

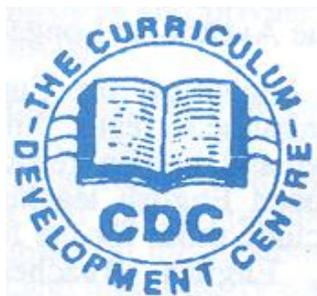


REPUBLIC OF ZAMBIA

MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL, TRAINING AND EARLY EDUCATION

# **BIOLOGY SYLLABUS**

**GRADE: 10 - 12**



Prepared and published by the Curriculum Development Centre

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**2013**

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## **VISION**

Quality, life-long education for all which is accessible, inclusive and relevant to individual, national and global needs and value systems.

## **PREFACE**

The syllabus was produced as a result of the Curriculum review process carried out by the Ministry of Education, Science, Vocational Training and Early Education under the auspices of the Curriculum Development Centre (CDC). The curriculum reform process started way back in 1999 when the Ministry of Education commissioned five (5) curriculum studies which were conducted by the University of Zambia. These studies were followed by a review of the lower and middle basic and primary teacher education curriculum. In 2005 the upper basic education National survey was conducted and information from learners, parents, teachers, school managers, educational administrators, tertiary institutions traditional leader's civic leaders and various stakeholders in education was collected to help design a relevant curriculum.

The recommendations provided by various stakeholders during the Upper Basic Education National survey of 2005 and National symposium on curriculum held in June 2009 guided the review process.

The review was necessitated by the need to provide an education system that would not only incorporate latest social, economic, technological and political developments but also equip learners with vital knowledge, skills and values that are necessary to contribute to the attainment of Vision 2030.

The syllabus has been reviewed in line with the Outcome Based Education principles which seek to link education to real life experiences that give learners skills to access, criticize analyse and practically apply knowledge that help them gain life skills. Its competences and general outcomes are the expected outcomes to be attained by the learners through the acquisition of knowledge, skills, techniques and values which are very important for the total development of the individual and the nation as a whole.

Effective implementation of Outcome Based Education requires that the following principles be observed: clarity of focus, Reflective designing, setting high expectations for all learners and appropriate opportunities.

It is my sincere hope that this Outcome Based syllabus will greatly improve the quality of education provided at Grade 8 and 9 as defined and recommended in various policy documents including Educating Our Future`1996 and the `Zambia Education Curriculum Framework `2013.

Chishimba Nkocha  
Permanent Secretary

**MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL, TRAINING AND EARLY EDUCATION.**

## **Acknowledgements**

The syllabus presented here is a result of broad-based consultation involving several stakeholders within and outside the education system.

Many individuals, institutions and organizations were consulted to gather their views on the existing syllabus and to accord them an opportunity to make suggestions for the new syllabus. The Ministry of Education wishes to express heartfelt gratitude to all those who participated for their valuable contributions, which resulted in the development of this syllabus.

The Curriculum Development Centre worked closely with other sister departments and institutions to create this document. We sincerely thank the Directorate of Teacher Education and Specialized Services, the Directorate of Planning and Information, the Directorate of Human Resource and Administration, the Directorate of Open and Distance Education ,the Examinations Council of Zambia, the University of Zambia, schools and other institutions too numerous to mention, for their steadfast support.

We pay special tribute to co-operating partners especially JICA and UNICEF for rendering financial technical support in the production of the syllabus.

C.N.M Sakala (Mrs.)

Director-Standard and Curriculum

**MINISTRY OF EDUCATION, SCIENCE, VOCATIONAL TRAINING AND EARLY EDUCATION**

## Introduction

This syllabus is designed to have greater emphasis on the understanding and application of scientific concepts and principles. This approach has been adopted in recognition of the need for learners to develop skills that will be of long term value in a changing technological world rather than focusing on large quantities of factual materials which may have only short term relevance.

This syllabus is intended to:

1. provide, through well designed studies of experimental and practical biological science, a worthwhile education experience for all learners, whether or not they go on to study Biology beyond this level and, in particular, to enable them to acquire sufficient understanding and knowledge to:
  - become confident citizens in a changing technology world, able to take or develop an informed interest in matters of scientific importance,
  - recognise the usefulness and limitations of the scientific method and to appreciate its applicability in order disciplines and in everyday life,
  - be suitably prepared for studies beyond Ordinary Level in pure sciences, in applied sciences or in science – dependent vocational courses.
2. stimulate learners to sustain their interest and the appreciation of the Biological Sciences.
3. develop abilities and skills that:
  - are relevant to the study and practice of Biological Sciences,
  - are useful in everyday life,
  - encourage efficient and safe practice,
  - encourage effective communication.
4. develop attitudes relevant to Biological Sciences such as:
  - concern for accuracy and precision,
  - objectivity,
  - integrity,
  - safety.
5. assist the development of:
  - the skills of enquiry,
  - the attitude of:
    - initiative,
    - inventiveness.

6. stimulate interest in and care for the local and global environment.
7. promote an awareness that:
  - the study and practice of Biological Science is subject to social, economic, technological, ethical and cultural influences and limitations,
  - the applications of Biological Sciences may be both beneficial and detrimental to the individual, the community and the environment, and
  - Biological Sciences transcend national boundaries and that the language of Science, correctly and rigorously applied is universal.

Therefore learners are expected to acquire competences in:

1. Knowledge with understanding

Learners will demonstrate knowledge and understanding in relation to:

- biological phenomena, facts, laws, definitions, concepts and theories,
- biological vocabulary, terminology, conventions (symbols, quantities and units),
- scientific instruments and apparatus used in biology (techniques of operation and safety),
- scientific quantities and their determination, and
- biological and technological applications with their social, economical and environmental implications.

2. Handling information and solving problems

Using oral, written, symbolic, graphical and numerical materials learners will:

- locate, select, organise and present information from a variety of sources,
- translate information from one form to another,
- manipulate numerical and other data,
- use information to identify patterns, report trends and draw inferences,
- present reasoned explanations for phenomena, patterns and relationships,
- make predictions and propose hypotheses, and
- solve problems.

3. Experimental skills and investigations

Learners will:

- follow a sequence of instructions,

- use techniques, apparatus and materials,
- make and record observations, measurements and estimates,
- interpret and evaluate observations and experimental data,
- plan an investigation, select techniques, apparatus and materials, and
- evaluate methods and suggest possible improvements.

### **Methodology**

The successful of Biology can be achieved by maximum participation by learners. This learning area that enhances creativity, analysis, problem solving and investigative approach, can be taught effectively using a variety of methods both in the classroom and outside. Learners are expected to conduct experiments, study tours, field work, group work, individual work and project work.

### **Assessment**

Assessment outcomes describe the knowledge, skills, values and abilities that learners are expected to demonstrate at the end of the course. They reflect those aspects such as:

#### **A. Knowledge with understanding**

Learners demonstrate knowledge and understanding in relation to:

- facts, laws, definitions, concepts and theories relating to biological phenomena,
- biological vocabulary, terminology, convention (including symbols, quantities and units),
- scientific instruments and apparatus used in Biology, including techniques of operations and aspects of safety,
- scientific quantities and their determination, and
- biological and technological applications with their social, economic and environmental implications.

#### **B. Handling information and solving problems**

Using oral, written, symbolic, graphical and numerical materials learners:

- locate, select, organise and present information from a variety of sources,
- translate information from one form to another,
- manipulate numerical and other data,
- use information to identify patterns, report trends and draw inferences,
- present reasoned explanations for phenomena, patterns and relationships,

- make predictions and propose hypotheses, and
- solve problems.

### C. Experimental skills and investigations

Learners:

- follow a sequence of instructions,
- use techniques, apparatus and material appropriately,
- make and record accurately and observations, measurements made,
- interpret and evaluate observations and experimental data,
- select appropriate techniques, apparatus and materials,
- evaluate methods and suggested possible improvements, and
- use experimental control.

Continuous assessment will be emphasised by using various methods of testing according to topics and themes at various levels. The examinations council of Zambia will prepare detailed procedures on how continuous assessment will be conducted by the teachers. The examination council will also develop examination syllabus to provide teachers with guidelines on the objectives to be tested. The scheme of assessment will consist of school based assessment and final examination that will be conducted by the examinations of council of Zambia.

School based assessment will be in the form of tests. Tests will be in the form of diagnostic, aptitude, achievement, oral, practice attitude and performance, learners.

### **Time and Period allocation**

Time allocation for this syllabus is will require at least five-40 minutes periods per week

## GRADE 10

### General outcomes:

- Develop positive attitudes and values about living organisms and life processes.
- Demonstrate knowledge and investigative skills.
- Develop positive attitudes and values about animals and plant cells.
- Demonstrate knowledge and investigative skills.
- Demonstrate understanding of the facts about the interaction of water with cells.
- Demonstrate an understanding of the facts about enzymes.
- Develop investigative skills.
- Recognise the importance of nutrients to the health of living organisms.
- Demonstrate understanding of facts about photosynthesis.
- Demonstrate understanding of saprophytic nutrition.
- Develop an understanding about the basic facts of nutrition in animals
- Recognise the importance of gaseous exchange
- Demonstrate an understanding of respiration.
- Recognise the importance of health.

### Key competences:

- Demonstrate the ability to Prepare and examine specimen using a microscope.
- Show ability to Carry out food tests from given food samples
- Demonstrate the ability to investigate the conditions necessary for photosynthesis
- Demonstrate the ability to control the spread of diarrhoea and malarial diseases by houseflies and mosquitoes.

