EXAMINATIONS COUNCIL
OF ESWATINI

Syllabus

For Examination in 2027

Science

JC

Junior Certificate
Examination

CONTENTS

BROAD GUIDELINES

This syllabus is designed to further the national aspirations enshrined in the national constitution and policies in the education sector. The National Constitution (2005) states that every child has a right to education which means that education should be accessible to all children. The Education Sector Policy (2018) states that curriculum must be responsive to changing goals and needs of society, considering emerging issues such as Education for Sustainable Development, diseases and environmental issues. It states that Eswatini shall adopt a competency-based approach to education and that education must be inclusive and learner centred.

The syllabus aims at developing a knowledge-based society in line with the aspirations of the Education Sector Policy. It envisages the holistic development of

- a confident learner,
- a concerned citizen,
- a successful learner,
- and a learner who will be an effective contributor to the country.

According to the Science, Mathematics and Technology Education policy (2013), science education should prepare the learner for life, further training and the world of work. Furthermore, it should equip learners with confidence to engage with Science both at personal and societal level.

INTRODUCTION

This is an assessment syllabus for the Junior Certificate Science. It is designed as a three-year course qualifying learners for the Junior Certificate. It pre-supposes that learners have completed the Eswatini Primary Science Curriculum or equivalent. It is designed to prepare learners for Science syllabuses of the Eswatini General Certificate of Secondary Education (EGCSE) and any other equivalent course. It shall be examined for the first time in 2024.

The syllabus is designed to provide a worthwhile educational experience in Science;

- accessible to all learners including learners with special needs,
- deliverable in all secondary school settings and by open and distance learning,
- cognisant of gender equity,
- cognisant of healthy living,
- and stimulates human ingenuity in Science.

BROAD AIMS

The syllabus is designed to enable learners to:

1 acquire sufficient scientific knowledge and understanding to;

- 1.1 become confident citizens in the technological world and to develop informed interest in matters related to Science,
- 1.2 appreciate the general applicability of Science in other disciplines and in everyday life, and to be inspired to seek scientific explanations of natural phenomena,
- 1.3 be suitably prepared for further studies in Science and Technology at higher levels.

2 develop abilities and skills that;

- 2.1 are useful in the development and enhancement of scientific knowledge and understanding,
- 2.2 are applicable in the learners' own problem solving and also in industrial innovations,
- 2.3 are necessary to confidently communicate scientific findings, orally and in writing, using proper scientific terminology and technology,
- 2.4 encourage concern for safety.

3 develop attitudes relevant to Science such as;

- 3.1 concern for accuracy and precision,
- 3.2 objectivity,
- 3.3 integrity,
- 3.4 enquiry,
- 3.5 initiative,
- 3.6 inventiveness,
- 3.7 perseverance,
- 3.8 open-mindedness,
- 3.9 validity and reliability.

4 promote awareness

- 4.1 that the applications of Science can be both beneficial and detrimental to people,
- 4.2 of the limitations of the scientific method,
- 4.3 of the importance to live in harmony with the environment,
- 4.4 of the potential of indigenous technologies and knowledge in developing local societies,
- 4.5 that the study and practice of Science is subject to social, economic, technological, ethical and cultural influences and limitations.

ASSESSMENT OBJECTIVES

The assessment objectives of the syllabus are given in three categories as:

A Knowledge with understanding

B Handling information and problem solving

C Science process skills

A KNOWLEDGE WITH UNDERSTANDING

Learners should be able to demonstrate knowledge and understanding of the following:

1 Scientific facts, laws, concepts, theories, phenomena, processes, definitions, terminology;

2 Scientific instruments and conventions including symbols, quantities and units;

3 Application of Science and Technology with their social, economic and environmental implications.

B HANDLING INFORMATION AND PROBLEM SOLVING

Using words or other written forms of presentation (i.e. symbols, graphs and numbers), learners should be able to:

1 locate, select, organise and present information from different sources;

2 identify patterns, report trends and draw conclusions from given information;

3 translate information from one form to another;

4 manipulate numerical and other data;

5 give reasoned explanations for phenomena, patterns and relationships;

6 solve scientific problems.

