basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

LIFE SCIENCES

EXAMINATION GUIDELINES

GRADE 12

2021

These guidelines consist of 18 pages.

TABLE OF CONTENTS

INTRODUCTION

The *Curriculum and Assessment Policy Statement* (*CAPS*) for Life Sciences outlines the nature and purpose of the subject Life Sciences. This guides the philosophy underlying the teaching and assessment of the subject in Grade 12.

The purpose of these Examination Guidelines is to:

- Provide clarity on the depth and scope of the content to be assessed in the Grade 12 National Senior Certificate (NSC) Examination in Life Sciences.
- Assist teachers to adequately prepare learners for the examinations.

This document deals with the final Grade 12 external examinations. It does not deal in any depth with the School-Based Assessment (SBA).

These Examination Guidelines should be read in conjunction with:

- *The National Curriculum Statement (NCS) Curriculum and Assessment Policy Statement (CAPS):* Life Sciences
- The National Protocol of Assessment: *An addendum to the policy document, the National Senior Certificate: A qualification at Level 4 on the National Qualifications Framework (NQF), regarding the National Protocol for Assessment (Grades R–12)*
- The national policy pertaining to the programme and promotion requirements of the National Curriculum Statement, Grades R–12
- *Grade 12 Abridged CAPS Amendments to Section 4* (Implementation: January 2021)

2. SPECIFIC AIMS FOR GRADE 12 (*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 knowing 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* document (pages 13–18). It is important that these specific aims are addressed in both teaching and assessing.

3. ASSESSMENT IN GRADE 12

Assessment in Grade 12 must cater for the differing abilities of learners by covering a range of **cognitive levels** and **degrees of difficulty**. These, together with the **subject content**, **specific aims** and **range of skills**, should be used to inform the planning and development of assessment tasks

3.1 WEIGHTING OF COGNITIVE LEVELS FOR GRADE 12 (*CAPS*)

The following weightings apply to assessment tasks set for Grade 12:

CATEGORY	COGNITIVE LEVELS	PERCENTAGE
A	Knowledge	40
B	Comprehension	25
C	Application	20
D	Analysis, Synthesis and Evaluation	15

3.2 DEGREES OF DIFFICULTY FOR EXAMINATIONS AND TESTS (*CAPS* AMENDED)

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/ability 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 (memo) difficulty

Refer to the Grade 12 Abridged *CAPS* Amendments to Section 4 for the framework for thinking about question difficulty.

3.3 SEQUENCE OF TOPICS FOR GRADE 12 (*CAPS* AMENDED)

The following sequence of topics is recommended for teaching in Grade 12 based on the progressive development of concepts through the different topics:

1. DNA: The Code of Life
2. Meiosis
3. Reproduction in Vertebrates
4. Human Reproduction
5. Genetics and Inheritance
6. Responding to the Environment (Humans)
7. Endocrine System and Homeostasis in Humans
8. Responding to the Environment (Plants)
9. Evolution

3.4 PROGRAMME OF FORMAL ASSESSMENT FOR GRADE 12 (*CAPS*)

Some changes have been made to the Programme of Assessment for Grade 12 from that which is specified on page 70 of the *CAPS* document. Refer to the *Abridged Section 4 Amendments.*

3.5 FORMAT OF THE QUESTION PAPER

The examination will consist of two question papers of 2½ hours and 150 marks each.
Each question paper has the following format:

SECTION	TYPES OF QUESTIONS	MARKS
A	Short answer questions such as multiple-choice, terminology, columns/statements and matching items	50
B	A variety of question types: Two questions of 50 marks each, divided into a number of subquestions. Each may be further divided.	2 x 50 = 100

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

PAPER 1

TOPIC	WEIGHTING	
	%	MARKS
Term 1:		
Reproduction in Vertebrates	5	8
Human Reproduction	27	41
Term 2:		
Responding to the environment (humans)	36	54
Term 3:		
Responding to the Environment (plants)	9	13
Term 2 and 3:		
Endocrine and Homeostasis (humans)	23	34
TOTAL	**100**	**150**

PAPER 2

TOPIC	WEIGHTING	
	%	MARKS
Term 1:		
DNA: Code of Life	18	27
Meiosis	14	21
Term 1 and 2:		
Genetics and Inheritance	32	48
Term 3:		
Evolution	36	54
TOTAL	**100**	**150**

4. ELABORATION OF CONTENT FOR GRADE 12 (*CAPS* AMENDED)

A topic-wise elaboration follows, which merely outlines the basic content that needs to be covered. This content can be assessed at all four cognitive and difficulty levels.