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.1 Living Organisms and life processes	10.1.1 Characteristics of living organisms	<p>10.1.1.1 Identify the characteristics of living organisms.</p> <p>10.1.1.2 Distinguish between living organisms and non-living things.</p> <p>10.1.1.3 Describe life processes of living organisms.</p>	<ul style="list-style-type: none"> <li>The characteristics of living organisms: Feeding, breathing, reproducing, growing, locomotion, sensitivity and excretion.</li> <li>Living organisms and non-living things.</li> <li>Life processes of living organisms: Metabolism (Catabolism and anabolism). Include the role of enzymes.</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> information on the characteristics of living organisms</li> <li><b>Comparing</b> Living and non-Living organisms</li> <li><b>Communicating</b> Metabolism and the role of enzymes</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> characteristics of living organisms</li> <li><b>Asking</b> questions for more understanding</li> <li><b>Appreciating</b> life processes and role of enzymes</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.2 Cell structure and organisation	10.2.1 Microscopes	10.2.1.1 Demonstrate the correct use of a microscope	<ul style="list-style-type: none"> <li>How to use a microscope: Focussing, mounting a slide, observing.</li> <li>Preparation and mounting a microscope slide</li> </ul>	<ul style="list-style-type: none"> <li><b>Demonstrating</b> the correct use of a microscope</li> <li><b>Observing</b> specimen</li> </ul>	<ul style="list-style-type: none"> <li><b>Cooperating</b> in class activities</li> <li><b>Knowing</b> the safety rules of microscope</li> </ul>
		10.2.1.2 Prepare specimen using a microscope			
		10.2.1.3 Calculate magnification of specimen.	<ul style="list-style-type: none"> <li>Magnification of specimen: as the ratio of linear dimensions of the drawing to that of specimen.</li> </ul>	<ul style="list-style-type: none"> <li><b>Measuring</b> the size of the specimen and drawing</li> <li><b>Comparing</b> the sizes of the specimen and the Drawing</li> </ul>	<ul style="list-style-type: none"> <li><b>Cooperating</b> in class activities</li> <li><b>Participating</b> in observation actively</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.2.2 Cell Structure and Function	10.2.2.1 Investigate the structure of cells and functions of the organelles	<ul style="list-style-type: none"> <li>Structure and functions of cells: Nucleus, cytoplasm, membrane, mitochondrion, ribosome, Golgi bodies, endoplasmic reticulum, chloroplasts, cell wall</li> </ul>	<ul style="list-style-type: none"> <li><b>Investigating</b> the detailed structure of the cell</li> <li><b>Comparing</b> the functions of cells in a chart</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the structure of the cell</li> <li><b>Cooperating</b> in group activities</li> </ul>
		10.2.2.2 Distinguish between plant and animal cell structure.	<ul style="list-style-type: none"> <li>Differences between plant and animal cells: Refer to the presence of chloroplast and cell wall in plant cells.</li> </ul>	<ul style="list-style-type: none"> <li><b>Comparing</b> the structures of plant and animal cells</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the structural differences of the two types of cell</li> </ul>
		10.2.2.3 Relate cell structure to functions	<ul style="list-style-type: none"> <li>Relationship between structure and functions of cell: Animals (Nerve cells, blood cells, muscle cells) and Plants (root hair cells, spongy cells, phloem cells and xylem cells) and their functions.</li> </ul>	<ul style="list-style-type: none"> <li><b>Inferring</b> the relationship between the structure of the cell to the function</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the relation between cell structure and function</li> <li><b>Participating</b> in class discussion</li> </ul>
	10.2.3 Cell Organisation	10.2.3.1 Describe cell organisation in multicellular organisms.	<ul style="list-style-type: none"> <li>Cell organization: Cell, tissue, organ, system and organism.</li> </ul>	<ul style="list-style-type: none"> <li><b>Classifying</b> cells as tissues, organs, system and organism organisation</li> </ul>	<ul style="list-style-type: none"> <li><b>Being</b> aware of different levels of cell organisation</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.2.4 Tissues	<p>10.2.4.1 Identify tissues in plants and animals.</p> <p>10.2.4.2 Explain the general functions of each tissue</p>	<ul style="list-style-type: none"> <li>Plants (palisade, phloem, epidermis, xylem , spongy) and Animals ( muscle, bone, nerves, blood)</li> <li>General functions of tissues: e.g. Muscle, epithelium, phloem</li> </ul>	<ul style="list-style-type: none"> <li><b>Observing</b> different animal and plant tissues and the functions</li> <li><b>Communicating</b> the function of tissues</li> </ul>	<ul style="list-style-type: none"> <li><b>Cooperating</b> in class activities</li> <li><b>Asking</b> questions for more understanding</li> </ul>
	10.2.5 Organs	<p>10.2.5.1 Identify organs in plants and animals</p> <p>10.2.5.2 Explain the general function of each organ</p>	<ul style="list-style-type: none"> <li>Organs in plants and animals: Plants (leaves, roots, stems, fruits, flowers), Animals (heart, liver, brain, lungs, kidneys)</li> <li>General functions of plants (leaves, roots, stems, fruits flowers), animals (heart, liver, brain, lungs, kidneys)</li> </ul>	<ul style="list-style-type: none"> <li><b>Classifying</b> different kinds of animal and plant organs</li> <li><b>Comparing</b> functions of each organ.</li> </ul>	<ul style="list-style-type: none"> <li><b>Being</b> aware of organs in plants and animals.</li> <li><b>Appreciating</b> the functions of plant and animal organs</li> <li>Participating in class activity</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.2.6 Diffusion, Osmosis and Active transport.	<p>10.2.6.1 Describe the processes of diffusion and osmosis</p> <p>10.2.6.2 Explain the effects and importance of diffusion and osmosis in living organisms</p> <p>10.2.6.3 Describe what active transport is.</p>	<ul style="list-style-type: none"> <li>• Process of diffusion and osmosis: Diffusion: Refer to movement of solutes into and out of the cell across the membrane; Osmosis as the movement of water molecules into and out of the cell</li> <li>• Effects and importance of diffusion and osmosis: Plasmolysis, turgidity, lysis and crenation</li> <li>• Active transport: Refer to uptake of mineral salts by root hair cells from the soil against concentration gradient.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the processes of osmosis and diffusion</li> <li>• <b>Investigating</b> the effects of diffusion and osmosis (Isotonic, hypertonic and hypotonic solutions)</li> <li>• <b>Analysing</b> information on active transport in plants</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the processes of diffusion and osmosis</li> <li>• <b>Cooperating</b> the class activity</li> <li>• <b>Being</b> aware of the uptake of mineral salts by roots against a concentration gradient.</li> </ul>
10.3 Enzymes	10.3.1 Characteristics of enzymes	<p>10.3.1.1 Investigate characteristics of Enzymes.</p> <p>10.3.1.2 Demonstrate the effects of temperature and pH on enzyme action</p> <p>10.3.1.3 Explain industrial</p>	<ul style="list-style-type: none"> <li>• Characteristics of enzymes: optimum temperature, pH, specificity of enzymes</li> <li>• Effects of temperature and pH on enzyme action (Refer to optimum temperature, and pH)</li> <li>• Industrial application</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> characteristics of enzymes.</li> <li>• <b>Investigating</b> the effects of pH and temperature on enzyme action.</li> <li>• <b>Communicating</b></li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the characteristics of enzymes.</li> <li>• <b>Participating</b> actively in class activities.</li> <li>• <b>Appreciating</b> the role of enzymes in industrial processes.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		application of enzymes.	of enzymes baking, brewing and biological washing powder.	industrial usage of enzymes	