C SCIENCE PROCESS SKILLS

Learners should be able to:

1 follow instructions and procedure of carrying out investigations correctly with safety considerations;

2 formulate hypotheses and predictions;

3 use techniques, apparatus and materials (including improvised equipment) with safety considerations;

4 make and record observations, measurements and estimates;

5 interpret and evaluate experimental observations and data;

6 communicate investigative findings and engage in scientific discourse (debate);

7 plan and carry out investigations, evaluate methods and suggest possible improvements, including the selection of techniques, apparatus and materials;

8 demonstrate the attitudes of: accuracy and precision, objectivity, integrity, enquiry, initiative, inventiveness, perseverance in investigations, open-mindedness, validity and reliability.

SPECIFICATION GRID

The approximate weightings allocated to each of the Assessment Objectives in the assessment model are summarised in the table below.

Assessment Objectives	Paper 1 (marks)	Paper 2 (marks)	Weighting of Assessment Objectives in overall qualification
A Knowledge with understanding	25	35 - 40	54%
B Handling information and problem solving	15	20 - 29	29%
C Experimental skills and investigations	0	17	17%
Weighting of paper qualification	30%	70%	

ASSESSMENT

Scheme of Assessment

All candidates must enter for two papers. These will be Paper 1 and Paper 2.

Paper 1 (1 hour)

This paper consists of 40 compulsory multiple-choice questions of the four choice type covering all topics of the syllabus. The questions will test skills mainly in Assessment Objectives **A** and **B**.

This paper will be weighted at 30% of the final total available marks.

Paper 2 (1 hour 30 minutes)

This Paper will consist of two sections with a total of 80 marks. Candidates will be expected to answer all questions in both sections.

Section A

This section will have a total of 60 marks balancing all the three themes of the syllabus (Physical Properties of Matter, Chemical Behaviour of Substances and Maintenance and Continuity of Life).

The questions in this section will be the structured type of questions, testing mainly Assessment Objectives **A** and **B**.

Section B

This section will carry 20 marks and will consist of questions testing mainly Assessment Objective **C**. The questions shall require familiarity with laboratory equipment and procedures, and shall assume that candidates have done practical activities.

This paper will be weighted at 70% of the final total available marks.

CURRICULUM CONTENT

The curriculum content is presented in terms of recurring themes in a suggested teaching sequence. It is however expected that curriculum implementers may wish to rearrange the content to suite their teaching themes and also reflect preferred teaching approaches such as the contextualised teaching approaches. The main themes and topics are written in bold.

PHYSICAL PROPERTIES OF MATTER I

1.0 MEASUREMENT AND DENSITY

All learners should be able to:

(a) state units of measurement for temperature, time, volume, mass and length

(b) state the System International (SI) units for measurement of time (seconds), length (metres) and mass (kilograms)

(c) name and use appropriate apparatus for measurement of: time (stop clock/stop watch), temperature (thermometer), volume (measuring cylinder), length (metre rule), mass (beam/lever balances), force (spring balance / force meter)

(d) determine the volume of irregular objects

(e) define density as the mass of an object per unit volume

(f) determine the density of regular and irregular objects from volume and mass

(g) state the unit for density

2.0 SPEED AND VELOCITY

Learners should be able to:

(a) state the difference between total distance and displacement

(b) define speed as the distance travelled per unit time

(c) investigate and calculate speed of given objects (speed/time graphs not required)

(d) describe the difference between speed and velocity in terms of directional and non-directional quantities

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3.0 MASS AND FORCE

All learners should be able to:

3.1 Force

(a) define force as a push, pull or twist

(b) state that a force may produce a change in size, shape and the motion of a body.

(c) list different types of forces (gravitational, friction, thrust, upthrust, suction, tension)

3.2 Frictional Force

(a) describe the force of friction

(b) describe situations where the existence of the frictional force is useful (car brakes, rubber tyres, human movement)

(c) describe situations where the existence of the frictional force is disadvantageous

3.3 Pressure

(a) define pressure as force per unit area

(b) state the unit of pressure as Pascal(Pa)

(c) state and investigate the use of the equation P = F/A (pressure in fluids not required)

3.4 Mass, weight and moments

(a) distinguish between mass and weight in terms of definitions, units and instruments of measurement

(b) describe centre of mass

(c) describe an experiment to determine the position of the centre of mass for a plane lamina

(d) investigate and describe the effects of the position of the centre of mass on the stability of simple objects

