



CARIBBEAN
EXAMINATIONS
COUNCIL

Caribbean Secondary
Education Certificate®

SYLLABUS

HUMAN AND SOCIAL BIOLOGY

CXC 35/G/SYLL 26

Effective for examinations from May–June 2028



CSEC®

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NOTE TO TEACHERS AND LEARNERS

This document *CXC 35/G/SYLL 26* replaces *CXC 35/G/SYLL 21* issued in 2021.

Please note that the syllabus has been revised and amendments are indicated by italics.

First Issued 2004
Revised 2009
Revised 2020
Amended 2022
Amended 2026

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For access to short courses, training opportunities and teacher orientation webinars and workshops go to our Learning Institute at <https://pli.cxc.org/>



PLEASE NOTE

This icon is used throughout the syllabus to represent key features which teachers and learners may find useful.

Human and Social Biology Syllabus

◆ RATIONALE

Human beings require knowledge of how the human body functions, the interdependence of living things, and the ways in which the environment functions to support life on earth in all its forms. This *knowledge* will aid individuals in making *informed* decisions on matters at home, work *and* in society, which routinely affect their health and, *consequently*, the quality of their lives. The study of Human and Social Biology provides learners with an opportunity to begin acquiring this knowledge.

Human and Social Biology is concerned with the study of the structure and function of the human body. It also involves the application of biological principles, knowledge and skills, and technological advances, to the maintenance of health and harmonious living. Additionally, learners will gain an understanding of the impact of socio-cultural factors on the health of people and the community. The subject incorporates the view that human beings have a responsibility to their environment and, as such, have an obligation to conserve, protect, maintain and improve its quality.

The **CSEC®** Human and Social Biology syllabus allows learners to utilise theoretical concepts in an interactive and practical manner. This *approach* facilitates the development of long-term transferable skills of ethical conduct, collaboration, problem solving, critical thinking, creativity and communication. It encourages the use of various teaching and learning strategies to inculcate these skills while catering to multiple intelligences and different learning styles. Students are expected to demonstrate an appreciation for all living organisms *within* their environment.

The **CSEC®** syllabus in Human and Social Biology provides Caribbean students with a foundation for further study in fields *that require* an understanding of the structure and function of the human body and the application of biological principles to *health* maintenance. It also helps to provide students with knowledge, skills and attitudes that are important for maintaining healthy lifestyles and creates an awareness of the social determinants of disease prevention and control. *Additionally, this syllabus prepares students for careers in fields such as allied health, physical education, food and nutrition and social work.*

This syllabus will contribute to the development of the Ideal Caribbean Person as articulated by the CARICOM Heads of Government in the following areas: respect for human life and awareness of the importance of living in harmony with the environment; multiple literacies; independent and critical thinking; the innovative application of science and technology to problem solving; promote physical, mental, social and spiritual well-being and contribute to the health and welfare of the community, country and region. Based on the UNESCO Pillars of Learning, this course of study will also contribute to a person who will learn to do, *to be*, to live together and learn to transform themselves and society.

◆ AIMS

The syllabus aims to:

1. develop an understanding of the structure and function of the human body;
2. increase awareness *of* the interdependence of living things *and their interaction* with the environment;
3. develop competencies that will enable students to adopt *and maintain* healthy lifestyles;
4. create awareness of the *commercial and* socio-cultural determinants of disease prevention and control;
5. develop long-term transferable skills of ethical conduct, collaboration, problem solving, critical thinking, creativity and communication;
6. develop experimental, data interpretation, and research skills;
7. create awareness of *current and emerging* technological advances, *and promote the integration* of information, communication and technology (ICT); and,
8. provide a foundation for further study and specialised training *in areas such as allied health, physical education, food and nutrition and social work.*

◆ SUGGESTED TIMETABLE ALLOCATION

It is *strongly* recommended that a minimum of five 40-minute periods per week, which must include one double period, over two academic years or the equivalent be allocated to the syllabus.

CLASS SIZE

It is recommended that practical classes accommodate a maximum of **twenty-five** students.

◆ ORGANISATION OF THE SYLLABUS

The syllabus is arranged in three MODULES. Each module covers a distinct set of topics that are clearly defined by General Objectives, Specific Objectives, corresponding explanatory notes, Suggested Practical Activities and Suggested Teaching and Learning Activities. The Specific Objectives are indicative of the content on which the assessment will be based and should not be treated in isolation as they are related to the general objectives and syllabus aims.

MODULE 1 Organisms and Metabolism	MODULE 2 Life Processes	MODULE 3 Heredity, Diseases and the Environment
• Living organisms and ecology • Nutrition • The Circulatory system • Excretion and homeostasis	• The Respiratory System • The Skeletal system • Coordination and control • The Reproductive system	• Heredity and variation • Diseases and their impact on humans • Impact of health practices on the environment

◆ APPROACHES TO TEACHING THE SYLLABUS

The organisation of each module in the syllabus is designed to facilitate inquiry-based learning and to ensure that connections among concepts are established. This modularised syllabus follows the complementary model design which allows modules to be taken in any order because of the horizontal relationships between content, making the outcome of one independent of another. Teachers are encouraged to introduce concepts familiar to the students and ensure that their lessons stimulate the use of all the senses and incorporate the use of technology where possible during the teaching and learning process. This will help students view science as a dynamic and exciting investigative process.

The general and specific objectives indicate the scope of the content including practical work that should be covered. However, unfamiliar situations may be presented as stimulus material in examination questions.

This syllabus caters to varying teaching and learning styles, with specific attention being drawn to the interrelatedness of concepts. Every opportunity should be made to relate the study of biological principles to the environment. An interactive and practical approach should be employed in the teaching of concepts to encourage students to make behavioural changes where necessary to their everyday lives.

The role of the teacher is to facilitate students' learning of accurate and unbiased information that will contribute to a more scientifically literate society that is capable of making educated and ethical decisions regarding the world *in which we live*.

◆ QUALIFICATION OVERVIEW

Credentialing is defined as the issuing of formal certification for successful achievement of a defined set of outcomes targeting specific knowledge, skills, and competencies. It includes the granting of an award or digital unit of measurement for learning. CXC® offers three categories of credentials across all levels of qualifications:

1. *A micro-credential is awarded after successful completion of a module. The Caribbean Targeted Education Certificate® (CTEC®) is a stackable micro-credential that allows individuals to achieve an intermediate or macro qualification.*
2. *An intermediate credential is awarded after successful completion of a set of defined modules that together, make up a CSEC® subject.*
3. *A macro-credential is awarded after successful completion of a combination of intermediate (subjects) and micro-credentials (modules) that culminate in the award of credits for a certificate, diploma or associate degree.*

A total of three micro-credentials may be obtained from pursuing the discrete modules captured in CSEC® Human and Social Biology. Candidates who pursue the requirements of individual modules of the syllabus may qualify for micro-credentials while those who pursue all the modules in one sitting (the regular examination) may qualify for micro-credentials (if they earn Grades A-D) and the intermediate credential. The modules in this syllabus may be pursued in any order.

Module	Duration	Credit Weighting
Module 1: Organisms And Metabolism	45 hours	1
Module 2: Life Processes	45 hours	1
Module 3: Heredity, Diseases and the Environment	45 hours	1

**The SBA is a requirement for the completion of the first micro-credential undertaken.*

◆ CERTIFICATION

The syllabus is offered for General Proficiency certification. A candidate's performance will be indicated on the certificate by an overall numerical grade on a six-point scale as well as a letter grade for each of two profile dimensions, namely, Knowledge and Comprehension and Use of Knowledge.

◆ SKILLS AND ABILITIES TO BE ASSESSED

On completion of the syllabus, students are expected to develop skills under two profile headings:

1. Knowledge and Comprehension (KC); and,
2. Use of Knowledge (UK).

Knowledge and Comprehension (KC)

The ability to:

Knowledge	identify, remember, and grasp the meaning of basic facts, concepts and principles; <i>and</i> ,
Comprehension	select appropriate ideas, match, compare and cite examples of facts, concepts and principles in familiar situations.

Use of Knowledge (UK)

The ability to:

Application	use facts and apply concepts, principles and procedures in familiar and novel situations; transform data accurately and appropriately; use formulae accurately for computational purposes;
Analysis and Interpretation	identify and recognise the component parts of a whole and interpret the relationship among those parts; identify causal factors and show how they interact with each other; infer, predict and draw conclusions; make necessary and accurate calculations and recognise the limitations and assumptions inherent in the collection and interpretation of data;

Synthesis	combine component parts to form a new and meaningful whole; make predictions and solve problems; <i>and</i> ,
Evaluation	make reasoned judgements and recommendations based on the value of ideas, information and their implications.

◆ FORMAT OF THE EXAMINATIONS

The examination will consist of three papers: Paper 01, an objective type paper, Paper 02, a structured type paper and Paper 032 (the alternate to the SBA). **CXC®** will offer candidates the following three options for sitting the Paper 01 and Paper 02.

Option A – Regular Sitting

For the regular sitting, candidates will be required to complete Paper 01, comprising of 60 multiple-choice questions from across all **THREE** modules with 20 questions on each module. Paper 02 consists of six compulsory structured type questions (two from each module) across three sections.

Option B – Modular Sitting (One Module)

Candidates attempting one module will be required to complete a modular Paper 01 and a modular Paper 02. Paper 01 comprises of 20 multiple-choice questions from the selected module and Paper 02 comprises of two compulsory structured type questions from the selected module.

Option C – Modular Sitting (Two Modules)

Candidates attempting two modules will be required to complete a modular Paper 01 and a modular Paper 02. Paper 01 comprises of 40 multiple-choice questions from the selected modules and Paper 02 comprises of four compulsory structured type questions, two from each of the modules selected.

All candidates will be required to attempt the Alternate Paper 032 at the first sitting regardless of the option of sitting chosen.

Paper	Modular Requirement		
Paper 01			
Regular (1 hour 15 minutes)			
Modular			
One Module (25 minutes)			
Two Modules (50 minutes)			
	Module	Number of Items	Marks
	Module 1	20	20
	Module 2	20	20
	Module 3	20	20
	Each item will be allocated one mark.		

Paper	Modular Requirement												
Paper 02 Regular (2 hours) Modular One Module (40 minutes) Two Modules (1 hour 20 minutes)	The paper consists of a maximum of six compulsory questions drawn from all areas of the syllabus organised under the three modules. There are two questions for each module. A question may require knowledge of several topics. However, all topics may not be given equal emphasis. <table><tr><th>Module</th><th>Number of Items</th><th>Marks</th></tr><tr><td>Module 1</td><td>2</td><td>30</td></tr><tr><td>Module 2</td><td>2</td><td>30</td></tr><tr><td>Module 3</td><td>2</td><td>30</td></tr></table> Question 1 in Module 1 will be a data analysis type question.	Module	Number of Items	Marks	Module 1	2	30	Module 2	2	30	Module 3	2	30
Module	Number of Items	Marks											
Module 1	2	30											
Module 2	2	30											
Module 3	2	30											
Paper 032 (1 hour 15 minutes)	This written paper will take the form of a case study and related questions involving a health-related issue in a named Caribbean territory. See Guidelines for the Alternate Paper 032 on pages 43-47.												

◆ ASSESSMENT GRID

The Assessment Grid shows the weighted marks assigned to Papers and to Modules, and percentage contributions of each paper to the total scores for the subject.

Papers	Module 1	Module 2	Module 3	Total Weighted marks	Total %
Paper 01	18	18	18	54	30
Paper 02	30	30	30	90	50
Paper 032	12	12	12	36	20
Total (Weighted)	60	60	60	180	

The marks assigned to papers and to skills and abilities, and the percentage contributions of each paper to the total score for EACH Module are shown in the table below.

Papers	Knowledge and Comprehension (KC)	Use of knowledge (UK)	Total Weighted marks	Total %
Paper 01	18 (20 raw)	-	18	30
Paper 02	12	18	30	50
Paper 032	-	12 (40 raw)	12	20
Total (Weighted)	30	30	60	100

◆ REGULATIONS FOR PRIVATE CANDIDATES



Private candidates must be entered for examination through the Local Registrar or private institutions in their respective territories and will be required to sit Papers 01, 02, and the Alternate Paper 032.

◆ REGULATIONS FOR RESIT CANDIDATES



Resit candidates must complete Papers 01 and 02 and Paper 03 of the examination for the year for which they reregister.

Candidates may reuse their Paper 032 score (starting from May/June 2028) or any moderated SBA score (from 2026 and 2027 May/June sittings only) within a four-year period. In order to assist candidates in making decisions about whether or not to reuse a moderated SBA score, the Council will continue to indicate on the preliminary results if a candidate's Paper 032 score or any moderated SBA score (from 2026 and 2027 sittings only) is less than 50% in a particular subject.

Candidates reusing SBA scores should register as "Resit candidates" and must provide the previous candidate number when registering.

All resit candidates may register through schools, recognised educational institutions, or the Local Registrar's Office. A candidate who sat the regular examinations may opt to resit only the Module/s in which they were unsuccessful. That is, candidates may reuse their modular performance if they earned Grades A-D for any Module/s when they register to resit.

◆ GUIDELINES FOR MODULAR CANDIDATES

*Candidates opting to sit the modular examinations must complete a Modular Paper 01 and a Modular Paper 02 and at their first sitting the Alternate Paper 032. Candidates who are using a modular approach must successfully complete all modules within a four-year period to be awarded the full **CSEC®** award.*

Candidates using a modular approach may reuse their Paper 032 score (starting from 2028 May/June sitting) or their moderated SBA score (from the 2026 and 2027 May/June sittings only) within a four-year period when attempting the other modules. In order to assist candidates in making decisions about whether or not to reuse a moderated SBA score, the Council will continue to indicate on the preliminary results if a candidate's Paper 032 score or moderated SBA score is less than 50 per cent in the particular subject.

Modular candidates may enter through schools or recognised educational institutions, or as private candidates through the Local Registrar's Office.

◆ MODULE 1: ORGANISMS AND METABOLISM

TOPIC 1: LIVING ORGANISMS AND ECOLOGY

Skills and Abilities: Knowledge and Comprehension and Use of Knowledge

Duration: 45 hours

Credit Weighting: 1

GENERAL OBJECTIVES

On completion of this section, students should:

1. understand the processes that govern the interactions of organisms in the environment and the processes by which life is perpetuated;
2. understand the nature of the interdependence of the processes, structures and functions of the major systems, within an organism in the maintenance of health;
3. *understand the role of nutrition in helping humans to obtain their energy and satisfy their physical needs;*
4. understand the role of transport and defence in humans; and,
5. *understand the process by which humans get rid of metabolic waste and maintain homeostasis.*

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

1. describe the characteristics of living organisms;
2. compare the structures of an unspecialised plant and animal cells and selected microbes;
3. state the functions of cell structures *and organelles*;

Include nutrition, respiration, excretion, growth, irritability, movement, reproduction.

Include basic structure of unspecialised *plant and animal cells* and microbes.

