The teachers will select a theme drawn from different Learning Areas and the broader categories of Pertinent and Contemporary Issues (PCIs) for the CSL project. It should also provide an opportunity for development of core competencies and nurturing of values. Learners will undertake a **variety of** integrated CSL group projects in teams of following a 6-step milestone approach as follows:

Milestone	**Description**
Milestone 1	**Problem Identification** Learners study their community to understand the challenges faced and their effects on community members. Some of the challenges in the community can be: • Environmental degradation • Lifestyle diseases, Communicable and non-communicable diseases • Poverty • Violence and conflicts in the community • Food security issues

Milestone 2	**Designing a solution** Learners create an intervention to address the challenge identified.
Milestone 3	**Planning for the Project** Learners share roles, create a list of activities to be undertaken, mobilise resources needed to create their intervention and set timelines for execution
Milestone 4	**Implementation** The learners execute the project and keep evidence of work done.
Milestone 5	**Showcasing /Exhibition and Report Writing** Exhibitions involve showcasing learners' project items to the community and reflecting on the feedback Learners write a report detailing their project activities and learnings from feedback
Milestone 6	**Reflection** Learners review all project work to learn from the challenges faced. They link project work with academic concepts, noting how the concepts enabled them to do their project as well as how the project helped to deepen learning of the academic concepts.

NOTE: The milestones will be staggered across the 3 terms of the academic calendar.

Assessment of CSL integrated Project

Assessment for the integrated CSL group projects will be conducted formatively. The assessment will consider both the process and end product. This entails assessing each of the milestone stages of the integrated CSL group projects. They will focus on 3 components namely: skills from various learning areas applied in carrying out the projects, core competencies developed and values nurtured.

APPENDIX 2: LIST OF SUGGESTED ASSESSMENT METHODS AND NON-FORMAL ACTIVITIES

Strand	Sub Strand	Suggested Assessment Methods	Suggested Non-Formal Activities
1.0 Mixtures, Elements and Compounds	1.1 Structure of the atom	● Observation ● Practical Work ● Assessment Rubrics ● Checklist ● Anecdotal Records ● Written Test ● Signed Questions and Answers	● Watching video tapes or documentaries on the structure of the atom ● Signed Speeches on the structure of an atom ● Science and engineering fair

	1.2.Metals and Alloys	• Practical Work • Observation Schedule • Checklist	• Organising and participating in exchange programmes / field trips to explore different metals and alloys. • Engaging resource persons to talk about how alloys can be made from different metals. • Interacting actively with resource persons to understand issues to do with metals and alloys.
	1.3.Water hardness	• Assessment Rubric • Practical Work • Observation Schedule • Checklist	• Conducting demonstrations on the effects of hard water on lathering with soap. • Engaging resource persons in discussing basic water hardness
2.0 Living things and the Environment	2.1 Nutrition in plants	• Written Test • Assessment Rubrics • Checklist • Anecdotal Records • Signed Questions and Answers	• Writing articles in school magazines on the importance of nutrition. • Engaging resource persons to talk about nutrition in plants.
	2.2 Nutrition in animals	• Assessment Rubrics • Checklist • Signed Questions and Answers • Written Test	• Engaging resource persons on different dentitions. • Science and engineering fair

	2.3. Reproduction in plants	• Practical Work • Observation Schedule • Checklist	• Inviting a resource person to talk about reproduction in plants • Conducting debates during club meetings on reproduction in plants • Science and engineering fair
	2.4 The interdependence of life	• Observation • Practical Work • Assessment Rubrics • Checklist • Anecdotal Records • Written Test • Signed Questions and Answers	• Engaging a resource person to talk about the interdependence of life • Organising and participating in exchange programs.
3.0 Force and Energy	3.1 Curved Mirrors	• Practical Work • Observation • Oral Questions and Answers • Assessment Rubrics	• Conducting document analysis on curved mirrors • Holding discussions on different types of curved mirrors.

		• Checklist • Anecdotal Records • Written Test	• Attending and Participating in Science and Engineering fairs. • Organising and participating in exchange programs. • Making presentations and demonstrations on applications of curved mirrors.
	3.2 Waves	• Written Test • Assessment Rubrics • Checklist • Anecdotal Records • Practical Work • Observation Schedule	• Initiating projects on how to set up simple waves on the water surface. • Participating in exchange programs. • Making presentations and demonstrations on applications of waves.