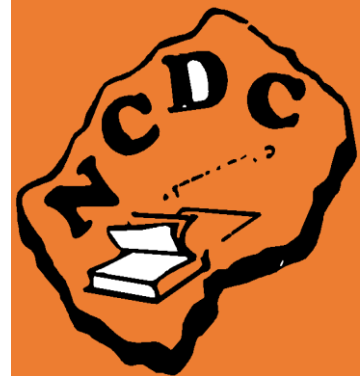




GRADE 10 & 11 BIOLOGY SYLLABUS 2020

Kingdom of Lesotho
Ministry of Education and
Training.



MOHLOLI OA THUTO

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INTRODUCTION

The National Curriculum Development Centre (NCDC) in collaboration with the Examination Council of Lesotho (ECoL), National Task Teams/Panels, teacher training institutions, teacher associations, policy makers and educators in Lesotho identified the need for a new Curriculum that would respond to the changing demands of the education sector.

Two major developments have been the move by the country to the universal and compulsory Basic Education and the launch of the Curriculum and Assessment Policy 2009 (Education for Individual and Social Development) which advocates for integrated Basic Education Curriculum that permits persons with a wide range of abilities to benefit from educational provision at this level. The decision to implement programmes to achieve Universal Basic Education and integrated curriculum is based on an understanding that the country needs a well-educated and trained labour force for an increasingly competitive global environment. A sound secondary education foundation is imperative for further education and training and for entry in the world of work.

Science is a systematic enterprise that builds and organises knowledge in the form of testable explanations and predictions about nature and the universe. It deals with collection of techniques, methods or processes used in the production of goods or services or in the accomplishment of objectives, such as scientific investigation. Science seeks to promote understanding of scientific and environmental phenomena. Biology as a science, deals with life sciences and is aimed at assisting the learners to understand systems, processes, health and their environment. It is a bases for all life science and it is imperative that all leaners who wish to pursue life sciences should do biology.

It considers the environment as a multi-dimensional concept consisting of biophysical, social, scientific, technological, political, economic, personal and contextual dimensions. It therefore concerns the understanding of scientific and environmental phenomena in terms of physical, economic, social, political and technological development and seeks to promote knowledge, skills and values pertinent to biology and technology.

Learners need to develop skills such as problem-solving, critical thinking, effective and functional communication, technological and creative skills, predicting, observing, classifying, hypothesising, experimenting, whilst gaining:

- understanding of biological and technological concepts, principles and processes for socio-economic development;

- an understanding of environmental phenomena, including the physical, socio-economic and technological dimensions of environmental issues;
- the ability to apply biological and technological skills in solving everyday life challenges; and
- positive attitudes and values towards the use of biology and technology in everyday life.

In Grade 10 and 11, the subject has designed activities in such a manner that they enable and promote the use of the scientific, investigation/inquiry and learner-centred approach. The four steps of the scientific method are observation of a phenomenon, formulation of a hypothesis, prediction of future outcomes or other phenomena, and experimentation to test the validity of the predictions. A hypothesis becomes a theory or law of nature if the experiments confirm its validity. Otherwise, it must be modified or rejected and the data further examined. Scientists postulate that the basic laws of the universe are unchangeable, and through observation and experimentation, humans determine the validity of their beliefs to better understand the nature of reality. As such teachers are encouraged to teach likewise. However, teachers can also adopt other approaches to facilitate effective and efficient teaching and learning. Teachers should ensure that activities given to learners develop the above-mentioned scientific competencies.

Certain attitudes or dispositions are also central to scientific inquiry and discovery: these include curiosity, a drive to experiment as well as a desire to challenge theories and to share new ideas and appreciate the world (Conezio & French, 2002).

TEACHING BIOLOGY

Careful selection of content, and use of a variety of approaches to teaching and learning Biology should promote understanding of:

- Biology as a discipline that sustains enjoyment and curiosity about the world and natural phenomena;
- the history of Science and the relationship between Sciences and other subjects;
- the different cultural contexts in which indigenous knowledge systems have developed;
- the contribution of Science to social justice and societal development;
- the need for using scientific knowledge responsibly in the interest of ourselves, of society and the environment; and
- the practical and ethical consequences of decisions based on Science.

