LIFE SCIENCES

EXAMINATION GUIDELINES

GRADE 10 (RATP)

2024

This guideline consists of 14 pages.

- **Introduction**

This Examination Guideline for implementation in January 2024 is designed to provide clarity on the content to be taught, learned, and assessed in Grade 10 from 2024.
The purpose of these Examination Guidelines is to;

- Provide clarity on the depth and scope of the content to be assessed in the Grade 10 Examination in Life Sciences.
- Assist teachers to adequately prepare learners for the Examinations.

This Examination Guideline must be read in conjunction with:

- The Life Sciences Curriculum and Assessment Policy Statement (CAPS)
- FET CAPS Amendments 2019: Abridged Section 4: grade 10-11(pages 113-120)
- Recovery ATP 2023/4

- **The Specific Aims for Grade 10 (CAPS)**

There are three broad subject-specific aims in Life Sciences which relate to the purposes of learning science as shown below:

Specific Aim	Elaboration
Specific Aim 1	Relates to the knowing of the subject content
Specific Aim 2	Relates to doing science or practical work and investigations
Specific Aim 3	Relates to understanding the applications of Life Sciences in everyday life, as well as understanding the history of scientific discoveries and the relationship between indigenous knowledge and science

These specific aims are described in greater detail in the CAPS Policy document (Pages 13-18) and Orientation Manual. It is important that these specific aims are addressed in both teaching and assessing.

- **Weighting of Cognitive Levels for Grade 10 (CAPS)**

The following weightings apply for assessment tasks set for Grade 10.

Category	Cognitive Levels	Percentage
A	Knowledge	40
B	Comprehension	25
C	Application	20
D	Analysis, Synthesis and Evaluation	15

4. Degrees of difficulty for examination/test questions

30%	40%	25%	5%
Easy for the average learner to answer	**Moderately** challenging for the average learner to answer.	**Difficult** for the average learner to answer	**Very difficult** for the average learner to answer. The skills and knowledge required to answer the question allows for level 7 learners (extremely high achieving learners) to be discriminated from other high ability/proficiency learners.

The framework for thinking about question/item difficulty comprises the following four general categories of difficulty:

- Content (Topic/concept) difficulty
- Stimulus (question and sources material) difficulty
- Task (process) difficulty and
- Expected response

Refer to the Grade 10 Abridged CAPS Amendments: Section 4 for the framework for thinking about question difficulty.

5. Sequence of Topics for Grade 10 (CAPS)

The following sequence of topics is recommended for Grade 10 based on the progressive development of concepts through the different topics:

1. Chemistry of Life
2. Cells: Basic Units of Life
3. Cell Division: Mitosis
4. Plant Tissues
5. Plant Organs (Leaf)
6. Support and Transport Systems: Plants
7. Animal Tissues
8. Support Systems: Animals
9. Transport Systems in mammals
10. History of Life on Earth
11. Biosphere and Ecosystems
12. Biodiversity and Classification

The paper that assesses each topic and the weighting of each topic in the relevant paper is addressed in the CAPS Policy document (Page 71).

6. Programme of Formal Assessment for Grade 10 (CAPS)

- Some changes have been made to the Program of Assessment for Grade 10 from that which is specified on Page 68 of the CAPS Policy document. Please refer to the FET CAPS Amendments 2019: Abridged Section 4: grade 10-11(pages 113-120)

7. Format of the Examination Paper

The examination will consist of 2 examination papers of 2 ½ hours and 150 marks each. Each paper will have the following format:

Section	Type of questions	Marks
A	Short answer, objective questions such as MCQ, terminology and matching	50
B	A variety of question types: 2 questions of 50 marks each, divided into 2 – 4 subsections	2 x 50 = 100

THE DISTRIBUTION OF TOPICS FOR THE TWO PAPERS (CAPS AMENDED)

PAPER 1 TOPICS	Weightings (%)	MARKS
T1: Chemistry of Life	21	33
T1: Basic units of life	13	19
T1: Cell Division, Mitosis	13	19
T2: Plant and Animal tisues	19	28
T2: Plant organs(leaf)	06	9
T2: Support and transport Systems: Plants	15	23
T2: Support systems: Animals	13	19
Total	**100**	**150**

PAPER 2 TOPICS	Weightings (%)	MARKS
T2: Transport systems in mammals	21	32
T3: Biosphere to Ecosystems	36	54
T4: Biodiversity and classification	14	21
T4: History of life on earth	29	43
Total	**100**	**150**

8. Elaboration of Content for Grade 10 (CAPS)

A topic-wise elaboration follows. It merely outlines the basic content that needs to be covered, but this content can be assessed at all 4 cognitive levels.

