



REPUBLIC OF BOTSWANA

**BOTSWANA GENERAL CERTIFICATE
OF SECONDARY EDUCATION
HUMAN AND SOCIAL BIOLOGY
ASSESSMENT SYLLABUS**



EXAMINATIONS RESEARCH AND TESTING DIVISION

MINISTRY OF EDUCATION

**BOTSWANA GENERAL CERTIFICATE OF SECONDARY
EDUCATION ASSESSMENT SYLLABUS
FOR HUMAN AND SOCIAL BIOLOGY
BECOMES
EFFECTIVE FOR EXAMINATION IN 2001**

HUMAN AND SOCIAL BIOLOGY

TABLE OF CONTENTS

Section	Page
Foreword	i
Acknowledgements	ii
1. Introduction	1
2. Aims	2
3. Assessment Objectives	3
4. Scheme of Assessment	5
5. Content	6
6. Grade Descriptions	33
7. Appendices	
	Glossary of Terms 35
	Presentation of Data 37

FOREWORD

The Ministry of Education is pleased to authorise the publication of this senior secondary syllabus which marks a watershed in the development of the public education system in Botswana and signals another milestone of progress in fulfilment of the goals set by the Revised National Policy on Education, Government Paper No. 2 of 1994.

In this era of widespread and rapid technological change and an increasingly inter-dependent global economy, it is essential that all countries foster human resources by preparing children adequately for their future. Survival in the coming millennium will depend on the ability to accommodate change and to adapt to environmental needs and emerging socio-economic trends. It is the wish of government to prepare Botswana for future growth and adaptation to ongoing change in the socio-economic context; specifically the transition from an agro-based economy to the more broadly based industrial economy, which we are aiming at.

The senior secondary programme builds on the Ten Year Basic Education programme and seeks to provide quality learning experiences. It aims to prepare our students for the world of work, further education and lifelong learning. However, secondary education must also pay attention to the all round development of the individual. It should provide not only for the acquisition of those skills needed for economic, scientific and technological advancement. It should also provide for the development of cultural and national identity and the inculcation of attitudes and values which nurture respect for one's self and for others.

Critical to the success of our secondary education programme is the recognition of individual talents, needs and learning styles. Hence, the role of the teacher in the classroom has changed. S/he must be a proficient manager and facilitator; a director of learning activities. S/he should be conscious of students' needs to take on board a measure of accountability and responsibility for their own learning. S/he must also take into account the widening range of ability of the student body and the different levels of achievement, which they aspire to. This means active participation for all and the creation of rich and diverse learning environments.

It is important then that we value the students' own experiences, build upon what they know and reward them for positive achievement. At the same time, we must be prepared to offer them guidance and counselling at all levels; assisting them to make the best decisions in keeping with their own interests, career prospects and preferences. In that way we shall prevail in nurturing at the roots of our system, the national ideals of democracy, development, self-reliance, unity and social harmony.

This syllabus document is the outcome of a great deal of professional consultation and collaboration. On behalf of the Ministry, I wish to record my appreciation and thank sincerely those who contributed to and were involved in the production of this syllabus.



P. T. Ramatsui
Permanent Secretary
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1. INTRODUCTION

As part of the Botswana Senior Secondary Education Programme, this Human and Social Biology Assessment Syllabus is designed to assess candidates who have completed the Senior Secondary School Human and Social Biology Teaching Syllabus.

This syllabus aims to assess positive achievement at all levels and candidates will be assessed in ways that encourage them to show what they know, understand and can do.

The syllabus is examined by two written papers. The papers are described in the Scheme of Assessment.

Candidates who have been entered for assessment on this syllabus may not be entered for Senior Secondary School Science: Single Award, Double Award, Physics, Chemistry and Biology.

Candidates will be graded on a scale A - G. Candidates failing to achieve grade G will be unclassified (U) and no grade will appear on the certificate.

This syllabus should be read in conjunction with:

- (a) the Senior Secondary School Human and Social Biology Teaching Syllabus;
- (b) the specimen question papers and marking schemes.

Syllabus-specific requirements and any further information are given in the Appendices.

2. AIMS

Candidates following this syllabus should acquire and develop:

- (a) an appreciation and an enjoyment of Human and Social Biology and its related work in improving the quality of life;
- (b) abilities and skills that are relevant to the study, safe practice and application of Human and Social Biology;
- (c) an understanding of the applications of Human and Social Biology and of the technological, economic, ethical and social implications of these;
- (d) desirable habits and behavioural patterns in interacting with the environment in a manner that is protecting, preserving, developmental and nurturing;
- (e) knowledge, attitudes and practices that will promote the awareness of practices that prepare them for a productive life;
- (f) positive attitudes, such as open-mindedness, inventiveness, concern for accuracy and precision, objectivity, integrity and initiative towards Human and Social Biology skills;
- (g) confidence, desirable attitudes and behavioural patterns necessary in interacting with a technologically changing world that is protective to the environment;
- (h) an understanding of the key concepts and principles of Human and Social Biology as experienced in everyday life;
- (i) an awareness that the application of Human and Social Biology may be both beneficial and detrimental to the individual, the community and the environment;
- (j) the knowledge that science transcends national boundaries and that the language of science, correctly and rigorously applied, is universal.