Include labelled diagrams of plant and animal cells and microbes which include:

(a) *Virus;*

(b) *Bacteria; and,*

(c) *Fungi.*

(a) *Cell structure*

(i) *cell wall; and,*

(ii) *cell membrane.*

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 1: LIVING ORGANISMS AND ECOLOGY (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | |
|--|---|
| <p>4. relate the structure of selected <i>specialised</i> cells to their function;</p> | <p>(b) <i>Organelles</i></p> <p>(i) nucleus;</p> <p>(ii) ribosomes;</p> <p>(iii) cytoplasm;</p> <p>(iv) mitochondria;</p> <p>(v) vacuoles;</p> <p>(vi) chloroplasts; and,</p> <p>(vii) endoplasmic reticulum.</p> |
| <p>5. explain the importance of cell specialisation in humans;</p> | <p>Include distinguishing features of epithelial, sperm, egg, nerve, muscle and connective tissue cells.</p> <p>Include labelled diagrams.</p> |
| <p>6. <i>explain the importance of passive and active transport in living systems;</i></p> | <p>Cell differentiation and specialization to the function of the organism as a whole: include cellular organisation and examples of tissues, organs and organ systems.</p> <p><i>Include definition of passive transport (simple diffusion, osmosis) and active transport.</i></p> <p>Comparison among <i>simple</i> diffusion, osmosis and active transport.</p> <p><i>Include examples of osmosis, simple diffusion and active transport occurring in plants and animals.</i></p> <p>(Link to Specific Objectives 2.24, 2.26 and 3.1).</p> |
| <p>7. conduct simple investigations on osmosis and diffusion;</p> | |

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 1: LIVING ORGANISMS AND ECOLOGY (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|-----|--|---|
| 8. | explain the process of photosynthesis; | <i>Include a definition of photosynthesis; word and chemical equations to summarise the process; site of photosynthesis (chloroplast); fate of products of photosynthesis - glucose and oxygen.</i> |
| | | Light and dark reactions not required. |
| 9. | <i>investigate the effect of light and chlorophyll on the production of starch;</i> | <i>Simple starch test on variegated and non-variegated leaves.</i> |
| 10. | explain the ways in which other living organisms depend on plants directly or indirectly for food; | <i>Include plants as producers; human beings' dependence on plants directly or indirectly for food.</i> |
| 11. | <i>explain the principles of a food chain and food web; and,</i> | <i>Include definitions of food chain, food web and trophic level; naming and identification of organisms feeding at each trophic level (omnivore, carnivore, herbivore, producer, primary and secondary consumers).</i> |
| | | <i>Explanation of reduction of available energy at each trophic level; utilisation of energy at each trophic level; the effect of bioaccumulation on human health; analysis of pyramid of biomass and pyramid of numbers.</i> |
| 12. | construct a food chain and food web from a selected habitat. | <i>Include terrestrial and aquatic (marine and fresh water) habitats.</i> |

MODULE 1: ORGANISMS AND METABOLISM (cont'd)

TOPIC 2: NUTRITION

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

2.1 *distinguish between macro and micronutrients;*

Include definitions and examples of macronutrients and micronutrients.

2.2 *discuss the functions and properties of macronutrients;*

Starch, reducing and non-reducing sugars, lipids, proteins; mention chemical and physical properties of carbohydrates, lipids and proteins.

Include sources of macronutrients; elements that make up the macronutrients.

Include hidden sources of sugars; effects of sugar-sweetened beverages on health; benefits of fresh fruits and vegetables with reference to fruits and vegetables grown in the Caribbean.

2.3 *discuss the functions of micronutrients;*

Vitamin A, B₁, C, D, E, and K and the minerals: calcium, magnesium, fluoride, iodine, phosphorous, sodium and iron.

Include sources of micronutrients.

Include hidden sources of salt.

2.4 *state the cause, symptoms and treatment of deficiency diseases;*

Night blindness, iron-deficiency anaemia, rickets, and goitre.

2.5 *classify vitamins as fat or water soluble;*

(a) *Fat soluble - A, D, E and K.*

(b) *Water soluble - B, C.*

2.6 *perform tests to distinguish among food nutrients;*

Starch, reducing sugars, non-reducing sugars, protein and fat.

(Link to Specific Objective 2.8).

2.7 *state the functions of water in the body;*

Include water as a solvent for hydrolysis and as a transport medium.

2.8 *explain the role of dietary fibre in the body;*

Including the link between fibre and obesity.

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 2: NUTRITION (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

2.9 describe the causes and effects of constipation and diarrhoea;

Including proper hygiene in the preparation of food.

(Link to Specific Objective 2.2).

2.10 discuss gastrointestinal diseases;

Include cholera and gastroenteritis.

Include causes, signs/symptoms, treatment, modality and prevention of these gastrointestinal diseases.

2.11 discuss cancer of the colon;

Include causes, signs/symptoms, treatment, modality and reduction of the risk of colon cancer.

2.12 discuss the importance of a balanced diet;

Must include definition, food groups, the effects of age, sex and occupation on dietary needs.

2.13 discuss the effects of malnutrition on the human body;

Include the definition of malnutrition (over and under nutrition), obesity (adult and childhood), anorexia and bulimia, protein and energy malnutrition (kwashiorkor, marasmus).

Pay attention to the sources and effects of hidden salt and sugars.

2.14 determine Body Mass Index (BMI);

$$\frac{\text{Weight (kg)}}{\text{Height (m)}^2}$$

Include determination of waist circumference; use of BMI and waist circumference to categorize obesity; factors and implications of obesity.

(Link to Specific Objectives 3.6, 3.11.)

2.15 discuss chronic/lifestyle-related diseases;

Include obesity (adult and childhood), diabetes mellitus (Type I and Type II), cardiovascular diseases (hypertension and coronary heart disease), secondary hypertension as complications of obesity.

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 2: NUTRITION (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

EXPLANATORY NOTES

2.16 use tables, charts and graphs to represent data on nutrition;

Include causes, signs/symptoms, treatment, modality and prevention of these diseases.

Include the importance of diet and exercise.

Include the prevalence and trends of childhood obesity in Caribbean countries.

Include construction and interpretation of tables, graphs and charts.

2.17 relate the types of teeth present in an infant and an adult human to their roles;

Include labelling of diagrams of teeth.

2.18 explain the importance of teeth in the process of digestion;

2.19 relate the structures of the tooth to their functions;

Internal and external structures; include functions of enamel, dentine, pulp cavity, cement; *labelling of diagrams required.*

2.20 state the causes of tooth decay;

Include the effects of sugar-sweetened beverages (through sugar and carbonation) on tooth decay.

2.21 describe the process of tooth decay;

Include conversion of food into acids by bacteria.

2.22 outline guidelines for the care of the teeth;

Include flossing, brushing at least twice daily, fluoridation, dental check-ups bi-annually and diet.

2.23 explain the properties, role and importance of enzymes involved in digestion;

Include site of production.

2.24 investigate the effects of temperature and pH on the activity of the enzymes, amylase and catalase in the digestive process;

Include construction and interpretation of tables, graphs and charts.

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 2: NUTRITION (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

2.25 *identify the various structures of the digestive system;*

Include labelling of diagrams of digestive system.

2.26 *relate the structures of the digestive system to their functions;*

Structure of the digestive system.

Functions of the parts of the digestive system.

2.27 *describe the processes of digestion and absorption of food in the alimentary canal;*

Include mechanical (mastication) and chemical digestion.

Include osmosis, diffusion and active transport.

(Link to Specific Objective 2.6).

2.28 *discuss the fate of the products of digestion after their absorption;*

Include glucose, amino acids, fatty acids and glycerol; role of hepatic portal vein; role of liver; assimilation.

2.29 *relate the structure of a villus to the function of absorption; and,*

Include labelling of diagram.

(Link to Specific Objective 2.6).

2.30 *distinguish between egestion and excretion.*

Include definition, examples of and difference between egestion and excretion.

MODULE 1: ORGANISMS AND METABOLISM (cont'd)
TOPIC 3: THE CIRCULATORY SYSTEM

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|-----|---|---|
| 3.1 | <i>explain the need for a transport system in the human body;</i> | <i>Include the limitations of simple diffusion; the relationship between surface area and volume.</i>

<i>(Link to Specific Objective 2.6).</i> |
| 3.2 | <i>identify the materials which need to be transported around the human body;</i> | <i>Nutrients, gases, hormones, antibodies, blood proteins and metabolic waste products.</i> |
| 3.3 | <i>relate the components of the blood to its function;</i> | <i>Plasma, serum, red blood cells, white blood cells, platelets. Differentiation between plasma and serum. Include labelling of diagrams.</i> |
| 3.4 | <i>relate the structures of red blood cells, phagocytes and lymphocytes to their functions;</i> | <i>Include labelling of diagrams.</i> |
| 3.5 | <i>relate the structures of the arteries, veins and capillaries to their functions;</i> | <i>Include labelling of diagrams; thickness of walls, size of lumen, presence or absence of valves.</i> |
| 3.6 | <i>relate the structures of the heart to their functions;</i> | <i>Include chambers, valves and blood vessels, cardiac muscles; the role of the pacemaker/artificial pacemaker; comparison of the differences in thickness of the right and left ventricles; include the labelling of diagrams.</i> |
| 3.7 | <i>explain the concept of blood pressure;</i> | <i>Systole and diastole.</i>

<i>Include modifiable risk factors (salt, fat, alcohol, smoking and stress) for elevated blood pressure; trends in hypertension and obesity in children in Caribbean countries; trends in modifiable risk factors.</i>

<i>(Link to Specific Objective 2.15).</i> |
| 3.8 | <i>describe the structure and function of the circulatory system in humans;</i> | <i>Pulmonary versus systemic circulation.</i> |

MODULE 1: ORGANISMS AND METABOLISM
TOPIC 3: THE CIRCULATORY SYSTEM (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

3.9 discuss blood groups;

3.10 explain the process and the importance of blood clotting;

3.11 discuss the causes and effects of heart diseases;

3.12 use tables, charts and graphs to represent data on diseases of the circulatory system;

3.13 describe the structure and function of the lymphatic system; and,

3.14 describe how tissue fluid and lymph are formed.

EXPLANATORY NOTES

Include A, B, AB and O: antigen and antibody for each group, precaution in transfusion and handling; Rh factor risk in pregnancy and precautions.

Role of platelets, calcium ions, Vitamin K, thromboplastin, prothrombin, thrombin, fibrinogen and fibrin.

Include haemophilia.

Include hypertension (high blood pressure), atherosclerosis, coronary thrombosis, and obesity.

Construction and interpretation of tables, graphs and charts.

Include the role of tissue fluid and lymph; location and function of lymph nodes.

Differentiation between tissue fluid and lymph.

Include labelling of diagrams.

MODULE 1: ORGANISMS AND METABOLISM (cont'd)
TOPIC 4: EXCRETION AND HOMEOSTASIS

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|------|--|--|
| 4.1 | <i>discuss the importance of excretion in human beings;</i> | <i>Include the importance of excretion in maintaining internal balance.</i> |
| 4.2 | <i>explain the roles of the organs involved in excretion;</i> | <i>Lungs, skin and kidney.</i>

<i>Include examples of metabolic wastes.</i> |
| 4.3 | <i>relate the structures of the kidney to their functions;</i> | <i>Include labelling of internal structure of the kidney, renal vessels and the nephron; structure and function of the nephron; differentiation between the renal artery and vein; ultra-filtration, selective re-absorption of substances; composition of urine; include a brief explanation of the process and importance of renal dialysis.</i> |
| 4.4 | <i>relate the structures of the skin to their functions;</i> | <i>Include dermis, epidermis, adipose tissue, sweat glands, erector muscles, hair, hair follicles, nerve endings and capillaries.</i>

<i>Include labelling of diagrams.</i> |
| 4.5 | <i>explain the concept of homeostasis;</i> | <i>Include a definition and examples.</i> |
| 4.6 | <i>explain the concept of feedback mechanisms;</i> | <i>Include positive and negative feedback and give examples.</i> |
| 4.7 | <i>discuss the regulation of blood sugar;</i> | <i>Role of insulin and glucagon in regulating blood sugar.</i>

<i>Include diabetes mellitus.</i> |
| 4.8 | <i>explain the regulation of water;</i> | <i>Include the role of Anti-diuretic hormone (ADH).</i> |
| 4.9 | <i>distinguish between heat and temperature; and,</i> | <i>Include definitions of heat and temperature.</i> |
| 4.10 | <i>discuss the regulation of temperature.</i> | <i>Include vasodilation and vasoconstriction.</i>

<i>Include diagrams.</i> |

MODULE 1: ORGANISMS AND METABOLISM (cont'd)

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this *module*, teachers are advised to engage students in the teaching and learning activities listed below.

TOPIC 1: LIVING ORGANISMS AND ECOLOGY

1. Arrange for students to create *charts, models, diagrams, infographics or presentations* on plants and animal cells *and* microbes.
2. Arrange for students to view and draw *plant* and animal cells as *seen* by a light microscope.
3. Allow students to work in groups to conduct laboratory activities pertaining to osmosis, diffusion and photosynthesis.
4. Arrange field trips for students to visit terrestrial and/or aquatic ecosystems to observe, record and report feeding relationships.
5. Use video presentations and computer-assisted learning *tools* to enhance learning.

TOPIC 2: NUTRITION

1. *Teachers should present authentic scenarios for students to discuss. For example, a family with different age groups, lifestyles, special dietary needs during pregnancy and suggested meals.*
2. *Present students with food labels and allow them to analyse the nutritional values of the products. Have students discuss the influence of packaging and marketing (commercial determinants) on the consumption of these products.*
3. *Have students keep a food log for three days to determine whether their diets are balanced.*
4. *Have students conduct tests on popular foods to determine the presence of the various food groups.*
5. *Have students create a Sugar, Salt or Fat Sense display.*
6. *Create social media campaigns/public service announcements (incorporating use of videos/pictures) to encourage the use of the ideal healthy plate using Caribbean food groups.*
7. *Obtain graphs/data, which depict the prevalence of obesity, hypertension, and diabetes and analyse them.*
8. *Arrange for students to view models of the organs of digestive system of animals.*
9. *Conduct demonstrations or show simulations of dissections or examination of specimens of the digestive system. A convenient source is the local butcher.*

MODULE 1: ORGANISMS AND METABOLISM (cont'd)

10. *Conduct research on the impact of diet on health especially in the Caribbean.*
11. *Arrange for students to view models of the organs of digestive system of animals.*
12. *Conduct demonstrations or show simulations of dissections or examination of specimens of the digestive system. A convenient source is the local butcher.*
13. *Have students create models to demonstrate the processes of the digestive system. Organise a science fair and invite members of the school population or immediate community to view students' displays.*
14. *Use flow charts to illustrate processes such as digestion and the absorption of nutrients.*
15. *Conduct laboratory activities.*

TOPIC 3: CIRCULATORY SYSTEM

1. *Have students visit websites such as <http://sciencespot.net/> to better understand the mechanism for blood typing.*
2. *Arrange for students to view audio visuals, computer-assisted learning for reinforcement of content of the circulatory system.*
3. *Draw and use charts, models, infographics, and concept maps to assist students with learning of the structures of different organs and processes in the circulatory system.*
4. *Undertake a brainstorming and discussion session to ascertain students' knowledge of topics. This type of activity may be used to generate interest before formal teaching/learning begins.*
5. *Obtain data on modifiable risk factors and determine their link to the incidence of obesity, hypertension and cardiovascular diseases.*
6. *Conduct research on the impact of diet on the circulatory system, especially in the Caribbean.*
7. *Obtain graphs/data, which depict the prevalence of obesity and hypertension and analyse them.*
8. *Arrange for students to view models of the organs of circulatory system of animals.*
9. *Conduct demonstrations or show simulations of dissections or examination of specimens of the circulatory system. A convenient source is the local butcher.*
10. *Have students create models to demonstrate the processes of the circulatory system. Organise a science fair and invite members of the school population or immediate community to view students' displays.*