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.4 Nutrients	10.4.1 Classes of nutrients	10.4.1.1 Investigate the presence of nutrients in food samples.  10.4.1.2 Identify good sources of nutrients	<ul style="list-style-type: none"> <li>• Nutrients in food: carrying out food tests on reducing sugars, starch, proteins, fats and oils</li> <li>• Sources of nutrients: Refer to sources of carbohydrates, proteins, lipids, Vitamins</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the presence of nutrients in different food samples</li> <li>• <b>Comparing</b> the sources of good nutrients</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of the presence of nutrients in food samples</li> <li>• <b>Participating</b> the class discussion actively</li> </ul>
	10.4.2 Disorders	10.4.2.1 Describe the importance of nutrients, salts, vitamins and roughage to the body.  10.4.2.2 Identify nutritional related disorders/ conditions	<ul style="list-style-type: none"> <li>• Importance of carbohydrates, proteins, lipids, roughage, water, vitamins and salts</li> <li>• Disease due to nutritional deficiency: e.g. kwashiorkor, marasmus, goitre, scurvy, rickets, anaemia, obesity</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the importance of nutrients</li> <li>• <b>Predicting</b> the effects of deficiency of nutrients</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the importance of nutrients</li> <li>• <b>Cooperating</b> class activity</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.4.3 Dietary needs	10.4.3.1 Design a balanced diet for people with different conditions.	<ul style="list-style-type: none"> <li>Well-balanced diet: Refer to diets of the aged, pregnant woman, lactating woman, sick person, pre-school aged, sportsman and the youth.</li> </ul>	<ul style="list-style-type: none"> <li><b>Planning</b> balanced diet for people with different conditions</li> </ul>	<ul style="list-style-type: none"> <li><b>Actively participating</b> in class activities.</li> <li>Being aware of requirements for people with different conditions.</li> <li><b>Applying</b> the idea of balanced diet in their daily life</li> </ul>
	10.4.4 Plant Nutrients	<p>10.4.4.1 Describe the micro and macro plant nutrients.</p> <p>10.4.4.2 Describe deficiency diseases of macro and micro plant nutrients.</p>	<ul style="list-style-type: none"> <li>Micro and macro plant nutrients: Refer to Macro: nitrogen, potassium, phosphorus (NPK) Micro: calcium, magnesium, sulphur boron, copper, iron)</li> <li>Deficiency diseases: Chlorosis, stunted growth, leaf flecking.</li> </ul>	<ul style="list-style-type: none"> <li><b>Comparing</b> effects of plant micro and macro nutrients.</li> <li><b>Investigating</b> deficiency diseases in plants.</li> </ul>	<ul style="list-style-type: none"> <li><b>Asking</b> questions for more understanding</li> <li><b>Participating</b> in class activity</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.5 Nutrition in plants	10.5.1 External and internal structure of a leaf.	<p>10.5.1.1 Describe the external and internal structure of a leaf.</p> <p>10.5.1.2 Investigate factors necessary for photosynthesis.</p> <p>10.5.1.3 Describe the light and dark reactions of photosynthesis.</p> <p>10.5.1.4 Describe the chemical reactions for photosynthesis</p> <p>10.5.1.5 Describe the fate of glucose in plants.</p> <p>10.5.1.6 Describe the importance of nutrients in plant.</p> <p>10.5.1.7 Identify storage organs of plants.</p>	<ul style="list-style-type: none"> <li>External and internal structure of a leaf: External structure: Veins and Lamina. Internal structure: Epidermis, stomata, palisade and spongy mesophyll cells, phloem and xylem, chloroplasts</li> <li>Factors necessary for photosynthesis: Carrying out investigations on the necessity of carbon dioxide, water, chlorophyll and light energy to photosynthesis</li> <li>Chemical equations for photosynthesis</li> <li>Utilization of glucose in plants (converted to sucrose and starch, used in respiration, conversion into proteins, cellulose and lipids)</li> <li>Source of food for all life forms</li> <li>Levels of CO<sub>2</sub> and O<sub>2</sub> in atmosphere: Refer to storage of nutrients in Seeds, roots, stems, leaves, fruits, rhizomes, corns and tubers.</li> </ul>	<ul style="list-style-type: none"> <li><b>Examining</b> the external and internal structures of a leaf</li> <li><b>Experimenting</b> on the necessity for photosynthesis</li> <li><b>Inferring</b> the factors of photosynthesis</li> <li><b>Interpreting</b> the equation for photosynthesis</li> <li><b>Communicating</b> information on the fate of glucose in leaves</li> <li><b>Communicating</b> the importance of photosynthesis.</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the external and internal structure of a leaf.</li> <li><b>Asking</b> questions for more understanding.</li> <li><b>Appreciating</b> the stages of photosynthesis</li> <li><b>Caring</b> for plant life.</li> <li>Being aware of storage organs in plants.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.6 Saprophytic nutrition	10.6.1 Rhizopus	<p>10.6.1.1. Investigate the structure of Rhizopus or Mucor.</p> <p>10.6.1.2 State the functions of the parts of Rhizopus.</p> <p>10.6.1.3 Describe what saprophytic nutrition is.</p> <p>10.6.1.4 Explain the importance of saprophytic nutrition.</p> <p>10.6.1.5 State other types of saprophytic nutrition.</p>	<ul style="list-style-type: none"> <li>• Structure of Rhizopus or Mucor: Mycelium (hyphae, sporangium, sporangiophore, stolons, rhizoids)</li> <li>• Functions of the parts of Rhizopus: Refer to Mycelium (hyphae, sporangium, sporangiophore, stolons and rhizoids)</li> <li>• Saprophytic nutrition: Feeding on dead or decaying matter. It involves secretion of enzymes onto the food by the saprotrophs (extracellular digestion)</li> <li>• Importance of saprophytic nutrition: Recycle of nutrients. Decomposition of dead organic matter.</li> <li>• Symbiosis/Mutualism, and Parasitism</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the structure of rhizopus and mucor</li> <li>• <b>Communicating</b> information on the structure of Rhizopus and mucor.</li> <li>• <b>Interpreting</b> stages in extracellular digestion</li> <li>• <b>Analysing</b> the importance of saprophytic nutrition</li> <li>• <b>Communicating</b> types of saprophytic nutrition</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Developing</b> curiosity in investigation</li> <li>• <b>Appreciating</b> functions of the parts of Rhizopus</li> <li>• <b>Cooperating</b> with others</li> <li>• <b>Listening</b> to others with respect</li> <li>• <b>Appreciating</b> the importance of saprophytic nutrition.</li> <li>• <b>Asking</b> more questions.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.7 Nutrition in Animals	10.7.1 Dentition in mammals	<p>10.7.1.1 Identify the external structure and function of the human teeth.</p> <p>10.7.1.2 Describe the internal structure and function of the human tooth.</p> <p>10.7.1.3 Describe the dental formulae of a dog and human being.</p> <p>10.7.1.4 Identify the differences in dentition of carnivores, herbivores and omnivores.</p> <p>10.7.1.5 Describe causes, signs and symptoms of gum disease and tooth decay.</p>	<ul style="list-style-type: none"> <li>External structure of teeth: Crown, neck and root.</li> <li>External Functions of teeth: such as incisors, canines, premolars and molars.</li> <li>Internal structure of the human tooth: Dentine, Cement, Pulp Cavity, Nerve Endings, Blood Vessels,(longitudinal section)</li> <li>Internal function of teeth</li> <li>Dental formulae: Dog i:3/3 c:1/1 pm:4/4 m:2/3, Man i:2/2 c:1/1 pm:2/2 m3/3</li> <li>Differences in dentition of carnivores, omnivores and herbivores: Refer to type of teeth present, function and the number of each type of teeth present in man, dog and goat</li> <li>Causes, signs and symptoms of gum disease and tooth decay</li> <li>Ways of preventing tooth decay</li> </ul>	<ul style="list-style-type: none"> <li><b>Observing</b> the external parts and functions of teeth.</li> <li><b>Identifying</b> the internal parts and functions of a tooth.</li> <li><b>Comparing</b> dental formulae of different animals</li> <li><b>Comparing</b> dentitions of carnivores, herbivores and omnivores</li> <li><b>Communicating</b> Causes, signs and symptoms of gum disease and tooth decay</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the structure and function of teeth.</li> <li><b>Being</b> aware of internal parts and function of teeth.</li> <li><b>Applying</b> knowledge on prevention of dental diseases</li> <li><b>Caring</b> for teeth</li> <li><b>Being</b> aware of causes, signs, symptoms and prevention of tooth decay.</li> </ul>
	10.7.2 Holozoic nutrition	<p>10.7.2.1 State the main processes in holozoic nutrition.</p> <p>10.7.2.2 Identify the main regions of the alimentary canal</p>	<ul style="list-style-type: none"> <li>Processes in holozoic: nutrition Ingestion, digestion, absorption, assimilation and egestion.</li> <li>The alimentary canal and associated organs (liver and</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> main processes of holozoic nutrition.</li> <li><b>Investigating</b> the main regions of the alimentary and the</li> </ul>	<ul style="list-style-type: none"> <li><b>Being</b> aware of the main processes of holozoic nutrition.</li> <li><b>Participating</b> in</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>and associated organs.</p> <p>10.7.2.3 Describe the processes of digestion, absorption and assimilation of nutrients.</p> <p>10.7.2.4 Investigate the common ailments of the alimentary canal.</p> <p>10.7.2.5 Describe the metabolic functions of the liver.</p> <p>10.7.2.6 Describe the effects of common ailments of the liver.</p>	<p>pancreas)</p> <ul style="list-style-type: none"> <li>• Functions of the parts of the alimentary canal and associated organs</li> <li>• Processes of digestion, absorption and assimilation of nutrients: Digestion, absorption and assimilation of proteins, carbohydrates, and lipids. -Role of hepatic portal vein -Absorption of vitamins and mineral salts</li> <li>• Dehydration (loss of mineral salts and loss of fluids) and inflammation of the alimentary canal</li> <li>• Metabolic functions of the liver: Deamination, detoxification, production of bile, regulation of blood sugar, storage of glycogen, vitamins and iron</li> <li>• Effects of common ailments of the liver: Poor bile formation, high blood sugar, low blood sugar and high toxin levels in the blood.</li> </ul>	<p>functions.</p> <ul style="list-style-type: none"> <li>• <b>Comparing</b> the processes of digestion, absorption and assimilation.</li> <li>• <b>Investigating</b> the common ailments of the alimentary canal.</li> <li>• <b>Communicating</b> the metabolic functions of the liver.</li> <li>• <b>Investigating</b> the common ailments of the liver</li> </ul>	<p>class activity.</p> <ul style="list-style-type: none"> <li>• <b>Developing</b> curiosity</li> <li>• <b>Actively participating</b> in group discussions.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.8 Respiratory system	10.8.1 Gaseous exchange	<p>10.8.1.1 Describe the respiratory organs of animals.</p> <p>10.8.1.2 Describe the mechanism of gaseous exchange in animals.</p> <p>10.8.1.3 Describe the composition of inspired and expired air.</p> <p>10.8.1.5 Describe the adverse effects of air pollutants on health of human beings.</p> <p>10.8.1.6 Explain gaseous exchange in green plants.</p>	<ul style="list-style-type: none"> <li>Respiratory organs of various animals: Insects (spiracles, trachea and tracheoles), Fish (operculum, mouth, gills), Humans (nostrils, trachea, bronchi, bronchioles, alveoli)</li> <li>Mechanism of inspiration and expiration in an insect, fish and human being: Refer to diffusion of gases in respiratory organs of humans, fish and insect.</li> <li>Composition of inspired and expired air: Refer to composition of oxygen, carbon dioxide, nitrogen, moisture, dust</li> <li>Effects of pollutants: Refer to Cigarette smoke (nicotine and tar), sulphur dioxide and carbon monoxide</li> <li>Gaseous exchange in green plants: During day time all the carbon dioxide produced from respiration is used up by photosynthesis. Oxygen from photosynthesis is used up during respiration</li> </ul>	<ul style="list-style-type: none"> <li><b>Observing</b> respiratory organs of different animals using models.</li> <li><b>Comparing</b> the different types of respiratory organs</li> <li><b>Analysing</b> the mechanism of gaseous exchange in animals</li> <li><b>Comparing</b> the composition of inspired and expired air</li> <li><b>Communicating</b> the effects of air pollutants</li> <li><b>Communicating</b> gaseous exchange in green plants.</li> </ul>	<ul style="list-style-type: none"> <li><b>Cooperating</b> in group activity</li> <li><b>Giving</b> presentation</li> <li><b>Listening</b> to others with respect</li> <li><b>Developing</b> curiosity</li> <li><b>Appreciating</b> the release of oxygen during respiration by green plants.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.8.2 Types of Respiration	<p>10.8.2.1 Describe types of tissue respiration.</p> <p>10.8.2.2 Describe the production of adenosine triphosphate.</p> <p>10.8.2.3 Investigate the production of carbon dioxide during respiration.</p> <p>10.8.2.4 State ways in which respiration is important.</p> <p>10.8.2.5 Explain the industrial applications of respiration</p>	<ul style="list-style-type: none"> <li>• Types of respiration: Aerobic and anaerobic respiration</li> <li>• Production of adenosine triphosphate Equations (word and chemical)</li> <li>• Production of carbon dioxide during respiration Formation of ATP from ADP and P (Experiment to show production of CO<sub>2</sub> during aerobic and anaerobic respiration)</li> <li>• Importance of ATP in cells: Production of biological energy, Maintenance of levels of CO<sub>2</sub> and O<sub>2</sub> in atmosphere</li> <li>• Industrial applications of respiration: Baking, brewing, dairy, sewage treatment.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> aerobic and anaerobic respiration</li> <li>• <b>Communicating</b> formation and importance of ATP</li> <li>• <b>Investigating</b> production of Carbon dioxide during respiration</li> <li>• <b>Communicating</b> ways in which respiration is important</li> <li>• <b>Investigating</b> the process of respiration in industry.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of types of tissue respiration.</li> <li>• <b>Appreciating</b> the formation of ATP from ADP and P, and its importance.</li> <li>• <b>Asking</b> questions for more understanding</li> <li>• <b>Valuing</b> the importance of respiration.</li> <li>• <b>Appreciating</b> the industrial application of respiration.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
10.9 Health	10.9.1 Diseases	<p>10.9.1.1 Describe what good health is.</p> <p>10.9.1.2 Define disease.</p> <p>10.9.1.3 Describe various types of diseases.</p> <p>10.9.1.4 Describe causative agents, signs and symptoms, methods of transmission and control.</p>	<ul style="list-style-type: none"> <li>• Good health: Refer to physical, mental and social well being, dependent on receiving a balanced diet and an appropriate physical and mental activity.</li> <li>• Definition of disease: Refer to loss of health resulting from disturbances of the normal processes of the body.</li> <li>• Types of diseases: Deficiency diseases, Genetic diseases, Pathogenic diseases, Social diseases, Mental illness, and Ageing and degenerative diseases.</li> <li>• Agents, symptoms, methods of transmission and control of disease: Refer to the following diseases: Cholera, Malaria and Bilharzia (Schistosomiasis).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> information on good health</li> <li>• <b>Interpreting</b> the meaning of the term disease.</li> <li>• <b>Classifying</b> diseases into different groups.</li> <li>• <b>Communicating</b> causative agents, signs and symptoms of pathogenic diseases.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> good health.</li> <li>• <b>Asking</b> questions for a better understanding of the meaning of the term disease.</li> <li>• <b>Appreciating</b> various types of diseases</li> <li>• <b>Applying</b> the knowledge on preventing disease in daily life</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.9.2 HIV and AIDS	<p>10.9.2.1 Describe ways of HIV transmission</p> <p>10.9.2.2 Explain the dangers of having multiple sexual partners.</p> <p>10.9.2.3 Describe ways of safe sexual practices.</p> <p>10.9.2.4 Identify the causes of stigma to people living with HIV and AIDS.</p> <p>10.9.2.5 Describe ways of reducing discrimination to people living with HIV and AIDS.</p>	<ul style="list-style-type: none"> <li>• Ways of HIV transmission: Sexual intercourse with an infected person, sharing contaminated body fluids, sharing un sterilised instruments.</li> <li>• Dangers of multiple sexual partners: Risk of contracting STIs’ including HIV, unintended pregnancy, disintegration of families</li> <li>• Safe sexual practices: Abstinence, Consistence and correct use of condoms, VCT Services</li> <li>• Causes of stigma: Fear, myth, lack of support groups, lack of information on the available services</li> <li>• Ways of reducing stigma: Support, care, treatment (ART) and advocacy.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> ways of transmission of HIV</li> <li>• <b>Communicating</b> dangers of having multiple sexual partners</li> <li>• <b>Communicating</b> ways of safe sexual practices.</li> <li>• <b>Investigating</b> causes of stigma to people living with HIV and AIDS.</li> <li>• <b>Communicating</b> ways of reducing discrimination to people living with HIV and AIDS</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of HIV transmission.</li> <li>• <b>Being</b> aware of dangers of having multiple sexual partners.</li> <li>• <b>Being</b> aware of safe sexual practices.</li> <li>• <b>Being</b> assertive to sexual advances.</li> <li>• <b>Showing</b> empathy to people living with HIV/AIDS.</li> <li>• <b>Sympathising</b> with people living HIV/AIDS.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	10.9.3 Immunity	<p>10.9.3.1 Explain the term of immunity to disease.</p> <p>10.9.3.2 Investigate the importance of the immune system.</p> <p>10.9.3.3 Describe the factors that reduce immunity to pathogenic diseases</p> <p>10.9.3.4 Explain the importance of immunisation.</p>	<ul style="list-style-type: none"> <li>Define immunity to disease: Refer to active, passive artificial and natural immunity.</li> <li>Importance of the immune system (Refer to control of diseases).</li> <li>Factors reducing immunity: Diet, repeated invasions by pathogens and development of resistant strains of the pathogens.</li> <li>Importance of immunisation: refer to induced active immunity</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> information on immunity to disease</li> <li><b>Investigating</b> the importance of immune system</li> <li><b>Identifying</b> factors that reduce immunity to pathogenic diseases</li> <li><b>Communicating</b> the importance of immunisation</li> </ul>	<ul style="list-style-type: none"> <li><b>Asking</b> questions for better understanding of immunity.</li> <li><b>Relating</b> the importance of immunity.</li> <li><b>Being</b> aware of factors that reduce immunity to pathogenic diseases.</li> <li><b>Appreciating</b> the importance of immunisation.</li> </ul>
	10.9.4 The life cycle of the housefly and the mosquito.	<p>10.9.4.1 Describe the life cycle of a housefly.</p> <p>10.9.4.2 Describe the life cycle of a mosquito.</p> <p>10.9.4.3 Explain the role of houseflies and mosquitoes in the spreading of diseases.</p> <p>10.9.4.4 Relate the control of malaria to the life cycle of the mosquito.</p> <p>10.9.4.5 Relate the control of water borne diseases to the life cycle of the housefly.</p>	<ul style="list-style-type: none"> <li>Life cycle of housefly: Egg, larva, pupa and adult</li> <li>Life cycle of a mosquito: Egg, larva, pupa and adult</li> <li>Role of Houseflies: Vectors in the spread of dysentery, cholera, typhoid. Role of Mosquito: Vector for malaria.</li> <li>Control of malaria: (Refer to use of biological and chemical control)</li> <li>Control of water borne disease: such as dysentery, cholera, typhoid and the life cycle of the housefly.</li> </ul>	<ul style="list-style-type: none"> <li><b>Investigating</b> life cycles of a housefly and mosquito</li> <li><b>Identifying</b> the relationship between cause of disease and effect of houseflies and mosquitoes</li> <li><b>Inferring</b> the control of malaria to the life cycle of the mosquito</li> <li><b>Investigating</b> the control of water borne diseases to the life cycle of the housefly</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the life cycle of housefly and mosquito.</li> <li><b>Being</b> aware of the role of houseflies and mosquitoes in spreading diseases.</li> </ul>