As far as possible, the aims will be reflected in the Assessment Objectives, however, some aims can not readily be assessed.

3. ASSESSMENT OBJECTIVES

The assessment objectives describe the knowledge, skills and abilities which candidates are expected to demonstrate at the end of the course. They reflect those aspects of the aims, which will be assessed.

There are two main Assessment Objectives:

1. **Knowledge and Understanding.**
2. **Handling Information, Application and Problem Solving.**

For assessment purposes, these are broken down into smaller units.

1. Knowledge and Understanding

Candidates should be able to demonstrate knowledge and understanding of Human and Social Biology in relation to:

- 1.1 phenomena, facts, laws, definitions, concepts, theories;
- 1.2 vocabulary, terminology, conventions (including symbols, quantities and units);
- 1.3 relevant scientific techniques of operation and aspects of safety;
- 1.4 applications of HSB and its social, economic, technological and environmental implications;
- 1.5 good family life and health practices including awareness and management of epidemics such as HIV/AIDS that prepare them for productive life.

The syllabus content defines the factual material that candidates need to recall and explain. Questions testing the objectives above will often begin with one of the following words: *define, state, name, describe, explain, or outline.* (*Glossary of Terms* appears on page 35)

2. Handling information, Application and Problem Solving

Candidates should be able to:

- 2.1 locate, select, organise and present information from a variety of sources;
- 2.2 translate information from one form to another;
- 2.3 manipulate numerical and other data;
- 2.4 use information to identify patterns, report trends, draw inferences, make predictions and propose hypothesis;
- 2.5 present explanations for phenomena, patterns and relationships;
- 2.6 solve problems as they relate to day to day life situations, some of a quantitative nature.

Questions assessing the objectives may contain information which is unfamiliar to the candidate. In answering such questions, candidates are required to use principles and concepts that are within the syllabus and apply them in a logical, deductive manner.

Questions testing the objectives in 2, may begin with one of the following words: *discuss, predict, suggest, calculate or determine.* (*Glossary of Terms* appears on page 35)

Weighting of the Assessment Objectives

For the overall assessment, the approximate weightings of the Assessment Objectives will be as follows:

1. Knowledge and Understanding	45% . Recall should not be more than half of this weighting.
2. Handling Information. Application and Problem Solving	55%

5. CONTENT

The syllabus content is arranged in three columns:

- (a) **Topics**
 - (b) **General Learning Objectives**
 - (c) **Specific Learning Objectives**
- (a) **Topics**, in the first column, are those strands of the subject which candidates should have studied.
- (b) Each topic is then defined in the second column in terms of **General Learning Objectives** - knowledge, understanding and skills on which candidates may be assessed.
- (c) The **Specific Learning Objectives** in the third column shows in detail what aspects of that topic are likely to be assessed.

1. CHARACTERISTICS OF LIVING ORGANISMS

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidate should be able to:
Activities of living organism	Acquire knowledge and understanding of characteristics of living things.	<ul style="list-style-type: none"> - list the characteristic activities of living organisms; feeding, respiring, excreting, growing, responding to stimuli, moving, reproducing.
Organisms affecting human health	Acquire knowledge and understanding of disease causing organisms.	<ul style="list-style-type: none"> - describe viruses as non-cellular, parasitic and reproducing only in living host cells - describe bacteria as unicellular, with a cellwall and DNA but no nucleus; some pathogenic and others non pathogenic and useful - describe fungi as having a mycelium of thread like hyphae, some being pathogenic and causing athlete's foot and ringworm. - describe protozoa as unicellular animals some causing diseases - describe flatworms as multi-cellular animals, reproducing both sexually and asexually, with complex life histories involving at least two host organisms e.g. blood fluke, <i>Schistosoma haematobium</i> - describe insects as multicellular animals with exoskeleton, segmented bodies and jointed limbs, life cycles , some insects are vectors of disease (anopheline mosquito, house fly).
Cells, the building blocks in organisation	Acquire knowledge on cells, their specialisation and organisation.	<ul style="list-style-type: none"> - describe the structure of the animal and plant cell as composed of cytoplasm, cell membrane, cell wall (plant and bacteria cell only), nuclear envelope and mitochondria - describe the functions of the cell membrane in controlling the passage of materials into and out of the cytoplasm - describe the function of the mitochondria as energy transfer in respiration.
Movement of particles in cells	Acquire knowledge and understanding of the processes of osmosis & diffusion and their role	<ul style="list-style-type: none"> - define diffusion as the movement of molecules from a region where they are at a higher concentration to a region where they are at a lower concentration i.e. down

	in living things.	<p>a concentration gradient</p> <ul style="list-style-type: none"> - define osmosis (a special form of diffusion) as movement of water molecules from a region of their higher concentration to a region of their lower concentration through a selective permeable membrane - explain the concept active transport as involving the use of energy against a concentration gradient.
	Acquire knowledge and understanding of cell organisation.	<ul style="list-style-type: none"> - describe the structure and function of the following tissues: <ol style="list-style-type: none"> 1. epithelium, (lining of trachea, covering of villus) 2. blood - define the term organ, with reference to the eye (retina, lens, choroid, sclera, iris, etc).