AIMS

The aims of Biology as a science are to:

1. provide a worthwhile educational experience to all learners of different abilities.
2. enable learners to acquire knowledge and understanding of the scientific phenomena:
 - recognize limitations of scientific methods; and
 - become confident citizens.
3. develop abilities and skills that:
 - encourage efficient and safe practice; and
 - encourage effective communication o are useful in everyday life.
4. develop relevant attitudes and values such as:
 - objectivity;
 - integrity;
 - initiative;
 - inventiveness;
 - concern for accuracy and precision;
 - awareness; and
 - caring for the environment

OBJECTIVES

It is expected that at the end of Grade 11 learners could have:

- acquired knowledge, skills, attitudes and values that will enable them to further their studies either in the Natural Sciences or Applied Sciences.
- developed research skills to assist them acquire new knowledge.
- acquired practical skills necessary for further studies.
- developed skills that will enable them to solve day to day problems.

SCHEME OF ASSESSMENT

All learners should take 3 Papers.

Paper 1 : Multiple Choice	1 hour
40 compulsory multiple-choice questions. This paper carries 40 marks. Weighted at 30% of the total qualification.	
Paper 2 : Theory	1 hour 45 minutes
This paper has two sections. Section A carries 50 marks and consists of a small number of compulsory, structured questions. Section B carries 30 marks and consists of three compulsory questions. Weighted at 50% of the total qualification	

Paper 3 : Alternative to practical	1 hour
A written paper designed to test familiarity with laboratory-based procedures and past experience of practical work.	
This paper carries 40 marks.	
Weighted at 20% of the total qualification.	

Source LGCSE Biology Syllabus 2018

Specification Grid

Assessment Objective	Weighting	Paper 1 (marks)	Paper 2 (marks)	Paper 3 (marks)	Total Qualification (%)
A Knowledge with understanding	50%	25-30	48-52	0	47-54
B Handling information and problem solving	30%	10-15	20-27	0	26-33
C Experimental skills and Investigations	20%	0	0	40	20

Source LGCSE Biology Syllabus 2018

TEACHING HOURS

It is recommended that the Biology be allocated 240 minutes per week comprising of four, forty (40) minutes periods and one eighty (80) minutes period, making a total of six periods per week. The double period should be used for practical work.

GRADE 10 AND 11 BIOLOGY SYLLABUS OVERVIEW

Learning Outcome: at the end of Grade 10 learners should be able to:

1. describe respiration.
2. describe transport in humans.
3. describe excretion.
4. describe maintenance of constant internal environment in the body.
5. describe relationships of organism with one another and with the environment
6. describe coordination.
7. describe hormones.
8. describe nuclear division.
9. describe inheritance.

**GRADE 10 & 11 BIOLOGY SYLLABUS
ACTIVITY PLAN**

Learning Outcomes: at the end of Grade 11, learners should be able to:	Concepts, skills, values and attitudes	Suggested learning experiences	What to assess: the teacher should assess learners' ability to:	Suggested resources
1. describe respiration.	<p>Concepts Respiration: - aerobic - anaerobic Oxygen debt Uses of energy Applications of anaerobic respiration</p> <p>Skills Manipulation Observation Problem-solving Critical thinking Interpretation Decision-making</p> <p>Values and Attitudes Caring Responsibility Awareness</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> • review breathing system and respiratory disorders. • discuss respiration, aerobic and anaerobic. • discuss applications of anaerobic respiration. • discuss the uses of energy from respiration in the body. <p>Learners under the guidance of a teacher:</p> <ul style="list-style-type: none"> • write word equations of aerobic and anaerobic respirations. • write balanced equation of aerobic respiration. • investigate the effect of lactic acid in muscle during exercise. • investigate the role of anaerobic respiration in yeast during brewing and bread 	<p>define respiration.</p> <p>describe respiration.</p> <p>distinguish between aerobic and anaerobic respiration.</p> <p>state the word and balanced equations of aerobic respiration.</p> <p>state the word equation for anaerobic respiration in muscles and micro-organisms.</p> <p>state the uses of energy from respiration in the human body</p> <p>describe the effect of lactic</p>	<p>Resource person.</p> <p>Internet.</p> <p>Field trips.</p> <p>Charts.</p> <p>Posters.</p> <p>Pictures.</p> <p>Photomicrographs.</p> <p>Simulations.</p> <p>Yeast.</p> <p>Sugar, Water.</p>