## GRADE 11

<p><b>General outcomes:</b></p> <ul style="list-style-type: none"><li>• Demonstrate understanding of transport and storage in plant.</li><li>• Develop investigative skills.</li><li>• Demonstrate understanding of the circulatory system in humans</li><li>• Recognise the importance of excretion.</li><li>• Acquire knowledge and values about homeostasis.</li><li>• Recognise the importance of the endocrine system.</li><li>• Demonstrate an understanding of the nervous system and sense organs.</li><li>• Demonstrate understanding of the Skeleton and locomotion.</li><li>• Demonstrate understanding of tropic and taxic responses</li><li>• Demonstrate an understanding of plant growth and development</li></ul>	<p><b>Key Competences:</b></p> <ul style="list-style-type: none"><li>• Show the ability to investigate the conditions necessary for transpiration</li><li>• Show ability to demonstrate the conditions necessary for germination of seeds.</li><li>• Show ability to identify different joints in mammals and insects</li></ul>
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TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
11.1 Transport and storage in plants	11.1.1 Transport in plants.	<p>11.1.1.1 Describe the external and internal structure of roots and stems.</p> <p>11.1.1.2 Describe absorption of water and uptake of mineral salts by roots.</p> <p>11.1.1.3 Describe the movement of water and transport of mineral salts from the roots to the leaves.</p> <p>11.1.1.4 Describe the movement of organic solutes in phloem.</p> <p>11.1.1.5 Demonstrate the process of transpiration.</p>	<ul style="list-style-type: none"> <li>• External and internal structure of roots and stems: Refer to Cross section and longitudinal section of roots and stems (xylem and phloem of herbaceous dicot and monocot anatomy)</li> <li>• The role of roots: absorption of water (osmosis), uptake of mineral salts (Active transport)</li> <li>• Movement of water and transport of mineral salts: Root pressure, capillarity(refer to adhesion and cohesion forces), transpiration stream</li> <li>• Movement of organic solutes: Refer to translocation of carbohydrates and amino acids in phloem</li> <li>• Process of transpiration: Refer to loss of water vapour through the stomata, opening and</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the external and internal structure of a dicot and monocot root and stem.</li> <li>• <b>Predicting</b> the movement of water and mineral salts in roots</li> <li>• <b>Analysing</b> the movement of water and transport of mineral salts up the plant.</li> <li>• <b>Analysing</b> the movement of organic solutes in phloem</li> <li>• <b>Communicating</b> the process of transpiration</li> <li>• <b>Investigating</b> factors that affect the rate of transpiration</li> <li>• <b>Observing</b> adaptive features in plants that reduce excess loss of water</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Asking</b> questions for better understanding of the structures of roots and stems.</li> <li>• <b>Developing</b> curiosity</li> <li>• <b>Cooperating</b> in group discussions</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Sharing</b> ideas with others</li> <li>• <b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.1.1.6 Investigate factors that affect the rate of Transpiration</p> <p>11.1.1.7 Describe adaptive features of a leaf to reduce excess loss of water.</p> <p>11.1.1.8 Explain the significance of transpiration in plants.</p>	<p>closing of stomata. Use a simple photometer</p> <ul style="list-style-type: none"> <li>• Factors affecting transpiration: Humidity; Temperature; deforestation; Light intensity; and Speed of wind</li> <li>• Adaptive features of a leaf: Reduction of leaf surface, shading of leaves, reducing the number of stomata</li> <li>• Significance of transpiration: Refer to water cycle, cooling effect in plants, absorption of mineral ions, provides water for photosynthesis</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Analysing</b> the significance of transpiration.</li> </ul>	