MODULE 1: ORGANISMS AND METABOLISM (cont'd)

11. *Use flow charts to illustrate processes such as circulation and blood clotting.*
12. *Conduct laboratory activities.*

TOPIC 4: EXCRETION AND HOMEOSTASIS

1. *Use flow charts to illustrate processes such as regulation of body temperature, glucose concentration in blood and osmoregulation.*
2. *Arrange for students to view models of the excretory organs of animals.*
3. *Conduct demonstrations or show simulations of dissections or examination of specimens of the excretory organs, for example the kidney. A convenient source is the local butcher.*
4. *Have students create models to demonstrate the processes of the excretory organs. Organise a science fair and invite members of the school population or immediate community to view students' displays.*
5. *Conduct laboratory activities.*

◆ MODULE 2: LIFE PROCESSES

Skills and Abilities: Knowledge and Comprehension and Use of Knowledge

Duration: 45 hours

Credit Weighting: 1

GENERAL OBJECTIVES

On completion of this section, students should:

1. *understand that respiration is the means by which energy is made available for carrying out life processes;*
2. *understand the mechanisms of movement and appreciate its role(s) in humans;*
3. *understand that humans detect and respond to changes in their external and internal environment; and,*
4. *understand the processes by which life is perpetuated.*

TOPIC 1: THE RESPIRATORY SYSTEM

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|-----|---|---|
| 1.1 | <i>explain the importance of breathing in humans;</i> | |
| 1.2 | <i>relate the structures of the respiratory tract to their functions;</i> | <i>Include labelling of diagram of respiratory system.</i> |
| 1.3 | <i>describe the breathing mechanism;</i> | <i>Include how changes in the volume of the chest cavity alter air pressure and result in inhalation and exhalation.</i>

<i>Demonstrate using a model.</i> |
| 1.4 | <i>outline the factors affecting the rate of breathing;</i> | <i>Exercise, smoking, anxiety, drugs, environmental factors, altitude, weight/obesity.</i> |
| 1.5 | <i>explain the concept of vital capacity;</i> | <i>Interpretation of graphical representation required.</i> |
| 1.6 | <i>distinguish between gaseous exchange and breathing;</i> | <i>Inclusion of gaseous exchange in the alveoli; include labelling of diagram of alveolus.</i> |

MODULE 2: LIFE PROCESSES

TOPIC 1: THE RESPIRATORY SYSTEM (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

1.7 identify characteristics common to gaseous exchange surfaces;

1.8 discuss respiratory diseases;

1.9 discuss cancer of the respiratory tract;

1.10 differentiate between aerobic and anaerobic respiration;

1.11 explain the role of adenosine diphosphate (ADP) and adenosine triphosphate (ATP) in the transfer of energy;

1.12 describe the technique of Cardiopulmonary Resuscitation (CPR);

1.13 discuss the effects of smoking; and,

1.14 use tables, graphs and charts to represent data on the respiratory system.

EXPLANATORY NOTES

Include large and moist surface area and thin membranes; copious blood supply.

Include asthma, influenza and bronchitis.

Include causes, signs/symptoms, treatment, modality, prevention and the effect of these diseases on the respiratory tract.

Include causes, signs/symptoms, treatment, modality and reduction of the risk of this cancer.

Include the definitions of aerobic and anaerobic respiration; site, the products of respiration; description of industrial and domestic applications of anaerobic respiration; oxygen debt; worded and chemical equations to represent the processes of aerobic and anaerobic respiration.

Include the comparison of the amount of energy released in both aerobic and anaerobic respiration.

Include how adenosine triphosphate is formed from adenosine diphosphate and how it acts as an energy currency of the cell.

Include disposal device for applying mouth-to-mouth resuscitation.

Effects of smoking (cigarette, marijuana, vaping, hookah); nicotine addiction, damage to the lungs, carcinogenic properties and reduction in oxygen-carrying capacity of the blood; hypertension and heart disease. Interpretation of data.

Construction and interpretation of tables, graphs and charts.

MODULE 2: LIFE PROCESSES (cont'd)
TOPIC 2: THE SKELETAL SYSTEM

SPECIFIC OBJECTIVES

Students should be able to:

- 2.1 identify the major bones of the skeleton;
- 2.2 relate the structure of the skeleton to its functions;
- 2.3 relate the structure of a long bone to its functions;
- 2.4 distinguish between bone and cartilage;
- 2.5 distinguish between tendons and ligaments;
- 2.6 discuss the types of joints;
- 2.7 describe movement in the hinge and ball and socket joints;
- 2.8 discuss the three types of muscles;
- 2.9 explain how skeletal muscles function in the movement of a limb;
- 2.10 identify the biceps and triceps of the upper arm;

EXPLANATORY NOTES

Cranium, clavicle, scapula, vertebral column, humerus, radius, ulna, *carpals, metacarpals*, rib cage, sternum, pelvic girdle, femur, tibia, fibula, *patella, tarsals, metatarsals and phalanges*.

Movement, *locomotion*, protection, support, breathing, production of blood cells, *storage of minerals*.

Include the labelling of diagram (internal and external view).

Include characteristics and functions.

Include characteristics and functions.

Include definition.

Types, location and characteristics of joints – hinge, fixed, synovial and ball and socket.

Include labelling of diagrams.

Include flexion and extension.

Include location and function of cardiac, skeletal and smooth muscles.

Include labelling of diagrams; the role of antagonistic muscles in the movement of limbs; include definition of muscle tone and the effect of exercise on it.

Include labelling of diagrams.

points of origin (location and definition);
 points of insertion (location and definition).

MODULE 2: LIFE PROCESSES
TOPIC 2: THE SKELETAL SYSTEM (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 2.11 explain the importance of locomotion to man; and,
- 2.12 evaluate the factors which adversely affect the skeletal system.

EXPLANATORY NOTES

Include labelling of diagrams.

The role of antagonistic muscles in the movement of limbs; include definition of muscle tone and the effect of exercise on it.

Include posture and inappropriate footwear to the activity, lifting heavy objects.

MODULE 2: LIFE PROCESSES (cont'd)
TOPIC 3: COORDINATION AND CONTROL

SPECIFIC OBJECTIVES

Students should be able to:

- 3.1 describe the main divisions of the nervous system;
- 3.2 distinguish between a neurone and a nerve;
- 3.3 explain the functions of motor and sensory neurones and spinal synapses;
- 3.4 describe the functions of the parts of the brain;
- 3.5 describe the mechanisms of a reflex action;
- 3.6 explain the process by which voluntary actions occur;
- 3.7 distinguish between a voluntary and involuntary action;

EXPLANATORY NOTES

Central nervous system – the brain, and spinal cord.

Peripheral nervous system: spinal nerves and cranial nerves, and autonomic nervous system.

Include definitions;

Properties of neurones; irritability; conductivity; structures of neurones: cell-bodies, axons and dendrites.

Include labelling of diagrams.

Include labelling of types of neurones (motor, relay, sensory), and their functions.

Include labelling of synapses.

Include examples and functions of chemical transmitters.

Cerebrum, cerebellum, medulla oblongata, hypothalamus, pituitary gland.

*Include a definition; structure of spinal cord (labelling of diagram); differentiation between the spinal reflex action (for example, knee-jerk reflex) and cranial reflex action (for example, pupil reflex); reaction to painful stimuli; include definition and examples of *conditioned* reflexes.*

Include a definition; transmission of nerve impulses; involvement of neurones in the brain, spinal cord and effector muscles.

Include examples of these actions.

MODULE 2: LIFE PROCESSES

TOPIC 3: COORDINATION AND CONTROL (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

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|------|--|--|
| 3.8 | explain the response of the sense organs to stimuli; | <i>Include the names of sense organs and stimuli to which they respond.</i> |
| 3.9 | relate the internal structures of the eye to their functions; | <i>Include labelling of the diagram of the eye (internal view).</i> |
| 3.10 | explain how images are formed in the eye; | Include labelling of diagrams. |
| 3.11 | explain accommodation in the eye; | <i>Include the role of ciliary muscle and the suspensory ligaments.</i> |
| 3.12 | discuss the causes of, and corrective measures for eye defects and diseases; | <i>Include myopia (short sightedness) and hyperopia/hypermotropia (long sightedness) and astigmatism, glaucoma, and cataracts.</i>

Include effect of diabetes on eyesight.

Include labelling of diagrams. |
| 3.13 | compare and contrast endocrine (hormonal) and nervous control systems; | |
| 3.14 | identify the sites of hormone production; and, | <i>Include labelling of location of endocrine glands.</i> |
| 3.15 | explain the roles of selected hormones in the human body. | Pituitary – anti-diuretic hormone (ADH).
Follicle stimulating hormone (FSH).
Luteinising hormone (LH).
Growth hormones.
Thyroid – thyroxine.
Pancreas – insulin, glucagon.
<i>Adrenal glands</i> – adrenaline.
Ovary – oestrogen, progesterone.
Testes – testosterone.

<i>(Link to Specific Objective 4.3).</i> |

MODULE 2: LIFE PROCESSES (cont'd)
TOPIC 4: THE REPRODUCTIVE SYSTEM

SPECIFIC OBJECTIVES

Students should be able to:

4.1 distinguish between sexual and asexual reproduction;

4.2 describe the structure and function of the reproductive systems in human beings;

4.3 describe the menstrual cycle;

4.4 explain ovulation, fertilisation, implantation and development of the embryo;

4.5 describe the stages of the birth process;

4.6 discuss pre-natal/ante-natal and post-natal care for mother and baby;

EXPLANATORY NOTES

Sexual: meiosis, gametes, variation in offspring, two individuals involved.

Asexual: mitosis, identical offspring, one individual involved.

Include the structures and adaptation of the gametes, related disorders such as ovarian, cervical and prostate cancers.

Include labelled diagram of systems.

Include the use of diagram for illustration; role of hormones: follicle stimulating hormone (FSH), luteinising hormone (LH), oestrogen, progesterone.

(Link to Specific Objective 3.15).

Include diagram of foetus in uterus; role of placenta, umbilical cord, amniotic sac and amniotic fluid.

Minute details of stages of development are not required.

Stage 1: contraction, dilation.

Stage 2: contraction, crowning, expulsion of foetus.

Stage 3: contraction, expulsion of the placenta.

Include the role of oxytocin.

Include the advantages of breastfeeding, immunisation, medical visits, proper diet.

Include conditions associated with the use of drugs, alcohol and smoking.

MODULE 2: LIFE PROCESSES

TOPIC 4: THE REPRODUCTIVE SYSTEM (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

4.7 *explain how birth control methods prevent pregnancy;*

4.8 *discuss the advantages and disadvantages of birth control methods;*

4.9 *discuss sexually transmitted infections (STIs);*

4.10 *discuss Human Immuno deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS);*

4.11 *describe the effects of sexually transmitted infections (STIs) on the pregnant mother and the foetus;*

4.12 *discuss cancers of the reproductive organs;*

4.13 *discuss the issues related to abortion;*

4.14 *discuss the importance of family planning; and,*

4.15 *use tables, charts and diagrams to represent data on diseases of the reproductive system.*

EXPLANATORY NOTES

Include natural, barrier, hormonal and surgical methods.

Include gonorrhoea, syphilis, Human Papillomavirus (HPV), herpes, and chlamydia.

Include causes, signs/symptoms, treatment, modality and prevention of these sexually transmitted infections (STIs).

Include causes, symptoms, method of transmission, mode of action, methods of limiting spread/prevention and possible treatment (anti-retroviral drugs - side effects) of HIV/AIDS.

Include ethical considerations. For example, discrimination.

Include gonorrhoea, syphilis, and herpes.

Include cancers associated with; cervix, breast, ovary, uterus, and prostate.

Include causes, signs/symptoms, treatment, modality and reduction of the risk of this cancer.

Include spontaneous abortion (miscarriage); reasons for; advantages and disadvantages and ethical concerns.

Include social and economic implications.

Construction and interpretation of tables, graphs, and charts.

MODULE 2: LIFE PROCESSES (cont'd)

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this *module*, teachers are advised to engage students in the teaching and learning activities listed below.

TOPIC 1: RESPIRATORY SYSTEM

1. Undertake a brainstorming and discussion session to ascertain students' knowledge of the respiratory system. This type of activity may be used to generate interest before formal teaching/learning begins.
2. Ask students to investigate breathing with measuring tapes, cobalt chloride paper and slides, to determine changes in the circumference of the chest cavity and the exhalation of water vapour.
3. Obtain graphs/data, which depict the prevalence of smoking and analyse them.
4. Invite personnel from the Red Cross Society or other health personnel to demonstrate Cardiopulmonary Resuscitation (CPR).
5. Draw and use charts, models, *infographics*, and *concept maps* to assist students with learning of the structures of different organs and processes of the respiratory system.
6. Arrange for students to view displays of specimens of the respiratory system of animals. A convenient source is the local butcher.
7. Arrange for students to view models of the organs of the respiratory system of animals.
8. Conduct demonstrations or show simulations of dissections or examination of specimens of the respiratory system. A convenient source is the local butcher.
9. Have students create models to demonstrate the processes of the respiratory system. Organise a science fair and invite members of the school population or immediate community to view students' displays.
10. Use flow charts to illustrate processes such as breathing and gaseous exchange.
11. Conduct laboratory activities.

TOPIC 2: THE SKELETAL SYSTEM

1. Have students create model of arms to demonstrate the working of antagonistic muscles.
2. Conduct demonstrations or show simulations of dissections or examination of models of bones, joints and limbs.

MODULE 2: LIFE PROCESSES (cont'd)

3. Arrange for students to view audio visuals, computer-assisted learning for reinforcement of content related to the skeletal system.
4. Arrange for students to view models of the bones/skeletons.
5. Have students create models to demonstrate movements of bones.
6. Use flowcharts to illustrate how antagonistic muscles work.

