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PROVINCE OF KWAZULU-NATAL
DEPARTMENT OF EDUCATION

STEP-AHEAD SUPPORT DOCUMENT

LESSON PLANS

GRADE 10

LIFE SCIENCES

JANUARY 2021

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PREFACE

This support documents serves to assist Life Sciences teachers and learners on how to deal with curriculum gaps and learning losses as a result of the impact of COVID 19 in 20202. It also captures the challenging topics in the Grade 10 work. The lesson plans should be used in conjunction with the 2021 Recovery Annual Teaching Plan. Activities should serve as a guide on how to assess topics dealt with in this document. It will cover the following:

Term	Page
Term 1	2 - 9
Term 2	10 - 23
Term 3	24 - 31
Term 4	32 - 35

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TERM 1

GRADE 10			
TOPIC : Orientation of Life Sciences			
TERM	1	**WEEK**	**1**
DURATION	2 hours	**WEIGHTING**	0%
SUB-TOPICS	Skills on drawings, and diagrams, graphs and investigations		
RELATED CONCEPTS/ TERMS/VOCABULARY	Aim, hypothesis, apparatus, method, validity, reliability, dependent and independent variables		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Graphs and scientific investigations learnt in Gr. 8 and 9 Maths and Natural Sciences

RESOURCES

Textbook, Previous Question Papers, charts, Grade 10 Life Sciences Exam Guideline, Worksheets

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- dependent and independent variables
- hypothesis formulation
- validity and reliability

METHODOLOGY

LESSON 1

Establish links between Natural Sciences (GET) and Life Sciences (FET), define life, its scope and its continuity.

- Explain safety Procedures in the laboratory
- Mention different types of Assessments as Formal/Informal
- Describe the skills on drawings and diagrams
- Describe different types of graphs
  - ✓ Line graph
  - ✓ Pie charts

LESSON 2

- Describe different types of graphs
  - ✓ Bar graph
  - ✓ Histogram
- Explain scientific investigation skills including:
  - ✓ Aim, hypothesis, variables, validity, reliability apparatus, method, results, conclusion,

ACTIVITIES / ASSESSMENT

- Draw a labelled diagram of a plant cell
- Draw graphs using tables
- Identify dependent and the independent variables from the given investigation
- State how to ensure / improve reliability and validity from the given investigation

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SUMMARY

Drawings and diagrams

- Biological drawings: use sharp pencil, caption, draw to be half a page label line without arrows, label lines never cross each other, labels to be done in ink,

Graphs

- Heading must have both variables, proper scale with units using correct multiplies, X and Y- axes, plotting of independent on the X- axes and dependent variable on Y-axes. Types of graphs:
  - ✓ Bar graph: bars to be of same width, same space between the bars
  - ✓ Histogram: bars to be of same width, bars must touch each other
  - ✓ Line graph: plot all dots and join them with a ruler or free hand
  - ✓ Pie chart: calculation, use the protractor to plot correct angles of sectors for the pie chart

Scientific investigations

- ✓ Aim is the reason why the investigation is conducted
- ✓ Hypothesis is a statement that suggests or predicts an answer to the question

- Types of variables
  - ✓ Dependent variable is a factor that is influenced by the independent variable
  - ✓ Independent variable is a factor that is manipulated by the researcher to observe the effect on the dependent variable
- Conclusion is based on the aim and result

GRADE 10			
TOPIC : Chemistry of Life			
TERM	1	**WEEK**	**2**
DURATION	4 hours	**WEIGHTING**	23 marks (16%)
SUB-TOPICS	• Inorganic Compounds • Organic Compounds		
RELATED CONCEPTS/ TERMS/VOCABULARY	Atoms, Elements, Molecules, Compounds, carbohydrates, monomers, iodine solution		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 and 9 NS: Matter and Materials: atoms and elements			
RESOURCES			
Textbook, JIT document 2020, Previous Question Papers, charts, Grade 10 Life Sciences Exam Guideline			

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ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Confuse:
  - ✓ Atoms and elements
  - ✓ Elements and compounds
  - ✓ Inorganic and organic compounds
  - ✓ Molecules and compounds

METHODOLOGY

LESSON 1

- Differentiate between the following concepts with examples:
  - ✓ Elements and atoms, Organic and inorganic compounds, Molecules and compounds, atoms and elements, micro- and macro elements

LESSON 2

- State the functions of the following elements K, Ca, P, Fe, Na and I in plants and animals
- State the diseases caused by a deficiency of K, Ca, P, Fe, Na and I in plants and animals
- List the main functions of water as an example of an inorganic compound

LESSON 3

- List the elements that make up carbohydrates (C, H, and O only)
- Describe types of carbohydrates based on number on monosaccharides

LESSON 4 (Practical)

- Conduct food test for:
  - ✓ starch and
  - ✓ glucose using different food samples.

ACTIVITIES / ASSESSMENT

- State the functions and diseases associated with the various minerals
- Give the functions of water
- Describe how carbohydrates are classified
- Conduct starch test (Practical)

SUMMARY

- All inorganic compounds do not contain carbon e.g. water and minerals
- Functions of water
  - ✓ Required to break down large organic compounds into smaller substances during digestion
  - ✓ Used in chemical reactions
  - ✓ For food and mineral salts transportation
  - ✓ For removal of unwanted dissolved waste products
- Monosaccharides are monomers of all carbohydrates
- Carbohydrates are all made up of elements carbon, hydrogen and oxygen only
- Groups of carbohydrates
  - ✓ Monosaccharides: glucose and fructose
  - ✓ Disaccharides: maltose, fructose and sucrose
  - ✓ Polysaccharide: starch, cellulose and glycogen

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GRADE 10			
TOPIC : Chemistry of Life			
TERM	**1**	**WEEK**	**3**
DURATION	**4** hours	**WEIGHTING**	
SUB-TOPICS	• Organic compounds		
RELATED CONCEPTS/ TERMS/VOCABULARY	Lipids, Proteins, Enzymes, Nucleic acids, Lock and key theory		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Grade 8 NS: (Life and Living)

RESOURCES

Textbook, JIT document, Previous Question Papers, charts, Grade 10 Life Sciences Exam Guideline

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Confuse:
  - ✓ Elements found in different organic compounds
  - ✓ Substrate and the enzyme-substrate complex
  - ✓ Fatty acids and amino acids
  - ✓ Saturated fats and unsaturated fats

METHODOLOGY

LESSON 5
Lipids
- Describe the composition of lipids
- Differentiate between saturated and unsaturated fats
- Explain how high cholesterol in foods leads to heart diseases
- Conduct a food test for the presence of lipids.

LESSON 6
Proteins
- Describe the composition of proteins
- Conduct food test for protein.