2. PLANTS, FOOD AND MAN

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Food production	Acquire knowledge and understanding of the process of food production in plants.	<ul style="list-style-type: none"> - state the role of green plants as primary producers of carbohydrate and protein - define photosynthesis as the production of carbohydrates from water and carbon dioxide, using light energy, in the presence of chlorophyll, and with the release of oxygen.
	Acquire knowledge and understanding of man's dependence on plants for food.	<ul style="list-style-type: none"> - state the dependence of all living organisms, including man directly or indirectly on photosynthesis.
The re-cycle of carbon	Acquire knowledge and understanding of the recycling of carbon.	<ul style="list-style-type: none"> - describe the carbon cycle in terms of the fixation of carbon from carbon dioxide in photosynthesis, its transfer as carbohydrate to animals and release back into the atmosphere as carbon dioxide as a result of respiration.

3. NUTRITION AND DIET

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Classification of nutrients	Acquire knowledge and understanding of food nutrients.	<ul style="list-style-type: none"> - list the major nutrients and state their sources and uses in the human body <ol style="list-style-type: none"> 1. carbohydrates : sugars and starch, digestible, and used as an energy source, and for storage (glycogen) 2. cellulose from plant cell, indigestible (fibre /roughage) 3. proteins: used for growth and repair of tissues and as a component of haemoglobin, insulin, and enzymes 4. fats (lipids) : used in the formation of cell membranes, as an energy source as a storage material, and as a solvent for vitamin D - describe or carry out the Benedict's test for reducing sugars, the iodine test for starch, the Biuret test for proteins, and the grease spot test for fats - list the principal sources of vitamins C and D, and of the inorganic elements calcium and iron - relate vitamin C to the formation of epithelial tissues and thus to the healing of wounds - relate vitamin D to the absorption of calcium ions from the ileum and to the prevention of rickets in children - list the uses of calcium ions in the formation of bones and teeth, in blood clotting and in muscular contraction - state the use of iron in the formation of haemoglobin and relate iron deficiency to anaemia.
Water and dietary fibre (roughage)	Acquire knowledge and understanding of the importance of water and fibre in diet.	<ul style="list-style-type: none"> - outline the uses of water in the body : as a reagent in the digestion (hydrolysis) of food, as a solvent and as a transport medium and component of body fluids and of cytoplasm

		- describe the role of fibre in the evacuation of the large intestine.
Sources of nutrients	Acquire knowledge of relative value of food nutrients.	- discuss the relative values, as sources of nutrients, of foods obtained from animals (meat, fish, milk and milk products) and foods obtained from plant roots, tubers, stems, seeds and fruits.
Balanced diet	Acquire knowledge of a balanced diet.	<ul style="list-style-type: none"> - define a balanced diet as a diet sufficient in all food nutrients (proteins, carbohydrates, fat, vitamins, minerals, fibre and water) in the right quantities, quality and energy to sustain a healthy life - define malnutrition as a lack of balanced diet, either as a shortage of particular nutrients (vit D and rickets) or as an excess (excess carbohydrate leading to obesity and coronary heart disease) - list the food and drink consumed in one week, including the nutrients contained - discuss the value of breast milk in feeding babies.

4. DIGESTION AND ABSORPTION OF FOOD

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Teeth and the break down of food	Acquire knowledge on physical process of digestion.	<ul style="list-style-type: none"> - state the increase in surface area : volume ratio after chewing food - describe need for chewing and peristalsis - state the cause of dental decay and describe the care for teeth.
Nature and properties of enzymes	Acquire knowledge on chemical process of digestion.	<ul style="list-style-type: none"> - define <i>enzymes</i> as proteins that act as biological catalysts involved in all biochemical processes, including digestion, respiration and protein synthesis - state the effects of change in temperature and pH on the rate of enzyme activity.
The alimentary canal	Acquire knowledge on the structure and function of the alimentary canal.	<ul style="list-style-type: none"> - identify from a drawing the main structures of the alimentary canal : mouth, oesophagus, stomach, small intestines, including duodenum and ileum, colon, rectum, anus. - describe peristalsis as a muscular movement, mixing and propelling food along the intestine and oesophagus - outline the functions of i) the pancreas ii) the liver - - state the functions of amylase, protease and lipase in the production of reducing sugars, amino acids , fatty acids and glycerol - state the main sites of the digestion of proteins - state the main sites of the digestion of starch to glucose - describe the need for the emulsification of fats - state, describe and explain the process of absorption of the products of digestion (structure of villus not required) - state the function of the colon as the site of absorption of water - describe the assimilation of the products of digestion by cells

		- define defecation, constipation and diarrhoea.
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5. BLOOD AND THE CIRCULATORY SYSTEM

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Composition and function of blood	Acquire knowledge and understanding of the functions of blood.	<ul style="list-style-type: none"> - identify red blood cells, phagocytes and lymphocytes from drawings and photographs - state the origin of Red Blood Cells, White Blood Cells and platelets - state the function of red blood cells in terms of transport of oxygen by haemoglobin - state the functions of white blood cells in the defence of the body against infections: phagocytosis; formation of antibodies to counteract antigens - state the functions of plasma in the transportation of the products of digestion and carbon dioxide, urea, hormones and heat - outline the function of platelets during the clotting of blood, soluble fibrinogen being converted to insoluble threads of fibrin - state the function of clotting as to protect the body from loss of blood and entry of pathogens.
Circulation of Blood	Acquire knowledge and understanding of the role of the mammalian circulatory system.	<ul style="list-style-type: none"> - identify from a drawing the structure of the heart as seen in section from the front - describe the action of the heart in terms of the pumping action produced by the contraction of muscles in a pair of two stage pumps, side by side - the direction of flow controlled by the tricuspid and pulmonary valves, and the bicuspid and aortic valves - list the likely causes and effects of heart attacks - describe the structure in relation to the function of arteries, arterioles, capillaries and veins - name the blood vessels to and from the heart, lungs, head, liver and kidneys