TOPIC 3: COORDINATION AND CONTROL

1. *Demonstrate the effects of light in the eye, that is, pupil and spinal reflex. Use of the pin hole camera.*
2. *Conduct demonstrations or show simulations of dissections or examination of specimens, for example, eye or brain.*
3. *Arrange for students to view models of the skin, brain, pancreas, adrenal glands, ovary and testis.*
4. *Conduct demonstrations or show simulations of dissections or examination of specimens of the eye, pancreas, adrenal glands, ovary and testis. A convenient source is the local butcher.*
5. *Have students create models to demonstrate the processes of the circulatory system. Organise a science fair and invite members of the school population or immediate community to view students' displays.*
6. *Use flow charts to illustrate processes such as reflex action and endocrine hormones.*
7. *Conduct laboratory activities.*

TOPIC 4: THE REPRODUCTIVE SYSTEM

1. *Arrange for students to view audio visuals, computer-assisted learning for reinforcement of content of the reproductive system.*
2. *Draw and use charts, models, infographics, and concept maps to assist students with learning of the structures of different organs and processes in the reproductive system.*
3. *Have a display of the methods of contraception, to include demonstrations where possible.*
4. *Arrange for students to view displays of specimens of the reproductive system of animals. A convenient source is the local butcher.*
5. *Arrange for students to view models of the organs of reproductive system of animals.*

MODULE 2: LIFE PROCESSES (cont'd)

6. *Conduct demonstrations or show simulations of dissections or examination of specimens of the circulatory system. A convenient source is the local butcher.*
7. *Have students create models to demonstrate the processes of the reproductive system. Organise a science fair and invite members of the school population or immediate community to view students' displays.*
8. *Use flow charts to illustrate processes such as the menstrual cycle, pregnancy and the birth process.*
9. *Conduct laboratory activities.*

◆ **MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT**

Skills and Abilities: Knowledge and Comprehension and Use of Knowledge

Duration: 45 hours

Credit Weighting: 1

GENERAL OBJECTIVES

On completion of this section, students should:

1. *understand the concept of a gene as it pertains to DNA, chromosomes and alleles;*
2. *understand the role of genes and heredity in determining how traits can be altered and inherited by asexual and sexual means through the process of mitosis and meiosis respectively;*
3. *develop an awareness of the importance of genetic variation and its role in natural selection;*
4. *appreciate the social and ethical implications of genetic engineering;*
5. *understand the basic concepts of human well-being and disease;*
6. *appreciate the social and economic importance of disease control;*
7. *appreciate the nature of the relationship between human beings and their environment;*
8. *understand that the environment is fragile and there is need to preserve it; and,*
9. *appreciate the contribution of modern technology to the maintenance of good health.*

TOPIC 1: HEREDITY AND VARIATION

SPECIFIC OBJECTIVES

Students should be able to:

- 1.1 *distinguish among DNA, chromosomes, genes and alleles;*
- 1.2 *describe the process of mitosis;*
- 1.3 *explain the importance of mitosis;*

EXPLANATORY NOTES

Include the definitions of genetic terms.

Haploid as the 'n' number of chromosomes.

Diploid as the '2n' number of chromosomes.

Include the definition of mitosis; movement of chromosomes during mitosis (include names of stages); labelling of diagrams.

Include the production of identical daughter cells having the same number (diploid) and type of chromosomes as the parent cell (clones); needed for growth, repair and asexual reproduction.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT
TOPIC 1: HEREDITY AND VARIATION (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|------|--|---|
| 1.4 | <i>describe the process of meiosis;</i> | <p><i>Include the definition of meiosis; movement and separation of homologous chromosomes and the subsequent separation of chromatids.</i></p> <p><i>Include names of stages; labelling of diagrams.</i></p> |
| 1.5 | <i>explain the importance of meiosis;</i> | <p><i>Include the importance of halving the chromosome number (haploid) in the formation of gametes; importance of meiosis in introducing variation into gametes.</i></p> |
| 1.6 | <i>explain the inheritance of a single pair of characteristics (monohybrid inheritance);</i> | <p><i>Include dominant, recessive, homozygous, heterozygous, genotype and phenotype.</i></p> <p><i>Monohybrid inheritance to include albinism and tongue rolling.</i></p> <p><i>Include the use of the Punnett Square to determine genotypic and phenotypic ratios obtained from crossing homozygous and heterozygous parental and genotypes.</i></p> |
| 1.7 | <i>describe the inheritance of sex in human beings;</i> | <p><i>Include the role of sex chromosomes in determining sex and the inheritance of genetic diseases.</i></p> <p><i>Include genetic diagrams for sex-linkage (haemophilia and colour blindness).</i></p> |
| 1.8 | <i>explain why genetic variation is important to living organisms;</i> | <p><i>Include examples of variation - height, weight, sex, blood type, tongue rolling; antibiotic-resistant bacteria.</i></p> |
| 1.9 | <i>distinguish between genetic variation and environmental variation;</i> | <p><i>Include the difference between continuous and discontinuous variation; Mutation, (Down Syndrome, Klinefelter's, Turner's Syndrome, and albinism).</i></p> |
| 1.10 | <i>discuss natural selection;</i> | <p><i>Include the development of antibiotic-resistant bacteria; the prevalence of sickle cell anaemia in people of African descent.</i></p> |

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT
TOPIC 1: HEREDITY AND VARIATION (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

1.11 *explain the concept of genetic engineering;*

Include the definition and examples.

1.12 *discuss the advantages and disadvantages of genetic engineering; and,*

Include recombinant DNA in the manufacture of insulin; its application in the production of food and medicine - Genetically Modified Organisms (GMOs).

Include ethical concerns.

1.13 *use tables, charts and graphs to represent data on heredity and variation.*

Construction and interpretation of tables, graphs and charts.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT (cont'd)
TOPIC 2: DISEASES AND THEIR IMPACT ON HUMANS

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|-----|---|--|
| 2.1 | define the terms health and disease; | <i>Include the World Health Organisation (WHO) definition.</i> |
| 2.2 | classify the types of diseases; | <i>Include communicable/pathogenic/infectious diseases: sexually transmitted infections (STIs), fungal infections, and vector-borne diseases.</i>

<i>Include non-communicable diseases (NCDs)/ chronic/degenerative/physiological diseases: nutritional deficiency diseases, inherited disorders, lifestyle diseases and mental health problems (anxiety, neurosis, stress and depression).</i> |
| 2.3 | differentiate between signs and symptoms of diseases; | <i>Include the definitions and examples of signs and symptoms of diseases.</i> |
| 2.4 | discuss the impact of diseases on the human population; | Include socio-economic implications.

<i>Include definitions of epidemic and pandemic.</i>

<i>Include how Non-Communicable Diseases (NCDs) affect personal productivity; assess how these affect goal- setting, occupation, and exercise.</i> |
| 2.5 | discuss the effect of vectors on human health; | <i>Include the definition and examples of vectors (rats, mosquitoes, houseflies).</i>

Include transmission of pathogen.

<i>Analysis and interpretation of data.</i> |
| 2.6 | describe the life cycle of the mosquito and housefly; | Include labelling of diagrams. |
| 2.7 | discuss mosquito-borne diseases; | <i>Include malaria, dengue (strains I - IV), Zika, chikungunya.</i>

<i>Include signs, symptoms, causative agent, method of transmission, prevention/control, and treatment of mosquito-borne diseases.</i> |

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT
TOPIC 2: DISEASES AND THEIR IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

2.8 explain the importance and methods of controlling vectors which affect human health;

Include the spread of communicable fatal diseases, such as leptospirosis, dengue fever, gastroenteritis.

Biological controls; chemical controls; mechanical controls; sanitary controls.

2.9 explain how and why personal hygiene is maintained;

Include elimination of body odours; social acceptance; prevention of infections (ringworm); prevention of dental caries.

Care of genitalia - include male circumcision.

2.10 explain the methods used to control the growth of microorganisms;

Include definition of the term sterilization, methods of sterilization (ultra- high temperature, pasteurisation, autoclaving, boiling, canning).

Include effects of high temperatures in the control of microorganisms.

Include disinfection - use of chemical agents (chlorine, disinfectants, antiseptics) in the control of microorganisms.

2.11 distinguish between disinfectants and antiseptics;

Include definitions.

2.12 explain the use of common antibiotics and antifungal agents;

Include definitions and functions of antibiotics, antigen, antibody, anti-toxin.

2.13 explain the types of immunity;

Include artificial (active and passive); natural (active and passive).

Include the function of lymphocytes.

2.14 distinguish between immunity and immunisation; vaccine and vaccination;

Include definition of terms.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT
TOPIC 2: DISEASES AND THEIR IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- 2.15 discuss the use and misuse of drugs on humans;

Include *classification (stimulants, depressants, hallucinogens, narcotics)*; dependence; Prescription drugs (opioids, sedatives, pain killers and medicinal marijuana); *antibiotics*.

Non-prescription (cocaine, methamphetamine, heroin, ecstasy, alcohol, marijuana; physiological and psychological effects.

- 2.16 explain the social and economic effects of drug misuse on the individual, family and community; and,

Analysis and interpretation of data.

- 2.17 use tables, graphs and charts to represent data on diseases and their impact on human beings.

Construction and interpretation of tables, graphs and charts.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT (cont'd)
TOPIC 3: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

3.1 *explain the recycling of carbon in nature;*

Include the importance of recycling carbon in nature.

Carbon cycle:

- (a) The importance of CO₂ in photosynthesis;*
- (b) Transformation of carbon from carbon dioxide to carbohydrates in photosynthesis;*
- (c) The release of carbon dioxide during respiration, decomposition and combustion and its contribution to the greenhouse effect;*
- (d) Death and decay (due to bacterial and fungal activities) of organisms to release carbon dioxide;*
- (e) Formation of fossil fuels from the remains of dead organisms;*
- (f) Release of carbon dioxide when fossil fuels are burnt; and,*
- (g) The impact of global warming on the well-being of humans.*

3.2 *identify pollutants in the environment;*

Include definition of pollution and pollutant; including domestic, industrial (thermal, heavy metals, dumping of oils) and agricultural pollutants.

3.3 *discuss the causes of water and air pollution;*

Include combustion and improper disposal of sewage.

3.4 *describe the effects of pollutants on human beings and the environment;*

Include eutrophication; social and economic effects.

Include effects on skin, lungs and kidneys.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT

TOPIC 3: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|------|---|---|
| 3.5 | <i>explain the methods of controlling pollution;</i> | <i>To include methods of controlling water, air, noise and land pollution. For example, the use of renewable energy sources.</i> |
| 3.6 | <i>describe the water cycle;</i> | <i>Include evaporation, condensation, run-off, transpiration, respiration and filtration through the layers of limestone.</i>

<i>Include labelling of diagrams.</i> |
| 3.7 | <i>describe simple ways of purifying water in the home;</i> | <i>Include boiling, purification tablets and addition of chlorine/bleach.</i> |
| 3.8 | <i>describe the process of testing water for bacteria;</i> | <i>Include use of Agar plate.</i>

<i>Include labelling of diagrams.</i> |
| 3.9 | <i>describe the processes involved in large-scale water purification;</i> | <i>Include screening, sedimentation, filtration, chlorination.</i>

<i>Include labelling of diagrams.</i> |
| 3.10 | <i>discuss the impact of human activities on water supplies;</i> | |
| 3.11 | <i>explain why contaminated water is detrimental to human beings;</i> | <i>Include waterborne diseases.</i> |
| 3.12 | <i>distinguish between proper and improper sewage disposal practices;</i> | |
| 3.13 | <i>discuss the impact of improper sewage disposal practices;</i> | |
| 3.14 | <i>outline the methods used for the treatment of sewage;</i> | <i>Include biological filter and activated sludge methods.</i>

<i>Include the importance of screening and filtration.</i>

<i>Include the role of microorganisms in the treatment of sewage.</i> |

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT

TOPIC 3: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|------|--|--|
| 3.15 | <i>evaluate the efficiency of the methods of domestic refuse disposal;</i> | Include composting, separation of waste, bio-diesel, dumping, burning, garbage collection.

<i>Include ethical considerations.</i>

Analysis and interpretation of data. |
| 3.16 | <i>differentiate between a dump and a landfill;</i> | |
| 3.17 | <i>describe the operations at a landfill;</i> | Include a description of a landfill. |
| 3.18 | <i>discuss the importance of landfills in the Caribbean;</i> | Include the function of landfill. |
| 3.19 | <i>evaluate the impact of solid waste on the environment;</i> | Analysis and interpretation of data. |
| 3.20 | <i>analyse measures used to control solid waste volume;</i> | <i>Include</i> reduce, reuse and recycle; examples of recyclable materials.

Include operations at a recycling centre. |
| 3.21 | <i>distinguish between the terms biodegradable and non-biodegradable;</i> | Include classification of biodegradable and non- biodegradable items. |
| 3.22 | <i>discuss the impact of environmental issues on humans; and,</i> | <i>Include food security, land security and health as it relates to environmental issues (for example, global warming).</i> |
| 3.23 | <i>use tables, charts and graphs to represent data on the impact of health practices on the environment.</i> | <i>Construction and interpretation of tables, graphs and charts.</i> |

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT (cont'd)

Suggested Teaching and Learning Activities

To facilitate students' attainment of the objectives of this *module*, teachers are advised to engage students in the teaching and learning activities listed below.

TOPIC 1: HEREDITY AND VARIATION

1. Arrange for students to construct models of mitosis and meiosis.
2. Assign students to construct models with the use of coloured beads or seeds to demonstrate genetic crosses and determine genotypic and phenotypic ratios.
3. Construct a model showing the use of bacteria and plasmids in genetic engineering.
4. Use of diagrams showing karyotype to illustrate homologous chromosomes and mutation. For example, Down Syndrome and Turner's Syndrome.
5. *Arrange for students to engage in panel discussions or debates relating to genetically modified foods and medicines.*
6. *Use of worksheets to practise genotypic and phenotypic ratios for monohybrid crosses.*
7. Use video presentations and computer-assisted learning *tools* to enhance learning.

TOPIC 2: DISEASES AND THEIR IMPACT ON HUMANS

1. Invite guest lecturers to discuss *health-related* issues.
2. Use video presentations and computer-assisted learning *tools* to enhance learning.
3. Arrange public visits to clinics or national associations, for example, Diabetes Association, Heart Foundation.
4. *Have students engage in panel discussions or debates on ethical behaviours in managing the spread of communicable diseases.*
5. Assign students to conduct research *and analysis of data* on diseases as well as the misuse of substances.
6. Have students create brochures, posters, infographics, and pamphlets on diseases.

MODULE 3: HEREDITY, DISEASE AND THE ENVIRONMENT (cont'd)

TOPIC 3: IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT

1. Conduct brainstorming and discussion sessions to ascertain students' knowledge on topics related to impact of health practices on the environment.
2. *Have students discuss ways in which they can reduce their negative carbon footprints/negative impact on the environment.*
3. *Arrange visits to landfills, sewage treatment, water treatment and recycling plants.*
4. Assign students to conduct research on landfills, sewage treatment plants and water treatment plants.
5. Assign students to carry out investigations involving data collection in the community or home on the impact of solid waste and make suggestions on how related problems may be resolved.
6. Use charts, *models* and other audio-visual aids to assist students with learning the processes involved in water and sewage treatment.
7. *Have students engage in panel discussions or debates on ethical behaviours in managing garbage disposal.*
8. Use video presentations and computer-assisted learning *tools* to enhance learning.

◆ GUIDELINES FOR THE ALTERNATE PAPER 032

RATIONALE

The Alternate Paper 032 is an integral part of student assessment in the course covered by this syllabus. It is intended to assist students in acquiring certain knowledge, skills and attitudes that are associated with the subject. The paper is a written examination that will consist of a case study and related questions involving a health-related issue in a named Caribbean territory. *Candidates will be expected to analyse and interpret the data provided and provide recommendations.*

In order to aid their preparation for the Paper 032, candidates are encouraged to complete the following formative project. While the project itself does not contribute to the final examination grade, it is useful to the development of the skills tested in the Paper 032.

THE FORMATIVE PROJECT

The *formative* project component of the Human and Social Biology Syllabus is a single guided research project.

Candidates will be required to conduct research in their school or community on a current health-related or environmental issue and its socio-economic impacts in their territory. They will be expected to collect data, analyse and interpret the data and provide recommendations.

