



Republic of Namibia

MINISTRY OF EDUCATION

JUNIOR SECONDARY PHASE

LIFE SCIENCE SYLLABUS

GRADES 8 - 10

FOR IMPLEMENTATION IN 2007

Ministry of Education
National Institute for Educational Development (NIED)
Private Bag 2034
Okahandja
Namibia

© Copyright NIED, Ministry of Education, 2010
Life Science Syllabus Grades 8 - 10

(This document is also available on the NIED webpage: <http://www.nied.edu.na>.)

ISBN: 0-86976-830-1

Printed by NIED

Publication date: January 2010

TABLE OF CONTENTS

1.	INTRODUCTION	1
2.	RATIONALE AND AIMS	1
2.1	Knowledge with Understanding	1
2.2	Values and Attitudes	1
2.3	Scientific Skills	2
2.4	Democratic Principles	2
3	COMPETENCIES AND LEARNING OUTCOMES	2
3.1	Competencies	2
3.2	Learning Outcomes	2
4.	PARTICULAR FEATURES OF LIFE SCIENCE IN THE JUNIOR SECONDARY PHASE	3
5.	GENDER ISSUES	3
6.	LOCAL CONTEXT AND CONTENT	3
7.	LINKS TO OTHER SUBJECTS AND CROSS -CURRICULAR ISSUES	3
8.	APPROACH TO TEACHING AND LEARNING	4
9.	SUMMARY OF LEARNING CONTENT	5
10.	LEARNING CONTENT	6
10.1	Grade 8 Learning Content	7
10.2	Grade 9 Learning Content	16
10.3	Grade 10 Learning Content	23
11.	ASSESSMENT	34
12.	ADDITIONAL INFORMATION	41
A1	Glossary of terms used in science teaching and assessment activities	41
A2	Assessment Record Sheet for Grades 8 to 10, Terms 1 and 2	42
A3:	Assessment Record Sheet for Grades 8 & 9, Term 3	43

1. INTRODUCTION

The revised syllabi for Life Science Grades 8-10 have been developed in such a way that they describe the intended learning outcomes and assessment practices for the Junior Secondary Phase within the science mainstream. The learning experiences and subsequent outcomes in the natural science subjects are tailored towards promoting the learners' knowledge and understanding of the physical and biological world in which they are a part. The Life Science syllabi for the Junior Secondary Phase therefore integrate natural science, social, economic, physical, mathematical and technological learning areas of the broad curriculum.

Furthermore, the Life Science syllabi were developed in a clear and simple style in order to convey the ethos of learner-centred education. Learner-centred education presupposes that teachers have a holistic view of the learner, valuing the learner's life experience as the focal point of learning and teaching. Teachers should therefore select learning content and methods on the basis of the learners' needs within their immediate environment and community.

The themes, topics, aims, learning objectives and competencies in the Life Science curriculum embrace content matter in all other subjects across the curriculum. Under ideal conditions, the Life Science syllabi for Grades 8-10 would require 4 periods per week.

2. RATIONALE AND AIMS

Learning experiences in the natural science area are focused upon promoting teaching and learning for understanding. Namibia, like most African countries, is rich in natural resources. The exploration of these resources requires scientific knowledge and relevant skills. The acquisition of scientific knowledge and skills presents itself as a prerequisite for a progressive national economy and improved standard of life for our people. Thus it is important for our learners to acquire knowledge and skills which will foster their understanding of the interaction of human beings and the environment in order to satisfy human needs. It must be understood that the physical and biological world around us is quite complex and therefore needs to be understood in a holistic manner by the society in order to sustain the natural resources.

The sustainability of our natural resources, however, requires advanced technology through the efficient and effective usage of equipment, materials and processes. Modern technology is required in order to assist our learners and society to solve problems through planning, design, realisation, and evaluation of activities and goals.

The main aim of the syllabi in the natural science area is therefore to provide essential scientific background for our learners with the hope of producing the much-needed scientists for the country. The Namibian society needs to be scientifically literate if it is to cope with challenges of appropriate global technology and other requirements.

The subject Life Science within the natural science area promotes the following aims in the curriculum guide:

2.1 Knowledge with Understanding

- develop knowledge, understanding, creativity, practical and experimental skills as a solid foundation for academic training to prepare learners for creative and meaningful adult life
- help learners develop self-confidence, self-knowledge and understanding of the world in which they live, through meaningful scientific activities

2.2 Values and Attitudes

- develop a sense of responsibility towards the environment, relating scientific practices to sustainable use of natural resources

- demonstrate desirable behavioural patterns and frame of mind in interacting with the environment in a manner that is protective, preserving and nurturing
- develop attitudes and practices, further knowledge and activities that promote the physical and mental health of the society
- develop and enhance respect for, understanding of, and tolerance of other people's beliefs, cultures and ways of life

2.3 Scientific Skills

- develop a lively, questioning, appreciative and creative intellect to enable learners to discuss issues rationally, to make careful observations and analysis, to think scientifically, to solve problems and apply these skills to tasks
- promote Information Communication Technology (ICT) as a tool to enhance understanding of the learning content

2.4 Democratic Principles

- promote equality of opportunity for females and males, enabling both sexes to participate equally and fully in all spheres of society and fields of employment
- lay a foundation for informed and responsible attitudes and choices towards the balance of population growth, ecological sustainability, and the quality of life for all citizens of Namibia

3 COMPETENCIES AND LEARNING OUTCOMES

3.1 Competencies

Basic Competencies are the basic cognitive operations, skills and attitudes and values that all learners in Namibian schools are expected to demonstrate, and which can be assessed. The Basic Competencies specified in the natural science subjects are intended to help teachers identify the normal progress and all-round development of the learners at each stage. The expectation from the Ministry is that most learners in the Junior Secondary Phase will achieve the Basic Competencies, some very well or exceptionally well, and will progress from one grade to the next. Learners who partly achieve the Basic Competencies will also be able to progress to the next year with compensatory teaching.

A small number of learners have special educational needs to a degree which requires greater individual attention or resources. Some will have handicaps which do not necessarily limit cognitive and affective learning and development, e.g. visually impaired, hearing impaired and physically handicapped.

3.2 Learning Outcomes

On completing Grade 10 learners in the Natural Science stream should be in a position to discover and develop their potential and interests in basic science that prepares them for varied aspects of life. They should possess the necessary skills in the scientific area of learning as tools to understand the whole world. These skills include the following:

- **Communication Skills:** the ability to communicate fluently by being able to tell, act out, draw, write, explain, show, discuss, display, report and dramatise
- **Numeracy Skills:** the ability of learners to effectively communicate in simple mathematical scientific language, numbers, equations and concepts
- **Information Skills:** recognition that information becomes accessible in various forms and learners need to develop higher cognitive skills of analysis, interpretation and evaluation to use information effectively
- **Self-Management and Competitive Skills:** learners develop self-confidence, self-reliance and understanding of the world in which they live through meaningful activities

- **Problem Solving Skills:** the ability to think critically in solving problems and apply these skills to tasks
- **Participation:** taking part in learning activities by relating to others and taking responsibility for one's actions
- **Physical Skills:** the ability to use appropriate techniques and to handle apparatus/material competently with due regard for safety; these skills are essential for most subject areas as they are concerned with the development of the psychomotor skills which are fundamental for the learner's daily life
- **Work and Study Skills:** equip learners to play an effective and productive role in the economic life of the nation
- **Critical and Creative Skills:** the ability to foster a critical approach to evidence and to generate new ideas

4. **PARTICULAR FEATURES OF LIFE SCIENCE IN THE JUNIOR SECONDARY PHASE**

The subject Life Science within the natural science area places more emphasis on the learners' understanding of the physical and biological world around them at the local, regional and international level. It thus includes how society uses natural resources to satisfy its needs, and how the environment may be changed in ecologically sustainable ways. At this phase and subject area the application of scientific knowledge and attitudes to health is of special relevance for the individual, the family, and society as a whole.

5. **GENDER ISSUES**

The subject Life Science is essential to help foster logical thinking skills and form part of the foundation needed for pursuing most careers. Therefore, including gender perspectives is important for the science curriculum in order to raise awareness of gender stereotyping (e.g. gender roles we previously associated with doctors, nurses, farmers, artisans, mechanics, lawyers, etc.). Teachers are obliged to promote gender equity in all spheres of life. In all activities carried out within the scientific area of study, female learners should experience the confidence which will motivate them to continue in the natural science stream throughout their school career and beyond.