	Appreciation	<p>making.</p> <ul style="list-style-type: none"> investigate the use of bacteria in yoghurt making and single cell protein. 	<p>acid in muscles during exercise</p> <p>describe the role of anaerobic respiration in:</p> <ul style="list-style-type: none"> yeast during brewing and bread-making bacteria in yoghurt and single cell protein 	<p>Flour.</p> <p>Milk.</p> <p>Fermenter.</p>
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Learning outcomes: at the end of Grade 11, learners should be able to:	Concept, skills values and Attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
2. describe transport in humans.	<p>Concepts</p> <p>Double circulation Heart Pulse rate Coronary heart diseases Valves Blood vessels Tissue fluids and plasma Immune system Lymphatic system</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> review circulatory system as done in Grade 7. review the health effects of smoking on the heart. discuss double circulation. discuss the functions of the heart, valves and blood vessels. discuss functions of tissue fluids and plasma. 	<p>state the function of the following: heart, valves, blood vessels.</p> <p>describe double circulation.</p> <p>describe the functions of the heart in terms of muscular contraction and the working of the valves.</p>	<p>Posters.</p> <p>Charts.</p> <p>Stop watch.</p> <p>Heart models.</p> <p>Simulations.</p>

	<p>Blood clotting</p> <p>Skills Manipulation. Observation. Identification. Problem-solving. Decision-making. Evaluation. Recording. Reporting. Measurement. Drawing.</p> <p>Values and Attitudes Caring. Responsibility. Awareness. Appreciation.</p>	<ul style="list-style-type: none"> • discuss the process of blood clotting • discuss the role of immune system and lymphatic system (give details of how they work) • discuss tissue rejection. • research and discuss coronary heart diseases in terms of the blockage of coronary arteries and state the possible causes (diet and stress) and preventative measures. <p>Learners:</p> <ul style="list-style-type: none"> • identify the main blood vessels to and from the heart, lungs, liver and kidneys from posters and diagrams. • investigate effects of physical activities on pulse rate. 	<p>state and explain the effect of physical activities on pulse rate.</p> <p>state functions of plasma.</p> <p>describe the transfer of materials between capillaries and tissue fluid.</p> <p>describe the role of the immune system in tissue rejection.</p> <p>name the main blood vessels to and from the heart, lungs, liver and kidneys.</p> <p>describe the functions of the lymphatic system in circulation of body fluids and production of lymphocytes.</p> <p>describe the process of clotting.</p>	<p>Resource person</p>
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			describe coronary heart disease. state possible causes of coronary heart diseases and preventative measures.	
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Learning outcomes: at the end of Grade 11, learners should be able to:	Concept, skills values and Attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
3. describe excretion in humans.	<p>Concepts Excretion kidney functions structure and function of kidney tubule osmoregulation: -pituitary gland -hormone ADH dialysis and its applications kidney transplant.</p> <p>Skills Observation. Manipulation.</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> • review kidney structure and functions as done in Grade 7. • discuss excretion. • discuss functions of kidney. • discuss structure and function of kidney tubule • discuss osmoregulation. • discuss the role of the pituitary gland and the hormone ADH in osmoregulation. • discuss dialysis and its applications. • discuss kidney transplant, 	<p>define excretion</p> <p>describe functions of kidney.</p> <p>describe structure and function of kidney tubule.</p> <p>describe the role of the pituitary gland and the hormone ADH in osmoregulation.</p> <p>explain dialysis and its applications.</p>	<p>Internet.</p> <p>Pictures.</p> <p>Posters.</p> <p>Simulations.</p> <p>Resource persons.</p> <p>Health centres.</p> <p>Visking tubing.</p>