ORIENTATION TO LIFE SCIENCES	Term 1	1½ weeks
❑ Scientific Skills • Graphs ○ Line graph ○ Bar graph ○ Histogram ○ Pie Chart • Calculations ○ Average ○ Percentage ○ Percentage increase/ decrease ❑ Scientific method ○ Planning steps ○ Identification of variables ○ Ensuring validity and reliability ❑ Microscopic skills • Brief overview of the history of microscopy • Scientific diagrams Calculations ○ Actual size ○ Magnification		

THE CHEMISTRY OF LIFE Paper 1: 33 marks	Term 1	2 weeks

CONTENT	ELABORATION
Introduction	❑ Define the following: • atoms • elements • molecules • compounds ❑ Differentiate between inorganic and organic compounds using examples
	❑ Functions of K, Ca, P, Fe, I and Na in plants and animals ❑ Diseases caused by deficiency of K, Ca, P, Fe, I and Na in plants and animals ❑ Main functions of water as an example of an inorganic compound
Inorganic compounds	❑ Water consists of H and O in the ratio of 2:1

Organic compounds	❑ Organic compounds • Carbohydrates ○ Made up of C, H and O ○ Monosaccharides: glucose and fructose ○ Disaccharides: maltose and sucrose ○ Polysaccharides: starch, cellulose, and glycogen ○ Stick diagrams to represent carbohydrate molecules, no detailed structures required ○ Biological importance of carbohydrates ○ Food tests for: ➢ Glucose ➢ Starch • Lipids (fats and oils) ○ Made up of C, H and O ○ Consist of monomers (building blocks) glycerol and fatty acids ○ Stick diagram to represent molecules, no detailed structures required ○ Differentiate between saturated and unsaturated fats ○ Effect of high cholesterol in foods leading to heart diseases ○ Biological importance of lipids ○ Food test for the presence of lipids • Proteins ○ Made up of H, O and N ○ May have S, P and Fe ○ Consist of monomers called amino acids ○ Biological importance of proteins ○ Sensitive to changes in temperature and pH ○ Food test for the presence of proteins • Enzymes ○ Properties of enzymes ➢ Biological catalysts ➢ Protein in nature ➢ Specific - "Lock and Key" Model ➢ Sensitive to temperature and pH ○ Investigations (the effect of pH and temperature on enzyme activity) ➢ Biological' washing powder (containing enzyme) OR ➢ Hydrogen peroxide and liver OR ➢ Fresh pineapple juice and solid egg white in a plastic drinking straw • Vitamins ○ Sources, functions, and deficiency diseases ➢ Vitamin A ➢ one of Vitamin B ➢ Vitamin C ➢ Vitamin D ➢ Vitamin E • Nucleic Acids (DNA and RNA) ○ Made up of C, H, O, N and P ○ Consist of monomers called nucleotides ○ Functions of nucleic acids: ➢ DNA carries hereditary information ➢ RNA plays a role in synthesis of proteins

CELLS: THE BASIC UNITS OF LIFE Paper 1: 19 marks	Term 1	2 WEEKS

CONTENT	ELABORATION
Introduction	❑ Review levels of organization: • Cells • tissues • organs • systems
Microscope	❑ Briefly describe the history of the development of the microscope and the discovery of cells ❑ Identify the different parts of the light microscope and state their functions ❑ Demonstrate/Describe how a light microscope works ❑ Use a light microscope/micrograph to observe and draw an example of: • a plant cell eg. onion epidermis • an animal cell eg. cheek cells ❑ Calculate the magnification of drawings (by measuring the field of view under a microscope) ❑ Calculate the size of a specimen on a micrograph using the scale line/magnification given
Cell structure	❑ Define the cell as the basic unit of life ❑ Describe the location, structure, and state the function of each of the following organelles/structures in plant and animal cells: • cell wall - support structure in plant cells only • cell membrane - fluid-mosaic model, boundaries, and transport, movement across the membrane: diffusion, osmosis and active transport • nucleus - chromatin material, nuclear material, nucleopores, nucleolus: the control centre, heredity • cytoplasm - storage and circulation of materials • mitochondria - release energy during cell respiration • ribosomes - protein synthesis • endoplasmic reticulum - rough and smooth, transport systems • Golgi body - secretions • Plastids - production and storage of food and pigments • vacuole, lysosomes, vesicles - storage, digestion and osmoregulation ❑ State the differences between plant and an animal cells ❑ State that different cells are specialized for different functions based on theirsize, shape and structure
Diffusion and osmosis	❑ Define the terms: • diffusion • osmosis ❑ Differentiate between passive movement and active transport of molecules. ❑ Conduct investigations to demonstrate the processes of: • diffusion • osmosis