		<ul style="list-style-type: none">- state the origin and function of the tissue fluid- state the origin and function of lymph.
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6. BREATHING AND RESPIRATION

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Breathing and gaseous exchange	Acquire knowledge and understanding of the process of breathing.	<ul style="list-style-type: none"> - define breathing as the movement of air in and out of the lungs - describe and recognise from a drawing the arrangement of the trachea, bronchi, outline of the lungs and diaphragm as seen in a frontal section through the thorax - describe the roles of the ribs, intercostal muscles and the diaphragm in the process of breathing - describe the relationship between changes in pressure and volume in the lungs during breathing - define gaseous exchange as uptake of oxygen and release of carbon dioxide in the alveoli - state the differences between inspired and expired air - describe vital capacity - describe the effects of change in physical activity on the rate and depth of breathing - describe the technique of mouth to mouth resuscitation.
Respiration and energy transfer	Acquire knowledge and understanding of respiration.	<ul style="list-style-type: none"> - define respiration as the release of energy from food substances in the cells of living organisms - state the equation of aerobic respiration, using words or chemical formulae / symbols - list activities where energy is required: e.g. cell division, active transport, maintenance of a constant body temperature, muscular action.
Diseases associated with tobacco smoke		<ul style="list-style-type: none"> - list the toxic material in cigarette smoke; nicotine, tar, carbon monoxide - state the effects of tar as a carcinogen (causes cancer) - discuss the effects of nicotine and carbon monoxide on the body and on a

		developing foetus - describe effects of cigarette smoke on the cilia which form the cleaning mechanism of the lungs.
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7. SKELETON, MUSCLES AND MOVEMENT

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Functions of the skeleton	Acquire knowledge of the functions of bones and how they are related to muscles.	<ul style="list-style-type: none"> - list the functions of the skeleton : support, protection of soft tissue, to increase effectiveness of movement by providing levers, as site for production of red blood cells - distinguish between tendons: (attach muscles to bones, inelastic) and ligaments: (join bone to bone , elastic) - identify from a drawing and describe the action of : a hinge joint (e.g. elbow), and a ball and socket joint (e.g. shoulder).
Muscles and movement	Acquire knowledge of how movement results.	<ul style="list-style-type: none"> - describe muscle as tissue which produces movement by contraction and relaxation using energy derived from respiration - identify the bones of the arm and shoulder, and show the origins and insertions of the biceps and triceps muscles - define antagonistic muscle action (contraction and relaxation) - describe the role of circular muscles in peristalsis and in the movements in the iris and ciliary body of the eye.

8. HOMEOSTASIS - MAINTAINING A STEADY INTERNAL ENVIRONMENT

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Homeostasis	Acquire knowledge and understanding of the importance of maintaining a constant internal environment.	<ul style="list-style-type: none"> - define homeostasis as the maintenance of a constant internal environment - locate and name the main organs which maintain a constant internal environment namely : pancreas and liver (blood glucose), kidneys (water and salt content) and skin (temperature) - identify and label on a diagram of the skin: hairs, sweat glands, receptors and blood vessels - describe the maintenance of constant temperature in human beings - discuss the co-ordinating role of the brain in maintaining a constant body temperature.
Excretion and regulation of body fluids	Acquire knowledge and understanding of the importance of removing metabolic waste from the body and how the concentration of blood is regulated.	<ul style="list-style-type: none"> - define excretion as the removal of waste products of metabolism and/or toxic materials from blood -urea and carbon dioxide - identify parts of the urinary system : ureter, bladder, urethra - state the functions of the parts of the urinary system - identify structures of the kidney: cortex, medulla, pelvis - describe the function of the kidney as a process of filtration followed by selective reabsorption of : glucose, salt, water, resulting in the adjustment of the concentration of blood plasma - relate the process of filtration to blood pressure in the glomerulus, collection of filtrate in the Bowman's capsule and reabsorption of materials at appropriate sections in the kidney tubule - describe the role of the antidiuretic hormone.

<p>Regulation of body temperature</p>	<p>Acquire knowledge of how the body regulates its body temperature.</p>	<ul style="list-style-type: none"> - explain the concept of negative feed back - define regulation of body temperature as maintaining a steady internal temperature by balancing heat production and heat loss - identify from a drawing the main structures involved in heat loss by the skin: sweat glands and ducts, capillaries and associated arterioles - relate the evaporation of sweat to the concept of heat loss - describe the effects of vasodilation and vasoconstriction of blood vessels in the skin - describe the loss of heat through the lungs during breathing.
<p>Regulation of blood sugar</p>	<p>Acquire knowledge and understanding of how the body's blood sugar level is maintained by hormonal action.</p>	<ul style="list-style-type: none"> - state that the pancreas secretes insulin when blood sugar level rises - describe the part played by the liver in the formation of insoluble glycogen in response to insulin release - describe diabetes as a disease caused by lack of the hormone insulin - describe the effect of insulin and glucagon, released by the pancreas, on the liver and explain the part it plays in homeostatic control of blood sugar.