	<p>Drawing . Decision-making. Problem-solving. Critical thinking. Measurement. Research. Reporting.</p> <p>Values and Attitudes Awareness. Appreciation. Cooperation. Responsibility.</p>	<p>advantages and disadvantages.</p> <p>Learners:</p> <ul style="list-style-type: none"> • research on kidney transplant and tissue rejection • draw and label the structure of kidney tubule and dialysis machine • investigate how dialysis machine works using visking tubing. (TG) 	<p>describe advantages and disadvantages of kidney transplants. compared with dialysis.</p> <p>write a report on investigation of how dialysis machine works.</p>	
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Learning outcomes: at the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
4. describe maintenance of constant internal environment in the body.	<p>Concepts: Homeostasis Body temperature maintenance:</p> <ul style="list-style-type: none"> - vasoconstriction - vasodilation - shivering - sweating - role of temperature 	<p>Teacher and learners:</p> <ul style="list-style-type: none"> • review structure of the skin and its functions as done in grade 8. • review blood glucose regulation as done in grade 9. • discuss homeostasis. • discuss body temperature 	<p>define homeostasis..</p> <p>describe maintenance of the constant body temperature.</p> <p>explain the concept of control by negative feedback.</p>	<p>Internet</p> <p>Posters/charts</p> <p>Simulations</p> <p>Photomicrographs</p>

	receptors Negative feedback Skills Manipulation Observation Identification Critical thinking Evaluation Problem-solving Decision-making Values and Attitudes Responsibility Awareness Appreciation	maintenance. • discuss negative feedback. Learners: • research body temperature maintenance by the skin. • illustrate concept of negative feedback.		
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Learning outcomes: at the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
5. describe relationship of organisms with one another and with the environment.	Concepts: Sun as principal energy source Noncyclical energy flow Ecosystem: - effects of humans	Teacher and learners: • review food chain and food web as done in Grade 6 and 7. • discuss the sun as the principal source of energy	state that the Sun is the principal source of energy input to biological systems; describe the non-cyclical nature of energy flow;	Internet. Posters/charts. Simulations.