(e) define a lever as a type of simple machine consisting of a rigid rod pivoted at a fulcrum

(f) identify the load, fulcrum and effort in a given lever

(g) describe and calculate the moment of a force (principle of moments not required)

CHEMICAL BEHAVIOUR OF SUBSTANCES I

4.0 MATTER, ATOMS, ELEMENTS AND COMPOUNDS

All learners should be able to:

4.1 Matter

(a) define matter as anything that has mass and volume

(b) describe the states of matter in terms of shape, volume and ability to flow

(c) describe the inter-conversions of the states of matter in terms of the kinetic particle theory

(d) differentiate the arrangement of particles in the states of matter

(e) define an atom as the smallest particle of matter

(f) describe the simple structure of atoms in terms of protons, neutrons and electrons

(g) state the relative charges for protons, neutrons and electrons

4.2 Molecules, elements and compounds

(a) define a molecule as a particle made up of two or more atoms that are chemically combined e.g H_2O, CO_2, O_2, HCl

(b) define an element as a substance that is made up of only one kind of atoms

(c) describe the Periodic Table as a method of classifying elements

(d) name and give symbols of the first 20 elements of the Periodic Table

(e) describe the arrangement of elements in groups and periods in the Periodic Table

(f) identify Group I and Group VIII elements in the Periodic Table

(g) describe the properties of Group I elements in terms of texture and reactivity with water, using sodium as an example (reactivity trends not required)

(h) state the uses of helium (in air balloons) and argon (in light bulbs)

(i) define a compound as a substance that is made up of two or more elements that are chemically combined

(j) name and give formulae of simple compounds such as H_2O, CO, CO_2, HCl, NaCl

(k) construct word equations for simple chemical reactions, showing the reactants and the products (e.g. combustion of magnesium and carbon)

5.0 EXPERIMENTAL TECHNIQUES

All learners should be able to:

5.1 Physical and chemical changes

(a) describe physical and chemical changes

(b) describe differences between chemical and physical changes in terms of formation of a new substance, energy being absorbed or released and the reversibility of the change

5.2 Mixtures

(a) define a mixture as a substance that contains two or more elements or compounds that are physically combined

(b) describe the differences between a mixture and a compound in terms of how they are separated

(c) define the terms:

(i) solute as a solid that dissolves in a liquid

(ii) solvent as the liquid in which a solid dissolves

(iii) solution as the mixture of a solute and a solvent

5.3 Separating mixtures

(a) describe methods of separating mixtures by: decanting, filtration, evaporation, crystallisation, simple distillation, separation by gravity

(b) describe the preparation of small and large crystals from a solution

(c) describe the general properties of crystals

MAINTENANCE AND CONTINUITY OF LIFE I

6.0 CHARACTERISTICS AND CLASSIFICATIONS OF LIVING ORGANISMS

All learners should be able to:

6.1 Characteristics of living organisms

List the characteristics of living organisms as movement, respiration, sensitivity, growth, excretion, reproduction and nutrition

6.2 Classifications of living organism

Classify, using visible characteristics, and named examples:

(a) living organisms into plants and animals (classification of bacteria and fungi is not required)

(b) plants to flowering and non-flowering plants

(c) flowering plants into monocotyledons and dicotyledons

(d) animals into vertebrates and invertebrates

(e) vertebrates into fish, amphibians, reptiles, birds and mammals

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7.0 CELL STRUCTURE AND ORGANISATION; DIFFUSION AND OSMOSIS

All learners should be able to:

7.1 The microscope

(a) name a microscope as a magnifying instrument

(b) identify and label parts of a microscope (eye piece, objectives, stage, stage clips, mirror, light source, focusing knob, arm) and state their functions

7.2 Cell structure

(a) define a cell as a basic unit of life

(b) describe plant and animal cells as seen under a light microscope

(c) state the functions of the parts of a plant cell (cell wall, cell membrane, nucleus, cytoplasm and chloroplast)

(d) state the functions of the parts of an animal cell (cell membrane, nucleus, cytoplasm)

(e) identify and name from diagrams [palisade cell, root hair cell, red blood cell, guard cell, sperm cell and white blood cells (lymphocytes and phagocytes)]

7.3 Cell organisation

(a) define a tissue as a group of similar cells that work together to perform a special function