DNA: THE CODE OF LIFE Paper 2: 27 marks	**Term 1**	**2 weeks**

CONTENT	ELABORATION
Introduction	❑ Revision of the structure of the cell with an emphasis on the ribosome, cytoplasm and the parts of the nucleus ❑ Two types of nucleic acids: DNA and RNA ❑ Nucleic acids consist of nucleotides
DNA: location, structure and functions	❑ Location of DNA: • Present in the nucleus (nuclear DNA) – makes up genes on chromosomes • Present in mitochondria (mitochondrial DNA) • Present in chloroplasts (plants) ❑ Brief history of the discovery of the DNA molecule (Watson & Crick, Franklin & Wilkins) ❑ Structure of DNA • The natural shape of the DNA molecule is a double helix • Each strand of the helix is made up of a sequence of DNA nucleotides ❑ Three components of a DNA nucleotide: • Nitrogenous bases linked by weak hydrogen bonds: o Four nitrogenous bases of DNA: adenine (A), thymine (T), cytosine (C), guanine (G) o Pairing of bases in DNA occur as follows: A: T and G: C • Sugar portion (deoxyribose in DNA) • Phosphate portion ❑ Stick diagram of DNA molecule to illustrate its structure ❑ Functions of DNA: • DNA makes up genes which carry hereditary information • DNA contains coded information for protein synthesis
DNA replication	❑ Process of DNA replication: • When in the cell cycle it takes place • Where in the cell it takes place • How DNA replication takes place (names of enzymes not required) • The significance of DNA replication
DNA profiling	❑ Interpretation of DNA profiles ❑ Uses of DNA profiles

CONTENT	ELABORATION
RNA: location, Structure and function	❑ Location of RNA: • mRNA is formed in the nucleus and functions on the ribosome • tRNA is located in the cytoplasm ❑ Structure of RNA • A single-stranded molecule consisting of nucleotides ❑ Three components of an RNA nucleotide: • Nitrogenous bases o Four nitrogenous bases of RNA: o adenine (A), uracil (U), cytosine (C), guanine (G) • Sugar portion (ribose in RNA) • Phosphate portion ❑ Stick diagram of mRNA and tRNA molecules to illustrate their structure ❑ Function of RNA: • RNA plays a role in protein synthesis
Protein synthesis	❑ The involvement of DNA and RNA in protein synthesis: • Transcription o The double helix DNA unwinds. o The double-stranded DNA unzips/weak hydrogen bonds break to form two separate strands. o One strand is used as a template o to form mRNA o using free RNA nucleotides from the nucleoplasm. o The mRNA is complementary to the DNA. o mRNA now has the coded message for protein synthesis. • mRNA moves from the nucleus to the cytoplasm and attaches to the ribosome. • Translation o Each tRNA carries a specific amino acid. o When the anticodon on the tRNA o matches the codon on the mRNA o then tRNA brings the required amino acid to the ribosome. o (Names of specific codons, anticodons and their amino acids are not to be memorised.) o Amino acids become attached to each other by peptide bonds o to form the required protein. ❑ Simple diagram to illustrate transcription and translation in protein synthesis