	<ul style="list-style-type: none"> ○ deforestation ○ pollution ○ combustion of fossil fuels ○ overuse of fertilisers ○ climate change ○ recycling ○ conservation <p>Use of hormones</p> <p>Trophic level</p> <p>Energy loss</p> <p>Pyramid:</p> <ul style="list-style-type: none"> - biomass - numbers <p>Carbon cycle:</p> <ul style="list-style-type: none"> - combustion - photosynthesis - fossilisation - decomposition <p>Nitrogen cycle:</p> <ul style="list-style-type: none"> - nitrogen fixation - nitrification - denitrification - decomposition <p>Population</p> <ul style="list-style-type: none"> - factors affecting growth rate and their importance 	<p>input to biological systems.</p> <ul style="list-style-type: none"> • discuss the non-cyclical nature of energy flow. • discuss energy losses between trophic levels. • discuss pyramids of biomass, numbers or energy. • discuss the carbon cycle. • discuss the nitrogen cycle. • discuss population. • discuss ecosystem and effects of humans in terms of deforestation, pollution, combustion, overuse of fertilisers. • discuss conservation of resources. <p>Learners:</p> <ul style="list-style-type: none"> • identify trophic levels from food chains and food webs. • construct pyramids of biomass, numbers or energy from food chains and food webs. • draw carbon cycle and nitrogen cycle. • research and present on factors affecting the rate of 	<p>define the terms:</p> <p>-<i>ecosystem</i> as a unit containing all of the organisms and their environment, interacting together, in a given area</p> <p>-trophic level as the position of an organism in a food chain, food web or pyramid of biomass, numbers or energy;</p> <p>describe energy losses between trophic levels;</p> <p>draw, describe and interpret pyramids biomass and numbers;</p> <p>explain why food chains usually have fewer than five trophic levels;</p> <p>explain why there is an increased efficiency in supplying green plants as human food and that there is a relative inefficiency, in</p>	<p>Videos.</p> <p>Graphs.</p> <p>Resource persons.</p>
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	<p>- sigmoid curve</p> <p>Skills Manipulation. Observation. Identification. Critical thinking. Evaluation. Problem-solving. Decision-making.</p> <p>Values and Attitudes Responsibility. Awareness. Appreciation.</p>	<p>population growth and their importance.</p> <ul style="list-style-type: none"> • construct and interpret sigmoid curves. • research and present on effects of humans in terms of deforestation, combustion of fossil fuels, and overuse of fertilisers. • research and present on effects of pollution under: <ul style="list-style-type: none"> - the effects of non-biodegradable plastics in the environment; - water pollution by sewage and chemical waste; - the causes and effects on the environment of acid rain, and the measures that might be taken to reduce its incidence; - how increases in greenhouse gases (carbon dioxide and methane) are thought to cause global warming; - -pollution due to 	<p>terms of energy loss, in feeding crop plants to animals.</p> <p>describe and state the importance of the carbon cycle.</p> <p>describe the nitrogen cycle.</p> <p>discuss the effects of combustion of fossil fuels.</p> <p>define population as a group of organisms of one species, living in the same area at the same time.</p> <p>state the factors affecting the rate of population growth for a population of an organism (limited to food supply, predation and disease), and describe their importance.</p> <p>identify the lag, potential (log), stationary death phases in the sigmoid</p>	
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		<p>pesticides including insecticides and herbicides;</p> <ul style="list-style-type: none"> - -pollution due to nuclear fall-out; • collect plastics, papers, bottles and other used materials to construct useful materials. 	<p>population growing in an environment with limited resources.</p> <p>describe the change in human population size and its implications.</p> <p>explain the factors that lead to:</p> <ul style="list-style-type: none"> • the lag phase, • exponential (log) phase • and stationary phase <p>in the sigmoid curve population growth reference, making reference, where appropriate, to the limiting factors.</p> <p>interpret graphs and diagrams of human population growth.</p> <p>outline the effects of humans on ecosystems, with emphasis on examples of international importance (tropical rain forests,</p>	
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			<p>oceans and important rivers).</p> <p>list the undesirable effects of deforestation (to include extinction, loss of soil, flooding, carbon dioxide build up and oxygen depletion).</p> <p>describe the undesirable effects of overuse of fertilisers (to include eutrophication of lakes and rivers).</p> <p>discuss the use of locally available organic mature over chemical fertilisers.</p> <p>describe the undesirable effects of pollution</p> <p>identify pollution in the local environment and discuss ways in which it can be prevented;</p> <p>discuss the use of</p>	
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			<p>hormones in agricultural food production (names not required);</p> <p>describe the need for conservation of natural resources. (limited to water and non-renewable materials including fossil fuels);</p> <p>explain how limited and non-renewable resources can be recycled. (including recycling of paper and treatment of sewage to make the water safe to return to the environment or for human use)</p>	
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Learning outcomes: At the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
6. describe coordination.	<p>Concepts: Coordination Nervous system: - central nervous system - peripheral nervous system Functions of parts of the nervous system Neurons Reflex actions Reflex arc Receptors and effectors Antagonistic muscles Voluntary and involuntary actions Structure and function of the eye Accommodation Pupil reflex.</p> <p>Skills Manipulation. Observation.</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> review the external structure of the eye. discuss coordination in humans. discuss human nervous system in terms of central nervous system and peripheral nervous system. discuss functions of parts of the nervous system. discuss different types of neurons discuss reflex actions. discuss the internal structure and functions of the parts of the eye. discuss voluntary and involuntary actions. <p>Learners:</p> <ul style="list-style-type: none"> identify parts of the nervous system on diagrams. draw and label different 	<p>differentiate between the central nervous system and the peripheral nervous system.</p> <p>describe the nervous system.</p> <p>identify parts of the nervous system.</p> <p>describe functions of parts of the nervous system.</p> <p>identify different types of neurons.</p> <p>describe a reflex action.</p> <p>describe a simple reflex arc.</p> <p>state the muscles and glands as effectors.</p>	<p>Internet.</p> <p>Posters/charts.</p> <p>Simulations.</p> <p>Photomicrographs.</p> <p>Models.</p> <p>lenses (concave and convex).</p>