6. **LOCAL CONTEXT AND CONTENT**

The learning content in this syllabus is based on the Namibian context, although the themes and topics are on a variety of scales to meet international standards. Teachers are therefore urged, where appropriate, to use local examples to illustrate scientific issues, concepts and processes.

7. **LINKS TO OTHER SUBJECTS AND CROSS -CURRICULAR ISSUES**

The cross-curricular issues, including Environmental Learning, HIV and AIDS, Population Education, Education for Human Rights and Democracy (EHRD) and Information and Communication Technology (ICT) form an integral part of the natural science curriculum. The cross-curricular issues thus serve as a direct link of the natural science syllabi to other subjects for the Namibian school curricular. Each of the issues deals with particular risks and challenges in our Namibian society.

All of our learners need to:

- understand the nature of these risks and challenges;
- know how they will impact our society and the quality of life of our people now and in the future;
- understand how these risks and challenges can be addressed on a national and global level;

- understand how each learner can play a part in addressing these risks and challenges in their own school and local community.

The main risks and challenges have been identified as:

- the challenges and risks we face if we do not care for and manage our natural resources;
- the challenges and risks caused by HIV and AIDS;
- the challenges and risks to health caused by pollution, poor sanitation and waste;
- the challenges and risks to democracy and social stability caused by inequity and governance that ignores rights and responsibilities;
- the challenges and risks we face from globalisation.

Since some subjects are more suitable to address specific cross-curricular issues, those issues will receive more emphasis in these syllabi.

Links in this syllabus to cross-curricular issues:

Cross Curricular Issues	Grade 8	Grade 9	Grade 10
Environmental Education	4. Plants and their abiotic environment 6. School garden 7. Ecosystem	3. Living organisms 4. Plants 6. Ecosystem	6. Diversity of organisms 8. Ecology
HIV and AIDS	2. Health Education	2. Health Education	1. The body's immune system
Population Education		6.1 People, food and environment	7.6 Reproduction 7.9 Family planning and contraception
Human Rights and Democracy	7. Ecosystem	6. Ecosystem	8. Ecology
Information and Communication Technology	1.2 Process skills: microscope	1.2 Process skills: microscope	2. Process skills: microscope

8. APPROACH TO TEACHING AND LEARNING

The approach to teaching and learning in the science mainstream is based on a paradigm of learner-centred education as described in the Ministry's policy documents, including curriculum guides and a conceptual framework of syllabus revision. This approach ensures optimal quality of learning when the following principles are put into practice.

The aim is to develop learning with understanding, including the skills and attitudes required to contribute to the development of society. The focal point for teaching and learning is based on the principle which states that learners bring to the school a wealth of knowledge and social experiences gained continually from the family, the community and through interactions with the environment. Learning at school must involve, build on, extend and challenge the learner's prior knowledge and experiences.

Learners learn best when they are actively involved in the learning process through a high degree of participation, contribution and production. At the same time, each learner is an individual with her/his needs, pace of learning, experience and abilities.

The teacher must be able to explore the needs of learners, the nature of learning to be done, and how to shape learning experiences accordingly. Teaching strategies must therefore be varied but flexible within well-structured sequences of lessons.

The teacher must decide, in relation to the learning objectives and competencies to be achieved, when it is best to convey content directly and when it is best to let learners discover or explore information themselves. The teacher should also decide when learners need directed learning, and when they need reinforcement or enrichment learning. She/he must furthermore decide when there is a particular progression of skills or information that needs to be followed or when learners can be allowed to find their own way through a topic or area of content.

Working in groups, in pairs, individually or as a whole class must therefore be organised as appropriate to the task at hand. Cooperative and collaborative learning should be encouraged wherever possible. In such cases, tasks must be designed so that pair or group work is needed to complete it, otherwise learners will not see any relevance in carrying out tasks together. As learners develop personal, scientific and communication skills, they can be gradually given increasing responsibility to participate in planning and evaluating their work, under the teacher's guidance.

9. SUMMARY OF LEARNING CONTENT

Teachers should realise that there are certain aspects of the syllabus that should not be taught as separate entities and at fixed times during the school year. These include incidental topics such as general knowledge, field trips, project work, investigations and observations, social events, etc.

Summary of Learning Content for Grades 8 - 10 Life Science

GRADE 8	GRADE 9	GRADE 10
What is Life Science		
Topic 1.1 What is life science	-	-
Scientific Processes		
Topic 1 Scientific processes	Topic 1 Scientific processes	Topic 2 Scientific processes
Health Education		
Topic 2 Health education	Topic 2 Health education	Topic 1 The body's immune system
Diversity of Organisms		
Topic 3 Living organisms	Topic 3 Living organisms	Topic 3 Classification of living organisms
Topic 4 Plants and their abiotic environment	Topic 4 Plants	Topic 4 Cell theory
Topic 5 Plant reproduction	-	Topic 5.1 Six kingdoms
Human Biology		
-	Topic 5 Human biology	Topic 6 Nutrition Topic 7 Human body
Ecology		
Topic 6 School garden Topic 7 Ecosystem	Topic 6 Ecosystem	Topic 8 Ecology

10. LEARNING CONTENT

NOTE:

1. The learning content outlined below is designed to provide guidance to teachers as to what will be assessed in the overall evaluation of learners. They are not meant to limit, in any way, the teaching program of any particular school.
2. The learning content is set out in THREE columns.
 - (a) **Themes and topics**
 - (b) **Objectives**
 - (c) **Basic Competencies**
3. **Topics** refer to those components of the subject which learners are required to study. The **Objectives** are derived from the topic and is the general knowledge, understanding and demonstration of skills on which learners will be assessed. The **Basic Competencies** are the detailed and specified content of the syllabus, which will be assessed.
4. Suggestions for practical activities **or** demonstrations that **are considered essential** which all learners should be exposed to, as preparation for assessment, are listed below each topic or set of related topics.

10.1 Grade 8 Learning Content

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 1 Scientific processes	This topic is an introduction to some of the basic scientific skills. The skills in this topic should not be taught in isolation, as they form an integral part of the other topics.	
1.1 Introduction to life science: what is life science?	- realise the intentions of and possibilities within Life Science - realise that Life Science promotes environmental awareness, food self sufficiency and healthy living	- relate the main themes of Life Science to their daily life - suggest issues and problems that they would like to deal with in Life Science - recognize that Life Science is an applied science which encourages curiosity and the development of problem solving and investigative skills - outline that investigations are a way to explore the world around us, develop new ideas to explain the world around us and to verify the results of other scientists
1.2 Basic process skills: observing, measuring, drawing, inferring, classifying, predicting, estimating and communicating	know and understand the importance and application of the basic process skills	- follow a sequence of instructions and make and record estimates and measurements - apply basic process skills included in a series of activities using magnifiers (e.g. observing structure of soil, germinating seeds, etc.) - make and record observations accurately of all practical activities in Grade 8 (note: <i>observe</i> in science is the use of the five senses: sight, hearing, touch, smell and taste [we do not usually use taste, as that could be dangerous]; very often the conclusion and observation are confused, e.g. water boils is a conclusion, while bubbles formed is an observation) - communicate detailed observations through writing, drawing and discussion
1.3 Apparatus	know how to use a hand lens and understand its properties	- use appropriate techniques, handle apparatus/material competently and have due regard for safety - state the properties of hand lenses and outline the principles of magnification - calculate the magnification of an object

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 1 Scientific processes	Practical activities, approaches or demonstrations:
1.1 What is Life Science	- investigate and report on issues they would like to explore in Life Science - discuss the relevance of the main themes of Life Science to their lives
1.2 Process skills	- apply basic process skills which are included in a series of activities - make measurements of given objects or specimens - investigate properties of hand lenses and calculate the magnification of an object - be able to observe and make drawings of given objects and specimens - observe and draw the magnified image of an object - estimate the magnification of an object - measure the length of the magnified object - display microphotographs in some way, to assist in pointing out important cell characteristics

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 2 Health education		
2.1 Personal health	- gain health decision-making skills to make wise decisions - apply health education information appropriately and responsibly in the decisions the learner makes	- recognise health decision-making skills (recognizing that it is not always easy to make wise decisions) - discuss the risks of sexual activity and indicate that abstinence from sexual activity is the best choice of contraception - describe how to apply health education information appropriately and responsibly - state ways to manage stress - discuss the risks and consequences of tobacco, alcohol and drug use in our society - identify the benefits of a drug-free lifestyle