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
11.2 Transport in Man	11.2.1 Blood	<p>11.2.1.1 Identify the composition of blood.</p> <p>11.2.1.2 Explain the functions of blood.</p> <p>11.2.1.3 Distinguish between the red and the white blood cells.</p> <p>11.2.1.4 Identify the sites where the blood cells are produced</p> <p>11.2.1.5 Explain the process of blood clotting</p>	<ul style="list-style-type: none"> <li>• Composition of blood: Solid (leucocytes, erythrocytes, thrombocytes), Liquid (plasma).</li> <li>• Functions of blood: Transporting oxygen and carbon dioxide, nutrients, mineral salts, vitamins, water, hormones, heat, metabolic wastes, fighting disease, and blood clotting</li> <li>• Structural and functional differences of red blood cells (erythrocytes) and white blood cells (leucocytes)</li> <li>• Sites of production of blood: RBCs-Bone marrow. WBCs-Bone marrow, lymph nodes, thymus and spleen. Platelets- Bone marrow</li> <li>• Process of blood clotting: Change of enzyme prothrombin to thrombin, fibrinogen to fibrin and role of calcium ions and thromboplastin.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Classifying</b> the components of blood</li> <li>• <b>Comparing</b> the functions of blood</li> <li>• <b>Comparing</b> structural and functional differences between RBC and WBC</li> <li>• <b>Investigating</b> the sites where the blood cells are produced</li> <li>• <b>Communicating</b> the process of blood clotting</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of the composition of blood.</li> <li>• <b>Appreciating</b> the functions of blood.</li> <li>• <b>Developing</b> curiosity</li> <li>• <b>Asking</b> questions for better understanding</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	11.2.2 Blood Groups	<p>11.2.2.1 Describe the ABO blood groups</p> <p>11.2.2.2 Explain the importance of determining the blood groups and Rhesus factors.</p> <p>11.2.2.3 Explain the donor-recipient compatibility of blood groups.</p> <p>11.2.2.4 Explain the importance of screening the blood for purpose of transfusion.</p>	<ul style="list-style-type: none"> <li>• Blood groups: Refer to blood types A,B,AB and O, antigens and antibodies</li> <li>• Importance of blood groups: Refer to blood transfusions and transplants; the danger of Rhesus positive blood to the foetus (haemolytic disease)</li> <li>• Donor-Recipient compatibility of Blood: Refer to antibody and Antigen reaction when bloods of different groups are mixed.</li> <li>• Importance of screening blood: Refer to risk of transmission of HIV and Hepatitis B by blood donors</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Classifying</b> blood into groups according to the antigens they carry.</li> <li>• <b>Analysing</b> the importance of determining of blood groups and rhesus factors</li> <li>• <b>Communicating</b> the donor - recipient compatibility of blood groups.</li> <li>• <b>Communicating</b> importance of screening the blood for purpose of transfusion</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> different blood types.</li> <li>• <b>Being</b> aware of the donor – recipient compatibility of blood groups.</li> </ul>
	11.2.3 Blood disorders	11.2.3.1 Investigate common blood disorders	<ul style="list-style-type: none"> <li>• Blood disorders: Leukaemia, sickle cell, anaemia and haemophilia</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> information on common blood disorders</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Showing empathy</b> to people with blood disorders.</li> </ul>
	11.2.4 The heart	<p>11.2.4.1 Describe the structure of the human heart.</p> <p>11.2.4.2 Describe how the heart functions.</p>	<ul style="list-style-type: none"> <li>• Structure of the heart: Refer to chambers, valves, vessels, including coronary arteries</li> <li>• Functioning of the heart: diastole and systole (Include pulse rate and heart beat).</li> <li>• Causes of coronary diseases: Include diet, stress, smoking</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Observing</b> the structure of the human heart with a model</li> <li>• <b>Communicating</b> information on how the heart functions</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Asking</b> questions for more understanding</li> <li>• <b>Developing</b> curiosity</li> <li>• <b>Applying</b> ways of preventing coronary heart</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.2.4.3 Explain the causes of coronary heart disease.</p> <p>11.2.4.4 Describe ways of preventing coronary heart diseases</p>	<p>and pollution.</p> <ul style="list-style-type: none"> <li>• Ways of preventing coronary diseases: Good diet and importance of exercises.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the causes of coronary heart diseases</li> <li>• <b>Communicating</b> ways of preventing coronary heart diseases</li> </ul>	<p>diseases.</p>
	11.2.5 Lymphatic system	<p>11.2.5.1 Describe the structure of the lymphatic system in relation to blood circulatory system.</p> <p>11.2.5.2 Compare tissue fluid and lymph to blood.</p> <p>11.2.5.3 Describe the flow of lymph.</p> <p>11.2.5.4 Describe the function of lymph nodes in disease prevention.</p>	<ul style="list-style-type: none"> <li>• Structure of the lymphatic system and relationship with blood circulatory system</li> <li>• Tissue fluid, lymph and blood (include composition and functions of tissue fluid and lymph)</li> <li>• Flow of lymph: Refer to the lymphatic system</li> <li>• The function of lymph nodes: Disease prevention, (STIs, TB, injury).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Relating</b> the structure of lymphatic system to blood circulatory system</li> <li>• <b>Comparing</b> the relationship of tissue fluid and lymph to blood</li> <li>• <b>Communicating</b> information on the flow of lymph in the lymphatic system.</li> <li>• <b>Investigating</b> the function of lymph nodes in disease prevention</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Actively participating</b> in group discussion</li> <li>• <b>Cooperating</b> in group activity</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Listening</b> to others with respect</li> </ul>
	11.2.6 Circulatory systems	<p>11.2.6.1 Describe types of blood circulatory systems.</p> <p>11.2.6.2 Describe double circulation.</p>	<ul style="list-style-type: none"> <li>• Types of blood circulatory systems Closed and open circulatory systems</li> <li>• Double circulation: Pulmonary and systemic circulation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> circulatory systems</li> <li>• <b>Investigating</b> double circulation</li> <li>• <b>Comparing</b> single and double blood</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Actively participating</b> in class discussion.</li> <li>• <b>Cooperating</b> in group activity</li> <li>• <b>Listening</b> to others with</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.2.6.3 Distinguish between the single and double circulation.</p> <p>11.2.6.4 Identify the main blood vessels in the double circulatory system</p> <p>11.2.6.5 Compare the structure and functions of arteries, veins and capillaries.</p> <p>11.2.6.6 Describe the structure of lymph vessels.</p>	<ul style="list-style-type: none"> <li>• Single and double circulation</li> <li>• Blood vessels: Arteries and Veins to and from the heart, lungs, head, limbs, intestines, liver and the kidneys</li> <li>• Structure and functions of Arteries, veins and capillaries (transverse sections).</li> <li>• Structure of lymph vessels: Refer to transverse section.</li> </ul>	<p>circulation</p> <ul style="list-style-type: none"> <li>• <b>Identifying</b> the main blood vessels in the double circulatory system</li> <li>• <b>Comparing</b> the structures and functions of arteries, veins and capillaries</li> <li>• <b>Observing</b> the structure of lymph vessels using models.</li> </ul>	<p>respect</p> <ul style="list-style-type: none"> <li>• <b>Accepting responsibility</b> for one's behaviour</li> </ul>
11.3 Excretion	11.3.1 Excretion	<p>11.3.1.1 Describe the process of excretion.</p> <p>11.3.1.2 Explain the importance of excretion to animals.</p>	<ul style="list-style-type: none"> <li>• Process of excretion: Refer to removal of toxic metabolic waste: Animals ( Carbon dioxide, Nitrogenous wastes,) Plants ( latex)</li> <li>• Importance of excretion: Refer to Removal of unwanted by-products and toxic wastes; Regulation of water content of body fluids and pH.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the process of excretion</li> <li>• <b>Communicating</b> the importance of removing of metabolic wastes</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the process and importance of excretion</li> <li>• <b>Participating</b> in group activity</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	11.3.2 The kidney	<p>11.3.2.1 Identify the internal structure of the kidneys.</p> <p>11.3.2.2 Explain the mechanism of excretion in the kidney.</p> <p>11.3.2.3 Identify common disorders and diseases associated with the kidney.</p>	<ul style="list-style-type: none"> <li>Internal structure of the kidneys: Cortex, medulla, pelvis, structure of nephron, inlet and outlet of blood vessels.</li> <li>Mechanism of excretion in the kidney Refer to ultra -filtration and selective re-absorption, osmoregulation</li> <li>Kidney failure (refer to infections, high blood pressure and low blood pressure) and remedies (dialysis machine and kidney transplant)</li> </ul>	<ul style="list-style-type: none"> <li><b>Observing</b> the internal structure of kidneys using models and specimen</li> <li><b>Communicating</b> the mechanism of ultra-filtration and re-absorption of substances in the kidneys</li> <li><b>Identifying</b> common disorders and disease associated with the kidney.</li> </ul>	<ul style="list-style-type: none"> <li><b>Being</b> aware of the structure of the kidneys.</li> <li><b>Appreciating</b> the mechanism of excretion by the kidneys.</li> <li><b>Being</b> aware of common disease and disorders.</li> </ul>
	11.3.3 The lungs	11.3.3.1 Investigate the role of lungs in excretion.	<ul style="list-style-type: none"> <li>Roles of lungs: Refer to elimination of carbon dioxide</li> </ul>	<ul style="list-style-type: none"> <li><b>Investigating</b> the role of the lungs in eliminating carbon dioxide</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the role of lungs in excretion</li> </ul>
	11.3.4 The human skin	<p>11.3.4.1 Identify the structure of the human skin.</p> <p>11.3.4.2 Describe the role of the human skin in excretion.</p>	<ul style="list-style-type: none"> <li>Structure of the human skin: Refer to the Epidermis, dermis and adipose tissue and associated structures.</li> <li>Role of the human skin Removal of salts, urea and excess water as waste products.</li> </ul>	<ul style="list-style-type: none"> <li><b>Identifying</b> the structures of the human skin</li> <li><b>Analysing</b> the roles of the human skin</li> </ul>	<ul style="list-style-type: none"> <li><b>Asking</b> questions for more understanding</li> <li><b>Cooperating</b> in group activity</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
11.4 Homeostasis and Osmoregulation	11.4.1 Homeostasis	<p>11.4.1.1 Describe what homeostasis is.</p> <p>11.4.1.2 Identify important organs in homeostasis.</p> <p>11.4.1.3 Describe the role of the kidney in maintaining the balance of water and salt ions.</p> <p>11.4.1.4 Describe the mechanism of thermoregulation by the skin.</p> <p>11.4.1.5 Describe the role of the liver in the regulation of blood sugar and body temperature.</p>	<ul style="list-style-type: none"> <li>• Homeostasis: Refer to maintaining of constant internal environment (blood temperature, contents of tissue fluid, salts, water concentration).</li> <li>• Organs of homeostasis: Kidney, skin and the liver</li> <li>• Role of the kidney: water/salt ion balance (Refer to the role of Anti Diuretic Hormone (ADH))</li> <li>• Mechanism of Thermoregulation: Overheating (Vasodilation and sweating), Overcooling (vasoconstriction and shivering)</li> <li>• Role of the liver in the regulation of the blood sugar (conversion of glucose to glycogen and vice versa. Amino acids and glycerol to glucose) and body temperature.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Analyzing</b> maintenance of constant internal environment</li> <li>• <b>Investigating</b> important organs in homeostasis</li> <li>• <b>Communicating</b> the role of the kidney in osmoregulation</li> <li>• <b>Analyzing</b> the mechanism of thermoregulation by the skin</li> <li>• <b>Communicating</b> the role of the liver in regulating blood sugar and body temperature</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Participating</b> in group discussion</li> <li>• <b>Cooperating</b> in class activity</li> <li>• <b>Listening</b> to others with respect</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Accepting responsibility</b> for one's behavior</li> </ul>
11.5 The endocrine system	11.5.1 Hormones	<p>11.5.1.1 Describe what hormones is.</p> <p>11.5.1.2 Identify the endocrine glands in a human</p>	<ul style="list-style-type: none"> <li>• Hormones: Refer to regulatory chemicals transported by blood to target organs.</li> <li>• Endocrine glands: Pituitary, pancreas, adrenal and thyroid, testes and ovaries</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> information on hormones as regulatory chemicals transported by</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Cooperating</b> in class activity</li> <li>• <b>Being</b> aware of the endocrine glands</li> <li>• <b>Developing</b></li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>being.</p> <p>11.5.1.3 Identify the hormones produced by the pancreas, adrenal, thyroid and pituitary glands.</p> <p>11.5.1.4 Describe the functions of thyroxine, insulin, glucagon and adrenaline.</p>	<ul style="list-style-type: none"> <li>• Hormones produced by the pancreas: Insulin and glucagon: Adrenal: Adrenaline, Thyroid: Thyroxine Pituitary: ADH,TSH,FSH,GH</li> <li>• Functions of Hormones: Thyroxine, insulin and adrenaline (Refer to the effects of over and under secretion of hormones)</li> </ul>	<p>blood to target organs</p> <ul style="list-style-type: none"> <li>• <b>Identifying</b> endocrine glands on the charts</li> <li>• <b>Investigating</b> hormones produced by some endocrine glands</li> <li>• <b>Communicating</b> functions of thyroxine, insulin, glucagon and adrenaline</li> </ul>	<p>curiosity</p>
11.6 The nervous system and sense organs	11.6.1 The nervous system	<p>11.6.1.1 Identify main parts of the nervous system in a human being.</p> <p>11.6.1.2 Describe what neurones are.</p> <p>11.6.1.3 Explain the path taken by an impulse through a spinal reflex arc.</p> <p>11.6.1.4 Describe what the spinal, cranial and the conditioned reflex actions are</p>	<ul style="list-style-type: none"> <li>• Main parts of nervous system: Brain, spinal cord and nerves.</li> <li>• Functions of Neurones: Refer to functions of sensory, motor and relaying neurones</li> <li>• Spinal reflex arc: Movement of an impulse through sensory neurone to the CNS and to effectors</li> <li>• Spinal reflex (knee jerk); Cranial reflex (blinking, coughing, response to light intensity) Conditioned reflex (Pavlov’s experiment)</li> <li>• Main parts of the brain:</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the main parts of the nervous system</li> <li>• <b>Investigating</b> functions of neurones</li> <li>• <b>Investigating</b> a spinal reflex arc</li> <li>• <b>Comparing</b> different reflex actions</li> <li>• <b>Communicating</b> the main parts of</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the functions of neurones</li> <li>• <b>Actively participating</b> in group activities</li> <li>• <b>Appreciating</b> the main parts of the human brain</li> <li>• <b>Developing curiosity</b> on the functions of the fore and hind brain</li> <li>• <b>Being</b> aware of the effects of abuse of drugs on the nervous</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.6.1.5 Identify the main parts of the brain of a human being.</p> <p>11.6.1.6 Explain the functions of the forebrain and the hindbrain.</p> <p>11.6.1.7 Describe the effects of abuse of drugs on the nervous system</p> <p>11.6.1.8 Explain the effects of tetanus infection.</p>	<p>Cerebral hemispheres, cerebellum, Hypothalamus and medulla oblongata.</p> <ul style="list-style-type: none"> <li>• Functions of fore brain (cerebrum and hypothalamus) and hind brain(cerebellum and medulla oblongata)</li> <li>• Effects of drug abuse: Affect the breathing centre of the brain (depressants), destroy the neurones, Increase reaction time</li> <li>• Effects of tetanus infections: Refer to damage to brain cells and impairment of nerve tissue</li> </ul>	<p>the brain</p> <ul style="list-style-type: none"> <li>• <b>Communicating</b> functions of the forebrain and hindbrain</li> <li>• <b>Inferring</b> effects of abuse of drugs</li> <li>• <b>Communicating</b> effects of tetanus the brain and nerve tissues</li> </ul>	<p>system</p> <ul style="list-style-type: none"> <li>• <b>Asking</b> questions for more understanding</li> <li>• <b>Listening</b> to others with respect</li> <li>• <b>Giving</b> presentation</li> </ul>
	11.6.2 Sense organs	<p>11.6.2.1 Identify the external and internal structures of the human eye.</p> <p>11.6.2.2 Explain the functions of the parts of eye.</p> <p>11.6.2.3 Describe the accommodation of the eye.</p>	<ul style="list-style-type: none"> <li>• External and internal structures of the human eyes: External structures (Sclera, cornea, iris, pupil) include eyebrows and eyelashes: Internal (include lens, humours ,layers and optic nerve)</li> <li>• Functions of parts of eye: Pupil, Iris, Cornea, Tear gland, Conjunctiva, Sclera, retina</li> <li>• Accommodation of the eye: Refer to the process of producing a focused image of near and distant objects on the retina</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> external and internal structures of the human eye</li> <li>• <b>Communicating</b> functions of parts of the eye</li> <li>• <b>Analysing</b> focusing of an image on the retina</li> <li>• <b>Communicating</b> causes of short and long</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the functions of the eye</li> <li>• <b>Developing curiosity</b> in understanding accommodation of the eye</li> <li>• <b>Being</b> aware of causes and correction of short and long sightedness</li> <li>• <b>Arousing curiosity</b> on causes and</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.6.2.4 Describe the causes of short and long sightedness.</p> <p>11.6.2.5 Explain the correction of short and long sight.</p> <p>11.6.2.7 Investigate the common causes and methods of preventing blindness.</p> <p>11.6.2.8 Describe the structure of the human ears.</p> <p>11.6.2.9 Explain the functions of the parts of the ear.</p> <p>11.6.2.10 Describe causes and methods of preventing deafness.</p> <p>11.6.2.11 Describe the role of the skin as a sense organ</p>	<ul style="list-style-type: none"> <li>• The causes of short and long sightedness: <i>Refer</i> to loss of elasticity of the lens and abnormal eye ball and age</li> <li>• Correction of short (use concave lens) and long sight (use convex lens)</li> <li>• Causes and methods of preventing blindness: (Vit A deficiency, filarial worm, physical injury and diabetes mellitus) Prevention (foods rich in Vitamin A, surgery and other measures)</li> <li>• Major parts of the ear: outer, middle and inner ears</li> <li>• Functions of each part of the ear: include eardrum, ossicles, Eustachian tube, cochlea and semi circular canals</li> <li>• Causes and methods of preventing deafness Causes: Methods of cleaning the ears; noise and disease.</li> <li>• Role of skin: Refer to Sensory receptors for heat, pain, touch and pressure</li> </ul>	<p>sightedness</p> <ul style="list-style-type: none"> <li>• <b>Analysing</b> correction of short and long sightedness</li> <li>• <b>Investigating</b> the common causes and methods of preventing blindness</li> <li>• <b>Communicating</b> major parts of the ear</li> <li>• <b>Analysing</b> functions of the parts of the ear</li> <li>• <b>Communicating</b> causes and methods of preventing deafness</li> <li>• <b>Communicating</b> role of the skin as a sense organ</li> </ul>	<p>methods of preventing</p> <ul style="list-style-type: none"> <li>• <b>Participating</b> in class discussion actively.</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Listening</b> to others with respect</li> <li>• <b>Accepting responsibility</b> of one's behavior</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
11.7 The skeleton and locomotion	11.7.1 Skeleton	11.7.1.1 Identify various types of skeleton.  11.7.1.2 Describe the functions of the skeleton.	<ul style="list-style-type: none"> <li>• Types of skeleton: endoskeleton, exoskeleton, hydrostatic</li> <li>• Functions of skeleton: Support, protection, structure and locomotion</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> various types of skeleton</li> <li>• <b>Classifying</b> functions of the skeleton</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Developing curiosity</b></li> <li>• Cooperating in class activity</li> </ul>
	11.7.2 The skeleton of an insect	11.7.2.1 Investigate the structure and composition of an exoskeleton.  11.7.2.2 Identify joints and muscles in the limbs of a grasshopper.	<ul style="list-style-type: none"> <li>• Structure and composition of an exoskeleton: Refer to the position and composition of a skeleton of an insect</li> <li>• Joints and attachment of muscle (flexors and extensors) in the limbs of a grasshopper</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the structure and composition of an exoskeleton</li> <li>• <b>Observing</b> joints and muscles in the limbs of a grasshopper</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Developing curiosity</b></li> <li>• <b>Cooperating</b> in group activity</li> <li>• <b>Listening</b> to others with respect</li> </ul>
	11.7.3 The mammalian skeleton	11.7.3.1 Identify the bones of the axial and the appendicular skeletons.  11.7.3.2 Explain a bone as a living tissue.	<ul style="list-style-type: none"> <li>• Types of Skeleton: Axial skeleton (skull, vertebral column), Appendicular skeleton (girdles, limbs)</li> <li>• A tissue of bone: Refer to living cells in bones, production of red blood cells. (Include bone marrow cancer and TB)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Observing</b> bones of the axial and appendicular skeletons</li> <li>• <b>Communicating</b> information on the living cells in bones</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Actively participating</b> in class activities</li> <li>• <b>Giving</b> presentation</li> </ul>
	11.7.4 Muscles and joints	11.7.4.1 Describe the structure of a skeletal muscle.	<ul style="list-style-type: none"> <li>• Structure of skeletal muscle: Refer to shape and amount of mitochondria</li> <li>• Action of antagonistic muscles: Refer to contraction and</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Observing</b> the structure of the skeletal muscle.</li> <li>• <b>Demonstrating</b> the action of</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Actively participating</b> in learning activities</li> <li>• <b>Asking</b></li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>11.7.4.2 Demonstrate the action of antagonistic muscles.</p> <p>11.7.4.3 Compare the ball and socket joint and the hinge joint.</p> <p>11.7.4.4 Identify the parts and functions of the synovial joint.</p> <p>11.7.4.5 Compare the joints, muscle attachment and movement in endoskeletons with those of exoskeletons</p>	<p>relaxation of biceps and triceps; circular and longitudinal muscles in iris</p> <ul style="list-style-type: none"> <li>• Joints: Refer to structure and movement of Ball and socket, and hinge joints. (Also refer to joint disorders e.g. gout)</li> <li>• Parts and functions of the synovial joint: Refer to Functions of the cartilage, ligament, capsule synovial fluid and membrane.</li> <li>• Muscle attachment and movement in an endoskeleton and exoskeleton.</li> </ul>	<p>antagonistic muscles.</p> <ul style="list-style-type: none"> <li>• <b>Comparing</b> the Ball and socket joint to the Hinge joint</li> <li>• <b>Classifying</b> the parts and functions of the synovial joint in a chart</li> <li>• <b>Comparing</b> similarities and differences between exoskeleton and endoskeleton.</li> </ul>	<p>questions for more understanding</p> <ul style="list-style-type: none"> <li>• <b>Giving</b> presentation</li> <li>• <b>Accepting responsibility</b> for one's behavior</li> </ul>
11.8 Tropic and taxic responses	11.8.1 Tropic responses	<p>11.8.1.1 Describe what tropic response is.</p> <p>11.8.1.2 Demonstrate growth responses exhibited by plants.</p> <p>11.8.1.3 Explain the effects of light energy and gravity on the growth of plants.</p>	<ul style="list-style-type: none"> <li>• Tropic response: Growth responses in plants to water, light, chemicals and gravity</li> <li>• Growth responses: Phototropism, geotropism Hydrotropism and chemotropism in plants</li> <li>• Effects of light energy and gravity on growth of shoots and roots (Refer to the Auxin theory).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> growth responses in plants</li> <li>• <b>Observing</b> growth responses exhibited by plant</li> <li>• <b>Analysing</b> effects of light energy and gravity on the growth of roots and shoots</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of tropic responses in plants</li> <li>• <b>Developing curiosity</b> in growth response exhibited by plants</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	11.8.2 Taxic Responses	11.8.2.1 Describe what taxic response is.  11.8.2.2 Explain responses exhibited by invertebrates.	<ul style="list-style-type: none"> <li>• Taxic response: Movement of animals in response to stimulus (refer to light)</li> <li>• Responses exhibited by invertebrates: Refer to movement of woodlice and cockroaches to light</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> movement of animals in response to stimulus</li> <li>• <b>Observing</b> movement of invertebrates in response to light</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Participating</b> in class discussion</li> <li>• <b>Cooperating</b> in group activity</li> </ul>
11.9 Growth and development	11.9.1 Growth in Plants	11.9.1.1 Explain the meaning of growth.  11.9.1.2 Identify the regions of growth in stems and roots.  11.9.1.3 Identify differentiated cells in plants.  11.9.1.4 Explain the differentiation of primary and secondary tissues in plants.	<ul style="list-style-type: none"> <li>• Growth: Increase in number of cells, dry mass, complexity and size</li> <li>• Regions of growth in stems and roots: cell division ,elongation and differentiation</li> <li>• Differentiated cells: Refer to meristematic region differentiating into collenchymas, parenchyma, cambium, sclerenchyma, phloem, and xylem</li> <li>• Differentiation of primary and secondary tissues in plants</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> meaning of growth in organisms</li> <li>• <b>Observing</b> growth regions in stem and roots</li> <li>• <b>Observing</b> differentiated cells in plants</li> <li>• <b>Communicating</b> differentiation of primary and secondary tissues in plants</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> meaning of growth</li> <li>• <b>Being</b> aware of the regions of growth in stem and roots</li> <li>• <b>Asking</b> questions to learn more about differentiated cells in plants</li> </ul>
	11.9.2 Germination and development	11.9.2.1 Distinguish the structure of a dicotyledonous and a monocotyledonous seed.  11.9.2.2 Investigate conditions necessary for germination.	<ul style="list-style-type: none"> <li>• Structure of a dicot and a monocot seed.</li> <li>• Conditions for germination: Suitable temperature, water and oxygen</li> <li>• Hypogeal and Epigeal</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> structure of a dicot and monocot seed</li> <li>• <b>Investigating</b> conditions necessary for germination</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> the structure of a dicot and monocot seed</li> <li>• <b>Appreciating</b> the conditions necessary for germination</li> <li>• <b>Cooperating</b> in</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		11.9.2.3 Demonstrate hypogeal and epigeal germination.	germination: Epigeal (refer elongation of epicotyls in dicots) and hypogeal (refer to elongation of hypocotyls in monocots) germination	<ul style="list-style-type: none"> <li>• <b>Recording</b> the data of observation</li> <li>• <b>Observing</b> hypogeal and epigeal germination</li> </ul>	<ul style="list-style-type: none"> <li>class activities</li> <li>• <b>Knowing</b> the safety rule of observation</li> </ul>