LESSON 7
Enzymes
- Describe characteristics of enzymes
- Explain how enzymes work by means of Lock and key theory
- Explain the effects of temperature and pH on enzyme action using graphs
- Describe the use of enzymes in industry, e.g. washing powders

LESSON 8
Nucleic Acids and Vitamins
- List two types of nucleic acids are DNA and RNA
- Name the elements that make the nucleic acids
- State the essential vitamins
  - ✓ Vitamin A
  - ✓ Vitamin B
  - ✓ Vitamin C
  - ✓ Vitamin D
  - ✓ Vitamin E

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ACTIVITIES /ASSESSMENT

- Draw a table showing the colour changes on lipids and proteins.
- Interpret data based on the organic content of various food types.
- Describe characteristics of enzymes.
- Interpret graphs based on the effects of temperature and pH on enzyme action.
- Name types of nucleic acids
- List the essential vitamins

SUMMARY

- **Lipids** contain elements: C.H.O (may also contain other elements such as P)
- Monomers of lipids are Glycerol and fatty acids
- **Proteins** contain elements C, H, O, N
- Amino acids are monomers (building blocks) of proteins.
- **Enzymes:**
  - ✓ are protein in nature
  - ✓ are organic catalysts
  - ✓ break down/synthesize molecules
  - ✓ are sensitive to extremes of temperature and pH
- **Nucleic Acids and Vitamins**
  - ✓ Types of nucleic acids (DNA and RNA)
  - ✓ Composition (C, H, O, N, P)
  - ✓ Essential vitamins are: Vitamin A, Vitamin B, Vitamin C, Vitamin D and Vitamin E

GRADE 10			
TOPIC BASIC UNIT OF LIFE			
TERM	1	**WEEK**	4
DURATION	4 hours	**WEIGHTING**	25 MARKS (17%)
SUB-TOPICS	• Cell structure • Diffusion and Osmosis • Microscope		
RELATED CONCEPTS/ TERMS/VOCABULARY	Diffusion, Osmosis, active transport, chromatin network, fluid Mosaic model		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 9 NS: Cell and Body systems Grade 8 NS: Tissues and organs			
RESOURCES			
Charts, Grade 10 Life Sciences Exam Guideline, Textbooks, slides with micrographs			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
• Confuse: ✓ Diffusion and Osmosis ✓ Cell wall and Cell membrane ✓ Nucleus ad Nucleolus			

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METHODOLOGY

LESSON 1

- Define the cell as the basic unit of life
- State the location and function of each of the following organelles/structures in plant and animal cells:
  - ✓ Cell wall
  - ✓ Cell membrane
  - ✓ Nucleus
  - ✓ Cytoplasm
  - ✓ Mitochondria
  - ✓ Ribosomes
  - ✓ Endoplasmic reticulum

LESSON 2

- State the location and function of each of the following organelles/structures in plant and animal cells:
  - ✓ Golgi body
  - ✓ Plastids
  - ✓ Vacuole, lysosomes, vesicles
- Compare differences between plant and animal cell

LESSON 3

Practical

- Prepare wet mount of onions cells and view them under light microscope

LESSON 4

- Define the terms:
  - ✓ Diffusion
  - ✓ Osmosis
- Differentiate between passive and active transport
- Conduct investigations to demonstrate the processes of:
  - ✓ Diffusion
  - ✓ Osmosis

ACTIVITIES / ASSESSMENT

- State the functions of the various cell components
- Make labelled drawings of selected cell organelles
- Tabulate differences between plant and animal cells
- Differentiate between diffusion and osmosis
- Define passive and active transport

SUMMARY

- Cell is the basic unit of life
- Cell wall is made up of cellulose and is found in plant cells only
- Cell membrane is the semi-permeable membrane – selective and allowing certain substances to pass through
- Nucleus control all activities of a cell
- Cytoplasm – jelly like material that makes much of a cell inside the cell membrane compose of water, salt and proteins

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- Mitochondria- site for cellular respiration
- Ribosomes – site for protein synthesis
- Plastids- responsible for production and storage of food and pigments
- Endoplasmic reticulum- (rough and smooth) for transport systems
- Golgi bodies- responsible for assemble secretion

GRADE 10			
TOPIC: Basic unit of life			
TERM	1	**WEEK**	5
DURATION	4 hours	**WEIGHTING**	18 marks (12%)
SUB-TOPICS	• Cell division - Mitosis		
RELATED CONCEPTS/ TERMS/VOCABULARY	Mitosis, cytokinesis, interphase, prophase, metaphase, anaphase, telophase, chromosomes, chromatids, centromere, centrosome		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

- Cell wall, cell membrane and structure of the nucleus

RESOURCES

Models of mitosis, Microscope slides, Micrographs, Posters, Exam guidelines, JIT document, Textbooks

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Confuse:
  - ✓ Centrosome, centromere and centriole
  - ✓ Chromosomes and chromatids

METHODOLOGY

LESSON 5

- Define mitosis
- Describe the cell cycle as including interphase, mitosis, cytokinesis and growth
- Describe the significance of interphase as doubling of genetic material so that it can be shared equally by the new cells formed during mitosis

LESSON 6

- Describe the following phases of mitosis using diagrams:
  - ✓ Prophase
  - ✓ Metaphase
  - ✓ Anaphase
  - ✓ Telophase

LESSON 7

- Compare telophase in plant and animal cells
- Examine mitosis using available resources (microscope slides, Micrographs and posters).
- Explain the role of mitosis in respect of growth, repair, replacement and reproduction in some simple organisms
- Briefly describe cancer

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ACTIVITIES / ASSESSMENT
• Describe the events of the various phases of mitosis • Make a labelled drawing of selected phases of mitosis • Interpret the phases and events of mitosis from given diagrams • Describe the causes and treatment of cancer • State the functions of the various cell components • Make labelled drawings of selected cell organelles • Tabulate differences between plant and animal cells
SUMMARY
• Mitosis is the cell division that occurs on the body cell that help to produce two genetically identical daughter cells • Mitosis helps to repair, replace and for growth of a cell • Takes place in somatic (body) cells • The different phases are: ✓ Interphase ✓ Prophase ✓ Metaphase ✓ Anaphase ✓ Telophase • Cancer is an uncontrolled division of the cells

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TERM 2

TOPIC: ANIMAL TISSUES			
TERM	2	**WEEK**	1
DURATION	4 Hours	**WEIGHTING**	25 Marks (16.67)%
SUB-TOPICS	Epithelial Tissues, Connective Tissues, Muscle Tissues, Nerve Tissues, Biotechnology, Stem Cells and Cloning, and Tissue Disorders.		
RELATED CONCEPTS/ TERMS/VOCABULARY	Epithelial tissue (squamous/columnar/ciliated/cuboidal) Connective tissue (areolar/cartilage/bone/blood) Muscle (voluntary/involuntary/cardiac) Nerve tissue (sensory/motor/inter-neuron) Biotechnology (Tissue Culture/Western/Traditional Medicine and Medicinal Plants & CAM), Stem cells and Cloning Tissue Disorders (Alzheimer, Osteoporosis, Cancer)		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Structure and different organs in animals (human body), Cell division (mitosis). Cell differentiation, Organisation of living organisms (cells- tissues- organ- systems- organisms).

RESOURCES

Textbook, Grade 10 Life Sciences Guidelines, Light microscope, Micrographs, Microscopic slides, Bio-viewer, chart, Previous papers, African potato, Tablets in 2 containers.

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Toleration of each other's religion/beliefs/Socialisation. Undermining indigenous knowledge, Differentiation between different cartilages

METHODOLOGY

Inclusive teaching and learning.
Demonstration
Observation
Pair work

LESSON 1: EPITHELIAL AND CONNECTIVE TISSUES

- Explain to learners that tissues are group of similar cells performing similar functions
- Use a comparative table to outline structure in relation to function.
- Explain the structure, location and functions of epithelial tissues (squamous, columnar, ciliated, and cuboidal)
- Explain the structure, location and functions of connective tissues.