	<p>Compare. Identification. Critical thinking. Evaluation. Problem-solving. Decision-making.</p> <p>Values and Attitudes Responsibility. Awareness. Appreciation.</p>	<p>types of neurons.</p> <ul style="list-style-type: none"> investigate reflex action. draw and label reflex arc. investigate action of antagonistic muscles. research accommodation. investigate pupil reflex. 	<p>describe the action of the antagonistic muscles.</p> <p>define sense organs.</p> <p>describe the internal structure and functions of the parts of the eye.</p> <p>describe accommodation and pupil reflex.</p> <p>distinguish between voluntary and involuntary actions.</p>	
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Learning outcomes: At the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
7. describe hormones.	<p>Concepts Hormones Adrenaline Target organs Chemical control Nervous and hormonal control</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> review and discuss hormones as done in Grades 8 and 9 discuss chemical control of metabolic processes discuss nervous and hormonal control 	<p>define a <i>hormone</i>.</p> <p>describe chemical control of metabolic processes.</p> <p>state the role of adrenaline in chemical control.</p>	<p>Resource person.</p> <p>Internet.</p> <p>Field trips.</p> <p>Charts.</p>

	<p>Auxins Tropism: -geotropism -phototropism Synthetic plant hormones</p> <p>Skills Drawing. Manipulation. Observation. Problem-solving. Critical thinking. Interpretation. Decision-making. Presentation.</p> <p>Values and Attitudes Caring. Responsibility. Awareness. Appreciation.</p>	<p>Learners under the guidance of a teacher:</p> <ul style="list-style-type: none"> • research and present the role of adrenaline in chemical control. • investigate chemical control of plant growth by auxins. <ul style="list-style-type: none"> - geotropism - phototropism • research and present effects of synthetic plant hormones used as weed-killers. 	<p>state examples of situations in which adrenaline is secreted.</p> <p>compare nervous and hormonal control systems.</p> <p>define <i>auxins</i> and explain their role in tropic responses.</p> <p>explain the chemical control of plant growth by auxins.</p> <p>define <i>geotropism</i> as a response in which a plant grows towards or away from gravity.</p> <p>define <i>phototropism</i> as a response in which a plant grows towards or away from the direction from which light is coming.</p> <p>investigate geotropism and phototropism.</p>	<p>Posters.</p> <p>Pictures.</p> <p>Photomicrographs.</p> <p>Simulations.</p> <p>Potted plants.</p> <p>Seeds.</p> <p>Clinostat.</p>
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			explain the effects of synthetic plant hormones used as weed-killers.	
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Learning outcomes: At the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
8. describe nuclear division.	<p>Concepts Nuclear components Chromosomes: Homologous Gene DNA Allele Nucleus - haploid - diploid Nuclear division - mitosis - meiosis.</p> <p>Skills Manipulation. Observation. Identification. Problem-solving.</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> review mitosis as done in Grade 9. discuss nuclear components. discuss nuclear division resulting to haploid and diploid nucleus. <p>Learners:</p> <ul style="list-style-type: none"> Identify nuclear components from charts and simulations. differentiate the role of mitosis in human body. observe meiosis process in terms of reduction division of chromosomes numbers from diploid to haploid. investigate gametes formation as a result of 	<p>define chromosome as a thread of DNA, made up of a string of genes.</p> <p>define a gene as a length of DNA that is the unit of heredity and codes for specific protein.</p> <p>define allele as any of two or more alternative forms of a gene.</p> <p>define homologous chromosomes as similar chromosomes containing similar genes.</p> <p>define haploid nucleus as a</p>	<p>Posters.</p> <p>Charts.</p> <p>Simulations.</p> <p>Resource person.</p> <p>Photomicrographs.</p> <p>Video clips.</p>