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
2.2 Sexual health/ diseases	know STDs common to Namibia, understand how STDs are spread/transmitted, prevented and treated	- list STDs common in Namibia - discuss the spread, prevention and treatment of gonorrhoea and syphilis - discuss the effects of STDs on one's health
2.3 HIV transmission	- know what HIV is and understand the requirements for its transmission - know the difference in attitudes towards an HIV positive person and an AIDS patient	- explain what HIV is - explain how HIV is transmitted and name the body fluids that can be infected with HIV - discuss the difference in attitudes towards an HIV positive person and an AIDS patient

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 2 Health education	Practical activities, approaches or demonstrations:
2.1 Health education	investigate and report on the benefits of a drug-free lifestyle
2.2 Sexual health	- invite a health worker to the school to discuss the importance of abstinence and the use of condoms - role play how learners can make appropriate decisions based on sexual behaviour
2.3 HIV transmission	- role play AIDS games with learners having different roles - discuss the difference in attitudes towards HIV positive people and AIDS patients - demonstrate how to use a condom /femidom, including the safe removal thereof

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 3 Living organisms		
3.1 Characteristics of living organisms	know all seven characteristics of living organisms	- list and define the characteristics of all living organisms - discuss the importance of these characteristics for the survival of the organisms - identify given organisms using a simple key

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
3.2 Classification	know and understand the principles of grouping and classifying organisms	- outline the principles of, and discuss the importance of, classifying organisms - outline how to identify organisms using a simple key
3.3 Plant and animal cells	know the basic structure of cells and understand the importance of cells in living organisms	- describe the basic structure of plant cells (onion and geranium cells) and animal cells (liver cells) - sketch and label the general structure of an animal and plant cell - distinguish (similarities and differences) between plant and animal cells - discuss the importance of cells in living organisms
3.4 Movement of particles and molecules: diffusion	appreciate that diffusion is an important process for the movement of molecules/particles	- relate diffusion to random movement of particles from a region of high concentration (a lot) towards a region of lower concentration (less) - discuss the importance of diffusion for living organisms

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 3 Living organisms	Practical activities, approaches or demonstrations:
3.1 Characteristics of living organisms	- observe organisms to compare their characteristics - use magnifiers/bug viewer to observe organisms - use locally available examples of insects to observe their characteristics
3.2 Classification	- construct diagrammatic keys of identification - classify organisms using examples given by the teacher - conduct field work around the school or local environment during summer and winter periods and collect insects or any other organisms to classify
3.3 Plant and animal cells	- examine cells using a microscope - compare cells from the same organism and from different organisms - learners should attempt to illustrate and label, as neatly and accurately as possible, what they have viewed through the microscope (note: if no microscope is available, less desirable alternatives are acceptable, e.g. cell diagrams on posters and overhead) - compare animal and plant cells using microphotographs - make a model cell, using a Zip plastic or using recycled paper

Topic 3 Living organisms	Practical activities, approaches or demonstrations:
3.4 Movement of particles and molecules: diffusion	• observe the process of diffusion using; a tea bag or potassium permanganate (in a Petri dish on the overhead projector) • investigate factors that can influence the rate of diffusion • investigate diffusion of gas in glass tubing

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 4 Plants and their abiotic environment		
4.1 Plants (dicotyledonous)	• know and understand the structure and function of vascular plants	• identify the roots, stems, leaves and flowers of a vascular plant • discuss the functions of the roots, stems, leaves, and flowers • describe the structure of fibrous- and taproot systems
4.2 Plants and soils	• know the soil properties required for plant growth	• outline the importance of soil properties for plant growth • discuss how growth and distribution of natural vegetation is limited by soil properties
4.3 Leaves and photosynthesis	• know the basic internal structure of a leaf and the importance of light and chlorophyll for photosynthesis	• state that leaves are the sites of photosynthesis and define photosynthesis as a process by which plants produce their own food, using the Sun as a source of energy • outline the factors that are important for, and explain the importance of, the products of photosynthesis • relate the importance of light and chlorophyll to photosynthesis
4.4 Plants and temperature	• know the influence of temperature on plant growth and transpiration	• analyse and compare the variations of daily air and soil temperatures in the shade and in the sunlight • predict the influence of extreme temperatures on plant growth and transpiration and identify the positive influence of temperature • explain how plants in the local environment and in the school garden are influenced by temperature
4.5 Storage of food in plants	• understand how storage of food (starch) takes place in leaves, roots,	• identify and describe the different parts of a plant where storage of food (starch) occurs

	stems and seeds	
--	-----------------	--

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 4	Plants and their abiotic environment	Practical activities, approaches or demonstrations:
4.1	Plants	- collect various structures of different vascular plants and list possible functions of each part - compare fibrous- and tap root systems
4.2	Plants and soils	- carry out practical investigations into the relationships between plant growth and some of the soil properties of different soil types - use different soil types to grow seedlings and observe and record how fast germination takes place for each type

Topic 4	Plants and their abiotic environment	Practical activities, approaches or demonstrations:
4.3	Leaves and photosynthesis	- collect various leaves and measure their surface area expose to light - investigate the importance of light and chlorophyll for photosynthesis (placing a potted plant in a cupboard for 48 hours or covering leaf surface with aluminium foil and testing for starch)
4.4	Plants and temperature	place seedlings of the same plant in different environments, some in the light, others in the dark, compare the influence of varying light (light versus dark environment) and temperatures on growth and transpiration and determine how these can influence photosynthesis
4.5	Storage of food in plants	collect and identify different storage organs of starch in various plants

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 5		
Plant reproduction		
5.1 Sexual reproduction	understand how plants reproduce sexually by pollination and by the production of seeds	- identify the different parts of a flowering plant and outline the functions of each reproductive organ - relate pollination to the transfer of pollen to a receptive stigma - distinguish between pollination and fertilization - discuss the importance of sexual reproduction for the survival of a plant

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
5.2 Asexual reproduction	• appreciate that some plants can reproduce without flowers and seeds, and know structures and methods used in asexual reproduction/vegetative propagation	• define asexual reproduction as a type of reproduction involving only one parent that produces a genetically identical offspring • distinguish between sexual and asexual reproduction • list and describe the methods of asexual reproduction with reference to binary fission, stem tubers and bulbs • discuss the commercial importance of asexual reproduction

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 5 Plant reproduction	Practical activities, approaches or demonstrations:
5.1 Sexual reproduction	• investigate or dissect a flower and observe different reproductive organs (use a hand lens where applicable) • collect samples of plants and compare how each plant is adapted for sexual reproduction • observe how insects are visiting flowers which enhances pollination • construct a model of a flower using the principles of bottle biology
5.2 Asexual reproduction	• collect and compare structures of asexual reproduction • investigate the importance of asexual reproduction for the economy of a country (Namibia)

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 6 School garden		
6.1 Maintaining a school garden	• acquire knowledge and skills on how to maintain a school garden and how to make compost • know the application of fertiliser to plants/crops and realise the important role of legumes in crop rotation	• list procedures of maintaining a garden • explain why it is important to shade, water, space, weed and control pests • explain how to make compost and describe its importance • describe how to apply organic and inorganic fertilisers to crops and discuss the advantages and disadvantages of organic and inorganic fertilisers • describe the importance of legumes (as plants with special abilities for

		nitrogen fixation) and discuss their role in crop rotation
THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
6.2 Harvesting and storage	know when to harvest crops, how to improve the quality and quantity of the harvest and store a harvested crop	- describe how to determine when a crop is ready for harvesting - explain how to improve the quality and quantity of a harvest in relation to both abiotic and biotic factors - explain how to store crops harvested from the school garden as well as those harvested by local farmers

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 6 School garden	Practical activities, approaches or demonstrations:
6.1 Keep a garden	- make a compost heap - construct a garden or visit any local gardening project and record the importance of maintenance, rotation and the adding of fertilizers to the soil
6.2 Harvesting and storage	- investigate the importance of different times of harvesting - compare traditional storage facilities (omashisha or iigaandhi) with modern technology - investigate the importance of harvesting and storage of crops

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 7 Ecosystem		
7.1 The flow of energy in an ecosystem	know the role of producers and consumers in food chains and understand the difference between ecology and ecosystem	- recognise the roles of producers (green plants) and consumers (herbivores, carnivores and omnivores) in food chains - distinguish between ecology and an ecosystem - sketch examples of food chains and food webs that are found in Namibian and regional ecosystems - describe the flow of energy through an ecosystem and recognise that energy flowing through food chains and webs is eventually transferred to heat energy (link to Topic 2.2 Matter and energy, in Grade 8 Physical Science)
7.2 Decomposition	appreciate the role played by	discuss the importance of decomposition for an ecosystem as a whole

	decomposers in an ecosystem and how organic matter is decomposed	• discuss how organic matter is decomposed
THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
7.3 Cycling of matter	• realise the principles of cycling of matter using the water cycle as an example	• describe the cycling of water in Namibian ecosystems • discuss the importance of cycling of water for living organisms