(b) list examples of tissues and their functions i.e. plant tissues-xylem, phloem, epidermis; animal tissues - muscles, epithelium, bone, nerve

(c) discuss relationships between cells, tissues, organs, systems and organisms

7.4 Diffusion and Osmosis

(a) describe diffusion and osmosis

(b) investigate the processes of diffusion and osmosis

8.0 ANIMAL AND PLANT NUTRITION

All learners should be able to:

8.1 Nutrients

(a) define nutrition as the obtaining of food substances by living organisms to sustain life

(b) describe nutrients as chemicals, obtained from food substances, that are required by living organisms to sustain life

(c) name the types of nutrients as carbohydrates, proteins, fats, minerals and vitamins

(d) name the smallest basic units making up carbohydrates, proteins and fats

(e) state the functions of the nutrients: carbohydrates, proteins, fats, vitamins (C, D and K) and minerals (iron, calcium) in the body, stating their local sources

8.2 Photosynthesis

(a) define photosynthesis as the process of making glucose in green plants using water and carbon dioxide in the presence of light

(b) state the word equation for photosynthesis

(c) investigate and describe the conditions necessary for photosynthesis

(d) state that most photosynthesis occurs in the leaves

PHYSICAL PROPERTIES OF MATTER II

9.0 WAVES

All learners should be able to:

9.1 Wave properties

(a) investigate and describe wave motion as illustrated by vibrations in ropes, springs and water waves

(b) distinguish between transverse and longitudinal waves

(c) identify the wavelength and amplitude of a wave

(d) describe the frequency of a wave and state the unit of its measurement as Hertz

(e) calculate the frequency of a wave

9.2 Sound waves

(a) investigate and describe the production of sound by vibrating sources

(b) state that sound waves are longitudinal in nature

9.3 Light

(a) list the common sources of light

(b) state that light waves are transverse in nature

(c) describe an experiment to investigate the laws of reflection

(d) list characteristics of the image formed by a plane mirror (drawing not necessary)

(e) describe refraction as the bending of light when it passes from one medium to another, such as from air into glass or water

(f) describe the action of a thin converging lens on a parallel beam of light

(g) describe the action of a thin diverging lens on a parallel beam of light

(h) state the properties of lenses in terms of principal axis, optical centre, focal length and focal point

(i) list the characteristics of a real image formed by a convex lens

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10.0 WORK AND ENERGY

All learners should be able to:

(a) state that work is done when a force moves an object in the direction of the force

(b) calculate work done, using the equation W= F x d, and state the unit as the joule(J)

(c) define energy as the ability to do work

(d) state examples of energy in different forms (gravitational potential, kinetic, electrical, chemical, sound, light, heat) and their conversion

(e) describe kinetic energy and gravitational potential energy

(f) state the law of energy conservation as; energy is neither created nor destroyed but can be changed from one form to another

(g) state some renewable sources of energy (biomass, solar, wind, waves, water)

(h) describe the use of solar energy and water in the generation of electricity

(i) investigate and describe qualitatively the thermal expansion of solids, liquids and gases

(j) describe the structure and operation of a liquid-in-glass thermometer (features of a clinical thermometer not required)

(k) describe some everyday applications (e.g. gaps in bridges, pavements or railway lines, bimetallic strip in electric irons), and consequences of thermal expansion (e.g. sags in electrical power lines, cracks in roads, overflowing of heated milk in pots)

CHEMICAL BEHAVIOUR OF SUBSTANCES II

11.0 Chemical reactions

All learners should be able to:

11.1 Energy changes

(a) state that chemical reactions release or absorb energy

(b) describe exothermic reactions using suitable examples

(c) describe endothermic reactions using suitable examples

11.2 Speed of reactions

investigate the speed of a reaction in terms of particle size of the reactants and temperature of the reactants

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12.0 ACIDS, BASES AND SALTS

All learners should be able to:

12.1 Properties of acids and bases

(a) describe physical properties of acids and bases

(b) define an indicator as a substance that has different colours in acidic or alkaline solutions

(c) identify acidic, alkaline and neutral substances using litmus paper

(d) describe neutrality, relative acidity and alkalinity in terms of pH (whole numbers only) measured using Universal Indicator