CELL DIVISION: MITOSIS Paper: 1 .19 marks	Term 1	1 WEEK

CONTENT	ELABORATION
Introduction	• Revise the structure of the nucleus
The process of Mitosis	❑ 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 ❑ Differentiate between replicated and unreplicated chromosomes ❑ State that each replicated chromosome is made up of two chromatids joined by a centromere ❑ Describe the following phases of mitosis using diagrams to show chromosome changes: • prophase • metaphase • anaphase • telophase ❑ State the difference between telophase in plant and animal cells ❑ Use microscope slides, micrographs, posters, and models to observe different phases and make drawings of different phases of mitosis.
Importance of mitosis	❑ Describe the importance of mitosis as follows • new cells are formed for growth • to allow for repair and replacement of damaged cells ❑ to allow for simple unicellular organisms to reproduce asexually eg.binary fission and vegetative reproduction
Cancer	❑ Define cancer ❑ Briefly describe the causes of and treatment of cancer e.g radiotherapy and chemotherapy (no details required) ❑ Briefly discuss beliefs and attitudes concerning cancer ❑ Conduct research on ONE type of cancer focusing on causes,prevalence and treatment

PLANT TISSUES Paper 1: 14 marks	Term 2	1 week

CONTENT	ELABORATION
Introduction	❑ Definition of a tissue
Plant tissues	❑ Structure and functions of plant tissues - Use diagrams to show the relationship between structure and function • Meristematic tissues • Permanent tissues ○ Epidermis: root hair and guard cells ○ Parenchyma ○ Collenchyma ○ Sclerenchyma ○ Xylem ❑ Phloem

Plant Organs Paper 1: 9 marks	Term 2	2 weeks

CONTENT	ELABORATION
Introduction	❑ Definition of an organ ❑ Location of the different plant organs i.e. roots, stems and leaves
Plant Organs	❑ Anatomy of dicotyledonous plants • Transverse section of: ○ Root ○ Stem ○ Leaf • Functions of dicotyledonous leaves in the following processes: ○ Photosynthesis ○ Gaseous exchange ○ Transpiration ○ Transport by diffusion and osmosis

SUPPORT AND TRANSPORT SYSTEMS IN PLANTS P1: 23 marks	Term 2	2 weeks

CONTENT	ELABORATION/SUGGESTED SEQUENCE
Introduction	❑ Review plant tissues involved in support and transport
Transpiration	❑ Definition of transpiration ❑ Relationship between water loss and leaf structure • Thickened cuticle • Size and shape of leaves • Number and position of stomata • Hairs on the leaf • Leaf arrangement ❑ Factors affecting the rate of transpiration

	• Temperature • Light intensity • Wind • Humidity ❑ Transport of water and mineral salts in plants • Uptake of water and minerals from the soil to the root hair • Lateral movement of water from the root hair to the xylem in the root • Transport of water from roots to the leaves: ○ Transpiration pull ○ Capillarity ○ Root pressure ❑ Translocation of manufactured food from leaves to other parts of the plant

ANIMAL TISSUES Paper 1: 14 marks	**Term 2**	**1 WEEK**

CONTENT	ELABORATION/SUGGESTED SEQUENCE
Animal tissues	❑ The location, structure, and functions – use diagrams to show the relationship between structure and functions: • Epithelial tissue ○ Squamous ○ Columnar ○ Ciliated ○ Cuboidal (glandular) • Muscle tissue ○ Skeletal ○ Smooth ○ Cardiac • Nerve tissue ○ Sensory neurons ○ Motor neurons ○ Interneurons • Connective tissue ○ Areolar ○ White fibrous (tendons) ○ Yellow fibrous (ligaments) ○ Cartilage ○ Bone ○ Blood (white blood corpuscles, red blood corpuscles and platelets)

SUPPORT IN ANIMALS Paper 1: 19 marks	Term 2	1 week

CONTENT	ELABORATION
Introduction	❑ Types of skeletons • Hydrostatic skeleton • Exoskeleton • Endoskeleton
Human Skeleton	❑ The two main parts of the skeleton • Axial Skeleton ○ The skull: ➢ Facial bones ➢ Cranium ➢ Foramen magnum ➢ Palate ➢ Jaws • Appendicular Skeleton ○ The pectoral girdle and upper limbs ○ The pelvic girdle and lower limbs ❑ Functions of the skeleton • Movement • Protection • Support • Storage of minerals • Hearing