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 7 Ecosystem	Practical activities, approaches or demonstrations:
7.1 Flow of energy in an ecosystem	• investigate the flow of energy in a given ecosystem • compile a list of foods students have eaten for lunch, note if the food item is a producer or consumer and to what trophic level it belong • draw examples of food chains and food webs (Namibian and regional)
7.2 Decomposition	• investigate how matter is decomposed in an ecosystem
7.3 Cycling of matter	• investigate aspects of the water cycle in the local environment • make a water cycle wheel and build a model of a water cycle

10.2 Grade 9 Learning Content

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 1 Scientific Processes	This topic is an introduction to some of the basic scientific skills. The skills in this topic should not be taught in isolation, as they form an integral part of the other topics.	
1.1 Process skills: observing, measuring, drawing, inferring, classifying, predicting, estimating and communicating	know and understand the importance and application of the basic process skills	- follow a sequence of instructions and make and record estimates and measurements - discuss and use basic process skills which are included in a series of activities using magnifiers (e.g. observing structure of soil, germinating seeds, etc.) - make and record observations accurately of all practical activities in Grade 9 (note: <i>observe</i> in science is the use of the five senses: sight, hearing, touch, smell and taste [we do not usually use taste, as that could be dangerous]; very often the conclusion and observation are confused, e.g. water boils is a conclusion, while bubbles formed is an observation) - analyse and communicate detailed observations through writing, drawing and discussion
1.2 Apparatus	know how to manipulate a light microscope and understand the functions of its various parts	- use appropriate techniques, handle apparatus/material competently and have due regard to safety - outline the principles of magnification, the properties and the functions of various parts of the microscope

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 1 Scientific Processes	Practical activities, approaches or demonstrations:
1.1 Process skills	- make a labelled diagram of a given object - make measurements of objects and calculate their magnification - use a microscope to observe cells and different structures

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 2 Health Education		
2.1 Immunisation	realize the types and importance of immunization and understand the importance of antibodies	- define immunization as a method of increasing a patient's defence against infection - describe the types of immunity and discuss the role of antibodies in immunity
2.2 STDs	understand the impact and prevention of STDs on one's vulnerability for getting AIDS	- identify and describe the variety of contraceptives and distinguish between those that prevent the transmission of STDs and HIV infections and those that will not - discuss the impact of STDs on one's vulnerability for getting AIDS
2.3 HIV and testing	know the signs, symptoms and various types of blood tests associated with HIV infection and realise the importance of care and support for infected and affected people	- state various types of blood tests related to HIV testing and discuss the importance of undertaking these tests - outline the signs and symptoms associated with HIV infection - discuss types of care and support which can be offered to infected and affected people

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 2. Health Education	Practical activities, approaches or demonstrations:
2.1 Immunisation	investigate and report on types of immunity
2.2 STDs	discuss the dangers of STDs for health and risks involved
2.3 HIV and testing	- conduct a role play on counselling a person with HIV - introduce an AIDS transmission game (using iodine and starch [see teachers guide]) - conduct a role play on caring for HIV positive and AIDS people - carry out the HIV Elisa test (simulation)

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 3 Living organisms		
3.1 Characteristics of living organisms	know how to apply the characteristics to identify organisms in their locality	- identify and describe the seven characteristics of living organisms - compare and classify organisms into major groups on the basis of their structure (external features)
3.2 Arthropods	know the 5 classes of arthropods in their locality (examples relating to Namibia)	- identify and describe the 5 classes of arthropods as found in their local environment - describe the diagnostic features of arthropods and identify different arthropods using a simple key - compare the adapted features of arthropods to different environments

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 3 Living organisms	Practical activities, approaches or demonstrations:
3.1 Characteristics of living organisms	classify organisms into major groups (use simple keys)
3.2 Arthropods	- collect examples of arthropods from the local environment - observe the external features of an arthropod using a hand lens or a bug viewer

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 4 Plants		
4.1 Food production in plants	know the internal structure of a leaf and the functions of its parts	identify and label the internal structure of a leaf and outline the functions of each part
4.1.1 Structures of a leaf	know how leaves are adapted for photosynthesis	- describe the functions of a leaf - recognize how leaves are adapted for photosynthesis
4.1.2 Photosynthesis	understand the basic outline and the importance of photosynthesis for life on earth	- list ways in which leaves are adapted for photosynthesis - describe the basic process of photosynthesis and relate their importance to living organisms - state the equation for photosynthesis in words and symbols

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
4.1.3 Cell respiration	know the features of gaseous exchange surfaces in plants and understand the significance of plant respiration	- list the features of gaseous exchange surfaces in plants - state the equation for, and discuss the significance of, respiration for plants
4.2 Roots and water absorption	know the concept of osmosis and its role in the absorption of water and understand how materials enter and move through a plant	- relate osmosis to the net movement of water from a region of high water concentration to a region of low water concentration through a selectively permeable membrane - describe the structure and the functions of root hairs - outline how the root hair cell is adapted for its function - suggest how water moves from soil into a root hair
4.3 Plant water relations	realize the importance of water absorption for plant processes, understand the structure and functions of root hairs and xylem in their role of transpiration	- explain the importance of water in plant processes - identify the structural components of xylem and describe water transport in the xylem - define transpiration as the passage of water vapour into the atmosphere through the aerial parts of plants - describe the importance of transpiration in the upward movement of water in a plant
4.4 Adaptations of plants to arid conditions	know examples of plants that are adapted to arid environment and the importance of these adaptations	- identify examples of local plants that are adapted to arid conditions - discuss the importance of these adaptations for the plant

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 4 Plants	Practical activities, approaches or demonstrations:
4.1 Food production in plants	- draw and label the external structures of a leaf - collect a leaf of elodea or geranium, and view the internal structure under a microscope or hand lens (follow the procedures of preparing a wet mount) - test variegated leaves for the presence of starch and compare their results - investigate how leaves from different species are adapted for photosynthesis - investigate the features of gaseous exchange surfaces of plants - carry out simple experiments to illustrate respiration in plants

Topic 4 Plants		Practical activities, approaches or demonstrations:
4.2	Roots and water absorption	- do simple experiments to demonstrate osmosis in living cells and artificial cells - investigate how substances move by means of osmosis
4.3	Plant-water relations	- investigate the importance of water in plant processes - draw and label the structure of a root hair cell - investigate the structure of xylem in a celery stalk (using a hand lens or a microscope) - do simple experiments to illustrate differences in transpiration due to the number of stomata per unit area - investigate the role of transpiration in the upward movement of water in plants
4.4	Adaptations of plants to arid conditions	- collect samples of plants adapted to arid conditions as found in their locality - investigate how leaves of different species are adapted to the environment and discuss their importance for the plant

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 5 Human biology		
5.1 Human digestive system	know the parts and functions of the digestive system and understand the process of swallowing	- list the various parts of the digestive system and outline the functions of each - describe the process of swallowing - identify different types and basic functions of teeth, and describe the importance of proper care of teeth
5.2 Breathing system	know the gross structure of the breathing system and appreciate the importance of breathing for cell respiration	- identify the various parts of the breathing system and outline the functions of each part - discuss the importance of breathing and outline the mechanism of breathing - discuss the importance of breathing for cell respiration
5.3 Structure of the heart	know the gross structure of the heart, the importance of each part and the significance of differences in muscular structure	- identify the internal and external structures of the heart - describe the functions of the different parts of the heart - explain the importance of the different muscular structures of the heart

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and which all learners should be exposed to them as a minimum.