MEIOSIS Paper 2: 21 marks	**Term 1**	**1½ weeks**

CONTENT	ELABORATION
Introduction	❑ Revision of the structure of a cell, with an emphasis on the parts of the nucleus, the centrosome and the cytoplasm ❑ Structure of chromosomes: • Chromosomes consist of DNA (which makes up genes) and protein • The number of chromosomes in a cell is a characteristic of an organism (e.g., humans have 46 chromosomes) • Chromosomes which are single threads become double (two chromatids joined by a centromere) as a result of DNA replication ❑ Differentiate between: • Haploid (n) and diploid (2n) cells in terms of chromosome number • Sex cells (gametes) and somatic cells (body cells) • Sex chromosomes (gonosomes) and autosomes ❑ Revision of the process of mitosis
Meiosis – The process	❑ Definition of meiosis ❑ Site of meiosis in plants and in animals ❑ Meiosis is a continuous process, but the events are divided into different phases for convenience ❑ Events of interphase: • DNA replication takes place o Chromosomes which are single threads, become double o Each chromosome will now consist of two chromatids joined by a centromere o DNA replication helps to double the genetic material so that it can be shared by the new cells arising from cell division ❑ The events of the following phases of Meiosis I, using diagrams: • Prophase I - including a description of crossing over • Metaphase I – including the random arrangement of chromosomes • Anaphase I • Telophase I ❑ The events of each phase of Meiosis II, using diagrams: • Prophase II • Metaphase II – including the random arrangement of chromosomes • Anaphase II • Telophase II
Importance of meiosis	❑ The importance of meiosis: • Production of haploid gametes • The halving effect of meiosis overcomes the doubling effect of fertilisation, thus maintaining a constant chromosome number from one generation to the next • Mechanism to introduce genetic variation through: o Crossing over o The random arrangement of chromosomes at the equator
Abnormal meiosis	❑ Non-disjunction and its consequences ❑ Non-disjunction of chromosomes at position 21 during Anaphase in humans to form abnormal gametes with an extra copy of chromosome 21 ❑ The fusion between an abnormal gamete (24 chromosomes) and a normal gamete (23 chromosomes) may lead to Down syndrome
Comparison of mitosis and meiosis	❑ Similarities of mitosis and meiosis ❑ Differences between mitosis and meiosis

REPRODUCTION IN VERTEBRATES Paper 1: 8 marks	Term 1	½ week

CONTENT	ELABORATION
Diversity of reproductive strategies	❑ The role of the following reproductive strategies in animals in maximising reproductive success in different environments (using relevant examples): • External fertilisation and internal fertilisation • Ovipary, ovovivipary and vivipary • Amniotic egg • Precocial and altricial development • Parental care

HUMAN REPRODUCTION Paper 1: 41 marks	Term 1	3 weeks

CONTENT	ELABORATION
Introduction	❑ Revision of the schematic outline of the human life cycle to show the role of meiosis, mitosis and fertilisation
Structure of the male reproductive system	❑ Structure of the male reproductive system, using a diagram ❑ Functions of the testis, epididymis, vas deferens, seminal vesicle, prostate gland, Cowper's gland, penis and the urethra
Structure of the female reproductive system	❑ Structure of the female reproductive system, using a diagram ❑ Functions of the ovary, Fallopian tubes, uterus lined by endometrium, cervix, vagina with its external opening and the vulva ❑ Structure of the ovary, using a diagram, showing the primary follicles, the Graafian follicle and the corpus luteum
Puberty	❑ Main changes that occur in male characteristics during puberty under the influence of testosterone ❑ Main changes that occur in female characteristics during puberty under the influence of oestrogen
Gametogenesis	❑ Formation of gametes (gametogenesis) by meiosis • Male gametes formed by spermatogenesis • Female gametes formed by oogenesis ❑ Spermatogenesis: • Under the influence of testosterone • diploid cells in the seminiferous tubules of the testes undergo meiosis • to form haploid sperm cells ❑ Structure of a sperm, using a diagram ❑ Functions of the parts of a sperm cell (acrosome, head with haploid nucleus, middle portion/neck with mitochondria and a tail) ❑ Oogenesis: • Diploid cells in the ovary undergo mitosis • to form numerous follicles. • At the onset of puberty • and under the influence of FSH, • one cell inside a follicle enlarges and undergoes meiosis. • Of the four cells that are produced, only one survives to form a mature, haploid ovum. • This occurs in a monthly cycle. ❑ Structure of an ovum, using a diagram ❑ Functions of different parts of an ovum (jelly layer, haploid nucleus, cytoplasm)