9. THE SENSES, NERVOUS SYSTEM, HORMONES AND CO-ORDINATION

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Perception	Acquire knowledge and understanding of the different sense organs and how they are affected by environmental stimuli.	<ul style="list-style-type: none"> - list the stimuli to which the sense organs respond: light energy, sound energy, temperature change, touch, chemical stimuli.
Structure and functions of the eye	Acquire knowledge of the function of the eye and its parts.	<ul style="list-style-type: none"> - describe and identify from a drawing a horizontal section through the eye : optic nerve, lens, sclera, cornea, iris, retina choroid, ciliary muscles aqueous humour , vitreous humour, blind spot, fovea and suspensory ligaments - describe the action of the components of the eye in forming inverted images on the retina - describe the mechanism of focusing (accommodation) - discuss short sightedness and long sightedness - state the function of the retina in transforming units of light into nerve impulses - describe the reflex action of the circular and radial muscles of the iris in regulating the amount of light to reach the retina.
Nervous system	Acquire Knowledge and Understanding of the nervous system.	<ul style="list-style-type: none"> - state the main divisions of the nervous system : <ol style="list-style-type: none"> 1. central nervous system (CNS) comprising the brain and spinal cord 2. peripheral nervous system (spinal nerves) - distinguish between a neurone and a nerve - define reflex action - describe and recognise from a drawing a simple spinal reflex arc - state the role of the sensory, intermediate and motor neurones and spinal synapses - relate the control of movement at the

		<p>elbow in withdrawing the hand from a stimulus to reflex action</p> <ul style="list-style-type: none"> - carryout simple experiment to demonstrate reflex action and measure reaction time.
Hormones	Acquire knowledge and understanding of the functions of hormones in body co-ordination.	<ul style="list-style-type: none"> - define a hormone as a chemical substance, produced by a ductless/endocrine gland, carried by the blood, which alters the activity of one or more specific target organs - state the role of adrenaline in co-ordination - state the role of testosterone - state / name the roles of oestrogen and progesterone in the menstrual cycle and in pregnancy - distinguish between the hormonal and nervous control systems (chemical substance or impulse: in terms of speed of response, widespread or localised response, long-term or short-lived response).
Alcohol and other drugs	Be aware of the dangers of alcohol as a drug.	<ul style="list-style-type: none"> - discuss drug dependence and drug abuse - describe the short-term effects of alcohol on reaction time (rate of transmission of impulses), co-ordination and the ability to make rational decisions - state the short term and long term effects of excessive intake of alcohol on the brain and liver - state the physical and social effects of marijuana, glue sniffing and other solvents.

10. REPRODUCTION AND THE CONTINUITY OF LIFE

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
The reproductive system	Acquire knowledge of the human reproductive system.	<ul style="list-style-type: none">- define a gamete as either a sperm or an ovum, having half the number of chromosomes found in the body cells- describe sexual reproduction as the process involving the fusion of nuclei from two different gametes to form a zygote- identify from a drawing the structure of the male and female reproductive system, as seen in side view- state the function of: testis, epididymis, sperm duct, prostate gland, urethra, ovary, oviduct, uterus, cervix, vagina.

Fertilisation	Acquire knowledge of the menstrual cycle, fertilisation, fetal development and birth.	<ul style="list-style-type: none"> - describe the menstrual cycle and the production of ova (eggs) - describe the roles of oestrogen and progesterone in the menstrual cycle and in pregnancy - describe fertilisation and early development of the zygote in terms of the formation of the ball of cells which becomes implanted in the lining of the uterus wall - describe implantation - describe the development of the foetus in terms of dependence on the placenta for exchange of food materials, oxygen,, urea and carbon dioxide between the maternal and foetal blood - distinguish between identical and fraternal twins - describe the placenta as a barrier , separating maternal and fetal red blood cells - describe the passage of nicotine, alcohol and some viruses from the mother to fetus through the placenta - state the protective function of the amniotic fluid, in terms of even distribution of pressure around the fetus - describe the three stages of birth: labour, opening (dilation), delivery and after birth (expulsion).
Family planning	Acquire knowledge of the use of a variety of birth control methods.	<ul style="list-style-type: none"> - describe family planning as a means of limiting the number of children in the family and of spacing births, thus giving both mother and children a better chance of receiving adequate nutrition and other resources and of developing good health - discuss the dangers of teenage pregnancy - list methods of birth control, stating practical advantages and disadvantages : rhythm (safe period), condom, cap, intra-uterine device (IUD, coil, loop), oral contraceptive pill, sterilisation (vasectomy for males, tying of oviduct for females) and abstinence.