Topic 5 Human biology	Practical activities, approaches or demonstrations:
5.1/2 Human breathing and digestive system	• draw and label the parts of the digestive system • complete the quizzes on the digestive and breathing system (see teachers guide) • make a model of the breathing system using bottle biology (see teachers guide)
5.3 Structure of the heart	• make a model of the heart and indicate the blood flow

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 6 Ecosystem		
6.1 People, food and environment	• understand why hunters and nomads became the farmers of today, the need for sustainable farming and realise how the population growth will result in possible depletion of natural resources and environmental problems	• outline how natural resources were used by our predecessors who were mainly hunters and nomads and discuss why they gradually became farmers • recognise why it is important to consider sustainability when farming and the environmental problems which might occur if sustainability is not considered • explain how the needs of the growing Namibian population will increase the use of natural resources and may lead to environmental problems
6.2 Namibian environments	• know the biodiversity of different Namibian environments and understand the relationship between biodiversity and environmental conditions	• discuss the importance of biodiversity with reference to different Namibian environments • compare the biodiversity of different Namibian environments and discuss how biodiversity is related to environmental conditions • suggest factors that affect the biodiversity of an ecosystem
6.3 Interaction in an ecosystem	• know and understand the interactions in an ecosystem	• describe a pyramid of energy in terms of energy flow through an ecosystem • describe the significance of biotic and abiotic factors of an ecosystem • explain how abiotic factors affect organisms in an ecosystem
6.4 Cycling of energy and nutrients in an	• appreciate the role of sunlight in an ecosystem and its significance in the	• discuss the role of sunlight in an ecosystem and its significance in the

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
ecosystem	transfer of energy	transfer of energy • describe the major ecological cycles with reference to nitrogen and carbon cycles
6.5 Pollution of the local and global environment	• realise that natural resources can be depleted and damaged by pollution • acknowledge that an understanding of pollution is important to safeguard the environment	• list and discuss examples of local pollution • recognize that natural resources can be depleted and damaged by pollution • suggest how knowledge about pollution contributes to safeguarding the environment
6.6 Littering and water pollution in Namibia	• know littering and water pollution as examples of human activities	• discuss the causes and negative effects of littering and water pollution on the people and the environment • describe the effects that toxic substances, such as DDT, dieldrin and radioactive substances, may have on living organisms • suggest preventative measures against littering and water pollution

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 6 Ecosystem	Practical activities, approaches or demonstrations:
6.1 People, food and environment	• list some human activities that have reduced the earth's carrying capacity for people and other organisms
6.2 Namibian environments	• make a random sampling of plant and animal life in their local environment • investigate and report on the impact of biodiversity on the environment
6.3 Interaction in an ecosystem	• investigate and report on the influence of abiotic and biotic factors on living organisms in the environment (school or home)
6.4 Cycling of energy and nutrients in an ecosystem	• carry out an experiment with seedlings and a light source (using different light intensities) • draw a diagram illustrating how energy flows within a particular ecosystem
6.5 Pollution of the local and global environment	• investigate the influence of gas from matchsticks on seedlings in a closed environment and relate it to the effects of pollution on plants (see teachers guide)
6.6 Littering and water pollution in Namibia	• investigate littering and water pollution in their locality

10.3 Grade 10 Learning Content

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
THEME: HEALTH EDUCATION: Biomedical aspects of STDs and HIV and AIDS		
Topic 1 The body's immune system		
1.1 HIV and AIDS and the immune system	realize that HIV destroys the immune system of the body, know how HIV is diagnosed and appreciate the importance of ARV treatment and the role they play in prolonging life	- list the components of an immune system and outline the basic functions of each component - describe how HIV destroys the immune system of the body and outline how HIV is diagnosed (the blood tests used to diagnosed the presence of HIV) - outline what each of these tests reveal with regard to HIV status - list the types of ARV treatments common to Namibia, explain their importance in prolonging life, and discuss their possible side effects
1.2 STDs	understand the transmission, symptoms, effects, treatment, and ways of preventing the transmission of common STDs	- list different STDs common to Namibia - describe the transmission, symptoms, effects and treatment of common sexually transmitted diseases and suggest ways how to prevent the transmission of STDs
1.3 Infectious diseases	understand the social implications and transmission of common infectious diseases, including malaria, in Namibia	- list common infectious diseases in Namibia and discuss their social implications - outline different ways of transmission of infectious diseases - describe the life cycle of the malaria parasite - describe the symptoms of malaria, the impact of malaria on one's health and discuss ways of treating the disease
1.4 Prevention and curing of diseases	understand vaccination as a defence mechanism against infectious diseases and realise the importance of traditional medicine in the prevention of diseases	- recognise vaccination as a defence mechanism against infectious diseases - explain vaccination as an immunization process - discuss the importance and role of traditional medicine in the prevention of diseases

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 1 The body's immune system	Practical activities, approaches or demonstrations:
1.1 HIV and AIDS and the immune system	• carry out AIDS simulation testing game (Elisa testing game) • investigate and collect statistics on the impact of AIDS in Namibia and plot a graph
1.2 STDs	• collect information from a clinic, hospital or health centre on STDs
1.3 Infectious diseases	• role play, using a potato, how pathogens can be transmitted • collect information from a health centre, clinic or hospital on how to reduce the prevalence of malaria
1.4 Prevention and curing of diseases	• collect and report on locally used examples of traditional medicine and discuss how and for what they are used • investigate the success or failure rate of the government's immunisation programme

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 2 Scientific processes		
2.1 Process skills: observing, measuring, drawing, inferring, classifying, predicting, estimating and communicating	• know and understand the importance and application of the basic process skills • know how to manipulate a light microscope and understand the functions of its various parts	• interpret detailed observations through writing, drawing and discussion • sketch a labelled diagram of an given object • state the functions of the various parts of the microscope • discuss the principles of magnification • calculate the magnification of an object

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 2 Scientific processes	Practical activities, approaches or demonstrations:
2.1 Process skills	• study various parts of the microscope and state the functions of its parts • collect specimens, measure, draw and calculate magnification

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 3 Classification of living organisms		
3.1 Taxonomy and major levels of classification	realise the importance of taxonomy and know the major levels of classification	- define taxonomy as the branch of biology that deals with the identification and naming of living things - list the major levels of classification - discuss the importance of classifying organisms - outline and identify the principles used to classify organisms
3.2 The binomial system of nomenclature	- understand the binomial system of nomenclature - know what a cladogram is and realise that the six kingdom classification is based on a three domain cladogram - understand the relationship between classification and evolution and know how to use a dichotomous key	- define the binomial system as a system using a two word Latin name (genus and species) to identify a specific type of organism (notice that the genus name is capitalised and species name is never capitalised) - relate a cladogram to a branching diagram showing relationships among taxa - state the three domains of a cladogram - outline the process of evolution - discuss the relationship between classification and evolution - suggest how to use a dichotomous key

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 3 Classification of living organisms	Practical activities, approaches or demonstrations:
3.1 Taxonomy and major levels of classification	collect local plant and animal species as examples to classify
3.2 The binomial system of nomenclature	draw a cladogram and discuss its importance for the identification of organisms

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 4 Cell theory		
4.1 Types of cells	• understand cell theory • realise that there are different types of cells • know and understand the importance of various cell structures of a eukaryotic cell • realise that organisms can be unicellular or multicellular • know the difference between permeable and a selectively permeable membranes • know the basic structure of a plasma membrane • know and understand the structural and functional relationship among cells, tissues, organs and systems	• describe cell theory • compare eukaryotic and prokaryotic cells (plants, animals and bacteria) • list various structures of a eukaryotic cell and describe their functions (cell membrane, mitochondria, nucleus, vacuoles, cell wall and chloroplast) • differentiate between unicellular and multicellular organisms • distinguish between a permeable and a selectively permeable membrane (cell walls, elodea, epidermis, onion leaf scale, sub-surface section of a leaf, parenchyma cells, tomato) • describe the structure of a plasma membrane and relate the structure to its various functions (no reference to fluid mosaic model) • describe the structural and functional relationship among cells, tissues, organs and systems (plants and animals) • discuss the significance of cell processes for an organism (include osmosis, diffusion and selective permeability)

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 4 Cell theory	Practical activities, approaches or demonstrations:
4.1 Types of cells	• construct a cell model with various structures • investigate the process of permeability using teabags (or cell walls, elodea, epidermis, onion leaf scale, sub-surface section of a leaf, parenchyma cells, tomato) • investigate the process of diffusion and relate it to temperature and its importance to human bodies • study prepared slides of cells and make drawings thereof • investigate osmosis using living cells and a dialysis tube • prepare wet mounts of cells

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 5 Diversity of organisms		
5.1 Six kingdoms	• realize that organisms are divided into six kingdoms and know diagnostic features of each group • realise that animals are divided into five (5) major classes • know the external diagnostic features of fish and recognize the importance of fish consumption for healthy living	• describe the six kingdom classification (eubacteria, archaebacteria, protista, fungi, plantae and animalia) • outline the differences among the major phyla in each kingdom (Monera, Protists, Fungi and Plants) • describe the diagnostic features of a monocotyledon and a dicotyledon as found in their local environment • identify the five major classes of vertebrates • describe the external diagnostic features of fish (tilapia or trout) • investigate the adaptation of tilapia/trout to the Namibian environment • discuss the economic importance of tilapia or trout for Namibia • suggest the importance of eating fish to enhance healthy living