CONTENT	ELABORATION
Menstrual cycle	❑ The menstrual cycle includes the uterine and ovarian cycles ❑ Events in the ovarian cycle: • Development of the Graafian follicle • Ovulation • Formation of the corpus luteum ❑ Events in the uterine cycle: • Changes that take place in the thickness of the endometrium • Menstruation ❑ Hormonal control of the menstrual cycle (ovarian and uterine cycles) with reference to the action of FSH, oestrogen, LH and progesterone ❑ Negative feedback mechanism involving FSH and progesterone in controlling the production of ova
Fertilisation and development of zygote to blastocyst	❑ Definition of copulation and fertilisation ❑ Process of fertilisation ❑ Development of zygote → embryo (morula and blastula/blastocyst) → foetus
Implantation, gestation and the role of the placenta	❑ Definition of implantation ❑ The role of oestrogen and progesterone in maintaining pregnancy ❑ Structure of the developing foetus in the uterus, using a diagram ❑ Functions of the following parts: • Chorion and chorionic villi • Amnion, amniotic cavity and amniotic fluid • Umbilical cord (including umbilical artery and umbilical vein) • Placenta

GENETICS AND INHERITANCE Paper 2: 48 marks	**Term 1 & 2**	**3½ weeks**

CONTENT	ELABORATION
Introduction	❑ Mention of Mendel as the 'father' of genetics
Concepts in inheritance	❑ Chromatin and chromosomes ❑ Genes and alleles ❑ Dominant and recessive alleles ❑ Phenotype and genotype ❑ Homozygous and heterozygous ❑ The Law of Dominance- • When two homozygous organisms with contrasting characteristics are crossed, all the individuals of the F_1 generation will display the dominant trait • An individual that is heterozygous for a particular characteristic will have the dominant trait as the phenotype.

CONTENT	ELABORATION
Monohybrid crosses	❑ Format for representing a genetics cross ❑ Mendel's Principle of Segregation –An organism possesses two 'factors' which separate or segregate so that each gamete contains only one of these 'factors' ❑ Types of dominance: • Complete dominance – one allele is dominant and the other is recessive, such that the effect of the recessive allele is masked by the dominant allele in the heterozygous condition • Incomplete dominance – neither one of the two alleles of a gene is dominant over the other, resulting in an intermediate phenotype in the heterozygous condition • Co-dominance – both alleles of a gene are equally dominant whereby both alleles express themselves in the phenotype in the heterozygous condition ❑ Genetics problems involving each of the three types of dominance ❑ Proportion and ratio of genotypes and phenotypes
Sex determination	❑ 22 pairs of chromosomes in humans are autosomes and one pair of chromosomes are sex chromosomes/gonosomes ❑ Males have XY chromosomes and females have XX chromosomes ❑ Differentiate between sex chromosomes (gonosomes) and autosomes in the karyotypes of human males and females ❑ Representation of a genetic cross to show the inheritance of sex
Sex-linked inheritance	❑ Sex-linked alleles and sex-linked disorders ❑ Genetics problems involving the following sex-linked disorders: • Haemophilia • Colour-blindness
Blood grouping	❑ Different blood groups are a result of multiple alleles ❑ The alleles $\mathbf{I^A}$, $\mathbf{I^B}$ and **i** in different combinations result in four blood groups ❑ Genetics problems involving the inheritance of blood type
Dihybrid crosses	❑ Mendel's Principle of Independent Assortment – The various 'factors' controlling the different characteristics are separate entities, not influencing each other in any way, and sorting themselves out independently during gamete formation. ❑ Dihybrid genetics problems ❑ Determination of the proportion/ratio of genotypes and phenotypes
Genetic lineages/pedigrees	❑ A genetic lineage/pedigree traces the inheritance of characteristics over many generations ❑ Interpretation of pedigree diagrams
Mutations	❑ Definition of a mutation ❑ Effects of mutations: harmful mutations, harmless mutations and useful mutations ❑ Mutations contribute to genetic variation ❑ Definition of gene mutation and chromosomal mutation ❑ Two types of mutations that can alter characteristics leading to genetic disorders: Gene Mutations • Haemophilia – absence of blood-clotting factors • Colour-blindness – due to absence of the proteins that comprise either the red or green cones/photoreceptors in the eye Chromosomal mutation • Down syndrome – due to an extra copy of chromosome 21 as a result of non-disjunction during meiosis