TRANSPORT SYSTEMS: MAMMALS (HUMAN) Paper 2: 32 marks	Term 2	2 weeks

CONTENT	ELABORATION
Introduction	❑ Composition and functions of blood tissue ❑ Closed blood system
Circulatory System	❑ External and internal structure of the heart and its associated blood vessels with the functions of each • Aorta • Pulmonary Artery and Veins • Superior Vena Cava • Inferior Vena Cava • Ventricles • Atria • Valves • Pericardium • Septum ❑ The cardiac cycle of the heart (flow of blood through the heart) • Atrial systole • Ventricular systole

	• General diastole ❑ Capillaries, arteries, and veins – use diagrams to differentiate between the blood vessels ❑ TWO types of blood circulation in humans • Pulmonary circulation (lungs and associated vessels) • Systemic circulation (major organs and associated vessels of the brain, small intestines, liver, and kidneys)

HISTORY OF LIFE ON EARTH Paper 2: 43 marks	**Term 3**	**3 weeks**

CONTENT	ELABORATION
Introduction	❑ Definition of evolution and biological evolution
Changes throughout the history of life on earth	❑ Composition of the atmosphere - increases in the levels of oxygen ❑ Climate change - ice ages ❑ Geological events such as movements of continents and distribution of living organisms ❑ Examples of evidence for changing sea levels
	❑ Geological timescale • Definition and use of geological timescale • Three eras: Paleozoic, Mesozoic and Coenozoic – divided into periods (names of periods not to be memorised)
	❑ Cambrian Explosion • Origins of early forms of animal groups • Significant changes that occurred in species occurring in Africa over the last four million years e.g. humans
	❑ Mass Extinction • Two major mass extinctions ○ 250 mya) – led to extinction of about 90% of all life on earth ○ 65mya) – resulted in the extinction of many species including the dinosaurs • 6th mass extinction
	❑ Fossils • Fossil formation • Methods of fossil dating ○ Relative dating ○ Radiometric dating

BIOSPHERE AND ECOSYSTEMS Paper 2: 54 marks	Term 3	5 weeks

CONTENT	ELABORATION
Introduction	❑ Definition of ecology
Biosphere and ecosystem	❑ Biosphere • Definition of biosphere • Components of biosphere • Hydrosphere • Lithosphere ❑ Atmosphere
	❑ Biomes • Types of biomes in Southern Africa - terrestrial and aquatic • Influence of the following factors on organisms in the biomes above: ○ Climate ○ Soils ○ Vegetation • Location of different biomes in South Africa ○ Savanna ○ Nama karoo ○ Succulent karoo ○ Grassland ○ Fynbos ○ Forest ○ Thicket ○ Freshwater ❑ Marine biomes
	❑ Environment • Human activities in the natural environment ❑ Human interactions with the natural environment
	❑ Ecosystems • Definition of ecosystem • Structure and functioning of ecosystem • Definition of biotic and abiotic factors in an ecosystem ○ Abiotic factors ➢ Physiographic factors: (aspect, slope, and altitude) ➢ Soil (pH, humus content, texture, water retaining capacity and aircontent) ➢ Light (day length and seasonal changes) ➢ Temperature (effect of day/night and seasons) ➢ Water (water cycle and importance of wetlands) ➢ Atmospheric gases ➢ Wind ○ Biotic factors ➢ Producers ➢ Consumers ➢ Decomposers ❑ Effects of biotic and abiotic factors on the community
	❑ Energy flow through ecosystems • Definition of a food chain and food web • Food pyramids with examples of organisms at each trophic level ○ Producers ○ Consumers (herbivores, carnivores, omnivores) and ○ Decomposers • Flow of energy through a food chain and food web

	❑ Nutrient cycles - using flow charts • Water cycle • Oxygen cycle • Carbon cycle • Nitrogen cycle - no detailed chemistry required

TOPIC: BIODIVERSITY AND CLASSIFICATION Paper 2: 21 marks	**Term 3 &4**	**2 weeks**

CONTENT	ELABORATION
Biodiversity and Classification	❑ Definition of biodiversity • Definition of classification- using practical examples from everyday life • Need for classification as a way of organising biodiversity ❑ Prokaryotes and eukaryotes ❑ Brief history of classification • Shared characteristics to classify organisms by early scientists ❑ 5-kingdom system of classification - features of each: • Monera - unicellular and prokaryotic • Protista - unicellular or multicellular and eukaryotic • Fungi - unicellular or multicellular, eukaryotic and without chlorophyll • Plantae - multicellular, eukaryotic and with chlorophyll (autotrophic) • Animalia - multicellular, eukaryotic, and heterotrophic ❑ Naming things in science • Definition of species • Linnaeus' binomial system of naming organisms ○ Genus name followed by the species name ○ Use of Latin in scientific names