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 5 Diversity of organisms	Practical activities, approaches or demonstrations:
5.1 Six kingdoms	• collect diagrams of Monera, Protists, Fungi, Monocots and Dicots and study their differences and similarities • investigate the adaptation of tilapia or trout to the Namibian environment

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 6 Nutrition		
6.1 Nutrients	• know the characteristics of the main categories of nutrients and realise the difference between organic and inorganic nutrients • understand the functions of organic and inorganic nutrients in the body and know the difference between macro and micro nutrients • know the nutritional value of food, the symptoms and diseases related to a deficient nutrient and the relationship between nutrition and the health, sex and age of a person	• list the main characteristics and categories of nutrients • outline the differences between organic and inorganic nutrients • describe and explain the main functions of different nutrients (carbohydrates, proteins, fats, vitamins and mineral salts, as well as water and fibres) • distinguish between macro and micro nutrients • identify and give examples of foods which are the main sources of micro and macro nutrients • suggest a diet required by people of different age and sex performing the same or different activities • suggest why people of different age and sex have different energy requirements • identify and describe the symptoms and diseases caused by a lack of a particular nutrient in a diet

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 6 Nutrition	Practical activities, approaches or demonstrations:
6.1 Nutrients	• collect labels of nutrients from various sources and determine the nutritional value of the food substance • investigate the nutritional value of the food items rich in carbohydrates, proteins and fats • analyse food composition tables and food labels and calculate the energy value for different age and sex groups • investigate the impact of malnutrition on the population of Namibia • make a list of food you have been eating for five (5) days and determine its nutritional value • report how you would improve your diet to make it a balance diet

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 7 Human Body		
7.1 Respiratory system	• know the significance of the respiratory system for gaseous exchange and realise the relationship between the rate of breathing and level of activity • know that pollution and smoking can impair the functions of the respiratory system	• list the features of the gaseous exchange surfaces in animals • discuss the significance of these features for maintenance of life • suggest how different levels of activity can influence the rate of breathing • list the effects of air pollution and smoking on the respiratory system • discuss how air pollution and smoking impair the function of the respiratory system
7.2 Blood circulation	• know the structures of the circulatory system and understand the functions of the heart, capillaries, arteries, veins and the components of blood • realise that pulse rate is related to activity and how the build up of cholesterol in the circulatory system can lead to functional disorder • realise the importance of a healthy lifestyle and good living conditions in maintaining an effective circulatory system	• identify and name the structures of the circulatory system • outline the functions of the heart, arteries, veins, capillaries and components of blood • discuss how pulse rate is related to different levels of an activity • suggest how the build up of cholesterol in the circulatory system can lead to functional disorders • suggest how the need for healthy lifestyle and living conditions contributes to the maintenance of an effective circulatory system
7.3 Excretion and water balance	• know the structures of the excretory system • realise the involvement of the lungs, skin and renal system in excretion and the importance of keeping a balance between intake and loss of water from the body	• define excretion as the process of removing the waste products of cellular respiration from the body • identify the structures of the excretory system • discuss the functions of the lungs, skin and renal system in excretion • identify the waste products expelled from the organs involved in excretion • discuss the importance of maintaining a balance between intake and loss of water

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
7.4 Nervous system and hormonal control	• know the structures and functions of the nervous system and realise that alcohol and drug abuse affect its function • know the functions of hormones that are produced in different glands and realise the importance of sense organs in responding to stimuli from the environment	• identify the components of the nervous system and outline their function • discuss the functions of the central nervous system • describe the effects of alcohol and drug abuse on the nervous system • discuss the influence of drug abuse on families and the community • identify the location of major glands in the body and describe the functions of the hormones they produce • explain the effects of growth hormone, thyroxine, insulin and adrenaline on the body • explain that sense organs respond to stimuli, using vision as an example
7.5 Skeleton and muscles	• know different types of muscles, where each are found in the body, and understand how the skeleton and muscles support and enable movement	• list and describe different types of muscles and determine where each is found in the body • discuss how the skeleton and muscles are organized to support, protect and move the body
7.6 Reproduction	• know the structures and function of the female and male reproductive systems and acknowledge the roles of testosterone, oestrogen and progesterone in the development of sexual characteristics and puberty • understand the roles played by oestrogen and progesterone in the menstrual cycle	• describe the structures of female and male reproductive systems • outline the functions of each system (male and female) • discuss the effects of testosterone, oestrogen and progesterone in the development of sexual characteristics and puberty • describe the menstrual cycle and the role of oestrogen and progesterone in the menstrual cycle
7.7 Conception, pregnancy and birth	• understand conception and the development of a foetus throughout pregnancy, and realise the role of the placenta, amniotic fluid and the uterus in the development of a foetus • acknowledge that the lifestyle and health of the expectant mother influences the development and health of a foetus • know the process of birth	• describe conception and the development of a foetus throughout pregnancy • discuss the function of the placenta, amniotic fluid and the uterus in the development of a foetus • suggest how the development and health of a foetus are affected by the lifestyle of the expectant mother • discuss the process of birth

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
7.8 Caring for the new-born child	know the requirements of a baby for optimal mental and physical development and recognise the benefits of breast-feeding	- list and discuss the requirements for the healthy development of a baby - suggest why a mother should breast-feed her baby
7.9 Family planning and contraception	recognise the advantages of family planning, the different methods of contraception, understand their advantages and disadvantages and realise the implications of abortion	- discuss the advantages of family planning - identify and describe the advantages and disadvantages of different methods of contraception - discuss the positive and negative implications of abortion
7.10 Chromosomes	- know the structure of a chromosome and appreciate its role in passing characteristics to an offspring - realise that the combination of X and Y chromosomes determines the sex of a person	- define a karyotype as an organised profile of a person's chromosomes - state the significance of a karyotype - describe a chromosome as a structure carrying hereditary information (in plants and animals) - describe how sex chromosomes are passed to an offspring - explain how the combination of sex chromosomes determine the sex of a person
7.11 Variation	- know that male and female sex cells contribute to genetic variation - realise that mutations are sources of genetic variation	- define genetic variation as differences in inherited traits that exist among the members of a species (living things) - discuss how the male and female sex cells contribute to genetic variation - define the terms recessive, dominant and co-dominant - state examples of variations among human beings caused by a recessive, dominant and co-dominant genes - suggest the causes and implications of mutations
7.12 Human evolution	know the mechanisms of biological evolution	outline the process of evolution

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 7 Human Body	Practical activities, approaches or demonstrations:
7.1 Respiratory system	• make a model of a respiratory system using two litre bottles • investigate the effect of smoking on cotton wool and relate it to our lungs
7.2 Blood circulation	• demonstrate how to take a pulse rate • investigate the influence of exercise on pulse rate • dissect the heart and lungs of a goat or sheep
7.3 Excretion and water balance	• dissect the kidney of a goat or sheep • investigate the excretory function of the kidney
7.4 Nervous system and hormonal control	• draw a annotated diagram of the major glands in the body • make a model of the neuron and nervous system using beads, clay, play dough, or Styrofoam • make a model of the brain lobes using different coloured clay
7.8 Caring for the newborn child	• investigate and report on the importance of breast feeding
7.9 Family planning and contraception	• discuss the importance of family planning • collect diagrams of different contraceptives from a local health centre, clinic or hospital
7.10 Chromosomes	• make a karyotype of human chromosomes • investigate how a karyotype is used to determine genetic disorders
7.11 Variation	• investigate how mutations cause variation
7.12 Human evolution	• investigate the process of evolution

THEMES AND TOPICS	LEARNING OBJECTIVES Learners will:	BASIC COMPETENCIES Learners should be able to:
Topic 8 Ecology		
8.1 Global warming	• understand how some gases create a greenhouse effect causing global warming • know local and global ecological	• distinguish between the greenhouse effect and global warming • identify carbon dioxide, methane, CFCs and nitrous oxide as gases causing global warming • list and describe the activities that release carbon dioxide, methane,

	effects of global warming on the environment	CFCs and nitrous oxide into the atmosphere • suggest and discuss ways of how to reduce the release of gases causing global warming • describe local and global ecological effects of global warming • predict and discuss how life in Namibia might be changed by global warming
8.2	Depletion of the ozone layer	• realise the role and importance of the ozone layer to living organisms • know human activities which cause the depletion of the ozone and how the use and release of CFCs can be reduced • describe the ozone layer and explain its importance in protecting organisms • list the most important human activities that release CFCs • describe how CFCs deplete the ozone layer • suggest methods which can reduce the release of CFCs
8.3	Human biology and health	• know ways in which people's health can be affected by the physical and psychological dimensions of the environment and the importance of human biology in promoting healthy living • discuss how people's health depends on and can be affected by psychological imbalances, e.g. stress and physical condition • discuss how an understanding of the social living conditions and the functioning of the human body can contribute to healthy living

The practical activities, approaches or demonstrations required for this topic are listed below. These are considered basic, and all learners should be exposed to them, as a minimum requirement.