(Bones, cartilage, ligaments, tendons and blood)

LESSON 2: MUSCLE AND NERVE TISSUES

- Give learners example of muscle tissues
  - ✓ Striated (Voluntary Muscles or Skeletal Muscle)
  - ✓ Cardiac (Heart Muscles)
  - ✓ Smooth (Involuntary Muscles)
- Explain the structure, location and functions of muscle tissues.
- Explain the structure, location and functions of the nerve tissues.

(Focus on three types of nerve cells (neurons), motor, sensory, and the interneuron).

LESSON 3: BIOTECHNOLOGY – TRADITITIONAL AND WESTERN MEDICINE

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- Explain to learners that they should respect and understand other people's views, respect the religions of others, other person's beliefs, personal viewpoints, opinions, socially accepted scientific facts, values and ethics.
- Ethics and legislation help to protect human rights and the rights of living organisms, informed consent and the overall good for all people.
- Differences in the approach to traditional and medical biotechnology.
- Explain the following, while learners use their text books
  - ✓ Herbal remedies: plant products that are treated and packaged. They may be purified and undergone some scientific testing.
  - ✓ Medicinal plants: used in many ways, usually in unpurified forms, by traditional healers. They have not been scientifically proven.
  - ✓ Pharmaceuticals: medicines that are manufactured from different chemicals in factories. They have all been scientifically tested. E.g. Antiretroviral drugs.
- Explain the use of African potato and Devils claw by the traditional healers.
- Explain to learners that medical biotechnology focus on:
  - ✓ Immunity (white blood cells)
  - ✓ Antibiotics
  - ✓ Vaccine
  - ✓ HIV and the use of Anti-retroviral

Blood transfusion(blood types, donors, recipient)

LESSON 4: STEM CELLS AND CLONING

- Explain to learners what is cloning.
- Explain to learners the advantages of tissue culture
- Explain animal cloning to learners.
- (Use diagrams to explain how Dolly the sheep was cloned)
- Explain stem cells to the learners.
- (Embryonic tissue cells that can produce more of themselves and differentiate into a variety of specialized cells)

Explain where stem cells can be harvested.

ACTIVITIES/ ASSESSMENT

Hands on Practical:

Resources: Microscope, Prepared Slides, Micrographs of Blood Samples, long bone

Focus on

- Identification of tissues
- Tabulate differences of the four examples of epithelial tissues, focusing on the following:
  - ✓ Structure
  - ✓ Location
  - ✓ Function
- Draw an annotated diagram of a Long Bone
- Tabulate differences in structure of smooth and cardiac muscle. **NB**: Use rubric to assess learner's response (table).
- Tabulate differences in structure of smooth, striated and cardiac muscle.
- Explain what makes the nerve cells suitable for transmitting messages.
- Draw labelled diagrams of sensory neuron and motor neuron
- Define the following terms: Legislation, stem cells, Biotechnology, vaccine and ethics.
- Ask learners to observe African potato and different tablets in two different containers, as groups.

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- Allow learners to identify the items and state their use
- Name 4 blood groups
- Explain what immunity is.
- Describe the role of white blood cells, antibiotics and antibodies and antigens.
- Do an investigation on biotechnology utilizing ONE of animal tissues e.g. cloning, stem-cell research? Summarise your findings on a poster.

SUMMARY

- Tissue are groups of cells with a common structure and function. Different types of tissue have different structures that are especially suited to their functions.
- 4 types of tissues: epithelial tissue connective tissue/supporting tissue (including blood) muscular tissue nervous tissue
- Biotechnology: Traditional and Western Medicines
- Achievements of modern medicine and discuss the underlying ethical issues these new treatments and technologies present: Immunity and vaccines, Antibiotics, Blood transfusions, Cloning & Stem cell research

GRADE 10			
TOPIC: Plant tissues			
TERM	1	**WEEK**	2
DURATION	4 HOURS	**WEIGHTING**	20 MARKS (13%)
SUB-TOPICS	• Plant tissues, Structure and Functions		
RELATED CONCEPTS/ TERMS/VOCABULARY	Tissue, Cell differentiation, Organ and System		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

- Cell structure from Natural Science Grade 9

RESOURCES

Exam guideline, Microscope, Bio-Strips, Micrographs, Posters

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Unable to differentiate between collenchyma and chlorenchyma
Identification of tissues based on thickness of cell walls

METHODOLOGY

LESSON 1

- Define tissue as a group of similar cells adapted for a particular function
- Define Cell differentiation.
- Define an organ and a system
- Use the comparative table to outline the location, appearance (diagram), structure and functions of plant tissues:
  - ✓ Meristematic tissue
  - ✓ Permanent Tissue
  - ✓ Upper Epidermis

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LESSON 2

- Zoom into complex tissues
- Draw, label and state functions of each of the following:
  - ✓ Lower epidermis in the leaf
  - ✓ Guard cell and stomata
  - ✓ Root hair

LESSON 3

- Use the comparative table to outline the location, appearance (diagram), structure and functions of plant tissues:
  - ✓ Parenchyma
  - ✓ Collenchyma
  - ✓ Sclerenchyma
  - ✓ Chlorenchyma

LESSON 4

- Use the comparative table to outline the location, appearance (diagram), structure and functions of plant tissues
  - ✓ Xylem: Tracheid and Vessels
  - ✓ Phloem: Companion cells and Sieve tubes
- Examine and identify plant tissues using microscope, bio-strips, micrographs or posters
- Draw cells that make-up these tissues to show specialised structures

ACTIVITIES / ASSESSMENT

- Observe tissues from prepared slides or micrographs
- Tabulate to outline the location, appearance (diagram), structure and functions of plant tissues

SUMMARY

- Tissues is a group of similar cell adapted for particular function
- Different types of plant tissues are:
  - ✓ Parenchyma
  - ✓ Collenchyma
  - ✓ Sclerenchyma
  - ✓ Xylem
  - ✓ Phloem

TOPIC: Plant organs			
TERM	2	**WEEK**	4
DURATION	4 Hours	**WEIGHTING**	5 marks (3%)
SUB-TOPICS	**Organs: Leaf structure**		
RELATED CONCEPTS/ TERMS/VOCABULARY	• Photosynthesis • Gaseous exchange • Plant tissues		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 9: Photosynthesis, Grade 10: Plant tissues			
RESOURCES			
Textbooks Charts, Microscopes, Micrographs/bioviewers			

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ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Cannot distinguish between the upper epidermis and lower epidermis, cannot state functional differences between spongy mesophyll and palisade mesophyll. Chloroplast and chlorophyll is usually taken as the same thing

METHODOLOGY

LESSON 1

- Explain to learners that an organ is a group of different tissues, each of which performs its own function, but also performs a common function as a group. The structure of a dicotyledonous leaf will be used as an example.
- Explain to learners the internal structure of a leaf. Use diagrams to explain internal structures of a leaf in relation to their functions. Focus on the following
  - ✓ Cuticle-Prevents the loss of water
  - ✓ Epidermis- Protect the underlying tissues/thin layer for fast absorption of radiant energy
  - ✓ Palisade- Elongated with more chloroplast, maximum absorption of radiant energy for photosynthesis.
  - ✓ Spongy cells- with air spaces to allow diffusion of molecules/ water and organic food from one cell to another.
  - ✓ Xylem- Transport water and mineral salts from the roots to various parts.
  - ✓ Phloem- transport food molecules from leaves to various parts
  - ✓ Lower epidermis- consist of special cells (guard cells) for gaseous exchange and regulation of water (transpiration)

LESSON 2

- Provide learners with one stem with leaves of angiosperm familiar to learners within that community e.g. peach stem).
- Explain to learners by means of a drawing, the external structure of leaves:
  - ✓ Apex -Leaf blade -Base -Leaf margin -Petiole -Midrib –Buds
- Explaining the following functions of a leaf: Photosynthesis, Transpiration

- **LESSON 3**
- Provide each learner with a labelled drawing of the internal structure of the leaf and the unlabelled micrograph of the internal structure of the leaf.
- Instruct learners to label the micrograph.
- Explain to learners that plants undergo photosynthesis, CO_2 is needed during the day and oxygen is released.
- Explain the structure of the guard cells with the stomata.
- During which environmental conditions do they think the stomata will open and close? (Sunny days, they open and cloudy days, no sun, they close).