12.2 Reactions of acids and bases

(a) investigate and describe the reactions of acids with metals, bases (hydroxides only) and carbonates

(b) construct word equations for the reactions of acids with metals, hydroxides and carbonates

(c) describe the preparation of soluble salts by reaction of acids with metals, hydroxides and carbonates

(d) describe the control of the acidity in soils using a base (chemical name of the base not required)

MAINTENANCE AND CONTINUITY OF LIFE II

13.0 REPRODUCTION IN HUMANS

All earners should be able to:

13.1 Reproduction and secondary sex characteristics

(a) define reproduction as the production of offspring for the continuity of organisms of the same kind

(b) describe the secondary sex characteristics in males and females at puberty.

13.2 Sexual reproductive system

(a) describe the structure and function of human male reproductive system: testis, penis, scrotum, sperm duct and urethra

(b) describe the structure and function of the female reproductive system: ovary, oviduct, vagina, cervix and uterus

13.3 The menstrual cycle

describe the menstrual cycle in terms of the alteration of ovulation and menstruation (hormonal control not required)

13.4 Fertilisation and pregnancy

(a) describe the sperm as the male sex cell and the ovum as the female sex cell

(b) state that sex cells carry genetic information about the characteristics that are passed on from parents to their offspring

(c) describe:

- **(i)** sexual intercourse,
- **(ii)** fertilisation,
- **(iii)** and pregnancy

(d) describe the consequences of teenage pregnancy

(e) describe methods of prevention of teenage pregnancy (abstinence and condoms)

13.5 Sexually transmitted infections

(a) define sexually transmitted infections (STI's) as infections that are transmitted mainly through sexual intercourse

(b) name and describe some examples of sexually transmitted infections

(c) describe the signs, symptoms and treatment for gonorrhoea and syphilis

13.6 HIV/AIDS

(a) describe the Human Immuno-deficiency Virus (HIV) as a virus that causes Acquired Immune deficiency Syndrome (AIDS) in human beings

(b) explain how AIDS develops, giving examples of opportunistic infections

(c) describe the methods of transmission of HIV/AIDS and how the spread of HIV can be prevented

14.0 ORGANISMS IN THEIR NATURAL ENVIRONMENT

All learners should be able to:

14.1 Principal source of energy and energy flow

(a) state that the sun is the principal source of energy to all living systems

(b) define food chains as simple feeding relationships between living organisms in a given habitat through which energy is passed from one organism to the other

(c) construct simple food chains

(d) describe energy flow in a food chain

14.2 Relationship of organisms with each other and their environment

(a) define ecology as the study of the relationship of organisms with each other and their environment

(b) define ecosystem as different organisms living together in a given environment and depending on each other, giving local examples

(c) describe, giving local examples, the terms: producer, primary consumer, secondary consumer

14.3 Environmental pollution and conservation

(a) state the human activities which bring about water pollution (fertilisers and industrial/household waste), land pollution (non-biodegradable waste), and air pollution(smoke, motor car exhaust fumes, dust from industries, pesticides and herbicides)

(b) explain the effects of water, land and air pollution (including global warming)

(c) define conservation as maintenance and protection of a habitat or species

PHYSICAL PROPERTIES OF MATTER III

15.0 ELECTRICITY AND MAGNETISM

All learners should be able to:

15.1 Magnetism

(a) state the simple properties of a magnet

(b) describe the effect of the poles of bar magnets on one another

(c) determine and draw the pattern of field lines around a bar magnet

(d) draw field lines around two bar magnets arranged end to end

(e) describe methods of:

- magnetisation (induction and stroking)
- demagnetisation (hammering and heating)

(f) describe how a simple electromagnet can be constructed

(g) describe the factors affecting the strength of an electromagnet (number of turns in coil, amount of current)

15.2 Electricity

(a) describe simple experiments to show the production and detection of electrostatic charges

(b) state that unlike charges attract and like charges repel

(c) define current as the rate of flow of charge

(d) distinguish between conductors and insulators of electricity

(e) describe the use of an ammeter, stating the unit of current as Ampere (A)

(f) describe the use of a voltmeter, stating the unit of potential difference as volt (V)

(g) define resistance as opposition to the flow of current, stating its unit as the Ohm (Ω)

(h) describe the factors that affect the resistance of a conductor (thickness, length and type of material)