Topic 8 Ecology		Practical activities, approaches or demonstrations:
8.1	Global warming	• investigate and report on the impact of global warming on the ecosystem
8.3	Human biology and health	• do a survey of the local environment and relate it to the health of the people

11. ASSESSMENT

A learner-centred curriculum and learner-centred teaching use a broad range of knowledge and skills which are relevant to the knowledge-based society. The basic competencies in the syllabuses state what understanding and skills a learner must demonstrate as a result of a teaching-learning process, and which will be assessed. However, it is intended that the curriculum be learning-driven, not assessment and examination driven. Assessment and examination are to support learning.

11.1 Continuous assessment

In order to capture the full range and levels of competence, a variety of formal and informal continuous assessment situations is needed to give a complete picture of the learner's progress and achievements in all subjects. Continuous assessment must be clear, simple and manageable, and explicitly anchored in learner-centred principles and practice. Teachers must elicit reliable and valid information of the learner's performance in the basic competencies. The information gathered about the learners' progress and achievements should be used to give feedback to the learners about their strong and weak points, where they are doing well, and why, and where they need to try more, how, and why. The parents should be regularly informed about the progress of their child in all subjects, be encouraged to reward achievements, and given suggestions as to how they can support their learning activities.

The learner's progress and achievements in all subjects must be reported to parents on the school report.

11.2 Formative and summative assessment

The two modes of assessment used are formative continuous assessment and summative assessment. Formative continuous assessment is any assessment made during the school year in order to improve learning and to help shape and direct the teaching-learning process. Assessment has a formative role for learners if and when:

- it is used to motivate them to extend their knowledge and skills, establish sound values, and to promote healthy habits of study
- assessment tasks help learners to solve problems intelligently by using what they have learned
- the teacher uses the information to improve teaching methods and learning materials

Summative assessment is an assessment made at the end of the school year based on the accumulation of the progress and achievements of the learner throughout the year in a given subject, together with any end-of-year tests or examinations. The result of summative assessment is a single end-of-year promotion grade.

11.3 Informal and formal methods

The teacher must assess how well each learner masters the basic competencies described in the subject syllabuses and from this gain a picture of the all-round progress of the learner. To a large extent, this can be done in an informal way through structured observation of each learner's progress in learning and practice situations while they are investigating things, interpreting phenomena and data, applying knowledge, communicating, making value judgements, and in their participation in general.

When it is necessary to structure assessment more formally, the teacher should as far as possible use the same sort of situation as ordinary learning and practice situations to assess the competency of the learner. The use of formal written and oral tests can only assess a limited range of competencies and therefore should not take up a great deal of time. Short tests in any subject should be limited to part of a lesson and only exceptionally use up a whole lesson. End-of-term tests should only be written in the first lesson of the day, so that teaching and learning can continue normally for the rest of the time.

In Grade 10 a mock examination may be held to learn examination skills and to identify areas of the syllabus which may need extra attention. Mock examinations only serve a useful purpose if they are used as a learning experience in how to organise oneself, how to read the paper, how to interpret and

answer examination-type questions, and how to allocate time in an examination. This involves the teacher going through the paper systematically with the class when their answers are returned.

11.4 Evaluation

Information from informal and formal continuous assessment is to be used by the teacher to know where it is necessary to adapt methods and materials to the individual progress and needs of each learner. At the end of each main unit of teaching, and at the end of each term, the teacher together with the learners should evaluate the process in terms of tasks completed, participation, what the learners have learnt, and what can be done to improve the working atmosphere and achievements of the class.

11.5 Criterion-referenced grades

When grades are awarded in continuous assessment, it is essential that they reflect the learner's actual level of achievement in the Basic Competencies, and are not related to how well other learners are achieving or to the idea that a fixed percentage of the learners must always be awarded a Grade A, B, C, and so on (norm-referencing). In criterion-referenced assessment, each letter grade must have a descriptor for what the learner must demonstrate in order to be awarded the grade. Grade descriptors must be developed for each subject for each year. It is important that teachers in each department/section work together to have a shared understanding of what the grade descriptors mean, and how to apply them in continuous assessment, so that grades are awarded correctly and consistently across subjects. Only then will the assessment results be reliable.

11.6. Grade descriptors in the Junior Secondary Phase

In the Junior Secondary phase, grades A-G and U (ungraded) apply as follows:

Grades	Mark range	Grade descriptor
A	80%+	Achieved Basic Competencies exceptionally well. The learner is outstanding in all areas of competency.
B	70-79%	Achieved Basic Competencies very well. The learner is highly proficient in most areas of competency.
C	60-69%	Achieved Basic Competencies well.
D	50-59%	Achieved Basic Competencies satisfactorily.
E	40-49%	Achieved a sufficient number of Basic Competencies to exceed the minimum competency level.
F	30-39%	Achieved the Basic Competencies needed to be considered competent. The learner needs learning support.
G	20-29%	Achieved the minimum number of Basic Competencies worthy of a grade. The learner needs learning support
U	0-19%	Did not achieve the minimum level of competence. The learner needs learning support

11.7 Conducting and recording assessment

Continuous Assessment should be planned and programmed at the beginning of the year, and kept as simple as possible. Marks given for class activities, practical activities, project work, assignments, homework, and short tests on completion of a topic may be recorded for continuous assessment.

11.8 Assessment objectives

A Knowledge with Understanding

Learners should be able to demonstrate knowledge and understanding in relation to:

- scientific language, terminology, symbols, quantities and units;
- instruments and apparatus, including techniques of operation and aspects of safety;
- the use of scientific facts, concepts, patterns and principles.

The objective is made up of Basic Competencies which require the learner to identify, give examples, name, list, state, indicate, give reasons, suggest ways, recognise, define, discuss and to outline.

B Handling Information, Application and Solving Problems

Using written, symbolic, graphical and numerical material, learners should be able to:

- analyse novel situations in a logical and deductive manner;
- locate, select, organise and present information from a variety of sources;
- translate information from one form to another;
- use information to identify patterns, report trends and draw inferences;
- present reasoned explanations for phenomena, patterns and relationships;
- make a value judgement about scientific and technological applications and their social, economic and environmental implications;
- solve problems.

This objective is made up of Basic Competencies which require the learner to predict, relate, describe, calculate, find, estimate, determine, sketch, and select, analyse, extract and analyse, synthesize, compare and discuss, deduce, explain, distinguish, suggest, interpret, and evaluate.

C Practical (Experimental and Investigative) Skills

Learners should be able to:

- use and organise techniques, apparatus and materials;
- observe, measure and record;
- handle, process and evaluate experimental observations and data;
- plan investigations.

11.9 Continuous Assessment: Detailed guidelines

Continuous assessment at Junior Secondary level consists of informal and more formal assessment. The table in 11.9.2 specifies how formal assessments are required for assignments, projects and shorter tests, in order to give an overall picture of the learner's knowledge and skills.

11.9.1 Types of Continuous Assessment

Practical Investigations: These are assessments of practical skills done during a practical activity where learners are required to plan and carry out investigations, and collect, report and analyse information. Except for one big investigation or project during the first or second term, these activities should assess not more than two skills and should count 15 or 10 marks (in the first and second term 15 marks and in the third term 10 marks).

Project: A project is a longer assignment than a topic task or investigation and gives learners an opportunity to complete an investigation into one of the theme topics outlined in the syllabus. This type of investigation will enable the teacher and learner to pursue a topic in greater depth and in a more lively and creative way than possible with short discrete topic tasks or investigations.

Topic Tasks: These are activities that most teachers already use in their day-to-day teaching. These are recorded and assessed activities that could introduce a topic or be used during teaching of a topic

and /or revision of a topic. They may well include assessment involving competencies to do with locating information, conducting surveys, analysing information or presenting information. Topic tasks will involve assessments of basic competencies in all assessment objectives; however, not all assessment objectives need to be present in every topic task. The greatest emphasis should be placed on assessment objectives B and C to meet the weighting shown in the Specification Grid at the end. The topic task should count 10 marks when entered into the final mark sheet.

Topic Tests: Completed topics should be ended with a test indicating the achievements of the learners in these topics

End of Term Test: A comprehensive test of the whole term's work. No homework should be assigned during the time of writing the end of term test.