## GRADE 12

<p><b>General outcomes:</b></p> <ul style="list-style-type: none"><li>• Demonstrate understanding of asexual reproduction.</li><li>• Demonstrate understanding of vegetative reproduction</li><li>• Develop investigative skills</li><li>• Demonstrate understanding of sexual reproduction in flowering plants.</li><li>• Demonstrate understanding of sexual reproduction in animals.</li><li>• Demonstrate understanding of genetics</li><li>• Demonstrate knowledge, attitudes and values about plants and animals.</li><li>• Acquire knowledge and value of soil.</li><li>• Develop knowledge, positive attitudes and values about ecology.</li><li>• Demonstrate knowledge, attitudes and values about population.</li></ul>	<p><b>Key Competences</b></p> <ul style="list-style-type: none"><li>• Demonstrate the ability to identify the reproductive parts in flowering plants</li><li>• Show the ability to demonstrate variation of characteristics in plants and animals</li><li>• Demonstrate the ability to identify and classify different species of animals and plants</li><li>• Demonstrate the ability to investigate the composition of soil.</li><li>• Demonstrate the ability to design a food chain in a given ecosystem</li></ul>
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TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.1. Asexual reproduction	12.1.1 Reproduction in fungi, amoeba and bacteria	<p>12.1.1.1 Describe the different types of reproduction.</p> <p>12.1.1.2 Describe asexual reproduction in unicellular organisms.</p> <p>12.1.1.3 Describe the sexual and asexual reproduction in fungus.</p> <p>12.1.1.4 Explain the importance of fungi and bacteria.</p>	<ul style="list-style-type: none"> <li>• Types of reproduction: Refer to asexual and sexual reproduction</li> <li>• Asexual reproduction in unicellular organisms (Refer to budding in yeast cells and bacteria, binary fission in amoeba)</li> <li>• Asexual and sexual reproduction in fungus (Refer to spores and zygospore)</li> <li>• Decomposition of organic matter and nutrient recycling. -Disease causing effects e.g. Ringworm and Bacillary dysentery. Production of a food and alcohol, source of food (mushroom)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> different types of reproduction</li> <li>• <b>Communicating</b> information on reproduction in unicellular organisms</li> <li>• <b>Analysing</b> the two types of reproduction in fungus</li> <li>• <b>Communicating</b> importance of fungi and bacteria</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> asexual reproduction in unicellular organisms</li> <li>• <b>Actively participating</b> in class activities.</li> <li>• <b>Appreciating</b> importance of fungi and bacteria</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	12.1.2 Vegetative Reproduction	<p>12.1.2.1 Describe different methods of natural propagation.</p> <p>12.1.2.2 Investigate different methods of artificial propagation.</p> <p>12.1.2.3 Explain the advantages and disadvantages of vegetative propagation.</p>	<ul style="list-style-type: none"> <li>• Different methods of natural propagation: Runners, rhizomes, corms, buds, suckers, stem tubers, root tubers, bulbs</li> <li>• Methods of artificial propagation: Refer budding, cuttings, grafting, layering</li> <li>• Advantages and disadvantages of vegetative propagation Advantages: cheap, genetic stability Disadvantages: overcrowding, no genetic variation.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> different methods of natural propagation</li> <li>• <b>Investigating</b> different methods of artificial propagation</li> <li>• <b>Communicating</b> advantages and disadvantages of vegetative propagation</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of different methods of natural propagation</li> <li>• <b>Questioning</b> new ideas in order to fully understand them.</li> <li>• <b>Being</b> aware of advantages and disadvantages of vegetative propagation.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.2 Sexual reproduction in flowering plants	12.2.1 Reproduction in plants	<p>12.2.1.1 Identify the parts of a typical flower.</p> <p>12.2.1.2 Describe the functions of various parts of a flower.</p>	<ul style="list-style-type: none"> <li>Parts of a Flower: Calyx, corolla, pistil, stamens, receptacle</li> <li>Functions of parts of a flower: Refer to Calyx, corolla, pistil, stamens, receptacle</li> </ul>	<ul style="list-style-type: none"> <li><b>Observing</b> parts of a typical flower</li> <li><b>Comparing</b> various functions of parts a flower</li> </ul>	<ul style="list-style-type: none"> <li><b>Developing curiosity</b> to learn more about reproduction in plants.</li> <li><b>Being</b> aware of functions of parts of a flower.</li> </ul>
	12.2.2 Pollination	<p>12.2.2.1 Distinguish between two different types of pollination.</p> <p>12.2.2.2 Distinguish between wind and insect pollination.</p> <p>12.2.2.3 Describe the process of fertilization in flowers.</p> <p>12.2.2.4 Investigate ways in which seeds and dispersed.</p> <p>12.2.2.5 Explain the adaptation of fruits and seeds to mode of dispersal.</p> <p>12.2.2.7 Explain the importance of fruit and seed dispersal.</p>	<ul style="list-style-type: none"> <li>Types of pollination: self pollination and cross pollination</li> <li>Wind and insect pollination (Include adaptive structures of wind and insect pollinated flowers)</li> <li>Process of fertilization in flowers: leading to fusion of male and female gametes include seed and fruit formation</li> <li>Seed dispersal: Refer to water, wind, animals and self mechanism.</li> <li>Adaptation of fruits and seeds: Scent, shape, colour of various parts</li> <li>Importance of dispersal: For plant propagation, plant preservation and survival</li> </ul>	<ul style="list-style-type: none"> <li><b>Comparing</b> self and cross pollination</li> <li><b>Comparing</b> wind and insect pollination</li> <li><b>Communicating</b> information on the process of fertilization in plants</li> <li><b>Investigating</b> seed and fruit dispersal</li> <li><b>Observing</b> adaptive features for dispersal</li> <li><b>Communicating</b> the importance of seed dispersal</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the two different types of pollination</li> <li><b>Participating</b> in class discussions in order to understand wind and insect pollination</li> <li><b>Appreciating</b> the process of fertilization in flowering plants</li> <li><b>Developing curiosity</b></li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.3 Reproduction in animals	12.3.1 Sexual reproduction in animals	<p>12.3.1.1 Describe the process of reproduction in a frog.</p> <p>12.3.1.2 Identify male and female reproductive organs in human beings.</p> <p>12.3.1.3 Explain the functions of the different organs of the human reproductive system.</p> <p>12.3.1.4 Describe the biological changes associated with sexual development in human beings.</p>	<ul style="list-style-type: none"> <li>• Process of reproduction in frogs: Refer to number of eggs laid, nature of fertilisation, care of young (metamorphosis is not needed)</li> <li>• Reproductive organs: Male (Testes, Epididymis, sperm duct, urethra, penis, prostate gland, seminal vesicle) and female(ovaries, oviduct, uterus, cervix, vagina)</li> <li>• Functions of different organs: Testes, Epididymis, sperm duct, urethra, penis, prostate gland, seminal vesicle) and female(ovaries, oviduct, uterus, cervix, vagina)</li> <li>• Biological changes: Primary and secondary characteristics. (Include formation of gametes and onset of menstruation, role of hormones), Stimulating the production of sperms and ova</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the process of reproduction in a frog</li> <li>• <b>Identifying</b> the differences between male and female reproductive organs</li> <li>• <b>Communicating</b> functions of different reproductive organs</li> <li>• <b>Investigating</b> biological changes associated with sexual development</li> <li>• <b>Communicating</b> menstrual cycle in humans</li> <li>• <b>Investigating</b> processes of fertilization and implantation</li> <li>• <b>Investigating</b> causes of infertility in humans</li> <li>• <b>Communicating</b> the</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Asking</b> questions in order to learn more about the reproduction in frogs</li> <li>• <b>Appreciating</b> the importance of human life</li> <li>• <b>Cooperating</b> in class activity</li> <li>• <b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		<p>12.3.1.5 Describe the menstrual cycle.</p> <p>12.3.1.6 Explain the processes of fertilisation and implantation in human beings.</p> <p>12.3.1.7 Identify causes of infertility in human beings</p> <p>12.3.1.8 Describe development of the embryo in the uterus.</p> <p>12.3.1.9 Describe health risks associated with foetal development</p> <p>12.3.1.10 Describe healthy pregnancy and safe child birth</p>	<ul style="list-style-type: none"> <li>• Menstrual cycle: Stages, follicular growth and ovulation; roles of hormones (FSH, LH, Oestrogen, progesterone)</li> <li>• Processes of fertilisation and implantation: Fusing of sperm and ovum in oviducts; Implantation of embryo to the uterus wall</li> <li>• Causes of infertility: Alcoholism, weak sperms, fibroids, blocked oviducts, ovulation disorders, STIs</li> <li>• Development of embryo: Refer to the functions of amnion, amniotic fluid, umbilical cord and placenta</li> <li>• Health Risks: Poor nutrition, smoking, alcohol and drugs/ herbal medicines during pregnancy</li> <li>• Healthy pregnancy: Antenatal services, good nutrition, exercise, giving birth at a health facility,</li> </ul>	<p>development of the embryo in the uterus</p> <ul style="list-style-type: none"> <li>• <b>Communicating</b> health risks associated with foetal development</li> <li>• <b>Communicating</b> knowledge on healthy pregnancy and safe childbirth</li> </ul>	