Heredity : Units and processes	Acquire knowledge and understanding of genes, chromosomes , mutation and appreciate variation in living things.	<ul style="list-style-type: none"> - define inheritance as the transmission of genetic information (genes) from one generation to the next - define a gene as a length of DNA coding for a particular characteristic, and distinguish clearly between the terms gene and allele - state that genes are carried on thread-like structures, made of protein and DNA, called chromosomes - define mitosis as a nuclear division resulting in the formation of two nuclei with the same number of chromosomes and same genetic content , as the original nucleus (stages not required) - define meiosis as a nuclear division resulting in a halving of the chromosome number, and the production of variation, during the formation of gamete cells (stages not required).
Monohybrid inheritance	Acquire knowledge and understanding of inheritance.	<ul style="list-style-type: none"> - define the terms dominant , recessive, genotype, phenotype, heterozygous and homozygous - using symbols, draw and interpret diagrams to show the genetic characteristics of the offspring from a monohybrid cross - using symbols, draw and interpret diagrams to show the inheritance of sex.

11. HEALTH AND DISEASE

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Health and disease	Understand the concept of health.	<ul style="list-style-type: none"> - define good health as a state of physical and mental wellbeing, dependent on receiving a balanced diet and on appropriate physical and mental activity - define disease as a loss of health resulting from a disturbance of the normal processes of the body, or due to various causes such as malnutrition, infectious organisms, degeneration of organs / tissue or environmental pollutants.
Non-transmissible diseases and disorders	Acquire knowledge and understanding of diseases.	<ul style="list-style-type: none"> - describe nutritional deficiency disease illustrated by rickets - describe degenerative diseases, as illustrated by coronary heart disease - describe cancer, as illustrated by lung cancer - describe inherited disorder, as illustrated by albinism, Down's syndrome.
Transmissible diseases	Acquire knowledge and understanding of transmissible diseases.	<ul style="list-style-type: none"> - describe transmissible diseases - distinguish between signs of a disease (e.g. rash, high temperature), which can be seen or measured, and symptoms (e.g. pain) which can only be described by the patient.
Influenza	Acquire knowledge and understanding of the disease influenza.	<ul style="list-style-type: none"> - state the chief signs - name the causative organism (virus) and the method of spread (droplet airborne) and methods of limiting spread.
Gonorrhoea and syphilis	Acquire knowledge and understanding of the two sexually transmitted diseases.	<ul style="list-style-type: none"> - state the chief signs and symptoms - state the method of control and prevention
AIDS (acquired immune deficiency syndrome)	Acquire knowledge and understanding of the disease AIDS.	<ul style="list-style-type: none"> - state the chief signs - state the causative organism (human immuno-deficiency virus, HIV) and the methods of spread: sexual intercourse, use of contaminated needles for injecting drugs, from mother to child, blood transfusion; methods of limiting spread.

Typhoid	Acquire knowledge and understanding of the disease typhoid.	<ul style="list-style-type: none"> - name the causative organism (bacterium) and methods of spread: contamination of human food by food handlers and by houseflies. - control of spread by sanitary disposal of faeces, preventing access for house flies to faeces, careful washing of hands after using the toilet / water closet and tracing of carriers, followed by medical treatment.
Tuberculosis	Acquire knowledge and understanding of the disease TB, and methods of control.	<ul style="list-style-type: none"> - state the chief signs and symptoms - name the causative organism as a bacterium (<i>Mycobacterium tuberculosis</i>), capable of forming spores and therefore of surviving drying ; state method of spread - control by good ventilation, avoiding overcrowding, avoiding spitting, BCG vaccination, early diagnosis by mass X-ray, drug treatment.
Cholera	Acquire knowledge and understanding of the disease cholera and its control.	<ul style="list-style-type: none"> - state the chief signs and symptoms, including dehydration - name the causative organism as a bacterium (<i>vibro</i>), spread by water contaminated with bacteria from human faeces - describe control by sanitary disposal of faeces and through chlorination of drinking water; occurrence and significance of epidemics.
Malaria	Acquire knowledge and understanding of the disease malaria and its control.	<ul style="list-style-type: none"> - state the chief signs and symptoms of malaria - name the causative organism as a protozoan (<i>plasmodium</i>) transmitted only by the bite of an infected, female anopheline mosquito - describe control of malaria by destruction of mosquito breeding sites, destruction of mosquito larvae, pupae and adults by appropriate means and by preventing mosquitoes from biting both patients suffering from malaria and healthy people.

12. CONTROL OF DISEASES

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Personal Hygiene	Appreciate the need for personal hygiene.	<ul style="list-style-type: none"> - discuss the importance of cleaning the body, particularly the pubic, anal regions and the hands, after contact with faeces and urine - discuss the meaning and importance of sanitary disposal of faeces, urine and sputum.
Control of the organisms that cause disease	Acquire knowledge and understanding about control of organisms causing diseases.	<ul style="list-style-type: none"> - define sterilisation - describe the use of high temperature as a means of destroying pathogens in cooking, steam sterilisation - describe the use of chemical sterilisation agents, with particular reference to the use of chlorine - distinguish between antiseptics which inhibit the reproduction of bacteria and disinfectants which kill bacteria but also damage human tissue.
Antibiotics	Acquire knowledge and understanding of the action of antibiotics in disease control.	<ul style="list-style-type: none"> - define antibiotics - discuss the use of antibiotics, illustrated by the use of penicillin in the treatment of gonorrhoea.
Control of vectors	Acquire knowledge and understanding of disease control.	<ul style="list-style-type: none"> - state the principles of controlling a disease by controlling the vector that transmits the pathogen, illustrated by methods of controlling houseflies (typhoid) and mosquito (malaria) - explain the need for knowing the life cycle and habits of the vectors.