In the research project, students should:

- 1. provide a background/overview of the current health-related or environmental issue;*
- 2. provide a statement of the issue to be investigated in an appropriate form - an observation or question;*
- 3. state the objective of the research;*
- 4. describe the methodology and instruments used to collect data;*
- 5. present the data obtained using at least two appropriate forms;*
- 6. analyse and interpret the data with reference to the issue;*
- 7. state relevant conclusions based on findings;*
- 8. make recommendations (at least two) based on the findings;*
- 9. provide personal reflections on completion of the project; and,*
- 10. present the report in an appropriate format including a cover page, table of contents, bibliography and appendices.*

FORMAT OF THE REPORT

A student's report should comprise the following components in the order prescribed below:

1. Cover Page including the candidates' number, name of subject and date of submission
2. Table of Contents
3. Introduction
 - Background or overview of the current health-related or environmental problem
 - Statement of the problem
 - Research Objective
4. Methodology – data collection procedures and instrumentation, limitations of research
5. Presentation of Data
6. Analysis and Interpretation of Data
7. Conclusion
8. Recommendations
9. Reflection
10. Bibliography
11. Appendices

MARK SCHEME FOR SCHOOL-BASED ASSESSMENT

Reports should be marked out of an aggregate of 40 marks. The following table shows the criteria that should be used to allocate marks for the various components of the report.

ASSESSMENT CRITERIA	PROFILE Use of Knowledge (UK) MARKS
1. Background/Overview of Issue • Provides a clear, detailed description of a current health-related or environmental issue • Description is detailed but lacks clarity	(2) 2 1
2. Problem Statement • Research problem is stated clearly • Research problem is in an appropriate form – an observation or question	(2) 1 1
3. Research Objective • Objective of the research is linked to the issue • Objective of the research is realistic/feasible	(2) 1 1

ASSESSMENT CRITERIA	PROFILE <i>Use of Knowledge</i> (UK) MARKS
4. Methodology • Sample/Materials used <u>identified</u> and <u>clearly described</u> • Data collection instrument/apparatus <u>identified</u> and <u>clearly described</u> • Method of data collection is <u>identified</u> and <u>clearly described</u> • Method of data collection is adequately justified • ONE limitation of data collection method clearly stated	(8) 2 2 2 1 1
5. Presentation of Data • Data is presented in an appropriate form using tables, graphs and charts • Data is presented in at least TWO forms • Form(s) used for presentation of data is correctly labelled • Data presented are accurate	(5) 1 2 1 1
6. Analysis and Interpretation of Data • Data is analyzed using appropriate calculations/statistics/themes • Data is summarized accurately • At least TWO statements of findings based on data presented • Findings are consistent with analyses	(5) 1 1 2 1
7. Conclusion • Conclusion succinctly summarizes the project • Conclusion is logical and based on findings	(2) 1 1
8. Recommendations • At least TWO recommendations proposed • Recommendations are realistic • Recommendations are informed by findings	(4) 2 1 1

ASSESSMENT CRITERIA	PROFILE <i>Use of Knowledge</i> (UK) MARKS
9. Reflection: <i>Candidate states the following information:</i> <i>TWO lessons learnt after undertaking the project.</i> <i>ONE way in which the lesson learnt could be applied to his/her personal life.</i> <i>ONE way in which the project could be improved.</i> <i>ONE social impact and ONE economic impact the issue could have on his/her school or community if not rectified.</i>	(6) 2 1 1 2
10. Overall Presentation <i>Layout of report follows the correct format inclusive of cover page, table of contents, bibliography and appendices</i> <i>If layout includes only two elements – 1 mark only</i> <i>Bibliographic information contains names of authors, publishers and dates of publication</i> <i>Consistent use of correct spelling and grammar</i>	(4) 2 1 1
TOTAL	40

MANAGEMENT OF THE PROJECT

The teacher is expected to provide guidance at all stages of the project. Each candidate should know the requirements of the project and the assessment criteria should be discussed.

The research project should be completed in the course of normal teaching time and supervised and marked by the teacher. *The project should be integrated in the teaching of the subject and assessment should be conducted on a continuous basis and feedback given to students for further improvement.* Although some of the data collection and research work must be undertaken outside of normal school time, the teacher must be satisfied that the work submitted for assessment is the student's own work.

The teacher must:

1. provide assistance to students in the selection of projects;
2. advise students of the nature of the task, the scope and depth required to fulfil the requirements of the SBA;
3. advise on the availability of resource materials;

4. monitor students' progress by advising them of the quality of their work and by recommending ways to improve the quality of the project;
5. collect and grade students' projects;
6. keep records of students' marks and submit these, together with samples of their work, as requested by **CXC®**; and,
7. ensure that the SBA guidelines are closely followed and the marking criteria are adequately met.

Authenticity

Teachers should ensure that the project presented is the work of the student. This can be achieved by systematic monitoring and evaluation of student's work throughout the development of the project. This will guard against plagiarism and ensure that the work is the intellectual property of the student.

Authenticity can also be ensured by:

1. *discussing the project and creating an outline with timelines;*
2. *offering guidance and timely feedback to students; and,*
3. *allocating some class time for students to work on the projects.*

◆ RESOURCES

The following is a list of books that might be used for Human and Social Biology. Each student should have access to at least one text.

<i>Fosbery, R., Alleyne, T., Brown, M. and Mitchell C.</i>	<i>Human and Social Biology for CSEC – A Caribbean Examinations Council Study Guide. 2014.</i>
<i>Fosbery, R. and Givens, P.</i>	<i>Human and Social Biology for CSEC. Oxford University Press, 2015.</i>
<i>Fullick, A. and Ragoobirsingh, D.</i>	Human and Social Biology for CSEC. 2 nd Edition. Essex: Pearson Education Limited, 2010.
Gadd, P.	<i>Human and Social Biology for CSEC Examination. 6th Edition. Oxford: MacMillian Education, 2009.</i>
<i>Morris, Alexia.</i>	<i>Human and Social Biology for CSEC. Pearson Education Limited, 2015.</i>
Waugh, A. and Grant, A. (Editors)	Ross and Wilson Anatomy and Physiology in Health and Illness. London: Churchill Livingstone, 2014.
Phill Gadd and Niva Miles	Macmillan Human and Social Biology textbook for CSEC. 7 th Edition, published by Macmillan Education, 2021.

Websites

Module	Topic	URLS
One: <i>Organisms and Metabolism</i>	<i>Living organisms</i>	https://www.cellsalive.com/StudyAids.htm https://www.centreofthecell.org/learn-play/games/ https://learn.genetics.utah.edu/content/cells/insideacell/ https://learn.genetics.utah.edu/content/cells/ https://www.biologyjunction.com/biology_games.htm http://workbench.concord.org/database/activities/321.html https://biomanbio.com/HTML5GamesandLabs/Cellgames/Cells.html
	<i>Ecology</i>	https://www.learner.org/wp-content/interactive/envsci/ecology/ecology.html https://biomanbio.com/HTML5GamesandLabs/EcoGames/ecology.html
	<i>Osmosis, diffusions, and Active transport</i>	https://www.liveworksheets.com/worksheet/en/biology/1844038 https://wordwall.net/resource/20647155/science/osmosis-diffusion-and-active-transport
	<i>Digestive</i>	https://digestivesystemwebinquiry.weebly.com/group-

Module	Topic	URLS
	<i>System</i>	activities.html https://wartgames.com/themes/humanbody/digestivesystem.html https://classroom.kidshealth.org/classroom/prekto2/body/systems/digestive.pdf
	<i>Circulatory</i>	https://gizmos.explorellearning.com/find-gizmos/lesson-info?resourceId=662 https://www.msmanuals.com/home/heart-and-blood-vessel-disorders/biology-of-the-heart-and-blood-vessels/biology-of-the-heart#Function-of-the-Heart_v29655041
	<i>Excretory system and homeostasis</i>	https://scichamp.com/Biology%20games/Excretory%20system/ https://www.liveworksheets.com/worksheet/en/natural-science/203977#google_vignette https://edukatte.com/hsb/excretion-and-homeostasis/
Two: Life Processes	<i>Respiratory System</i>	https://www.getbodysmart.com/respiratory-system/ https://biomanbio.com/HTML5GamesandLabs/Physiologygames/respiratory_journeyhtml5page.html
	<i>Skeletal System</i>	https://www.merckmanuals.com/home/multimedia/3dmodel/skeletal-system https://www.getbodysmart.com/skeletal-system/
	<i>Nervous system</i>	https://printableworksheets.in/human-body-worksheets https://quizlet.com/subject/human-biology/ https://learn.genetics.utah.edu/content/neuroscience/crossingdivide/ https://learn.genetics.utah.edu/content/neuroscience/madneuron/
	<i>Reproductive System</i>	https://www.innerbody.com/image/repfov.html https://www.visiblebody.com/learn/reproductive
Three: Heredity, Diseases and the Environment	<i>Heredity and variation</i>	https://www.biologyjunction.com/biology_games.htm https://learn.genetics.utah.edu/content/basics/
	<i>Disease and Their Impact on humans</i>	Infectious disease activity: https://www.windows2universe.org/?page=/teacher_resources/infectious_disease.html Mosquito-borne disease: https://www.hhmi.org/biointeractive/stopping-mosquito-borne-

Module	Topic	URLS
		disease Malaria: https://www.hhmi.org/biointeractive/stopping-mosquito-borne-disease Infection prevention: https://byjus.com/biology/infectious-diseases/ Cancer basics: https://www.cancer.org/cancer/cancer-basics.html What is cancer? https://www.easyteacherworksheets.com/science/cancer.html Games - drug use and effects https://teens.drugabuse.gov/games https://www.educationworld.com/a_tech/archives/webquest.shtml https://www.teachertube.com/video/human-impact-on-the-environment-gcse-biology-293011
	<i>Impact of health practices on the environment</i>	Air pollution: https://byjus.com/biology/air-pollution-control/ Green activities: https://www.teachervision.com/green-activities Climate kids: https://climatekids.nasa.gov/ Recycle city: https://www3.epa.gov/recyclecity/

◆ GLOSSARY

WORD/TERM	DEFINITION/MEANING	
annotate	Add a brief note to a label.	Simple phrase or a few words only; (UK)
apply	Use knowledge/principles to solve problems.	make inferences/ conclusions; (UK)
appraise	To judge the quality or worth of.	(UK)
assess	Present reasons for the importance of particular structures relationships or processes.	compare the advantages and disadvantages or the merits and demerits of a particular relationship or process; (UK)
calculate	Arrive at the solution to a numerical problem.	steps should be shown; units must be included; (UK)
classify	Divide into groups according to observable characteristics.	(UK)
comment	State opinion or view with supporting reasons.	(UK)
compare	State similarities and differences.	an explanation of the significance of each similarity and difference stated may be required for comparisons which are other than structural, (KC/UK)
construct	Use a specific format to make and/or draw a graph, histogram, pie chart or other representation using data or material provided or drawn from practical investigations, build (for example, a model), draw scale diagram.	such representations should normally bear a title, appropriate headings and legend; (UK)
deduce	Make a logical connection between two or more pieces of information; use data to arrive at a conclusion.	(UK)

WORD/TERM	DEFINITION/MEANING	
define	State concisely the meaning of a word or term.	This should include the defining equation/formula where relevant. (KC)
demonstrate	Show clearly by giving proof or evidence; direct attention to.	(KC)
derive	To deduce; determine or extract from data by a set of logical steps some relationship, formula or result.	This relationship may be general or specific. (UK)
describe	Provide detailed factual information of the appearance or arrangement of a specific structure or the sequence of a specific process.	Descriptions may be in words, drawings or diagrams or any appropriate combination. Drawings or diagrams should be annotated to show appropriate detail where necessary. (KC)
determine	Find the value of a physical quantity.	
design	Plan, and present with appropriate practical detail.	Where hypotheses are stated or when tests are to be conducted, possible outcomes should be clearly stated and/or the way in which data will be analysed and presented.
develop	Expand or elaborate an idea or argument with supporting reasons.	(KC/UK)
differentiate/distinguish (between/among)	State or explain briefly those differences between or among items which can be used to define the items or place them into separate categories.	(KC)
discuss	Present reasoned arguments; consider points both for and against; explain the relative merits of a case.	(UK)
draw	Make a line representation from specimens or apparatus that shows an accurate relationship between the parts.	In case of drawings from specimens, the magnification must always be stated. A diagram is a simplified representation showing the relationship between components. (KC/UK)

WORD/TERM	DEFINITION/MEANING	
estimate	Make an approximate quantitative judgment.	
evaluate	Weigh evidence and make judgments based on given criteria.	The use of logical supporting reasons for a particular point of view is more important than the view held; usually both sides of an argument should be considered. (UK)
explain	Give reasons based on recall; account for. <i>Make plain or understandable; give reasons for/or causes of; show the logical development of a relationship.</i>	(KC)
find	Locate a feature or obtain as from a graph.	(UK)
formulate	To express in a formula or in a systematic manner.	(UK)
identify	Name or point out specific components or features	(KC)
illustrate	Show clearly by using appropriate examples or diagrams, sketches.	(KC/UK)
investigate	Use simple systematic procedures to observe, record data and draw logical conclusions.	
justify	To prove a statement or claim true.	(UK)
label	Add names to identify structures or parts indicated by pointers.	(UK)
list	Itemise without detail.	(KC)
measure	Take accurate quantitative readings using appropriate instrument.	
name	Give only the name of.	No additional information is required.
note	Write down observations.	
observe	Pay attention to details which characterise a specimen, reaction or change taking place; to examine and note scientifically.	Observations may involve all the senses and/or extensions of them, but would normally exclude the sense of taste.

WORD/TERM	DEFINITION/MEANING
plan	Prepare to conduct an exercise.
predict	Use information provided to arrive at a likely conclusion or suggest a possible outcome. (UK)
record	Write an accurate description of the full range of observations made during a given procedure. This includes the values for any variable being investigated where appropriate recorded data may be depicted in graphs, histograms or tables.
relate	Show connections between; explain how one set of facts or data depend on others or are determined by them. (UK)
sketch	Make a simple freehand diagram showing relevant proportions and any important details. (KC)
state	Provide factual information in concise terms, omitting explanation. (KC)
suggest	Offer an explanation deduced from information or previous knowledge. No correct or incorrect solution is presumed but suggestions must be acceptable within the limits of scientific knowledge; (UK).
suggest an hypothesis	Provide a generalisation which offers a likely explanation for a set of data or observations. (UK)
test	To find out by following set procedures.

SECTION	SPECIFIC OBJECTIVES	PRACTICAL ACTIVITIES
A: LIVING ORGANISMS AND THE ENVIRONMENT	2	Draw and label cells and cell structures from electron micrographs (mag. x 2000) <i>or prepared slides</i> .
	5	Examine prepared slides or micrographs of the different tissue types. For example, blood, muscle, nerves, connective tissue.
	7	- Experimental activity to demonstrate osmosis and diffusion in living cells. - Osmosis: the effect of different concentrations on plant tissue. - Diffusion: liquid in liquid and solid in liquid.
	9	Simple starch test on variegated and non-variegated leaves.
	12	Field study of a terrestrial or aquatic ecosystem.
B: LIFE PROCESSES	1.6	- Starch: Iodine Test. - Protein: Biuret Test (sodium hydroxide and copper <i>sulphate</i> solutions). - Reducing sugars: Benedict's Test. - Non-Reducing sugars: Hydrochloric acid followed by sodium bicarbonate and Benedict's solution. - Fats: Grease Spot and Emulsion Tests.
	1.21	Experiments to determine the effects of temperature and pH on potatoes or liver.
	2.3	Construct a model that demonstrates the breathing mechanism.
	2.4	Investigate the breathing rate before and after exercise.
	6.5	- Demonstration of knee jerk reflex. - Conduct an experiment investigating reaction time.
C: HEREDITY AND VARIATION	1	Construct models of the structure of DNA and chromosomes.
	2	<i>Construct models of the stages of mitosis.</i>
	4	<i>Construct models of the stages of meiosis.</i>
	8	Investigate and compare discontinuous variation with continuous variation. For example: discontinuous traits (tongue rolling, widow's peak, earlobes attached or detached), with continuous traits (height, foot size, length of index finger).