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
			avoiding taking harmful substances to the body.		
	12.3.2 Birth Control	<p>12.3.2.1 Explain some methods of birth control.</p> <p>12.3.2.2 Describe the benefits and possible risks of using contraceptives</p>	<ul style="list-style-type: none"> <li>• Method of birth control: Refer to mechanical (Condoms, IUDs) surgical, hormonal and natural</li> <li>• Benefits and Risks of Contraceptives: Benefits: Planned families, Risks: side effects (Disturbed menstrual cycle, weight gain, and hormonal imbalance)</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Comparing</b> different methods of birth control</li> <li>• <b>Communicating</b> benefits of using contraceptives</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> different methods of birth control</li> <li>• <b>Asking</b> questions in order to understand new ideas about contraceptives</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.4 Genetics	12.4.1 Variation in plant and animal species	<p>12.4.1.1 Describe terms used in the study of genetics.</p> <p>12.4.1.2 Describe the variations in human beings.</p> <p>12.4.1.3 Observe variations in flowering plants.</p> <p>12.4.1.4 Distinguish between continuous and discontinuous variations.</p> <p>12.4.1.5 Describe the factors that cause variations among plant and animals of the same species.</p>	<ul style="list-style-type: none"> <li>• Terms used in the study of genetics: Gene, allele, chromosome, genotype, phenotype, dominant gene, recessive gene.</li> <li>• Variation in human being: Eye colour, skin colour, finger print, tongue rolling, height).</li> <li>• Variations in flowering plant: Fruit structure and scent, height (tall, dwarf. Include leaf size, shape, and weight).</li> <li>• Continuous and discontinuous variations in human being: Continuous( refer to height ,skin colour, body mass) and discontinuous variations ( eye colour, blood group, sex and tongue rolling)</li> <li>• Factors that cause variations: Refer to climatic factors, nutrition, soils.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> terms in genetics.</li> <li>• <b>Classifying</b> variations in human beings</li> <li>• <b>Observing</b> variations of flowers in the locality</li> <li>• <b>Comparing</b> continuous and discontinuous variation in species</li> <li>• <b>Communicating</b> factors that cause variations among plant and animals of the same species</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Developing curiosity</b> in understanding variations in human beings</li> <li>• <b>Asking</b> questions to learn more about continuous and discontinuous variation</li> <li>• <b>Participating</b> in group discussion</li> <li>• <b>Cooperating</b> in class activity</li> <li>• <b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	12.4.2 Cell division and Chromosomes	<p>12.4.2.1 Describe the stages of cell division.</p> <p>12.4.2.3 Explain the importance of mitosis and meiosis.</p>	<ul style="list-style-type: none"> <li>Stages of cell division in mitosis and meiosis: (Refer to chromosome and double strand of DNA).</li> <li>Importance of mitosis and meiosis: Refer to growth and reproduction. Include uncontrolled cell division(cancer)</li> </ul>	<ul style="list-style-type: none"> <li><b>Comparing</b> stages of cell division</li> <li><b>Communicating</b> importance of mitosis and meiosis</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the stages of cell division</li> <li><b>Appreciating</b> the importance of mitosis and meiosis</li> </ul>
	12.4.3 Inheritance	<p>12.4.3.1 Explain what a monohybrid inheritance is.</p> <p>12.4.3.2 Demonstrate the inheritance of human characteristics using the crossings</p> <p>12.4.3.3 Explain the factors that determine the sex of a human being.</p> <p>12.4.3.4 Explain the inheritance of sex linked characteristics.</p> <p>12.4.3.5 Describe the mechanism of ABO blood groups inheritance.</p>	<ul style="list-style-type: none"> <li>Monohybrid crosses: Refer to homozygous, heterozygous recessive, dominant, F<sub>1</sub>, F<sub>2</sub> generation, offspring, ratio, gene, chromosomes, alleles, phenotype and genotype, gamete.</li> <li>Inheritance of human characteristics: Refer to height, eye colour, albinism, sickle cell.</li> <li>Sex of a human being: (Refer to X and Y chromosomes)</li> <li>Inheritance of sex linked to characteristics (Refer to red, green colour blindness and haemophilia).</li> <li>Mechanism of ABO blood groups inheritance: Refer</li> </ul>	<ul style="list-style-type: none"> <li><b>Interpreting</b> chromosomes and the genes they carry.</li> <li><b>Inferring</b> the genotype and phenotype of the offspring.</li> <li><b>Demonstrating</b> the inheritance of characteristics using the crosses.</li> <li><b>Communicating</b> information on the X and Y chromosomes.</li> <li><b>Analysing</b> the mechanism of ABO blood groups inheritance</li> </ul>	<ul style="list-style-type: none"> <li><b>Asking</b> questions in order to understand the outcomes of monohybrid crossings</li> <li><b>Developing curiosity</b> to learn more about inheritance of human characteristics</li> <li><b>Appreciating</b> sex determination in human being</li> <li>Giving presentation</li> <li><b>Appreciating</b> the mechanism of inheritance blood groups</li> <li><b>Accepting responsibility</b> of one's behavior</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
			to alleles I <sup>A</sup> , I <sup>B</sup> , I <sup>O</sup> ; dominance, co-dominance and recessive		
	12.4.4 Mutation	<p>12.4.4.1 Describe what mutation is.</p> <p>12.4.4.2 Identify the causes of mutation.</p> <p>12.4.4.4 Explain effects of mutation.</p> <p>12.4.4.5 Describe the uses of mutations</p>	<ul style="list-style-type: none"> <li>• Mutation (refer to permanent changes in structure of chromosomes and genes).</li> <li>• Causes of mutation: Natural radiation (nuclear emission, and x-rays, ultra-violet light).</li> <li>• Effects of mutation: Down's Syndrome, haemophilia, sickle cell anaemia</li> <li>• Uses of mutations: Induced mutation in Agriculture. (Polyploidy plants).</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> information on mutation</li> <li>• <b>Investigating</b> causes of mutations</li> <li>• <b>Investigating</b> effects of mutations</li> <li>• <b>Communicating</b> uses of mutations</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of permanent changes in structure of chromosomes and genes</li> <li>• <b>Asking</b> questions in order to understand mutation</li> <li>• <b>Awareness</b> of effects of mutation</li> <li>• <b>Appreciating</b> the uses of mutations</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.5 Classification of Plants and animals	12.5.1 Classification	<p>12.5.1.1 Identify various types of plants.</p> <p>12.5.1.2 Identify various types of animals.</p> <p>12.5.1.3 Formulate a simple key for classification of plants and animals.</p> <p>12.5.1.4 Use a simple classification key to identify plants and animals.</p>	<ul style="list-style-type: none"> <li>Types of plants: Chlorophytes (Algae), Bryophytes (mosses, ferns), coniferous plants and flowering plants.</li> <li>Types of mammals: reptiles, amphibians, birds, arthropods and protozoa.</li> <li>Simple keys for classification: Refer to Dichotomous keys.</li> <li>Identify classes of vertebrates and common invertebrates using simple classification keys.</li> </ul>	<ul style="list-style-type: none"> <li><b>Classifying</b> plants into different phyla.</li> <li><b>Classifying</b> animals into their classes.</li> <li><b>Formulating</b> classification keys.</li> <li><b>Applying</b> use of a classification key.</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> various characteristic features of different types of plants</li> <li><b>Appreciating</b> characteristic features of different animals</li> <li><b>Asking</b> questions in order to formulate simple dichotomous keys for plants and animals</li> <li><b>Actively participating</b> in class activities.</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.6 The soil	12.6.1 Soil Composition and fertility.	<p>12.6.1.1 Demonstrate soil composition.</p> <p>12.6.1.2 Describe the types of soil and their properties.</p> <p>12.6.1.3 Describe factors that make soil fertile.</p> <p>12.6.1.4 Investigate causes of loss of fertility in soil.</p> <p>12.6.1.5 Explain methods of improving and retaining soil fertility.</p> <p>12.6.1.6 Determine the distribution of earth worms in different types of soils</p>	<ul style="list-style-type: none"> <li>• Soil composition: Air, micro-organism, soil particles, humus</li> <li>• Types and Properties of soil: types; Clay, Loam and sand soils</li> <li>• Factors that make soil fertile: Air, micro organisms, moisture, mineral elements, organic matter, pH</li> <li>• Causes of loss of fertility in soil: Deforestation, poor farming methods, late burning, overgrazing, leaching, harvesting</li> <li>• Methods of improving and retaining soil fertility: Suitable pH, weeding, application of fertiliser, crop rotation, conservation farming</li> <li>• Distribution of earth worms: Refer to sand, loam, clay of different acidity, alkalinity, moisture or water and plant population</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Observing</b> the composition of soil using a soil sample</li> <li>• <b>Classifying</b> the types of soils and their properties.</li> <li>• <b>Communicating</b> factors that make soil fertile.</li> <li>• <b>Investigating</b> causes of loss of fertility in soil.</li> <li>• <b>Communicating</b> methods of improving and retaining soil fertility</li> <li>• <b>Investigating</b> the distribution of earth worms in different types of soils</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> soil composition</li> <li>• <b>Appreciating</b> different types of soil</li> <li>• <b>Cooperating</b> in group activities</li> <li>• <b>Being</b> aware of factors that make soil fertile</li> <li>• <b>Asking</b> questions in order to identify causes of soil fertility</li> <li>• <b>Developing curiosity</b> in the distribution of earth worms in different types of soils</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
12.7 Ecology	12.7.1 Biotic and abiotic interactions.	12.7.1.1 Explain the term ecology.  12.7.1.2 Explain the terms used in ecology	<ul style="list-style-type: none"> <li>Ecology: Interaction of organisms with their environment</li> <li>Ecological terms: Habitat, niche, population, community (Refer to specialisation and adaptation to a specific habitat)</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> the term ecology</li> <li><b>Communicating</b> terms used in ecology</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> interaction of organisms with their environment</li> <li><b>Asking</b> questions in order to understand terms used in ecology</li> </ul>
	12.7.2 Feeding relationships and energy flow	12.7.2.1 Design a food chain.  12.7.2.2 Design a food web.  12.7.2.3 Describe the way energy flows along food chains and food webs.  12.7.2.4 Describe the efficiency of energy transfer between trophic levels.  12.7.2.5 Construct pyramids of numbers, bio-mass and energy	<ul style="list-style-type: none"> <li>Food Chain: Producer, Consumer and Decomposer.</li> <li>Food web (Relate the food chain to development of a food web).</li> <li>Energy flow: Refer to ultimate source of energy as being sunlight; non-cyclical nature of energy flow.</li> <li>Efficiency of energy transfer between trophic levels (Refer to 90% loss of energy at each level).</li> <li>Pyramids of numbers, bio-mass and energy (Refer to diagrammatic representation)</li> </ul>	<ul style="list-style-type: none"> <li><b>Designing</b> a food chain</li> <li><b>Formulating</b> a model of food web</li> <li><b>Designing</b> the way energy flows along trophic levels</li> <li><b>Analysing</b> the efficiency of energy transfer between trophic levels</li> <li><b>Constructing</b> pyramids of numbers, biomass and energy</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> linear and webbed feeding relationships</li> <li><b>Appreciating</b> flow and efficiency of energy</li> <li><b>Developing curiosity</b> about pyramids of numbers, bio-mass and energy</li> <li><b>Participating</b> in group activity</li> <li><b>Giving</b> presentation</li> <li><b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	12.7.3 Population	<p>12.7.3.1 Explain the term population.</p> <p>12.7.3.2 Investigate factors that cause change in population size.</p> <p>12.7.3.3 Interpret population data.</p>	<ul style="list-style-type: none"> <li>Population: Refer to different species in a community.</li> <li>Change in population size: Refer to natural disasters, disease, immigration, emigration, and wars.</li> <li>Refer to graphs, histograms, tables and pie charts</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> the term population</li> <li><b>Investigating</b> factors that cause change in population size</li> <li><b>Collecting</b> population data</li> <li><b>Interpreting</b> population data</li> </ul>	<ul style="list-style-type: none"> <li><b>Being</b> aware of population, factors that cause change in population size</li> <li><b>Appreciating</b> population data.</li> </ul>
	12.7.4 Carbon and nitrogen, Water cycles	<p>12.7.4.1 Describe how carbon and nitrogen are cycled within an ecosystem.</p> <p>12.7.4.2 Describe what the water cycle is.</p>	<ul style="list-style-type: none"> <li>Carbon and nitrogen cycles: Include the roles of micro-organisms</li> <li>Water cycle (Relate to human and environmental factors)</li> </ul>	<ul style="list-style-type: none"> <li><b>Communicating</b> how carbon and nitrogen are cycled</li> <li><b>Collecting</b> the data on water cycle</li> <li><b>Formulating</b> the cycle of water in environment</li> </ul>	<ul style="list-style-type: none"> <li><b>Appreciating</b> the water cycle</li> <li><b>Participating</b> in group discussion</li> <li><b>Giving</b> presentation</li> <li><b>Listening</b> to others with respect</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
	12.7.5 Ecosystem	<p>12.7.5.1 Investigate key features of an ecosystem.</p> <p>12.7.5.2 Explain the effects of Agriculture on an ecosystem.</p> <p>12.7.5.3 Describe the effects of deforestation on soil stability and climate.</p>	<ul style="list-style-type: none"> <li>• Features of an ecosystem: Community and Non-living part of environment (Use a pond as an example).</li> <li>• Effects of agriculture on ecosystem: Refer to water, soil and air pollution.</li> <li>• Effects of deforestation: Soil erosion, global warming.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> key features of an ecosystem</li> <li>• <b>Communicating</b> the effects of Agriculture on an ecosystem.</li> <li>• <b>Analysing</b> effects of deforestation on soil stability and climate</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of effects of agriculture on an ecosystem</li> <li>• <b>Being</b> aware of effects of deforestation on soil stability and climate</li> <li>• <b>Participating</b> in group discussion</li> <li>• <b>Giving</b> presentation</li> <li>• <b>Listening</b> to others with respect</li> </ul>
	12.7.6 Pollution	<p>12.7.6.1 Describe the undesirable effects of pollution.</p> <p>12.7.6.2 Determine measures to prevent pollution.</p>	<ul style="list-style-type: none"> <li>• Undesirable effects of pollution on water, air and land</li> <li>• Measures to prevent pollution: Refer to waste management. Use of filters in chimneys. Include the conversion of sulphur dioxide to sulphuric acid by passing it through a tank of water</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Analysing</b> undesirable effects of pollution on our life</li> <li>• <b>Communicating</b> measures to prevent pollution</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Caring</b> for the environment by understanding the undesirable effects of pollution</li> <li>• <b>Applying</b> preventive measures of pollution to daily life</li> </ul>
	12.7.7 Conservation	<p>12.7.7.1 Identify the importance of conserving plant and animal species.</p> <p>12.7.7.2 Explain how to reuse, reduce and recycle materials.</p>	<ul style="list-style-type: none"> <li>• Importance of conserving plant and animal species (Refer to endangered species)</li> <li>• 3Rs: Reduce, Reuse, Recycle</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Communicating</b> the importance of conserving plant and animal species</li> <li>• <b>Investigating</b> the ways of 3Rs</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Being</b> aware of the importance of conserving plant and animal species</li> <li>• <b>Applying</b> the idea of 3Rs to daily life</li> </ul>