(i) calculate the combined resistance of two resistors in series

(j) state and use the equation V= IR

15.3 Simple circuit diagrams

(a) draw and interpret circuit diagrams containing cells, switches, not more than two bulbs, a voltmeter and an ammeter

(b) draw and interpret circuit diagrams with electrical components such as bulbs connected in series and in parallel

(c) describe the advantages and disadvantages of connecting bulbs in parallel and in series

(d) state that the current in a series circuit is the same at every point

15.4 Practical Electricity

(a) describe the function of a fuse in a circuit

(b) state the uses of electricity (heating, lighting and driving motors)

(c) describe the power of an appliance and state its unit as the watt (W)

(d) state and use the equation P = VI

(e) describe how a three pin plug is wired

CHEMICAL BEHAVIOUR OF SUBSTANCES III

16.0 METALS

All learners should be able to:

16.1 Properties of metals

(a) describe the general physical properties of metals in terms of lustre, malleability, ductility, sonority, electrical and heat conductivity

(b) investigate and place in order of reactivity: calcium, copper, iron, magnesium and zinc by reference to the reactions of the metals with dilute hydrochloric acid and sulfuric acid (only word equations required for the reactions)

(c) describe the ease in obtaining metals from their ores by relating the elements to the reactivity series

(d) name metals that occur in pure state (copper and gold)

16.2 Extraction of metals

(a) name the main ores of aluminium and iron

(b) define oxidation and reduction in terms of oxygen gain or loss

(c) describe the essential reaction in the extraction of iron (reduction of iron(III) oxide) Include a word equation for the reaction (details of blast furnace not required)

(d) define an alloy as a mixture of two or more metals or a metal and a non metal

(e) list the elements that make up the alloys: mild steel, stainless steel and brass

(f) describe the idea of changing the properties of iron by the controlled use of additives to form steel alloys, i.e. mild steel and stainless steel

(g) name the uses of mild steel (car bodies and machinery) and stainless steel (chemical plant and cutlery)

(h) name the uses of zinc i.e. galvanizing and for making brass

(i) name the uses of copper (electrical wiring and in cooking utensils) and aluminium (aircraft bodies and food containers), relating them to their properties

17.0 NON-METALS

All learners should be able to:

17.1 Physical properties of non-metals

compare the general physical properties of metals and non-metals

17.2 Air

describe the approximate composition of air (21 % oxygen, 0.03% carbon dioxide, 78% nitrogen, and remainder being mixture of noble gases and water vapour)

17.3 Hydrogen gas

(a) describe the preparation and collection of hydrogen using a reactive metal and an acid

(b) describe the properties of hydrogen

(c) describe the test for hydrogen using a lighted splint

(d) state the use of hydrogen as a fuel in rockets

17.4 Oxygen

(a) describe the preparation and collection of oxygen by the method of heating potassium permanganate

(b) describe the properties of oxygen

(c) describe the test for oxygen using a glowing splint

(d) state the uses of oxygen including its use in hospitals and with acetylene in welding

(e) investigate combustion using magnesium and fuels made of carbon

Include word equations for:

(i) the formation of carbon dioxide from carbon and oxygen

(ii) the formation of magnesium oxide from magnesium and oxygen

17.5 Rusting

(a) investigate the conditions necessary for rusting to occur

(b) describe methods of rust prevention: painting, oiling and galvanising to exclude oxygen

17.6 Carbon dioxide

(a) describe the preparation and collection of carbon dioxide (word equation required)

(b) describe the properties of carbon dioxide

(c) describe the test for carbon dioxide using limewater

(d) state the uses of carbon dioxide in fire extinguishers, fizzy drinks and baking

17.7 Water

(a) state the physical properties of water in terms of melting point, boiling point and density.

(b) investigate the physical properties of water (melting point and boiling point) in terms of the temperature changes.