CONTENT	ELABORATION
Genetic engineering	❑ Biotechnology is the manipulation of biological processes to satisfy human needs. ❑ Genetic engineering is an aspect of biotechnology and includes: • Stem cell research – sources and uses of stem cells • Genetically modified organisms – brief outline of process (names of enzymes involved are not required) and the benefits of genetic modification • Cloning – brief outline of process and benefits of cloning
Paternity testing	❑ The use of each of the following in paternity testing: • Blood grouping • DNA profiles
Genetic links	❑ Mutations in mitochondrial DNA used in tracing female ancestry

RESPONDING TO THE ENVIRONMENT (HUMANS) Paper 1: 54 marks	**Term 2**	**4 weeks**

CONTENT	ELABORATION
Introduction	❑ The nervous system (involving nerves) and endocrine system (involving hormones) are two components that help humans respond to the environment
Human nervous system	❑ The need for a nervous system in humans: • Reaction to stimuli (stimuli can be external and internal) • Coordination of the various activities of the body
Central nervous system	❑ The brain and spinal cord are protected by meninges ❑ Location and functions of the following parts: • Brain o Cerebrum o Cerebellum o Corpus callosum o Medulla oblongata • Spinal cord
Peripheral nervous system	❑ Location and functions of the peripheral nervous system (cranial and spinal nerves)
Autonomic nervous system	❑ Location and functions of the autonomic nervous system (sympathetic and parasympathetic sections)
Structure and functioning of a nerve	❑ Nerves send and carry signals to and from all parts of the body and are made up of neurons (sensory or motor) ❑ Functions of sensory and motor neurons ❑ Structure and functions of parts of sensory and motor neurons, using diagrams: nucleus, cell body, cytoplasm, myelin sheath, axon and dendrites
The simple reflex arc	❑ Definition of a reflex action and a reflex arc ❑ Structure of a reflex arc and functions of each part, using a diagram: receptor, sensory neuron, dorsal root of spinal nerve, spinal cord, interneuron, motor neuron, ventral root of spinal nerve, effector ❑ Functioning of a simple reflex action, using an example ❑ Significance of a reflex action ❑ Significance of synapses
Disorders of the CNS	❑ Causes and symptoms of the following disorders of the nervous system: • Alzheimer's disease • Multiple sclerosis
Receptors	❑ Functions of receptors, neurons and effectors in responding to the environment ❑ The body responds to a variety of different stimuli, such as light, sound, touch, temperature, pressure, pain and chemicals (taste and smell). (No structure and names necessary except for names of the receptors in the eye and ear.)

CONTENT	ELABORATION
Human eye	❑ Structure and functions of the parts of the human eye, using a diagram ❑ Binocular vision and its importance ❑ The changes that occur in the human eye for each of the following, using diagrams: • Accommodation • Pupillary mechanism ❑ The nature and treatment of the following visual defects, using diagrams: • Short-sightedness • Long-sightedness • Astigmatism • Cataracts
Human ear	❑ Structure of the human ear and the functions of the different parts, using a diagram ❑ Functioning of the human ear in: • Hearing (include the role of the organ of Corti, without details of its structure) • Balance (include the role of maculae and cristae, without details of their structure) ❑ Cause and treatment of the following hearing defects: • Middle ear infection (the use of grommets) • Deafness (the use of hearing aids and cochlear implants)