TOPIC	SUB-TOPIC	SPECIFIC OUTCOMES	CONTENT		
			Knowledge	Skills	Values
		12.7.7.3 Investigate the importance of sustainable use of resources	<ul style="list-style-type: none"> <li>• Sustainable use of resources: Avoid deforestation, over fishing, over hunting; encourage game keeping</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> the importance of sustainable use of resources</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Caring</b> for the sustainable use of resources</li> </ul>
	12.7. 8 Bio-diversity	<p>12.7.8.1 Investigate diversity of organisms in a given locality.</p> <p>12.7.8.2 Investigate the importance of diversity of organisms in given locality</p> <p>12.7.8.3 Explain how some organisms are adapted to the environment</p> <p>12.7.8.4 Investigate the impact of human activity on organisms</p> <p>12.7.8.5 Describe the economic reasons for maintaining bio-diversity.</p>	<ul style="list-style-type: none"> <li>• Bio-diversity: Refer to school grounds, a pond or nearby wetland organic reserves.</li> <li>• Importance of biological diversity: Refer to equilibrium of organisms in the ecosystem</li> <li>• Adaptations of organisms: Refer to adaptive characteristics of fish, insects, mammals and plants.</li> <li>• Impact of human activities on organisms: Refer to hunting, fishing, and charcoal production. Also refer to the threatened extinction of the African elephant.</li> <li>• Maintaining biodiversity: Refer to tourism, medicinal plants and animal, source of food.</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Investigating</b> diversity of organisms in a given locality</li> <li>• <b>Communicating</b> importance of organisms in a given locality</li> <li>• <b>Observing</b> adaptive characteristics of organisms in an environment</li> <li>• <b>Investigating</b> the impact of human activity on organisms</li> <li>• <b>Communicating</b> economic reasons for maintaining bio diversity</li> </ul>	<ul style="list-style-type: none"> <li>• <b>Appreciating</b> different species of organisms in a given locality</li> <li>• <b>Developing curiosity</b> in the adaptation of organisms in the environment</li> <li>• <b>Conserving</b> organisms for future generations</li> <li>• <b>Appreciating</b> economic importance of maintaining biodiversity</li> <li>• <b>Applying</b> the idea of bio-diversity to daily life</li> </ul>

## APPENDIX I - SCOPE and SEQUENCE

The following table shows the “Scope and Sequence” of Biology syllabus from G10 to G12.

Grade 10		Grade 11		Grade 12	
UNIT/ TOPIC	SUB-TOPIC	UNIT/ TOPIC	SUB-TOPIC	UNIT/ TOPIC	SUB-TOPIC
1.0: Living Organisms and life processes	10.1.2 Characteristics of living organisms	1.0: Transport and storage in Plants	11.1.1 Transport in plants	1.0: Asexual reproduction	12.1.1 Reproduction in fungi, amoeba and bacteria
2.0: Cells	10.2.1 Microscopes	2.0 Transport in Human	11.2.1 Blood		2.0: Sexual Reproduction in Flowering Plants
	10.2.2 Cell Structure and Function		11.2.2 Blood Groups	12.2.1 Reproduction in plants	
	10.2.3 Cell Organisation		11.2.3 Blood disorders		
	10.2.4 Tissues		11.2.4 The heart	3.0: Reproduction in Animals	12.3.1 Sexual reproduction in animals
	10.2.5 Organs		11.2.5 Lymphatic system		12.3.2 Birth Control
	10.2.6 Diffusion, Osmosis and Active transport		11.2.6 Circulatory systems	4.0: Genetics	12.4.1 Variation in plant and animal species
3.0: Enzymes	10.3.1 Characteristics of enzymes	3.0: Excretion	11.3.1 Excretion	5.0: Classification of Plants and Animals	12.4.2 Cell division and Chromosomes
4.0: Nutrients	10.4.1 Classes of nutrients		11.3.2 The kidney		12.4.3 Inheritance
	10.4.2 Disorders		11.3.3 The lungs		12.4.4 Mutation
	10.4.3 Dietary needs		11.3.4 The human skin		12.5.1 Classification

Grade 10		Grade 11		Grade 12	
UNIT/ TOPIC	SUB-TOPIC	UNIT/ TOPIC	SUB-TOPIC	UNIT/ TOPIC	SUB-TOPIC
	10.4.4 Plant Nutrients	4.0: Homeostasis	11.4.1 Homeostasis	6.0: The Soil	12.6.1 Soil Composition and fertility
5.0: Nutrients in Plants	10.5.1 External and internal structure of a leaf	5.0: The Endocrine system	11.5.1 Hormones	7.0: Ecology	12.7.1 Biotic and abiotic interactions
6.0: Saprophytic nutrition	10.6.1 Rhizopus	6.0: The Nervous system and Sense organs	11.6.1 The nervous system		12.7.2 Feeding relationships and energy flow
7.0: Nutrition in animals	10.7.1 Dentition in mammals		11.6.2 Sense organs		12.7.3 Population
	10.7.2 Holozoic nutrition	7.0: The Skeleton and locomotion	11.7.1 Skeleton		12.7.4 Carbon and nitrogen, Water cycles
8.0: Respiration	10.8.1 Gaseous exchange		11.7.2 The skeleton of an insect		12.7.5 Ecosystem
	10.8.2 Types of Respiration		11.7.3 The mammalian skeleton		12.7.6 Pollution
9.0: Health	10.9.1 Diseases		11.7.4 Muscles and joints		12.7.7 Conservation
	10.9.2 HIV and AIDS	8.0: Tropic and Toxic responses	11.8.1 Tropic responses		12.7.8 Bio-diversity
	10.9.3 Immunity		11.8.2 Toxic Responses		
	10.9.4 The life cycle of the housefly and the mosquito	9.0: Growth and development	11.9.1 Growth in Plants		
			11.9.2 Germination and development		