MAINTENANCE AND CONTINUITY OF LIFE III

18.0 COORDINATION AND RESPONSE

All learners should be able to:

18.1 Senses and sense organs

(a) describe sense organs as groups of receptor cells responding to specific stimuli (light, sound, touch, temperature and chemicals)

(b) describe the sensory functions of the human ear, eye, tongue and skin in terms of the perceived stimuli, its conversion to nerve impulses and transmission to the brain (detail of structures not required)

18.2 Voluntary and reflex actions

(a) distinguish between voluntary and reflex actions

(b) investigate and describe reaction times

(c) describe the brain and spinal cord as the central nervous system (CNS)

(d) describe the reflex arc in reflex actions

18.3 Drugs and drug abuse

(a) define a drug as any externally administered substance which modifies or affects chemical reactions in the body

(b) describe the effects of alcohol, cannabis, heroin and cocaine

(c) describe the personal and social problems (crime and HIV infection) arising from drug abuse, by references to alcohol, cannabis, heroin and cocaine

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19.0 TRANSPORTATION, RESPIRATION AND EXCRETION

All learners should be able to:

19.1 Transportation

(a) describe the composition of blood (plasma, red blood cells, white blood cells and platelets)

(b) identify and name the components of blood from pictures and photomicrographs

(c) state the functions of the red blood cells (transport of oxygen), white blood cells (defence) and plasma (transport of dissolved food, heat and waste material)

(d) label parts of the internal structure of the human heart (right and left atria, right and left ventricles, valves (specific names not required), aorta, pulmonary vein, pulmonary artery and vena cava) and state their functions

(e) describe the direction of flow of blood through the heart

(f) state the functions of the three types of blood vessels (arteries, veins and capillaries)

19.2 Respiration

(a) label parts of the respiratory system (larynx, trachea, bronchi and lungs)

(b) state differences between inhaled and exhaled air

(c) describe the role of lungs, rib cage and diaphragm in breathing (role of intercostal muscles not required)

(d) describe the role of lungs in removal of carbon dioxide and water from the body

(e) describe respiration as the breakdown of glucose in the presence of oxygen to release energy in all living cells

19.3 Excretion

(a) state the function of the urinary system in excretion

(b) label parts of the urinary system (kidneys, bladder, ureter, urethra, renal vein and renal artery)

(c) state the functions of the parts of the urinary system.

MATHEMATICAL REQUIREMENTS

Calculators may be used in all parts of the Assessment.

Candidates should be able to:

1. add, subtract, multiply and divide;
2. understand and use *averages, decimals, fractions, percentages* and *ratios;*
3. recognise and use standard notation;
4. use direct and inverse proportion;
5. use positive, whole number indices;
6. draw charts and graphs from given data;
7. interpret charts and graphs;
8. select suitable scales and axes for graphs;
9. make approximate evaluations of numerical expressions;
10. recognise and use the relationship between length, surface area and volume and their units on metric scales;
11. use usual mathematical instruments (ruler, compasses, protractor, set square);
12. solve equations of the form $x = yz$ for any one term when the other two are known;
13. recognise and use points of the compass (N, S, E, W).
14. calculations to 3 significant figures if answer is not exact.

GLOSSARY OF TERMS

It is hoped that the glossary will prove helpful to candidates as a guide i.e., it is neither exhaustive nor definitive. The glossary has been deliberately kept brief 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.

In all questions, the number of marks allocated is shown on the examination paper, and should be used as a guide by candidates to how much detail to give or time to spend in answering. In describing a process the mark allocation should guide the candidate about how many steps to include. In explaining why something happens, it guides the candidate on how many reasons to give, or who much detail to give for each reason.

CALCULATE Used when a numerical answer is required. In general, working should be shown, especially where two or more steps are involved.

DEDUCE Used in a similar way to "Predict" except that some supporting statement is required (e.g., reference to a law, principle, or the necessary reasoning is to be included in the answer).

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

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".

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., resistance, the formula of an ionic compound).

DISCUSS Requires the candidate to give a critical account of the points involved in the topic.

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.

EXPLAIN May imply reasoning or some reference to theory, depending on the context.

FIND Is a general term that may variously be interpreted as "Calculate", "Measure", "Determine", etc.

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.

MEASURE Implies that the quantity concerned can be directly obtained from a suitable measuring instrument (e.g., length, using a rule, or mass, using a balance).

OUTLINE Implies brevity (i.e., restricting the answer to giving essentials).

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 earlier part of the question. Predict also implies a concise answer with no supporting statement required.

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

STATE Implies a concise answer with little or no supporting argument (e.g., a numerical answer that can readily be obtained 'by inspection').