- **LESSON 4**
- Explain how mesophyll cells are responsible for photosynthesis (focus on the concentration of the chloroplast in the palisade and the spongy cells).
- Explain how CO_2 and oxygen diffuse from the stomata pores to the surrounding tissues or from the surrounding tissues to the outside. Focus should be on the intercellular air spaces between the spongy cells.
- Explain how starch and water are transported from one cell to the other. Use the model of for learners to easily identify the parts. Focus should be on the conductive tissues (xylem and phloem).

ACTIVITIES/ assessment

- Draw a labelled cross section of a dicot leaf and give its functions

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- Provide the correct biological terms of thus chapter
- Describe structural suitability of a leaf in performing the following functions
  - ✓ Gaseous exchange
  - ✓ Photosynthesis

Summary

- Structural adaptations of tissue for its functions
- Epidermal cells are transparent to allow sunlight to enter the leaf for photosynthesis
  Epidermal cells are closely packed to protect underlying cells
- Epidermal cells in stems and leaves covered by cuticle to reduce water loss
- Presence of guard cells with stomata to allow for gaseous exchange
- Guard cells have chloroplasts for photosynthesis

TOPIC : SUPPORT AND TRANSPORT SYSTEM IN PLANTS			
TERM	2	**WEEK**	5
DURATION	4 Hours	**WEIGHTING**	25 marks (17%)
SUB-TOPICS	TRANSPIRATION		
RELATED CONCEPTS/ TERMS/VOCABULARY	Transpiration, Potometer, Evaporation, Humidity, Water potential, Light intensity, Plasmolysis, Wilting, Guttation, Temperature.		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Osmosis, Diffusion, Plant tissues and leaf structure

RESOURCES:

Microscope, Wall charts, Simple potometer, exam guidelines, JIT Document

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Confuses the three forces involved in transpiration: pull, cohesion and adhesion
Cannot distinguish between wilting and guttation
Experimental precautions

METHODOLOGY

LESSON 1

- Describe the internal factors affecting the rate of transpiration / structural suitability of a leaf in reducing the rate of transpiration
  - ✓ Size and shape of a leaf
  - ✓ Leaf arrangement.
  - ✓ Number and location of stomata
  - ✓ Presence of hairs
  - ✓ Presence of thickened cuticle

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LESSON 2

- Describe the external/ environmental factors affecting the rate of transpiration (accompanied by graphs)
  - ✓ Temperature
  - ✓ Humidity
  - ✓ Light intensity
  - ✓ Wind

LESSSON 3

- Introduction of Biological terms / description of terms :
  - ✓ Transpiration
  - ✓ Potometer
  - ✓ Xerophytes
  - ✓ Hydrophytes
  - ✓ Mesophytes
  - ✓ Plasmolysis
  - ✓ Wilting

PRACTICAL

Aim to show the path of movement of water using red dye (eosinophil)

LESSON 4

PRACTICAL

- Describe the planning steps before the investigation
- Describe the planning steps during the investigation
  - ✓ Formulate the aim and hypothesis
  - ✓ Identify variables
  - ✓ How to increase reliability
  - ✓ How to increase validity
- Design and conduct an investigation to discover the effect of:
  - ✓ Temperature
  - ✓ Light intensity,
  - ✓ Humidity.
- Record and analyze the results
  - ✓ Draw graphs

- Describe the structural suitability of a leaf in reducing the rate of transpiration.
- Interpret graphs and explain the effect of temperature, light intensity, wind and human and humidity on the rate of transpiration.
- Draw line graphs on effect of any one environmental factor on the rate of transpiration
- Give the correct biological terms for each of the following:

  (Cut out the cards with the following terms and give to learners to put each term next to the correct description below. Transpiration, Potomoter, Xerophytes, Hydrophytes, Mesophytes, Plasmolysis, Wilting, Guttation)
  - ✓ Evaporation of water from the leaves of plants
  - ✓ An instrument that is used to measure the rate of transpiration
  - ✓ Plants adapted to live in dry and arid conditions.
  - ✓ Plants adapted to living completely or partially under water
  - ✓ Plants neither adapted to living in dry or wet environments.
  - ✓ The pulling away of the cell membrane from the cell wall due to loss of water
  - ✓ Limping and drooping of non-woody plants as a result of water loss
- The appearance of drops of xylem sap on the edges of leaves of plants

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SUMMARY

- Describe the internal factors affecting the rate of transpiration / structural suitability of a leaf in reducing the rate of photosynthesis.
- Describe the external / environmental factors affecting the rate of transpiration (accompanied by graphs)
- Description of biological terms
- Design and conduct an investigation to discover the effect of Temperature, Light intensity, Humidity.

TOPIC: SUPPORT AND TRANSPORT IN PLANTS			
TERM	2	**WEEK**	6
DURATION	4 Hours	**WEIGHTING**	
SUB-TOPICS	Uptake of water and minerals into the xylem in roots		
RELATED CONCEPTS/ TERMS/VOCABULARY	Osmosis, Diffusion, Active transport, Tissues		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Plant tissues, organelles, movement across membranes

RESOURCES

Wall charts, light microscope. micrographs, microscope slides, bioviewers, biostrips
Draft Exam Guideline, JIT Document

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Learners confuse Diffusion with osmosis and active transport

METHODOLOGY

LESSON 1

Introduction

- Revise plant tissues, organelles and movement of substances across membranes
- Describe the absorption of water by root hairs, using wall charts, micrographs/slides show a detailed diagram of a cross section of a dicotyledonous root.
- Conduct an investigation that demonstrate the tissue responsible for upward transport of water in plants.

LESSON 2

The stem

- Describe the upward movement of water:
  - ✓ Root pressure(guttation)
  - ✓ Capillarity
  - ✓ Transpiration

LESSON 3

- Describe the upward movement of water:
  - ✓ Transpiration pull

LESSON 4

- Describe transport of manufactured food

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ACTIVITIES/ASSESSMENT

- Provide names and functions of various labelled parts in a section through the roots & stem
- Describe movement of water from the soil → roots → stem → leaves
- State TWO types of cells making up phloem and give their functions.

SUMMARY

- Xylem transport water and mineral salts from the roots to other parts of the plants
- Diffusion is the movement of substances from high concentration to lower concentration.
- Osmosis is the movement of water from the dilute solution/high water potential to concentrated solution/low water potential through a semi permeable membrane.
- Guttation loss of water by plant in the form of droplets.
- Capillarity refer to the ability of water to spontaneously rise up very narrow tubes.
- Transpiration refer to the loss of water by plants in the form of water vapour through stomata
- Transpiration pull is force responsible for upward movement of water against to gravity.
- Phloem transport manufactured food from the leaves to other plants of the plants.