ENDOCRINE SYSTEM AND HOMEOSTASIS Paper 1: 34 marks	**Term 2 and 3**	**2½ weeks**

CONTENT	ELABORATION
Endocrine system	❑ Difference between an endocrine and an exocrine gland ❑ Definition of a hormone ❑ Location of each of the following glands, using a diagram, the hormones they secrete and function(s) of each hormone: • Hypothalamus (ADH) • Pituitary/Hypophysis (GH, TSH, FSH, LH, prolactin) • Thyroid glands (thyroxin) • Islets of Langerhans in the pancreas (insulin, glucagon) • Adrenal glands (adrenalin, aldosterone) • Ovary (oestrogen, progesterone) • Testis (testosterone)
Introduction – Homeostasis	❑ Homeostasis as the process of maintaining a constant, internal environment within narrow limits, despite changes that take place internally and externally. ❑ The conditions within cells depend on the conditions within the internal environment (the tissue fluid) ❑ Factors such as carbon dioxide, glucose, salt, water concentration, temperature and pH must be kept constant in the internal environment (tissue fluid)
Homeostasis: Negative feedback mechanisms	❑ Negative feedback mechanism controlling each of the following in the body: • Thyroxin levels • Blood glucose levels • Blood carbon dioxide levels • Water balance (osmoregulation) • Salt ❑ Disorders caused by an imbalance in levels of: • Thyroxin – Goitre • Blood glucose – Diabetes mellitus

CONTENT	ELABORATION
Homeostasis: Negative feedback mechanisms (*… continued*)	❑ Thermoregulation • Structure of the skin, using a diagram, with an emphasis on the parts involved in thermoregulation ❑ Role of the following in negative feedback mechanism for controlling temperature/thermoregulation: • Sweating • Vasodilation • Vasoconstriction

RESPONDING TO THE ENVIRONMENT (PLANTS) Paper 1: 13 marks	**Term 3**	**1 week**

CONTENT	ELABORATION
Plant hormones	❑ General functions of the following: • Auxins • Gibberellins • Abscisic acid ❑ The control of weeds using plant hormones ❑ The role of auxins in: • Geotropism • Phototropism
Plant defence mechanisms	❑ Role of the following as plant defence mechanisms: • Chemicals • Thorns

EVOLUTION Paper 2: 54 marks	**Terms 3**	**4weeks**

CONTENT	ELABORATION
Introduction	❑ Definition of biological evolution change in the characteristics of species over time ❑ Difference between a hypothesis and a theory ❑ The Theory of Evolution is regarded as a scientific theory since various hypotheses relating to evolution have been tested and verified over time
Evidence for evolution	❑ Role of the following as evidence for evolution: • Fossil record – Link to Grade 10 • Biogeography – Link to Grade 10 • Modification by descent (homologous structures) • Genetics
Variation	❑ Definition of a biological species and a population ❑ A review of the contribution of each of the following to variation that exists amongst individuals of the same species: • Meiosis o Crossing over o Random arrangement of chromosomes • Mutations • Random fertilisation • Random mating ❑ Types of variation: • Continuous variation – those characteristics where there is a range of intermediate phenotypes, e.g. height • Discontinuous variation – those characteristics that fall into distinct categories e.g., blood groups

CONTENT	ELABORATION
Origin of an idea about origins (a historical development)	❑ Ideas on evolution in the order of their origin are as follows: • Lamarckism • Darwinism • Punctuated Equilibrium
Lamarckism (Jean Baptiste de Lamarck – 1744–1829)	❑ Lamarck used two 'laws' to explain evolution: • 'Law' of use and disuse • 'Law' of the inheritance of acquired characteristics ❑ Reasons for Lamarck's theory being rejected
Darwinism (Charles Darwin – 1809–1882)	❑ Darwin's theory of evolution by natural selection: • There is a great deal of variation amongst the offspring. • Some have favourable characteristics and some do not. • When there is a change in the environmental conditions or if there is competition, • then organisms with characteristics, which make them more suited, survive • whilst organisms with unfavourable characteristics, which make them less suited, die. • The organisms that survive, reproduce • and thus, pass on the allele for the favourable characteristic to their offspring. • The next generation will therefore have a higher proportion of individuals with the favourable characteristic.
Punctuated Equilibrium (Eldredge and Gould – 1972)	❑ Punctuated Equilibrium explains the speed at which evolution takes place: • Evolution involves long periods of time where species do not change or change gradually through natural selection (known as equilibrium). • This alternates with (is punctuated by) short periods of time where rapid changes occur through natural selection • during which new species may form in a short period of time.
Artificial selection	❑ Artificial selection involving: • A domesticated animal species • A crop species
Formation of new species	❑ Biological species concept: similar organisms that are capable of interbreeding to produce fertile offspring ❑ Speciation and extinction and the effect of each on biodiversity ❑ Speciation through geographic isolation: • If a population of a single species becomes separated by a geographical barrier (sea, river, mountain, lake) • then the population splits into two. • There is now no gene flow between the two populations. • Since each population may be exposed to different environmental conditions/the selection pressure may be different • natural selection occurs independently in each of the two populations • such that the individuals of the two populations become very different from each other • genotypically and phenotypically. • Even if the two populations were to mix again • they will not be able to interbreed. • The two populations are now different species. ❑ Speciation through geographic isolation in ONE of the following: • Galapagos finches • Galapagos tortoises • Plants on different land masses (linked to continental drift) o Baobabs in Africa and Madagascar o Proteas in South Africa and Australia • Any example of mammals on different land masses