13. IMMUNITY AND IMMUNISATION

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Immunity	Acquire knowledge and understanding of the concept of immunity.	<ul style="list-style-type: none">- define immunity to diseases- define active immunity, illustrated by immunity to tuberculosis gained naturally during recovery from the disease, and artificially through BCG vaccination- define passive immunity, illustrated by immunity to tetanus gained by injection with the immune serum- discuss the differences between active, natural, passive and artificial immunity- discuss the WHO campaign to eliminate small pox and the immunisation programme to control tuberculosis.

14. COMMUNITY AND ENVIRONMENTAL HEALTH

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Sewage disposal	Acquire knowledge and understanding to appreciate the need for proper sewage disposal.	<ul style="list-style-type: none"> - define sewage as the waste liquid expelled from a house, factory or town. - state the risks from leaving sewage untreated and exposed to rain and flies - describe, and identify from a drawing a section through a pit latrine - state the reasons for the careful siting of the pit latrines in relation to water sources - state the part played by micro-organisms in making sewage harmless and the effluent safe for discharge into a river.
Safe drinking water	Acquire knowledge and understanding of the need for water that is safe to drink: Small scale, Large scale.	<ul style="list-style-type: none"> - compare the relative purity of water e.g. from rivers, shallow wells, boreholes and rain water collected from a roof, as appropriate locally - discuss the effects of boiling water for drinking - describe the large scale treatment of water (sedimentation, filtration, chlorination).
Refuse disposal	Acquire knowledge and understanding of the ways in which waste is disposed.	<ul style="list-style-type: none"> - state the dangers from allowing domestic waste to accumulate around living quarters; attracting house flies and providing suitable conditions for breeding; attraction of rats and mice (vectors of diseases) - state the reasons for, and methods of controlling the breeding of houseflies - relate the life cycle of the house fly to the need for the regular emptying of bins for domestic waste - state the methods of disposal of domestic refuse: burying, burning and incineration (total destruction by burning at very high temperature), compacting refuse at communal sites to make it more difficult for rats to penetrate.

15. POLLUTION

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Air pollution	Acquire knowledge and understanding of air pollution.	<ul style="list-style-type: none"> - define pollution as destruction, damage or contamination of the environment - state the toxic components of motor exhaust fumes, carbon monoxide, lead, nitrogen oxides - describe the effects of lead on the body - describe the causes and effects of global warming - describe the effect of Chlorofluoro Carbons (CFC's) and other pollutants on the ozone layer.
Water pollution	Acquire knowledge and understanding of water pollution.	<ul style="list-style-type: none"> - describe the undesirable effects of water pollution by: discharge of untreated sewage (cholera); discharge of chemical waste from industrial plants; surface run-off of chemicals (fertilizers, pesticides and herbicides); discharge of oils at sea, from garages; solid matter / litter.
Deforestation	Acquire knowledge and understanding of the extent and problems of deforestation.	<ul style="list-style-type: none"> - state the effects of deforestation on the environment; climate change and soil erosion - state the effects of veld fires on the environment.

16. BIOTECHNOLOGY

Topic	General Objective	Specific Objective
	Candidates should be able to:	Candidates should be able to:
Biotechnology	Acquire knowledge and understanding of the use of biotechnology in solving day to day problems and its role in the provision of food, fuels and in medicine.	<ul style="list-style-type: none"> - define biotechnology as the application of biological organisms, systems or processes to manufacturing and service industries - explain why micro-organisms are used in biotechnology - discuss the role of micro-organisms in food production e.g. bread, <i>madila</i>, <i>chibuku</i> - explain the role of micro-organisms in fuels and chemicals e.g. biogas, alcohol, biological enzyme washing powders - discuss the role of micro-organisms in medicine e.g. the production of antibiotics (penicillin) and vaccines (BCG).

6. GRADE DESCRIPTIONS

GRADE A

Candidate should be able to:

- use scientific vocabulary, recall a wide range of scientific concepts, principles and theories;
- relate a wide range of scientific concepts to scientific principles and theories and recognise scientific relationships;
- apply scientific knowledge and understanding, identify patterns, report trends from given information and draw appropriate conclusions and give recommendation to new situations;
- translate information from one form to another: process information from graphs, tables and charts; represent information in the form of graphs, tables and charts with ease;
- make concise and complete experimental procedure (plan), critically discuss the plan; generate hypotheses to solve a scientific problem which may involve a wide range of variables.

GRADE C

Candidate should be able to:

- use scientific vocabulary, recall a wide range of scientific concepts, principles and theories with some assistance;
- relate scientific concepts to scientific principles and theories and recognise scientific relationships with some assistance;
- apply scientific knowledge and understanding, identify patterns, report trends from given information, draw conclusions and give recommendation to simple situations;
- translate information from one form to another: process information from graphs, tables and charts; represent information in the form of graphs, tables and charts with some assistance;
- make and complete experimental procedure (plan); generate hypotheses to solve a scientific problem involving few variables with some assistance.