TOPIC: Support in Animals

TERM	2	**WEEK**	7
DURATION	4 hours	**WEIGHTING**	17
SUB-TOPICS	Axial skeleton, Appendicular skeleton		
RELATED CONCEPTS/ TERMS/VOCABULARY	Skeleton, foramen magnum		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Revise musculoskeletal system from grade 8 and Animal tissues from grade 10

RESOURCES

Photograph/ model of human skeleton, Long bone, power points, textbook, past exam papers

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Not able to differentiate between axial and Appendicular skeleton
- Confusing Long bone with upper limb
- Not able to label upper limb and lower limb

METHODOLOGY

LESSON 1

- Demonstrate human skeleton and State that the human skeleton is divided into the axial and Appendicular skeleton.
- Describe and demonstrate/show axial skeleton such as facial bones, Cranium, foramen magnum, palate, jaws and their functions.
- Also show/demonstrate Appendicular skeleton such as pectoral girdle, pelvic girdle upper limb and lower limb and their functions.

LESSON 2

- Identify the various regions and bones that make up the pectoral girdle and upper limbs using the model/photograph.
- Draw and label the pectoral girdle and upper limbs.

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LESSON 3

- Identify the various regions and bones that make up the pelvic girdle using the model/photograph
- Draw and label the pelvic girdle

LESSON 4

- Identify the various regions and bones that make up the lower limbs using the model/photograph
- Draw and label the lower limbs

ACTIVITIES/ ASSESSMENT

- Use the worksheet provided to identify Axial and Appendicular skeleton
- And also state their functions
- Draw and label the pectoral girdle and upper limb
- Draw and label the pelvic girdle
- Draw and label the long bone

SUMMARY

- Axial skeleton consisting of facial bones, cranium, foramen magnum, palate and Jaws
- Appendicular skeleton consisting pectoral girdle, upper limbs, pelvic girdle and lower limbs

TOPIC : TRANSPORT IN MAMMALS			
TERM	2	**WEEK**	8
DURATION	4 DAYS	**WEIGHTING**	20 MARKS (20%)
SUB-TOPICS	**BLOOD CIRCULATION**: Double Circulation, Cardiac Cycle		
RELATED CONCEPTS/ TERMS/VOCABULARY	Diastole, systole, oxygenated blood, deoxygenated blood, cardiac muscles, atria, ventricles, tricuspid, bicuspid, semi-lunar valve, pericardium, Septum, Blood vessels		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Internal and external structure of the heart, Blood vessels, blood composition, pulmonary system, location and positon of the heart, size of the heart, functions of the hear

RESOURCES

Model of the human heart, fresh heart from the butchery, Wall charts, Stop watch, microscope, Exam guidelines, JIT document.

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Leaners fail to differentiate between:
  - ✓ oxygenated and deoxygenated blood
  - ✓ Diastole and systole
- Blood is oxygenated / purified by the heart
- One function of the is to generate / store love
- The heart is located on the left side of the body

METHODOLOGY

LESSON 1

- Description of biological terms / Terminology
  - ✓ **Heart**: Vascular organ that is responsible for pumping blood.
  - ✓ **Circulatory system**: The system that circulate fluids through the body

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- ✓ **Pulmonary Circulatory system**: The system that carries blood from the heart to the lungs and back
- ✓ **Systematic circulation**: the system that carries blood from the heart to the body and back
- ✓ **Apex**: The bottom section of the heart which is slightly pointed
- ✓ **Septum**: The muscle that separates the left atrium from the right atrium and left ventricle from the right ventricle
- ✓ **Pericardium**: The membrane that covers the heart.
- ✓ **Atria**: The upper chambers of the heart
- ✓ **Ventricles**: The lower chambers of the heart
- ✓ **Atrioventricular valve**: a valve found between atria and ventricles
- ✓ **Tricuspid valve**: A valve found between the right atrium and right ventricle
- ✓ **Bicuspid valve**: A valve found between the left atrium and left ventricle
- ✓ **Inferior vena cava:** A vein that carries blood from the lower part of the body to the heart.
- ✓ **Superior vena cava**: A vein that carries blood from the upper part of the body back to the heart.
- ✓ **Pulmonary artery**: Artery that carries deoxygenated blood from the heart to the lungs.
- ✓ **Pulmonary vein**: A vein that carries oxygenated blood from the lungs to the heart.
- ✓ **Aorta**: The main artery that carries oxygenated blood away from the heart.
- ✓ **Atrial systole**: The contraction of the atria during cardiac cycle
- ✓ **Ventricular systole:** The contraction of the ventricles during cardiac cycle
- ✓ **Diastole**: The phase where all heart muscles are relaxed.

LESSON 2

- Describe the composition of blood tissue.
  - ✓ Blood Plasma
  - ✓ Red blood cells
  - ✓ White blood cells
  - ✓ Platelets
- Distinguish between closed and open system
- Describe the blood vessels associated with the heart
- Blood vessels that transport blood to the heart:
  - ✓ Superior and Inferior vena cava transport deoxygenated blood.
  - ✓ Pulmonary vein transports oxygenated from the lungs to the heart.
  - ✓ Coronary artery transports oxygenated blood to the heart muscles.
- Blood vessels that transport blood away from the heart:
  - ✓ Pulmonary artery carries deoxygenated blood from the heart to the lungs
  - ✓ Aorta carries oxygenated blood from the heart to the body.
  - ✓ Coronary vein transports deoxygenated blood from the heart muscles to the right atrium

LESSON 3

- Describe the labels and functions of the external and internal structure of the heart.
- Pericardium: The membrane that covers the heart.
- The heart is separated by the septum into two hemispheres
  - ✓ Right hemisphere has deoxygenated blood
  - ✓ Left hemisphere has oxygenated blood

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- ✓ Each hemisphere has two chambers
- ✓ The upper chambers are called atria
- ✓ The lower chambers are ventricles

- Describe the role of valves in cardiac cycle
  - ✓ Tricuspid valve prevents the blood from flowing back into the right atrium when the right ventricle contracts
  - ✓ Bicuspid prevents the blood from flowing back into left atrium when the left ventricle contacts
  - ✓ Semilunar valve prevent blood from flowing back into the ventricles when the relax

LESSON 4

- Define cardiac cycle as the rhythmical contraction and relaxation of the heart muscles.
- Explain how the muscles of the heart bring about rhythmical (systole) and relaxation (diastole) of the heart.
- Describe three stages of cardiac cycle using models or diagrams.
  - ✓ Atrial systole (period where both atria contract)
  - ✓ Ventricular systole (period where both ventricles contract)
  - ✓ Atrial and ventricular diastole (period where both atria and ventricles relaxes)

ACTIVITIES / ASSESSMENT

- Describe the cardiac cycle
- Draw a pie chart indicating the time taken for each phase in the cardiac cycle

SUMMARY

- Description of biological terms / Terminology
- Describe the labels and functions of the external and internal structure of the heart
- Describe the composition of blood tissues.
  Distinguish between closed and open system
- Describe the blood vessels associated with the heart
- Define cardiac cycle as the rhythmical contraction and relaxation of the heart muscles.
- Explain how the muscles of the heart bring about rhythmical (systole) and relaxation (diastole) of the heart.
- Describe three stages of cardiac cycle using models or diagrams