◆ RECOMMENDED MINIMUM EQUIPMENT LIST

Several of the items listed may be supplied within the school.

- | | |
|---|---|
| 1. Beakers 400 cm ³ /500 cm ³ (graduated) | 16. Test tube brushes |
| 2. Beakers 250 cm ³ (graduated) | 17. Test tube holders |
| 3. Bell jars with bungs | 18. Test tube racks |
| 4. Bottles (reagent), assorted | 19. Knives or scalpels |
| 5. Bunsen Burners | 20. Hand lenses |
| 6. Borers, cork | 21. Microscope, light. Magnification x 40
objective, x 10 eyepiece |
| 7. Charts and models | 22. Plane mirrors |
| (a) Eye, human | 23. Refrigerator, small |
| (b) Skeleton, human | 24. Metre rules |
| (c) Skin, human | 25. Scissors |
| (d) Female and male reproductive
systems, pregnancy | 26. Microscope slides |
| (e) Respiratory system | 27. Retort stands with clamps |
| (f) Digestive system | 28. Tripod stands |
| (g) Circulatory system | 29. Stop Clocks |
| (h) Excretory system | 30. Stoppers or bungs, assorted cork, rubber |
| (i) Cell structure | 31. Measuring tapes |
| (j) Cell division – mitosis and meiosis | 32. Thermometers, -10 to 110°C (Spirit) |
| 8. Coverslips or cover glasses | 33. Boiling tubes |
| 9. Measuring Cylinders (assorted) | 34. Tubing (glass), assorted |
| 10. Petri Dishes | 35. Tubes, Y-piece connector |
| 11. Watch glasses | 36. Tubing (rubber), normal and heavy wall |
| 12. Conical Flasks, 250 ml | 37. Wire Gauzes, with insulated centers |
| 13. Filter Funnels (assorted) | 38. Spatulas |
| 14. Forceps | 39. Dissecting pan and mat |
| 15. Test tubes | |

◆ RECOMMENDED MATERIAL LIST

1. *Alcohol or ethanol*
2. *Balloons*
3. *Benedict's solution*
4. *Calcium Hydroxide*
5. *Cobalt Chloride paper*
6. *Copper II Sulphate*
7. *Methylene blue solution 1%*
8. *Hydrochloric acid (conc.)*
9. *Indicator, Universal pH paper*
2. *Indicator, Universal pH solution*
3. *Iodine in potassium iodide (KI) solution*
12. *Masking tape*
4. *Cotton wool*
5. *Filter paper*
10. *Plasticine*
11. *Pipettes, teat (droppers)*
12. *Sodium Chloride (table salt)*
13. *Sodium Hydrogen Carbonate*
14. *Sodium Hydroxide (pellets)*
15. *Vaseline*
16. *Prepared slides - human blood smear, Muscles*
17. *Skeleton*
 - (a) *Skeleton, mammalian, complete*
 - (b) *Vertebrae*
 - (c) *Girdles*
 - (d) *Long bone*
 - (e) *Skulls*
 - (f) *Teeth*

Western Zone Office
25 August 2026

CARIBBEAN EXAMINATIONS COUNCIL®

**Caribbean Secondary Education Certificate®
CSEC®**



HUMAN AND SOCIAL BIOLOGY

**Specimen Papers and
Mark Schemes/Keys**

Specimen Papers, Mark Schemes and Keys:

Paper 01
Paper 02
Paper 032



TEST CODE **01253010**

SPECIMEN 2026

CARIBBEAN EXAMINATIONS COUNCIL
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION

HUMAN AND SOCIAL BIOLOGY

Paper 01 – General Proficiency

1 hour 15 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This test consists of 60 items. You will have 1 hour and 15 minutes to answer them.
2. In addition to this test booklet, you should have an answer sheet.
3. Each item in this test has four suggested answers lettered (A), (B), (C), (D). Read each item you are about to answer and decide which choice is best.
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

Sample Item

Abnormally high blood pressure is called

- (A) distension
- (B) hypotension
- (C) hypertension
- (D) hyperglycaemia

Sample Answer



The best answer to this item is “hypertension”, so (C) has been shaded.

5. If you want to change your answer, erase it completely before you fill in your new choice.
6. When you are told to begin, turn the page and work as quickly and as carefully as you can. If you cannot answer an item, go on to the next one. You may return to that item later.
7. Figures are not necessarily drawn to scale.

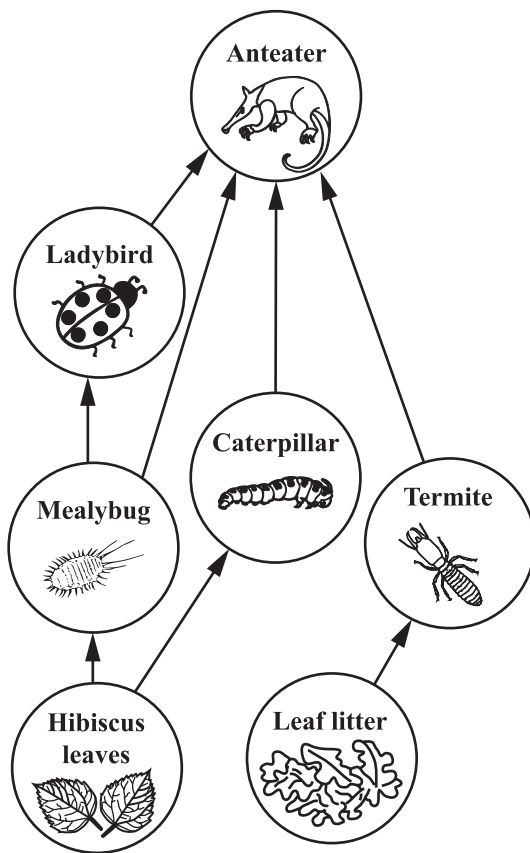
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1. Which part of the cell controls ALL of the activities that take place within it?

(A) Nucleus
(B) Lysosome
(C) Cytoplasm
(D) Chloroplast

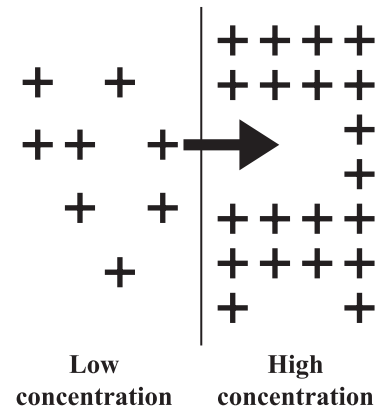
Item 2 refers to the following food web which shows the feeding relationships for animals in a forest.



2. Which of the following outcomes will occur if the mealybug becomes extinct?

(A) The hibiscus leaves will decrease.
(B) The anteater population will die out.
(C) The ladybird population will die out.
(D) The caterpillar population will increase.

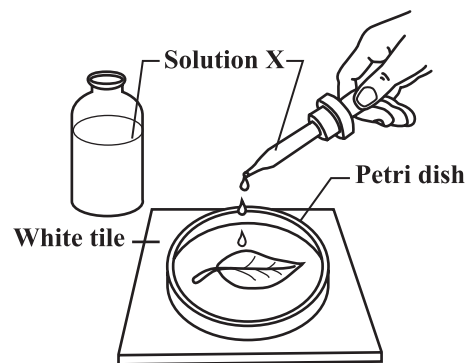
Item 3 refers to the following diagram which shows a process that occurs in the human body.



3. The process illustrated in the diagram above is referred to as

(A) osmosis
(B) diffusion
(C) transpiration
(D) active transport

Item 4 refers to the following diagram which shows the final step involved in testing for the presence of starch in a leaf.



4. When Solution X is dropped on the leaf, assuming photosynthesis has occurred, the leaf will become

(A) pale
(B) black
(C) yellow
(D) wrinkled

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5. Which of the following minerals plays an important role in the nucleus of the cell and is necessary for the formation of bones and teeth?

(A) Iron
(B) Iodine
(C) Calcium
(D) Phosphorus

6. The BEST reason for including water in the diet is that it

(A) dissolves nutrients during digestion
(B) is the medium in which certain minerals are stored
(C) is necessary to prevent the development of scurvy
(D) stops hunger from returning too early after a meal is eaten

7. Which of the following measures can be used to categorize obesity?

(A) Height
(B) Weight
(C) Blood pressure
(D) Body mass index

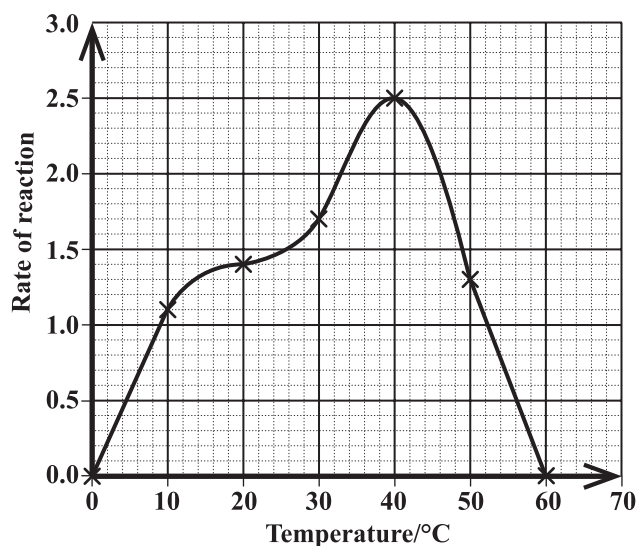
8. Which of the following teeth, present in children and adults, is responsible for grinding food into smaller pieces?

(A) Molar
(B) Canine
(C) Incisor
(D) Premolar

9. Which row in the following table correctly matches the enzyme with its site of production?

	Enzyme	Site of Production
(A)	Sucrase	Pancreas
(B)	Maltase	Salivary glands
(C)	Pepsin	Walls of stomach
(D)	Amylase	Walls of small intestine

Item 10 refers to the following graph which shows how the rate of reaction varies with temperature for a certain enzyme.

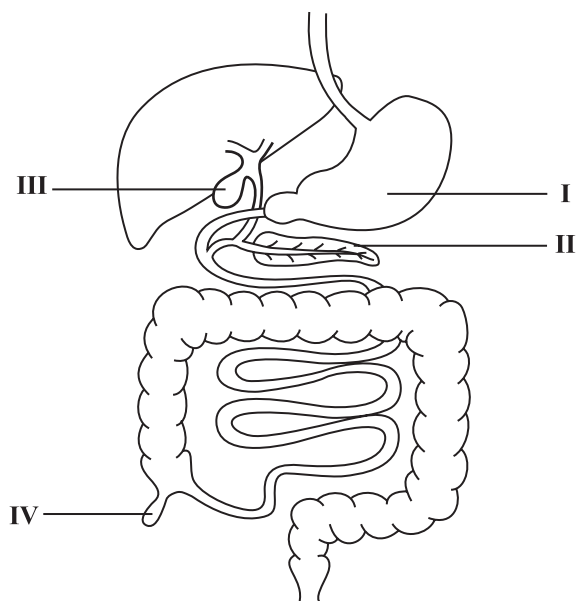


10. The graph above shows that the

(A) rate of reaction is slower at lower temperatures
(B) optimum temperature for the reaction is 30 °C
(C) rate of reaction reaches a maximum at 20 °C
(D) rate of reaction decreases as the temperature increases

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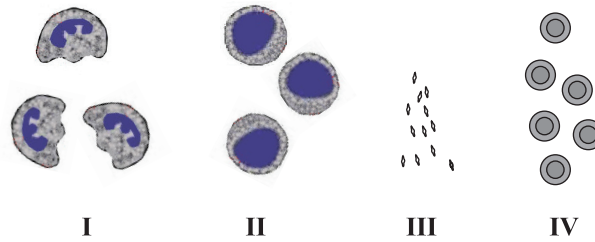
Item 11 refers to the following diagram which shows the organs of the digestive system.



11. Which of the labelled organs above is the pancreas?
- (A) I
 - (B) II
 - (C) III
 - (D) IV
12. A villus is able to perform its function because it has
- (A) a thick epithelial lining
 - (B) a very small surface area
 - (C) few carrier proteins within its cell membrane
 - (D) several projections (microvilli) present on its surface
13. In which of the following organs does chemical digestion occur **only**?
- (A) Mouth
 - (B) Stomach
 - (C) Small intestine
 - (D) Large intestine
14. Which chamber of the heart has the thickest wall?
- (A) Left atrium
 - (B) Right atrium
 - (C) Left ventricle
 - (D) Right ventricle
15. Systolic pressure is defined as the
- (A) lowest pressure when the heart relaxes
 - (B) highest pressure when the heart relaxes
 - (C) lowest pressure when the heart contracts
 - (D) highest pressure when the heart contracts
16. Lymph is different from tissue fluid because lymph contains a higher concentration of
- (A) nutrients and oxygen
 - (B) amino acids and water
 - (C) carbon dioxide and urea
 - (D) plasma proteins and blood cells

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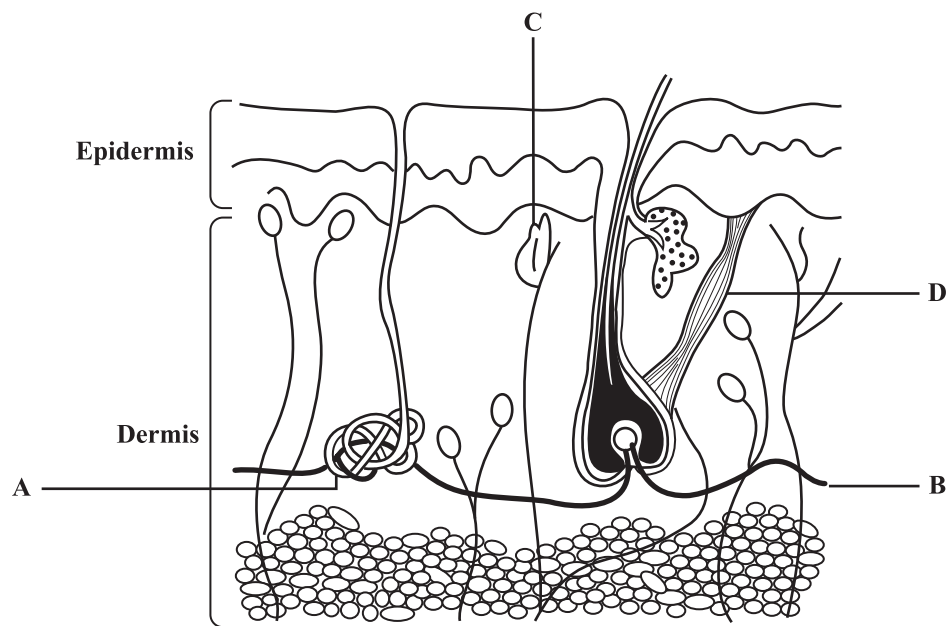
Item 17 refers to the following actions which show four components of human blood.