SUGGEST Used in two main contexts (i.e., either to imply that there is no unique answer (e.g., in Chemistry, two or more substances may satisfy the given conditions describing an 'unknown'), or to imply that candidates are expected to apply their general knowledge to a 'novel' situation, one that may be formally 'not in the syllabus').

WHAT DO YOU UNDERSTAND BY/WHAT IS MEANT BY: "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.

PERFORM Perform an experiment in the syllabus implies that the learners will gain great benefit from carrying out such an experiment themselves, and as a result will be able to recall and explain the procedures and the associated science knowledge and understanding, demonstrate how to handle and interpret data from the experiment, and draw conclusions.

INVESTIGATE Investigate in the syllabus implies that the learners will have planned the experiment themselves before carrying it out, and as a result will be able to use hypotheses to makepredictions and so explain the experimental plan, as well as the issues included above.

DATA SHEET
The Periodic Table of the Elements

Group I	Group II											Group III	Group IV	Group V	Group VI	Group VII	Group 0
							1 H Hydrogen 1										4 He Helium 2
7 Li Lithium 3	9 Be Beryllium 4											11 B Boron 5	12 C Carbon 6	14 N Nitrogen 7	16 O Oxygen 8	19 F Fluorine 9	20 Ne Neon 10
23 Na Sodium 11	24 Mg Magnesium 12											27 Al Aluminium 13	28 Si Silicon 14	31 P Phosphorus 15	32 S Sulfur 16	35.5 Cl Chlorine 17	40 Ar Argon 18
39 K Potassium 19	40 Ca Calcium 20	45 Sc Scandium 21	48 Ti Titanium 22	51 V Vanadium 23	52 Cr Chromium 24	55 Mn Manganese 25	56 Fe Iron 26	59 Co Cobalt 27	59 Ni Nickel 28	64 Cu Copper 29	65 Zn Zinc 30	70 Ga Gallium 31	73 Ge Germanium 32	75 As Arsenic 33	79 Se Selenium 34	80 Br Bromine 35	84 Kr Krypton 36
85 Rb Rubidium 37	88 Sr Strontium 38	89 Y Yttrium 39	91 Zr Zirconium 40	93 Nb Niobium 41	96 Mo Molybdenum 42	Tc Technetium 43	101 Ru Ruthenium 44	103 Rh Rhodium 45	106 Pd Palladium 46	108 Ag Silver 47	112 Cd Cadmium 48	115 In Indium 49	119 Sn Tin 50	122 Sb Antimony 51	128 Te Tellurium 52	127 I Iodine 53	131 Xe Xenon 54
133 Cs Caesium 55	137 Ba Barium 56	139 La Lanthanum 57 *	178 Hf Hafnium 72	181 Ta Tantalum 73	184 W Tungsten 74	186 Re Rhenium 75	190 Os Osmium 76	192 Ir Iridium 77	195 Pt Platinum 78	197 Au Gold 79	201 Hg Mercury 80	204 Tl Thallium 81	207 Pb Lead 82	209 Bi Bismuth 83	209 Po Polonium 84	210 At Astatine 85	222 Rn Radon 86
223 Fr Francium 87	226 Ra Radium 88	227 Ac Actinium 89 †															

140 Ce Cerium 58	141 Pr Praseodymium 59	144 Nd Neodymium 60	147 Pm Promethium 61	150 Sm Samarium 62	152 Eu Europium 63	157 Gd Gadolinium 64	159 Tb Terbium 65	163 Dy Dysprosium 66	165 Ho Holmium 67	167 Er Erbium 68	169 Tm Thulium 69	173 Yb Ytterbium 70	175 Lu Lutetium 71
232 Th Thorium 90	231 Pa Protactinium 91	238 U Uranium 92	237 Np Neptunium 93	244 Pu Plutonium 94	243 Am Americium 95	247 Cm Curium 96	247 Bk Berkelium 97	251 Cf Californium 98	252 Es Einsteinium 99	257 Fm Fermium 100	258 Md Mendelevium 101	259 No Nobelium 102	260 Lr Lawrencium 103

* 58–71 Lanthanoid series
† 90–103 Actinoid series

Key: a X b — a = relative atomic mass; X = atomic symbol; b = atomic (proton) number

The volume of one mole of any gas is 24 dm^3 at room temperature and pressure (r.t.p.).