TOPIC: Transport system in animals			
TERM	2	**WEEK**	9
DURATION	4 hours	**WEIGHTING**	
SUB-TOPICS	• Direction of blood flow: Lungs and pulmonary system • Structural and functional differences between arteries, veins and capillaries • Systemic circulation		
RELATED CONCEPTS/ TERMS/VOCABULARY	Ventricles, atrium, tricuspid, bicuspid, semi lunar valve, arteries, veins, capillaries, Oxygenated blood, deoxygenated blood, aorta, inferior vena cava, superior vena cava,		

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PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Revise structure of the heart, Major blood vessels of the heart, Body systems (Circulatory system, Digestive system, respiratory system) grade 9 NS

RESOURCES

Chart, heart model from human torso, PowerPoint, Textbook, past exam papers

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

- Learners fail to:
  - ✓ describe pulmonary circulation
  - ✓ Tabulate differences between arteries, veins and capillaries
- Learners confuse oxygenated or deoxygenated in arteries and veins especially pulmonary artery and pulmonary veins

METHODOLOGY

LESSON 5

- Using a chart/diagram explain how pulmonary circulation take place, showing the difference in direction of deoxygenated and oxygenated blood

LESSON 6

- Define systemic circulation as a system that sends oxygenated blood to the all body tissues and brings deoxygenated blood back to the heart
- Describe, using diagram or flow charts how the aorta branches into major arteries going into organs such as brain, liver, kidneys and small intestines
- Examples:
  - ✓ Renal artery send blood with wastes to the kidneys to release wastes in the liver
  - ✓ Branch of aorta with oxygenated blood to the small intestine to absorbs digested food
- Describe the following branching of blood vessels:
  - ✓ Arteries branches to arterioles and then to blood capillaries as they enter into organs and tissues
  - ✓ Blood capillaries re-join as they leave tissues to form venules then larger veins
- Describe with the aid of the diagram how veins from lower body joins into inferior vena cava and veins from head region joins to the superior vena cava bringing deoxygenated blood from all tissues into the right atrium of the heart

LESSON 7

- Use diagrams to show and explain the difference between arteries, veins and capillaries
- Tabulate differences between arteries, veins and capillaries.

ACTIVITIES/ ASSESSMENT

- Describe how pulmonary circulation take place
- Describe the blood flow in systemic circulation
- Tabulate THREE differences between arteries and veins

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SUMMARY

Pulmonary circulation

- Deoxygenated blood flows from the right atrium through the tricuspid valves Into the right ventricle
- Ventricles contract then the blood passes through the semi lunar valves Into the pulmonary artery which enters each lung.
- Carbon dioxide is released and oxygen is picked up, the oxygenated blood then leaves the lungs through the pulmonary vein to the left atrium of the heart into the left ventricle
- Then passes to aorta to all parts of the body

Blood vessels

- ✓ Veins are thinner walled and returns blood to the heart
- ✓ Arteries are thick walled and transport blood away from the heart
- ✓ Capillaries are very thin walled and allows diffusion of materials across capillary

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TERM 3

TOPIC: BIOSPHERE TO ECOSYSTEMS			
TERM	3	**WEEK**	1
DURATION	4 hours	**WEIGHTING**	54 marks (36%)
Sub-topics	• Biosphere • Biomes		
RELATED CONCEPTS/ TERMS/VOCABULARY	Ecology, ecosystem, biosphere, atmosphere, hydrosphere, lithosphere, biomes, climate, terrestrial, aquatic, vegetation		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Grade 7 NS: Biosphere, biodiversity
Grade 8 NS: Interactions and interdependence within the environment

RESOURCES

Textbooks, Study guides, Charts, Past Question papers

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Confusion between:

- Biome and biosphere
- Ecology and ecosystem

METHODOLOGY

LESSON 1

- Define biosphere
- Define and describe the three components of the biosphere:
  - ✓ Atmosphere
  - ✓ Lithosphere
  - ✓ hydrosphere
- Define the term biome, using some examples.

LESSON 2

- Name and describe the location/s of different terrestrial biomes in Southern Africa using a Map
- Describe the effect of climate, soil and vegetation on the organisms in each of the following biomes:
  - ✓ Savanna
  - ✓ Desert
  - ✓ Grassland

LESSON 3

- Describe the effect of climate, soil and vegetation on the organisms in each of the following biomes:
  - ✓ Forest
  - ✓ Nama Karoo
  - ✓ Succulent Karoo
  - ✓ Fynbos

LESSON 4

- Name and describe the location/s and organisms of different aquatic biomes in Southern Africa:
  - ✓ Fresh water biomes: dams and lakes, rivers and wetlands
  - ✓ Marine biomes: sandy shores, rocky shores, coral reefs, mangrove swamp, estuaries, oceans or open seas

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ACTIVITIES/ASSESSMENT
• Terminology related to biosphere and biomes. • Identify the location of different biomes using a map. • Tabulate characteristics of different biomes with respect to: • Location, description, climate, soil and vegetation
SUMMARY
• **Biosphere** is that portion of the Earth in which living organisms are found, it is made up of **atmosphere**, **lithosphere** and **hydrosphere**. • **Biome** is any region with a distinct climate together with all the organisms that live in it. • There are two groups of biomes: **terrestrial** and **aquatic**.

TOPIC: BIOSPHERE TO ECOSYSTEMS			
TERM	3	**WEEK**	2
DURATION	4 hours	**WEIGHTING**	54 marks (36%)
Sub-topics	• Environment • Ecosystem		
RELATED CONCEPTS/ TERMS/VOCABULARY	Environment, global warming, deforestation, greenhouse effect, enhanced greenhouse effect, desertification, pollution, poaching, recycling, conservation, sustainability, monoculture, eutrophication, habitat, alien plants, alien invasive plants,		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 NS: Abiotic and biotic factors			
RESOURCES			
Textbooks, Study guides, Charts, Past Question papers			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
Confusion between: • Alien plants and alien invasive plants			
METHODOLOGY			
LESSON 5 • List and briefly explain the negative ways in which humans influence the environment in which they live, locally and globally. Negative effects: ✓ Increased carbon emissions lead to global warming by increasing the greenhouse effect ✓ Habitat destruction leading to loss of biodiversity ✓ Pollution of air, land and water			
LESSON 6 • List and briefly explain the negative ways in which humans influence the environment in which they live, locally and globally. Negative effects: ✓ Deforestation ✓ Desertification ✓ Exploitation of natural resources, e.g. medicinal plants and animals ✓ Poor farming practices, e.g. Monoculture			

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LESSON 7

- List and briefly explain the positive ways in which humans influence the environment in which they live, locally and globally.
  Positive effects:
  - ✓ Conservation attempts
  - ✓ Attempts to use renewable energy sources
  - ✓ Removal of alien invasive plants

LESSON 8

- List and briefly explain the positive ways in which humans influence the environment in which they live, locally and globally.
  Positive effects:
  - ✓ Reducing carbon emissions through carbon tax and through new technology
  - ✓ Recycling projects
  - ✓ Improved farming practices, e.g. Crop rotation, mixed culture (as opposed to monoculture)

ACTIVITIES/ASSESSMENT

- Compile a list of terminology related to the topic and define the terms
- Name and explain the ways in which humans influence the environment in which they live locally and globally, negatively and positively.
- Give learners a case study about human influence on the environment, e.g. about poaching

SUMMARY

- Humans influence the environment in which they live locally and globally in a positive and negative way.