17. Which row in the following table correctly identifies each component of blood above?

	I	II	III	IV
(A)	Phagocytes	Lymphocytes	Platelets	Red blood cells
(B)	Platelets	Red blood cells	Phagocytes	Lymphocytes
(C)	Red blood cells	Phagocytes	Lymphocytes	Platelets
(D)	Lymphocytes	Platelets	Phagocytes	Red blood cells

Items 18 and 19 refer to the following diagram which shows the internal structures of the skin.



In answering Items 18 and 19, each option may be used once, more than once or not at all.

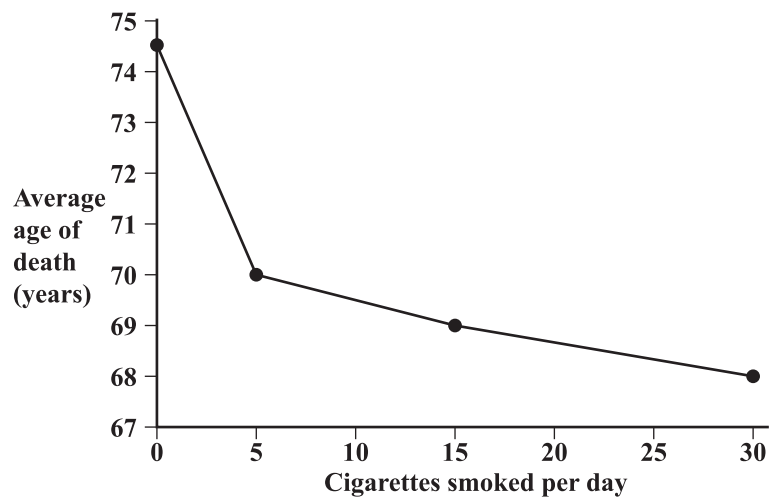
18. Which of the structures above secretes sweat?
19. Which of the structures above is stimulated when a person feels cold?

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20. Which of the following actions would cause the body to release antidiuretic hormone (ADH)?

- (A) Eating salty food
- (B) Excessive sweating
- (C) Drinking a lot of water
- (D) Drinking sugary liquids

Items 21 and 22 refer to the following graph which shows the relationship between the average age of death and the number of cigarettes smoked per day.



21. If an individual died at 70 years old, how many cigarettes did he/she smoke per day?

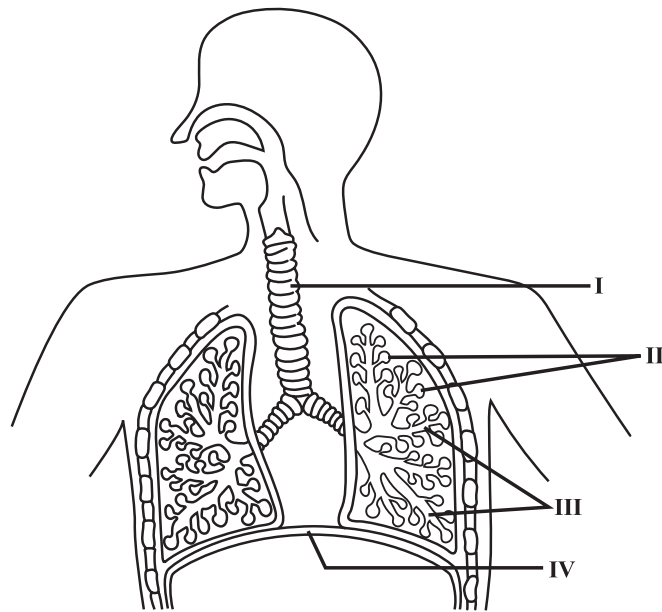
- (A) 0
- (B) 5
- (C) 10
- (D) 15

22. At what average age did non-smokers die?

- (A) 75.5 years
- (B) 75.0 years
- (C) 74.5 years
- (D) 74.0 years

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Item 23 refers to the following diagram which shows the structures of the human respiratory system.

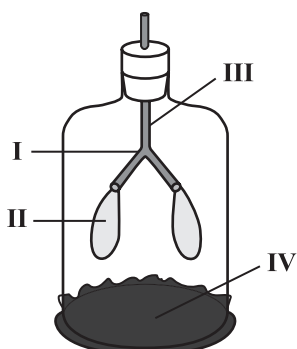


23. In which of the labelled structures above does gaseous exchange take place?

- (A) I
- (B) II
- (C) III
- (D) IV

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Items 24 and 25 refer to the following model which can be used to demonstrate the breathing mechanism.



24. In order for Part II to inflate, Part IV must be

- (A) blown up
- (B) pushed in
- (C) pulled down
- (D) pinched or squeezed

25. Which of the following diseases affects the human structure represented by Part I?

- (A) Asthma
- (B) Bronchitis
- (C) Pneumonia
- (D) Emphysema

26. Tendons are tissues which

- (A) attach bones at a joint
- (B) prevent the rubbing of bones
- (C) prevent the dislocation of bones
- (D) attach the ends of muscles to bones

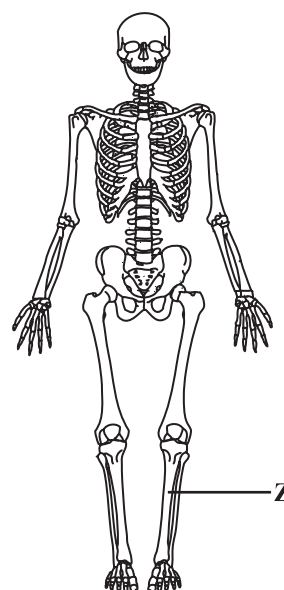
27. Which row in the following table describes the action of the antagonistic muscles when flexing the lower arm?

	Biceps	Triceps
(A)	Relaxes	Relaxes
(B)	Relaxes	Contracts
(C)	Contracts	Relaxes
(D)	Contracts	Contracts

28. At which type of joint are bones separated by cartilage pads and allow slight movement?

- (A) Fixed
- (B) Hinge
- (C) Synovial
- (D) Ball and socket

Item 29 refers to the following diagram of a skeleton.



29. The bone labelled Z is the

- (A) ulna
- (B) tibia
- (C) fibula
- (D) radius

30. Muscles which are striated and under voluntary control are called

(A) ciliary muscles
(B) cardiac muscles
(C) skeletal muscles
(D) smooth muscles

31. Which of the following types of reflexes is pupil dilation?

(A) Spinal
(B) Cranial
(C) Voluntary
(D) Conditioned

32. Which of the following describes the functions of sense organs?

I. Detect stimuli
II. Warn of danger
III. Inform about the environment

(A) I and II only
(B) I and III only
(C) II and III only
(D) I, II and III

33. Linda is looking at a coconut tree. If she has normal vision, how would the image of the tree appear on her retina?



34. Brent has low blood sugar levels. Which of the following hormones is being secreted to ensure that he has sufficient energy to continue his activities?

(A) Insulin
(B) Glucagon
(C) Growth hormone
(D) Antidiuretic hormone

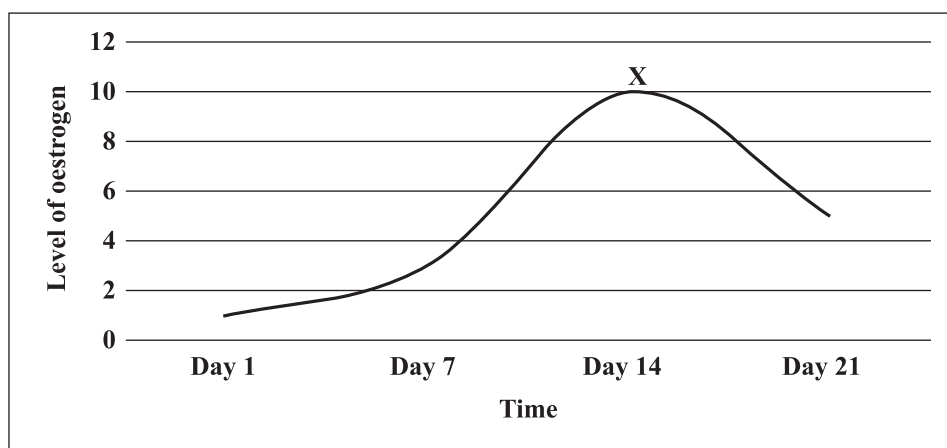
35. Michael has diabetes mellitus. Which of the following vision disorders is he at risk of developing?

- (A) Glaucoma
- (B) Astigmatism
- (C) Long-sightedness
- (D) Short-sightedness

36. Which of the following comparisons about sexual and asexual reproduction is true?

	Sexual	Asexual
(A)	Requires one parent.	Requires two parents.
(B)	Offspring are genetically identical.	Offspring are not genetically identical.
(C)	Involves the fusion of gametes.	Does not involve the fusion of gametes.
(D)	Large number of offspring produced.	Small number of offspring produced.

Item 37 refers to the following graph which shows the level of oestrogen produced during the menstrual cycle.



37. Which of the following processes is MOST likely occurring at Point X?

- (A) Ovulation
- (B) Conception
- (C) Implantation
- (D) Menstruation

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38. Which of the following is the LAST structure to be expelled from the vagina after childbirth?

- (A) Placenta
- (B) Amniotic sac
- (C) Amniotic fluid
- (D) Umbilical cord

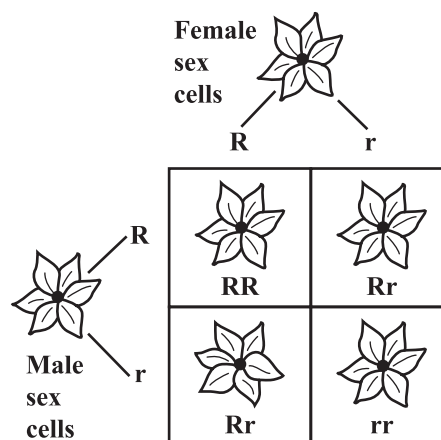
39. Which of the following methods of birth control prevents BOTH ovulation and implantation?

- (A) Barrier
- (B) Natural
- (C) Surgical
- (D) Hormonal

40. The human papillomavirus (HPV) vaccine for young women may help prevent

- (A) lung cancer
- (B) skin cancer
- (C) breast cancer
- (D) cervical cancer

Item 41 refers to the following Punnett square for flower colour where R = red and r = white.

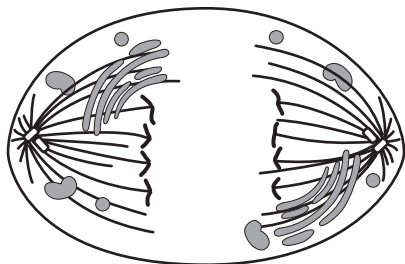


41. What is the genotypic ratio of red flowers to white flowers?

- (A) 2:1
- (B) 3:1
- (C) 1:2:1
- (D) 1:3:1

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Item 42 refers to the following diagram which shows a cell undergoing the process of mitosis.



42. Which of the following phases of mitosis is occurring in the cell above?
- (A) Prophase
 - (B) Anaphase
 - (C) Telophase
 - (D) Metaphase
43. Alternative genes for eye colour are referred to as
- (A) alleles
 - (B) mutations
 - (C) chromatids
 - (D) chromosomes
44. Which of the following statements about genetic engineering are true?
- I. It can be used to build new DNA molecules.
 - II. It can be used to alter genetic material in a cell.
 - III. It can be used to give an organism new characteristics.
- (A) I and II only
 - (B) I and III only
 - (C) II and III only
 - (D) I, II, and III
45. Which of the following is an example of discontinuous variation?
- (A) Height
 - (B) Foot size
 - (C) Tongue rolling
 - (D) Length of index finger
46. Georgia does not complete her course of antibiotics because she is feeling better. Which of the following outcomes is likely to occur as a result of her failing to complete her course of antibiotics?
- (A) She is feeling well; nothing else should happen.
 - (B) Resistant bacteria in her body are left to grow and multiply.
 - (C) Resistant viruses in her body are left to grow and multiply.
 - (D) She is likely to contract another type of infectious disease.
47. Organisms that transmit disease-causing microbes to other organisms are called
- (A) vectors
 - (B) bacteria
 - (C) parasites
 - (D) pathogens
48. Infectious diseases, such as colds and influenza, are MOST commonly spread by
- (A) hand-to-face contact
 - (B) drinking infected water
 - (C) eating contaminated food
 - (D) inhaling airborne pathogens

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49. The correct sequence of the stages in the life cycle of a mosquito is

- (A) egg, larva, pupa, adult
- (B) egg, pupa, larva, adult
- (C) larva, pupa, egg, adult
- (D) pupa, egg, larva, adult

50. Mala is vaccinated against a disease and her antibody concentration increases rapidly. However, over the next few days, there is a gradual decrease in her antibody concentration. What type of immunity does Mala experience?

- (A) Active natural
- (B) Active artificial
- (C) Passive natural
- (D) Passive artificial

51. Which of the following diseases is classified as hereditary?

- (A) Polio
- (B) Rabies
- (C) Small pox
- (D) Colour blindness

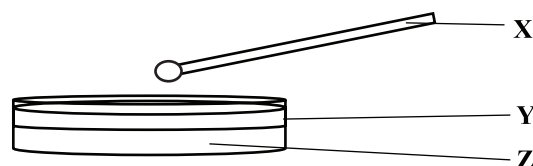
52. What is the correct order of the processes involved in large-scale water purification?

- (A) Chlorination, screening, sedimentation, filtration
- (B) Sedimentation, screening, chlorination, filtration
- (C) Screening, sedimentation, filtration, chlorination
- (D) Filtration, screening, sedimentation, chlorination

53. What is the role of bacteria in sewage treatment?

- (A) Creates sludge
- (B) Aerates the sludge
- (C) Decomposes organic matter
- (D) Causes the solid matter to settle

Item 54 refers to the following apparatus which is used by a student to test water for bacteria.



54. Which row in the following table shows the correct labels for X, Y and Z?

	X	Y	Z
(A)	Swab	Watch glass	Agar gel
(B)	Swab	Petri dish	Agar gel
(C)	Spatula	Watch glass	Petroleum jelly
(D)	Spatula	Petri dish	Petroleum jelly

55. Aaron lives down river from a farm. One year he notices that algae are covering the surface of the river and fish are washing up dead on the shore. The fish MOST likely died because of

- (A) a lack of oxygen
- (B) the overgrowth of algae
- (C) pesticides from the farm
- (D) fertilizers from the farm

Item **56** refers to the following table which shows the types of garbage generated on a weekly basis in the households of persons in a rural village.