11.9.2 Summary of Continuous Assessment tasks

GRADES 8 and 9						
COMPONENTS	TERM 1		TERM 2		TERM 3	
	Number & Marks	Total CA	Number & Marks	Total CA	Number & Marks	Total CA
Practical Investigations	2×15	30	1×15	15	1×10	10
Projects			(1×30)÷2	15		
Topic Tasks*	2×10	20	2×10	20	2×10	20
Topic Tests	(2×20)÷2	20	(2×20)÷2	20	(2×20)÷2	20
End of Term Test	65	(65×2) 130	65	(65×2) 130		
Term Mark		200		200		50
Weighted Term Mark	200÷2	100	200÷2	100		

GRADE 10				
COMPONENTS	TERM 1		TERM 2	
	Number & Marks	Total	Number & Marks	Total
Practical Investigations	2×15	30	1×15	15
Projects			(1×30)÷2	15
Topic Tasks*	2×10	20	2×10	20
Topic Tests	(2×20)÷2	20	(2×20)÷2	20
End of Term Test	65	(65×2) 130	130	130
Term Mark		200		200
Weighted Term Mark	200÷2	100	200÷2	100

11.10 End of year examinations: Detailed guidelines

In Grades 8 and 9 there will be internal end-of-year examinations. As before, the purpose of these examinations is to focus on how well learners can demonstrate their thinking, communication, and problem-solving skills related to the areas of the syllabus, which are most essential for continuing in the next grade. Preparing for, and conducting these examinations should not take up more than two weeks altogether right at the end of the year.

There will be an external examination at the end of Grade 10. The purpose of the examination is to assess how far each learner can demonstrate their achievement in reaching the competencies as a preparation for everyday life and for further studies or training, and to what extent the system as a whole is enabling learners to achieve optimally.

WRITTEN EXAMINATION GRADES 8-10			
Grades	Description of papers	Duration	Marks
8, 9 and 10	Written Examination This will consist of ONE paper consisting of two sections: SECTION A: 30 Multiple choice questions (30 marks) SECTION B: Variety of structured questions (100 marks)	2 hours15 minutes	130

11.11 Promotion marks

In Grades 8-10, Continuous Assessment contributes 35% of the summative mark.

COMPONENT	DESCRIPTION	MARKS	WEIGHTING
Written Examination	Paper 1/Section A:	30	15%
	Paper 1/Section B:	100	50%
Continuous Assessment	Topic Tasks, Topic Tests, Practical Investigations/Projects, End of Term Test	70	35%
	TOTAL		100%

The promotion marks are calculated as follows:

PROMOTION MARK FOR GRADES 8 & 9				
Term Mark	Term 1	Term 2	Term 3	Total
	200	200	50	
CA mark	$450 \div 45 \times 7$			70
End-of-year examination	130 Marks (Grade 8 & 9)			130
Promotion Mark	Average Term Mark + End-of-Year Examination $\div 2$ $200 \div 2$			100

PROMOTION MARK FOR GRADE 10			
Term Mark	Term 1	Term 2	Total
	200	200	400
CA mark	$400 \div 40 \times 7$ (CA mark for Grade 10 to be sent to DNEA)		70
End-of-year examination	130 Marks (JSC exam)		130
Promotion Mark	Average Term Mark + End-of-Year Examination $\div 2$ $200 \div 2$		100

11.12 Specification grid

The Specification grid below indicates the weighting allocated to each objective for both Continuous Assessment and for the Written Examination.

Assessment Objectives for Written Examination	
Components	Weighting
Objective A Knowledge with Understanding	30%
Objective B Handling Information, Application & Solving Problems	70%
Total	100%
Assessment Objectives for Continuous Assessment	
Components	Weighting
Objective A Knowledge with Understanding	10%
Objective B Handling Information, Application & Solving Problems	40%
Objective C Practical (Experimental and Investigative) Skills	50%
Total	100%

11.13 Assessment criteria

11.13.1 Notes on Practical Assessment of Objective C

It is recommended that a minimum of FIVE practical investigations should be assessed and recorded (two investigations during the first, two during the second and one during the third term. One of the investigations during the second term should be a project or a practical investigation that will allow at least three major skills to be demonstrated by learners. The assessment should be chosen approximately equally from the Chemistry and Physics sections of the syllabus. The criteria for assessment of practical exercises are set below.

The general skills listed for Objective C: Practical (Experimental and Investigative) skills are related to the basic competencies considered most suitable for continuous assessment. Hence, Objective C basic competencies are assessed mostly as part of CA.

11.13.2 Assessment rubric for Skill A: Practical Techniques

This includes experiments, handling and organising apparatus and materials, developing apparatus from readily available materials, following instructions to carry out an experiment, and showing due regard for safety in conducting experiments.

Teachers should use the following 5 point scale when evaluating the performance tasks of Skill A:

Points	General Criteria For Practical Techniques
5	The assessed skill is performed well above average, neatly and independently, with little or no support or guidance from the teacher.
4	The assessed skill is performed above average with little or no support or guidance from the teacher.
3	The assessed skill is performed at an average level with some support or guidance from the teacher.
2	The assessed skill is performed below average with some support or guidance from the teacher.
1	The assessed skill is performed well below average, requiring pronounced support or guidance from the teacher.
0	This mark is only given when the learner is not assessed due to non participation without valid reason*

*If a learner is absent or not participating with a valid reason, she/he should be given an opportunity to perform the involved skill or ability at a later stage.

11.13.3 Notes on the assessment of Skills B, C and D

Skill B Observing, Measuring and Recording

This includes writing down detailed quantitative and qualitative data, reading scales and tabulating results.

Skill C Handling, Processing and Evaluating Data

This includes inferring conclusions from data, processing numerical data, drawing graphs and charts and dealing approximately with anomalous or inconsistent results.

Skill D Planning and Carrying Out Investigations

This includes analysing a practical problem systematically and producing a logical plan for an investigation.

These skills are made up of Basic Competencies which require the learner to report to their class, collect, locate and display investigations and conclusions, collect and present a report, collect and present information, write an essay, conduct a survey, design and carry out a project, demonstrate skills practically, produce a poster, write a news report, carry out and analyse information and data.

12. ADDITIONAL INFORMATION

A1 Glossary of terms used in science teaching and assessment activities

WORD	MEANING
Analyse	examine information in detail to discover patterns or relationships
Calculate	a numerical answer is required – working must be shown
Compare	find resemblances and differences
Deduce	use the information provided to come to a conclusion, e.g. reference to a law or principle
Define	a literal statement is required
Describe	write down what you do, or what you would see, hear, feel, smell and taste, in as much detail as possible
Determine	use the information given to work out the answer
Discuss	give a critical account of the points involved in the topic
Distinguish	show the difference between one or more variables
Estimate	implies a reasoned order or statement or calculation about something
Evaluate	use the information provided to make a judgement about something
Explain	give a reason for your answer
Find	a general term which means calculate, determine or measure
Give /state /write down	write down your answer
Identify	find out what is unique about a material or situation
Interpret	reasoning or some reference to theory, depending on the content
Investigate	examine a problem in a systematic way
List	give a number of points, generally one word for each
Outline	give a brief answer writing down the main points
Predict	make a logical deduction either from your own knowledge or from the information given in the question or both
Recognise	be aware of a fact or problem
Relate	find the relationship between one or more variables
Select	choose from a number of alternatives
Sketch	in diagrams, make a simple, freehand drawing and in graph work, the shape and/or position of the curve
Study	use the information provided or data to investigate a problem in a systematic way
Suggest	use your knowledge of science and the information in the question to give what you think is the best answer

A2 Assessment Record Sheet for Grades 8 to 10, Terms 1 and 2

ASSESSMENT RECORD SHEET FOR LIFE SCIENCE (TERMS 1 & 2)													Grade:			
Year:													Teacher:			
		Practical Investigations			Topic Task			Topic Tests				Total	End of Term Test	Term Mark	Weighted Term Mark	DNEA Grade 10
Name of Learner		1	2	Total	1	2	Total	1	2		(40÷2)		(65×2)		200÷2	(400÷40) ×7
	Mark	15	15	30	10	10	20	20	20	40	20	70	130	200	100	70
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															
	1															
	2															

A3: Assessment Record Sheet for Grades 8 & 9, Term 3

[illegible]



The National Institute for Educational Development

P/Bag 2034

Okahandja

NAMIBIA

Telephone: +64 62 509000

Facsimile: + 64 62 509073

E-mail: info@nied.edu.na

Website: <http://www.nied.edu.na>

© NIED 2010