CONTENT	ELABORATION
Mechanisms of reproductive isolation (Keeping species separate)	❑ A brief outline of reproductive isolation mechanisms that help to keep species separate: • Breeding at different times of the year • Species-specific courtship behaviour • Plant adaptation to different pollinators • Infertile offspring • Prevention of fertilisation
Evolution in present times	❑ Any ONE example of natural selection and evolution in present times: • Use of insecticides and consequent resistance to insecticides in insects • Development of resistant strains of tuberculosis-causing bacteria (MDR and XDR) to antibiotics, due to mutations (variations) in bacteria and failure to complete antibiotic courses • HIV resistance to antiretroviral medication • Bill (beak) and body size of Galapagos finches
Evidence of common ancestors for living hominids, including humans	❑ Interpretation of a phylogenetic tree to show the place of the family Hominidae in the animal kingdom ❑ Characteristics that humans share with African apes ❑ Anatomical differences between African apes and humans, with the aid of diagrams, as it applies to the following characteristics: • Bipedalism (foramen magnum, spine and pelvic girdle) • Brain size • Teeth (dentition) • Prognathism • Palate shape • Cranial ridges • Brow ridges ❑ Lines of evidence that support the idea of common ancestors for living hominids including humans: • Fossil evidence: Evidence from fossils of different ages show that the anatomical characteristics of organisms changed gradually over time. • Emphasis on evolutionary trends provided by the anatomical features of fossils of the following three genera: o *Ardipithecus* o *Australopithecus* o *Homo* as well as: o The age of each fossil found/time-line for the existence of the three genera o The fossil sites where they were found: emphasis on the fossil sites that form a part of the Cradle of Humankind o The scientists who discovered them • Genetic evidence: mitochondrial DNA • Cultural evidence: tool-making
Out-of-Africa hypothesis	❑ The Out-of-Africa hypothesis: Modern humans originated in Africa and then migrated to other continents ❑ Evidence for the 'Out-of-Africa' hypothesis: • Fossil evidence: information on each of the following fossils that serve as evidence for the 'Out-of-Africa' hypothesis: o *Ardipithecus* (fossils found in Africa only) o *Australopithecus* (fossils found in Africa only, including Karabo, Little Foot, Taung Child, Mrs Ples) o *Homo* (fossils of *Homo habilis* found in Africa only; oldest fossils of *Homo erectus* and *Homo sapiens* found in Africa, while the younger fossils were found in other parts of the world) • Genetic evidence: mitochondrial DNA ❑ Timeline for the existence of different species of the genus *Homo* and significant features of each of fossil type to show the differences amongst them ❑ Interpretation of phylogenetic trees proposed by different scientists showing possible evolutionary relationships as it applies to hominid evolution

5. CONCLUSION

This Examination Guidelines document is meant to articulate the assessment aspirations espoused in the *CAPS* document. It is therefore not a substitute for the *CAPS* document which teachers should teach to.

Qualitative curriculum coverage as enunciated in the *CAPS* cannot be over-emphasised.