TOPIC: BIOSPHERE TO ECOSYSTEMS			
Term	3	**WEEK**	3
DURATION	4 hours	**WEIGHTING**	54 marks (36%)
SUB-TOPICS	Ecosystem		
RELATED CONCEPTS/ TERMS/VOCABULARY	Ecosystem, biotic factors, abiotic factors, edaphic factors, water retention capacity, physiographic factors, slope, aspect and altitude.		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 NS: Biotic and abiotic factors			
RESOURCES			
Textbooks, Study guides, Charts, Past Question papers			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
Confusion between: • Slope and aspect • Ecology and ecosystem			

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METHODOLOGY

LESSON 9

- Define the term ecosystem.
- Differentiate between abiotic and biotic factors in an ecosystem
- Describe the following abiotic factors:
  - ✓ Climatic factors
  - ✓ Physiographic factors
  - ✓ Edaphic factors
- Explain the effects of the following climatic factors on organisms in an ecosystem:
  - ✓ Light – day length
  - ✓ Temperature – effect of day and night and seasons
  - ✓ Water – importance of wetlands and
  - ✓ Atmospheric gases
  - ✓ Wind – (link to Gr 10 transpiration)

LESSON 10

- Describe how the following physiographic factors affect organisms in an ecosystem:
  - ✓ slope,
  - ✓ aspect and
  - ✓ altitude

LESSON 11

- Describe how the following edaphic factors affect organisms in an ecosystem:
  - ✓ soil texture
  - ✓ water retention capacity,
  - ✓ air content of the soil,
  - ✓ humus content, and
  - ✓ soil pH

LESSON 12

- Use many different examples to describe the role of each of the following biotic factors in an ecosystem:
  - ✓ Producers: Plants and algae
  - ✓ Consumers: Primary consumers – herbivores
    Secondary consumers – carnivores
    Tertiary consumers – omnivores and/or top carnivores
    Decomposers: fungi and bacteria

ACTIVITIES/ASSESSMENT

- Compile a list of terminology related to the topic and define each term.
- Use appropriate diagrams to identify and describe the interactions between biotic and abiotic factors in terrestrial and aquatic ecosystems.
- Illustrate the effect of **aspect** on the plant and animal life in an ecosystem.
- Conduct an investigation on water holding/retention capacity of different soil types.
- Analyse and interpret data on water-holding capacity and soil pH of different soil samples.

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SUMMARY
• **Abiotic factors** are non-living things in an ecosystem. These include climatic factors, edaphic factors and physiographic factors. • **Biotic factors** are the living things in an ecosystem. • **Producers** manufacture their own food, e.g. plants and algae • **Consumers** depend on producers for food, e.g. Herbivores, carnivores, and omnivores. • **Decomposers** feed on dead plant and animal matter, e.g. Bacteria and fungi

TOPIC: Energy flow			
TERM	3	**WEEK**	4
DURATION	4 hours	**WEIGHTING**	54 marks (36%)
SUB-TOPICS	• Food pyramids • Trophic levels		
RELATED CONCEPTS/ TERMS/VOCABULARY	Food chain, food web, consumers, producers, decomposers, herbivores, omnivore, carnivores, biomass		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 NS: Energy flow			
RESOURCE			
Textbook, study guides, charts, worksheets, past question papers			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
Confusion between: • Food chain and food web • Herbivores, carnivores and omnivores			
METHODOLOGY			
LESSON 9 • Describe the concept of a food chain using examples • Construct and interpret food chains • Explain energy flow as the flow of energy through a food chain from the sun to producers, consumers(herbivores, carnivores, omnivores) and decomposers			
LESSON 10 • Define a food web using examples • Construct and interpret a food web • Describe the impact of human activities on the existence of food chains and food webs.			
LESSON 11 • Define trophic level • Describe the concept of a food pyramid indicating the various trophic levels • Describe the following type of ecological pyramid: ✓ Pyramid of numbers ✓ Pyramid of biomass ✓ Pyramid of energy • Construct and interpret food pyramids			
LESSON 12 • Use examples of food chains and provide appropriate data in order to construct pyramids of numbers, biomass and energy.			

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ACTIVITIES /ASSESSMENT
• Analyse and interpret food chains and food webs to show the relationships that exist amongst the organisms represented. • Describe the effect of removing organisms from food chains and food webs. • Analyse and interpret the different types of food pyramids with respect to energy flow and trophic levels. • Choose ONE ecosystem within the local biome to conduct field work on the interactions between biotic and abiotic factors.
SUMMARY
• A **food chain** represents the flow of energy through consecutive organisms in an ecosystem. • A **food web** represents several food chains linked together to show all possible pathways of energy flow. • **Trophic level** is a position an organism occupies in a food web. • **Food pyramid** is another way of representing the relationships between organisms in the ecosystem.

TOPIC: Nutrient cycles			
TERM	3	**WEEK**	5
DURATION	4 hours	**WEIGHTING**	54 marks (36%)
Sub-topics	Water cycle, oxygen cycle, nitrogen cycle and carbon cycle		
RELATED CONCEPTS/ TERMS/VOCABULARY	Condensation, evaporation, transpiration, precipitation, photosynthesis, respiration, decomposition, combustion		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 NS: Photosynthesis, respiration Grade 9 NS: Water cycle			
RESOURCES			
Textbook, study guides, charts, worksheets, past question papers			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
• Confusion between: ✓ Precipitation and condensation ✓ Evaporation and transpiration ✓ Denitrifying bacteria and nitrifying bacteria ✓ Nitrite bacteria and nitrate bacteria • Learners fail to provide a descriptive account of the different nutrient cycles			
METHODOLOGY			
LESSON 13 • Describe the water cycle by constructing a flow chart to show how water is recycled • Define terminology related to the water cycle			
LESSON 14 • Describe the nitrogen cycle by constructing a flow chart to show how nitrogen is recycled • Define terminology related to the nitrogen cycle			
LESSON 15 • Describe the carbon cycle by constructing a flow chart to show how carbon is recycled			

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• Define terminology related to the carbon cycle
LESSON 16 • Describe the oxygen cycle by constructing a flow chart to show how oxygen is recycled • Define terminology related to the oxygen cycle
ACTIVITIES /ASSESSMENT
• Analyse and interpret flow diagrams on the water cycle and identify the processes that occur during this cycle. • Analyse and interpret flow charts of the nitrogen cycle and describe the processes that occur during this cycle. • Analyse and interpret diagrams based on the carbon cycle
SUMMARY
• **The Water cycle** is a continuous movement of water within the Earth and the atmosphere. • **The Oxygen cycle** describes the different processes that move oxygen between the atmosphere, biosphere and lithosphere. • **The Nitrogen cycle** is the process during which nitrogen moves through both living and non-living things. • **The Carbon cycle** is the process in which carbon travels from the atmosphere into organisms and the Earth and then back into the atmosphere.

TOPIC: DIVERSITY AND CLASSIFICATION			
TERM	3	**WEEK**	6
DURATION	4 hours	**WEIGHTING**	21 marks (14%)
SUB-TOPICS	Classification		
RELATED CONCEPTS/ TERMS/VOCABULARY	Classification, taxonomy, binomial nomenclature, genus, species, phyla, kingdom, unicellular, multicellular, prokaryote, eukaryote, autotrophic, heterotrophic, saprophytic, saprotrophic, decomposers, domain		
PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE			
Grade 8 NS: Microorganisms			
RESOURCES			
Textbooks, Study guides, Charts, Past Question papers			
ERRORS/MISCONCEPTIONS/PROBLEM AREAS			
Learners confuse: • Prokaryote and eukaryote • Autotrophic and heterotrophic • Saprophytic and saprotrophic • Failing to classify organisms according to their kingdoms			

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METHODOLOGY

LESSON 1

- Define the term classification
- Explain the need for classification
- Describe the binomial system of naming organisms including the contribution of Linnaeus
- Explain why Latin is used in naming of organisms
- Provide an overview of the history of classification to show how systems have changed over a period of time with increased information and technology.