	<p>Decision-making. Evaluation. Recording. Reporting. Drawing.</p> <p>Values and Attitudes Caring. Responsibility. Awareness. Appreciation.</p>	<p>meiosis.</p> <ul style="list-style-type: none"> carry out an experiment on investigating meiosis in terms of gene variation. 	<p>nucleus containing a single set of unpaired chromosomes.</p> <p>define diploid nucleus as a nucleus containing two sets of chromosomes.</p> <p>define meiosis as reduction division in which the chromosome number is halved from diploid to haploid.</p> <p>state that gametes are the result of meiosis.</p> <p>state that meiosis results in genetic variation so the cells produced are not all genetically identical.</p>	
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Learning outcomes: At the end of Grade 11, learners should be able to:	Concept, skills values and attitudes	Suggested learning experiences	What to assess: teacher should assess learners' ability to:	Suggested resources
9. describe inheritance.	<p>Concepts</p> <p>Inheritance Variation Genotype Phenotype Types of genes: - homozygous - heterozygous Types of alleles - dominant - recessive Sex determination Monohybrid cross Codominance Mutation Selection - artificial - natural Genetic engineering - insulin production - GMOs</p> <p>Skills</p> <p>Observation Manipulation</p>	<p>Teacher and learners:</p> <ul style="list-style-type: none"> • revise nuclear components and division • discuss inheritance. • discuss variation. • discuss genotype and phenotype. • discuss types of alleles and genes. • discuss monohybrid crosses. • discuss sex determination. • discuss codominance in terms of blood groups. • discuss mutation in relation to down's syndrome and sickle cell anaemia. • discuss artificial and natural selection. • discuss genetic engineering (insulin production and GMOs). <p>Learners:</p> <ul style="list-style-type: none"> • carry out activities that demonstrate continuous and 	<p>define inheritance as the transmission of genetic information from generation to generation.</p> <p>describe the inheritance of sex in humans (XX and XY chromosomes).</p> <p>define the terms: - <i>genotype</i> - <i>phenotype</i> - <i>homozygous</i> - <i>heterozygous</i> - <i>dominant allele</i> - <i>recessive allele</i></p> <p>calculate and predict the results of monohybrid crosses involving 1 : 1 and 3 : 1 ratios.</p> <p>explain codominance by reference to the inheritance of ABO blood groups</p>	<p>Internet</p> <p>Pictures</p> <p>Posters</p> <p>Simulations</p> <p>Resource persons</p>

	<p>Drawing Decision-making Problem-solving Critical thinking Measurement Research Reporting</p> <p>Values and Attitudes Awareness Appreciation Cooperation Responsibility</p>	<p>discontinuous variation.</p> <ul style="list-style-type: none"> investigate complete dominance and codominance from local farms. predict and calculate monohybrid crosses. research and report on artificial and natural selection. research and report on genetic engineering (insulin production and GMOs). 	<p>(phenotypes, A, B, AB and O blood groups and genotypes I^A, I^B, and I^O);</p> <p>state that continuous variation is influenced by genes and environment, resulting in a range of phenotypes between two extremes, e.g. height, skin colour in humans;</p> <p>state that discontinuous variation is caused by genes alone and results in a limited number of distinct phenotypes with no intermediates e.g. A, B, AB and O blood groups in humans, sex determination;</p> <p>define <i>mutation</i> as a change in a gene or chromosome.</p> <p>describe mutation as a source of variation, as shown by Down's syndrome.</p>	
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			<p>outline the effects and consequences of ionising radiation and chemicals on the rate of mutation.</p> <p>describe sickle cell anaemia and explain its incidence in relation to that of malaria.</p> <p>describe the role of artificial selection in the production of varieties of animals and plants with increased economic importance.</p> <p>define <i>natural selection</i> as the greater chance of passing on of genes by the best adapted organisms.</p> <p>describe variation and state that competition leads to differential survival of, and reproduction by, those organisms best fitted to the environment.</p> <p>explain the importance of</p>	
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			<p>natural selection as a possible mechanism for evolution.</p> <p>describe the development of strains of antibiotic resistant bacteria as an example of natural selection.</p> <p>define <i>genetic engineering</i> as altering the genetic makeup of an organism by introducing or removing genetic material.</p> <p>explain that the gene that controls the production of human insulin can be inserted into bacterial DNA.</p> <p>describe that genetically engineered bacteria can be used to produce human insulin on a commercial scale.</p> <p>describe potential advantages and dangers of</p>	
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			genetic engineering.	
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