GRADE F

Candidate should be able to:

- use scientific vocabulary, recall basic scientific concepts, principles and theories with assistance all the way;
- relate basic scientific concepts to scientific principles and theories and recognise scientific relationships with assistance all the way;
- apply basic scientific knowledge and understanding, identify patterns, report trends from given information and draw conclusions and give recommendation to familiar situations with assistance all the way;
- translate information from one form to another: process information from graphs, tables and charts; represent information in the form of graphs, tables and charts with assistance all the way;
- make simple and complete experimental procedure (plan); device fair test which involves only a few scientific problems which only involves a few familiar factors with assistance all the way.

7. APPENDICES

Glossary of terms

It is hoped that the glossary (which is relevant only to Science subjects) will prove helpful to candidates as guide i.e. it is neither exhaustive nor definitive. The glossary has been deliberately kept brief not only with respect to the number of terms included but also to the descriptions of their meanings. Candidates should appreciate that the meaning of a term must depend in part on its context.

1. **Define** (the term(s)) is intended literally, only a formal statement or equivalent paraphrase being required.

What do you understand by/What is meant by (the term(s)) normally implies that a definition should be given, together with some relevant comment on the significance or context of the term(s) concerned, especially where two or more terms are included in the question. The amount of supplementary comment intended should be interpreted in the light of the indicated mark value.

2. **State** implies a concise answer with little or no supporting argument, e.g. a numerical answer that can readily be obtained 'by inspection'.
3. **List** requires a number of points, generally each of one word, with no elaboration. Where a given number of points is specified this should not be exceeded.
4. **Explain** may imply reasoning or some reference to theory, depending on the context.
5. **Describe** requires the candidate to state in words (using diagrams where appropriate) the main points of the topic. It is often used with reference either to particular phenomena or to particular experiments. In the former instance, the term usually implies that the answer should include reference to (visual) observations associated with the phenomena.

In other contexts, describe should be interpreted more generally, i.e. the candidate has greater discretion about the nature and the organisation of the material to be included in the answer. Describe and explain may be coupled, as may state and explain.

6. **Discuss** requires the candidate to give a critical account of the points involved in the topic.
7. **Outline** implies brevity, i.e. restricting the answer to giving essentials.
8. **Predict** implies that the candidate is not expected to produce the required answer by recall but by making a logical connection between other pieces of information. Such information may be wholly given in the question or may depend on answers extracted in an early part of the question.

Predict also implies a concise answer with no supporting statement required.

9. *Deduce* is used in similar way to predict except that some supporting statement is required, e.g. reference to a law or principle, or the necessary reasoning is to be included in the answer.
10. *Suggest* is used in two main contexts:-
 1. to imply that there is no unique answer (e.g. in Chemistry, two or more substances may satisfy the given conditions describing an 'unknown'),
 2. to imply that candidates are expected to apply their general knowledge to a 'novel' situation, one that may be formally 'not in the syllabus'.
11. *Find* is a general term that may variously be interpreted a calculated, measure, determine, etc.
12. *Calculate* is used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.
13. *Measure* implies that the quantity concerned can be directly obtained from a suitable measuring instrument, e.g. length, using a ruler, or mass, using a balance.
14. *Determine* often implies that the quantity concerned cannot be measured directly but is obtained by calculation, substituting measured or known values of other quantities into a standard formula, e.g. relative molecular mass.
15. *Estimate* implies a reasoned order of magnitude statement or calculation of the quantity concerned, making such simplifying assumptions as may be necessary about points of principle and about the values of quantities not otherwise included in the question.
16. *Sketch*, when applied to graph work, implies that the shape and/or position of the curve need only be qualitatively correct, but candidates should be aware that, depending on the context, some quantitative aspects may be looked for, e.g. passing through the origin, having an intercept, asymptote or discontinuity at a particular value.

In diagrams, sketch implies that a simple, freehand drawing is acceptable; nevertheless, care should be taken over proportions and the clear exposition of important details.

Presentation of data

(a) Tables

- (i) Each column of a table will be headed with the physical quantity and the appropriate SI units, e.g. time/s, rather than time(s).
There are three acceptable methods of stating units, e.g. metre per sec or m per s or m s^{-1} .
- (ii) The column headings of the table can then be directly transferred to the axes of a constructed graph.

(b) Graphs

- (i) The independent variable will be plotted on the x (horizontal axis) and the dependent variable plotted on the y (vertical axis).
- (ii) The graph is the whole diagrammatic presentation. It may have one or several curves plotted on it.
- (iii) Curves and lines joining points on the graph should be referred to as 'curves'.
- (iv) Points on the curve should be clearly marked as crosses (\times) or encircled dots (\odot). If a further curve is included, vertical crosses (\dagger) may be used to mark the points.

(c) Pie Charts

These should be drawn with the sectors in rank order, largest first, beginning at 'noon' and proceeding clockwise. Pie Charts should preferably contain no more than six sectors.

(d) Bar Charts

These are drawn when one of the variables is not numerical, e.g. percentage of vitamin C in different fruits. They should be made up of narrow blocks of equal width which do not touch.

(e) Column Graphs

These are drawn when plotting frequency graphs from discrete data, e.g. frequency of occurrence of leaves with different numbers of prickles or pods with different numbers of seeds. They should be made up of narrow blocks of equal width which do not touch.

(f) **Histograms**

These are drawn when plotting frequency graphs with continuous data, e.g. frequency of occurrence of leaves of different lengths. These blocks should be in order of increasing or decreasing magnitude and **should** be touching.