LESSON 2

- Describe characteristics of the Five Kingdoms as follows:
  - ✓ Monera: (bacteria) single-celled organism with no true nucleus – prokaryotic.
  - ✓ Protista: (protists) includes single-celled or simple multicellular organisms, some are autotrophic, e.g. algae, and some are heterotrophic, e.g. amoeba, they are eukaryotic.

LESSON 3

- Five Kingdom system continues...:
  - ✓ Fungi: Includes single-celled organisms, e.g. yeasts,
    Includes multicellular organisms, e.g. mushrooms, body composed of very fine threads, e.g. moulds, they are saprophytic, eukaryotic
  - ✓ Plantae: (plants) multicellular organisms, cells have cell walls, they obtain energy through photosynthesis, and they are eukaryotic

LESSON 4

- Five Kingdom system continues...:
  - ✓ Animalia: (animals) multicellular, aquatic and terrestrial organisms, cells have no cell walls, they feed on other organisms and are eukaryotic
- Describe the differences between prokaryotic cell and eukaryotic cell

ACTIVITIES/ASSESSMENT

- Terminology related to biodiversity and classification
- Provide a table to tabulate the following characteristics for each of the five kingdoms:
- Unicellular/multicellular
- Prokaryotic/eukaryotic
- Mode of feeding
- Tabulate the differences between prokaryotes and eukaryotes

SUMMARY

- **Species** is a group of similar organisms, living together, having the ability to interbreed and produce a fertile and viable offspring.
- **Classification** is the sorting and grouping things according to their similarities and differences.
- **The Five Kingdom system** includes Kingdom Monera, Kingdom Protista, Kingdom Fungi, Kingdom Plantae and Kingdom Animalia.
- **Prokaryotes** are made up of cells that do not have a true nucleus while eukaryotes are organisms that possess membrane bound nucleus.

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TERM 4

TOPIC: History of Life on Earth			
TERM	4	**WEEK**	1
DURATION	4 Hours	**WEIGHTING**	50 Marks (33.3%)
SUB-TOPICS	• Life's history • Geological Timescale • Cambrian explosion		
RELATED CONCEPTS/ TERMS/VOCABULARY	Evolution, Extinction, Prokaryotes, Eukaryotes, Paleontology, Biogeography, Anaerobic, Aerobic Respiration		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

- Cells (prokaryotic and eukaryotic) Grade 9 and 10
- Cellular respiration (Grade 8)

RESOURCES

Textbook, Life Sciences Grade 10 examination guideline, ATP/CAPS document, Previous question papers

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Confusing the names of eras and periods
Interpretation of years in the geological timescale

METHODOLOGY

LESSON 1

- **History of Life on Earth**.
- Explain that theory of evolution suggests that earth is about 4.6 billion years ago.
- Describe the relationship between the history of Life and the following important events:
  - ✓ Increase in oxygen levels
  - ✓ Plate tectonics
  - ✓ Ice ages

LESSON 2

- Describe the relationship between the history of Life and the following important events:
  - ✓ Continental drift
  - ✓ Biogeography
  - ✓ Fossil evidence

LESSON 3

- Describe the geological timescale with respect to the following three eras as mentioned by scientists to understand the history of life:
  - ✓ Palaeozoic
  - ✓ Mesozoic
  - ✓ Cenozoic
- Interpretation of the geological timescale

LESSON 4

- Cambrian explosion
  - ✓ Describe Cambrian explosion.
  - ✓ State what happened towards the end of Cambrian explosion

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ACTIVITIES/ASSESSMENT

- Provide the correct term for various phrases/definitions related to the History of Life on Earth
- Describe factors that have led to changes in life forms that have existed over millions of years
- Interpret various forms of the geological time-scale and representations of the history of life on Earth.

SUMMARY

- **History** - as something of the past
- **Life on Earth** - as living organisms on earth.
- **Increase in oxygen levels** – absence of oxygen in the primitive earth led to the formation of life itself. Increase in oxygen levels led to diversification of life.
- **Plate tectonics** – upward movement of the plates.
- **Ice ages** – long periods where earth experienced extremely cold weather.
- **Continental drift** – the breaking up of the original land mass into different continents.
- **Biogeography** – study of past and present distribution of plants and animals on earth.
- **Fossil evidence** – fossils are evidence of ancient life forms
- **Geological time scale**- is divided into three eras. (Palaeozoic, Mesozoic and Coenozoic)
- In the last four million years, significant changes have occurred in species occurring in Africa (e.g. humans- Homo sapiens).

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TOPIC: History of Life on Earth			
TERM	4	**WEEK**	2
DURATION	4 Hours	**WEIGHTING**	
SUB-TOPICS	Mass extinctions, Fossil studies		
RELATED CONCEPTS/ TERMS/VOCABULARY	Evolution, Extinction, Paleontology, Radiometric dating, Relative dating, Fossil, Biodiversity		

PRIOR-KNOWLEDGE/ BACKGROUND KNOWLEDGE

Biodiversity and classification (Grade 10 Term 3)

RESOURCES

Textbook, Life Sciences Grade 10 examination guideline
ATP/CAPS document, Previous question papers

ERRORS/MISCONCEPTIONS/PROBLEM AREAS

Confusing mass extinction and extinction

METHODOLOGY

LESSON 5

Mass extinction

- Differentiate between extinction and mass extinction
- Mention how many mass extinctions have occurred throughout history.
- State possible causes of mass extinctions.
- State possible causes that have been provided for the following two major mass extinctions:
  - ✓ 250 mya
  - ✓ 65 mya
- Explain why the current rate of extinction is referred to as the sixth mass extinction.
- Construct a timeline showing history of life, research missing link between dinosaurs and birds, hypotheses of extinction.

LESSON 6

Fossil studies

- Define the term fossil
- Describe how fossils are formed
- List different types of fossils and state how they are formed.

LESSON 7

Fossil studies

- Describe the following methods of dating fossils.
  - ✓ Relative dating
  - ✓ Radiometric dating

ACTIVITIES/ASSESSMENT

- Provide the correct biological term used in mass extinction
- Describe the mass extinction that took place 250 mya and 65 mya.
- Describe the link between dinosaurs and birds (Archaeopteryx)
- Describe the link between fish and amphibians (Coelacanth)
- Describe how fossils are formed
- Describe the two methods of fossil dating.

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SUMMARY

- **Extinction –** death of all members of a particular species
- **Mass extinction –** death of more than 50% of species found on earth
- There are five major Mass extinction of which **TWO** are important. Namely:
  - ✓ **Permian extinction** – 250 mya (the extinction of about 90% of all life on Earth)
  - ✓ **Cretaceous extinction** – 65 mya the extinction of many species, including the dinosaurs).
- **Sixth mass extinction** (Holocene extinction) – current extinction caused mainly by human activities.
- **Fossils** – remains of ancient life forms that have been preserved in sedimentary rocks.