Type of Garbage	Number of Bags Produced in a Week
Peelings/garden trimmings	6
Tins/glass bottles	25
Plastic	10
Paper waste	3

- 56.** What would be the BEST method of domestic refuse disposal for the villagers to utilize to help reduce the amount of garbage sent to the landfill?
- (A) Burning
(B) Biodiesel
(C) Recycling
(D) Composting
- 57.** Surav burns his household garbage every weekend. Which of the following is a likely effect of the smoke?
- (A) Silicosis
(B) Eutrophication
(C) Global warming
(D) Ozone depletion
- 58.** Which of the following components is common to BOTH the biological filter method and the activated sludge method?
- (A) Grit pit
(B) Aeration tank
(C) Percolating filter
(D) Stones covered with aerobic bacteria
- 59.** Which of the following is an agricultural pollutant?
- (A) Sewage
(B) Acid rain
(C) Herbicides
(D) Heavy metals
- 60.** Which method would be LEAST effective for purifying water?
- (A) Boiling
(B) Filtering
(C) Water purification tablets
(D) Addition of chlorine bleach

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

2026 CSEC HSB SPECIMEN PAPER 01 TOS

Item Number	Key	Specific Objective
1	A	1.1.3
2	C	1.1.11
3	D	1.1.6
4	B	1.1.9
5	D	1.2.3
6	A	1.2.7
7	D	1.2.14
8	D	1.2.17
9	C	1.2.23
10	A	1.2.24
11	B	1.2.25
12	D	1.2.29
13	C	1.2.27
14	C	1.3.6
15	D	1.3.7
16	C	1.3.14
17	A	1.3.3
18	A	1.4.4
19	D	1.4.4
20	B	1.4.8
21	B	2.1.13
22	C	2.1.13
23	B	2.1.2
24	C	2.1.3
25	B	2.1.8
26	D	2.2.5
27	C	2.2.9
28	A	2.2.6
29	B	2.2.1
30	C	2.2.8
31	B	2.3.5
32	D	2.3.8
33	D	2.3.10
34	B	2.3.15
35	A	2.3.12

2026 CSEC HSB SPECIMEN PAPER 01 TOS

36	C	2.4.1
37	A	2.4.3
38	A	2.4.5
39	D	2.4.7
40	D	2.4.9
41	C	3.1.6
42	B	3.1.2
43	A	3.1.1
44	C	3.1.11
45	C	3.1.9
46	B	3.2.12
47	A	3.2.5
48	D	3.2.2
49	A	3.2.6
50	D	3.2.13
51	D	3.2.2
52	C	3.3.9
53	C	3.3.14
54	B	3.3.8
55	A	3.3.4
56	C	3.3.15
57	C	3.3.1
58	A	3.3.14
59	C	3.3.2
60	B	3.3.7

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CARIBBEAN SECONDARY EDUCATION CERTIFICATE EXAMINATION®

HUMAN AND SOCIAL BIOLOGY - SPECIMEN PAPER

TABLE OF SPECIFICATIONS

Paper 02 - Structured/Essay

Question Number	Specific Objectives	Topic/Content	Marks		
			KC	UK	Total
1	1.2.1	Macronutrients and micronutrients	6	9	15
	1.2.2	Functions of macronutrients			
	1.2.4	Causes, symptoms and treatment of deficiency diseases			
	1.2.13	Effects of malnutrition on the body			
	1.2.14	Body mass index (BMI)			
2	1.3.7	Concept of blood pressure	6	9	15
	1.3.11	Cause and effect of heart disease			
	1.2.15	Prevention of heart disease			
3	2.4.2	Structure and function of the reproductive systems in humans	6	9	15
	2.4.3	The menstrual cycle			
	2.4.7	How birth control methods prevent pregnancy			
	2.4.8	Advantages and disadvantages of birth control methods			
	2.4.12	Cancers of the reproductive organs			
	2.4.14	Importance of family planning			
4	2.2.1	Major bones of the skeleton	6	9	15
	2.2.6	Types of joints			
	2.2.7	Movement in the hinge and ball and socket joints			
	2.2.9	How skeletal muscles function in the movement of a limb			

5	3.1.4	Process of meiosis	6	9	15
	3.1.5	Importance of meiosis			
	3.1.7	Inheritance of genetic diseases			
	3.1.12	Advantages and disadvantages of genetic engineering (GMOs)			
6	3.3.15	Methods of domestic refuse disposal	6	9	15
	3.3.16	Differentiation of landfill and dump			
	3.3.22	Impact of environmental issues on humans			
Total			36	54	90

SPECIMEN 2026



TEST CODE **01253020**

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E X A M I N A T I O N**

HUMAN AND SOCIAL BIOLOGY

Paper 02 – General Proficiency

2 hours

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This examination paper consists of THREE sections. Each section consists of TWO questions.
2. Answer ALL questions.
3. Write your answers in the spaces provided in this booklet.
4. Do NOT write in the margins.
5. You may use a silent, non-programmable calculator to answer questions.
6. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
7. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

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NOTHING HAS BEEN OMITTED.

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Sequential Bar Code

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SECTION A

MODULE 1: ORGANISMS AND METABOLISM

Answer ALL questions in this section.

1. (a) In order to avoid suffering from malnutrition, our diets should consist of both micro-nutrients and macronutrients.

- (i) Define the term ‘malnutrition’.

.....
.....
.....

(2 marks)

- (ii) Name ONE macronutrient and ONE micronutrient found in foods.

Macronutrient

Micronutrient

(2 marks)

- (iii) Identify ONE healthy macronutrient food source that provides energy for the body.

.....

(1 mark)

- (iv) Identify ONE healthy micronutrient food source.

.....

(1 mark)

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- (b) Table 1 shows signs of deficiency diseases observed in four children at a health clinic.

TABLE 1: SIGNS OF DEFICIENCY DISEASES

Child	Signs
P	Swollen abdomen, thin limbs
Q	Frequent infections, poor wound healing
R	Thin body, poor muscle development
S	Poor night vision

From Table 1, identify

- (i) the disease from which Child P is MOST likely suffering

.....
(1 mark)

- (ii) the child who is MOST likely suffering from marasmus

.....
(1 mark)

- (iii) the nutrient that is lacking in the diets of Child Q and Child S.

Nutrient lacking in Child Q

Nutrient lacking in Child S
(2 marks)

- (v) Suggest TWO **other** ways in which malnutrition could affect the growth and development of children.

.....
.....
.....
.....
(2 marks)

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- (c) While doing trials for the school's basketball team, a group of secondary school students failed their health test. The students were told that some of them were suffering from malnutrition and so they decided to investigate the body mass index (BMI) of four students in the group.

Table 2 shows the height, mass and BMI of the four students.

TABLE 2: DATA COLLECTED ON STUDENT BMI

Student	Height (m)	Mass (kg)	BMI
A	1.60	52	20.3
B	1.68	74	26.2
C	1.72	60	20.3
D	1.58	44	17.6

The BMI categories are as follows.

- Underweight: less than 18.5
- Normal weight: 18.5–24.9
- Overweight: 25.0–29.9
- Obese: 30.0 and above

From Table 2,

- (i) identify the student who is underweight

.....
(1 mark)

- (ii) state the BMI category for Student B

.....
(1 mark)

- (iii) suggest ONE reason why BMI alone would not have been an accurate measure of health.

.....
.....
(1 mark)

Total 15 marks

GO ON TO THE NEXT PAGE

2. (a) (i) Define the term 'blood pressure'.

.....

.....

.....

.....

(2 marks)

- (ii) Differentiate between the terms 'systole' and 'diastole'.

.....

.....

.....

.....

(2 marks)

- (iii) Karen has a blood pressure reading of 120/80. Identify which number in the reading is the systole.

.....

(1 mark)

- (iv) State ONE **modifiable** risk factor for high blood pressure.

.....

(1 mark)

- (b) Peter's diet consists of fruits, grains, nuts and vegetables. James smokes heavily but is very careful with his diet and eats no meat. John has a diet that is rich in fats and processed foods.

Table 3 shows the blood pressure readings of Peter, James and John.

TABLE 3: BLOOD PRESSURE READINGS

Peter	James	John
120/80	140/90	225/160

- (i) Explain why James' blood pressure is lower than John's blood pressure, even though James smokes heavily.

.....

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(4 marks)

GO ON TO THE NEXT PAGE

- (ii) Since both James and John have elevated blood pressures, the doctor recommended that each of them do a fitness test which involves a stepping exercise. James' and John's initial heart rates were measured. They both exercised for four minutes and their heart rates were measured at one-minute intervals. Their heart rates were again measured every minute for three minutes after they stopped exercising. Table 4 shows the results of the fitness test.

TABLE 4: HEART RATES OF JAMES AND JOHN

Time/Minute	Heart Rate/Beats per minute	
	James	John
0	60	80
1	60	90
2	80	140
3	95	156
4	120	170
5	90	160
6	80	140
7	60	90

Describe the changes in John's heart rate.

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(2 marks)

- (iii) State how the changes in John's heart rate differ from those in James' heart rate.

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(1 mark)

- (iv) Explain why John's heart rate did NOT return to its basal rate and suggest ONE lifestyle change that he could make to improve his cardiac function.

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(2 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

SECTION B

MODULE 2: LIFE PROCESSES

Answer ALL questions in this section.

3. (a) Figure 1 is a diagram which shows a section through the female reproductive system.

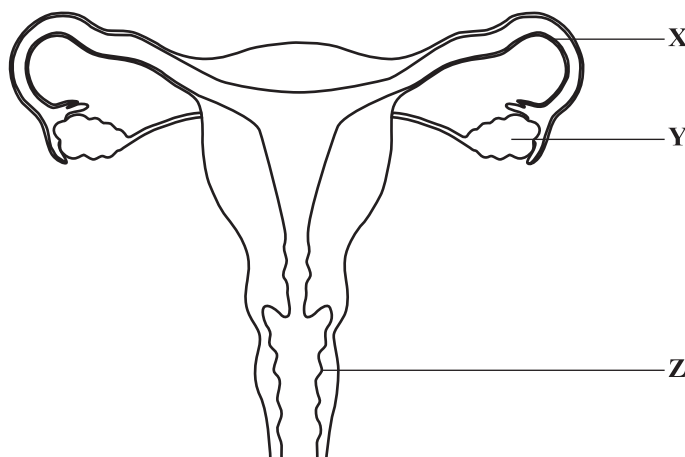


Figure 1. Section through the female reproductive system

- (i) Identify EACH of the structures labelled X, Y and Z in Figure 1.

Structure X

Structure Y

Structure Z

(3 marks)

- (ii) Name the TWO hormones produced in Structure Y in Figure 1 and state the function for which they are **both** responsible.

Hormones

Function

(3 marks)

- (b) Samantha and Patty were discussing contraceptive methods. Samantha said that condoms were the best type of contraceptive for an eighteen-year-old girl but Patty said the withdrawal method was more than adequate.

- (i) State which of the two contraceptive methods is more effective. Justify your response.

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(2 marks)

- (ii) Suggest THREE reasons why family planning is important.

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(3 marks)

GO ON TO THE NEXT PAGE

(c) Samantha's aunt was recently diagnosed with cervical cancer.

- (i) Suggest TWO risk factors that may have contributed to her aunt's development of cervical cancer.

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(2 marks)

- (ii) Recommend TWO ways in which the risk of cervical cancer can be reduced.

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(2 marks)

Total 15 marks

4. (a) Figure 2 is a diagram which shows the bones and joints of the human arm.

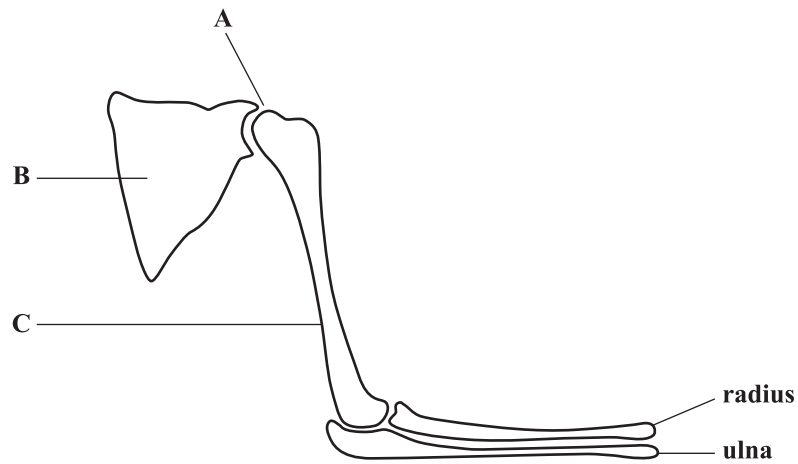


Figure 2. Diagram showing bones and joints of the human arm

From Figure 2,

- (i) identify the bones labelled B and C

Bone B

Bone C

(2 marks)

- (ii) name the type of joint found at A and state **another** area in the body at which this type of joint is found

Joint A

Other area of the body

(2 marks)

- (iii) state TWO types of movement that are possible at Joint A.

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(2 marks)

GO ON TO THE NEXT PAGE

- (b) During a cricket match, a player bends and then straightens his arm while bowling the ball.

- (i) Explain how the muscles in the arm work together to produce the movement at the elbow joint.

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(4 marks)

- (ii) State the term used to describe the way in which the muscles in the arm work together to produce the movement at the elbow joint.

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(1 mark)

- (iii) Explain how TWO named features of the elbow joint serve to make movement easier and reduce injury.

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(4 marks)

Total 15 marks

GO ON TO THE NEXT PAGE

SECTION C

MODULE 3: HEREDITY, DISEASES AND THE ENVIRONMENT

Answer ALL questions in this section.

5. (a) (i) State the location of the chromosomes in the cell during metaphase.

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(1 mark)

- (ii) Explain why a chromosome resembles an 'X' during metaphase.

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(2 marks)

- (b) Figure 3 is a diagram that shows the inheritance of a genetic disorder.

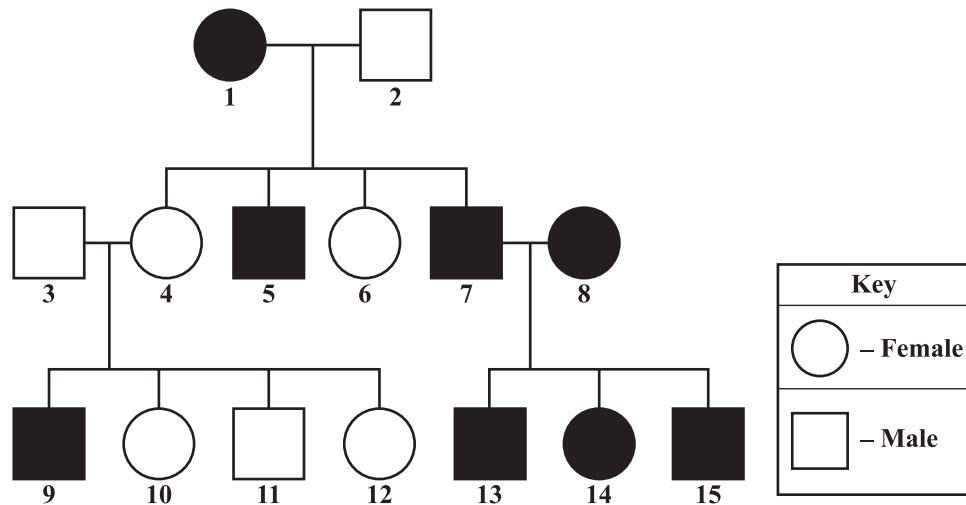


Figure 3. Diagram showing the inheritance of a genetic disorder

- (i) Identify the type of inheritance illustrated in the diagram in Figure 3.
-
- (1 mark)
- (ii) Identify, by number, ONE female in Figure 3 who has developed the disorder.
-
- (1 mark)
- (iii) State ONE **other** example of a genetic disorder that displays the type of inheritance depicted in Figure 3.
-
- (1 mark)

GO ON TO THE NEXT PAGE

- (c) (i) Many Caribbean farmers are opting to use genetically modified seeds to grow their crops. As a result, native forms of crops are becoming rare.

Outline TWO reasons why native crops are becoming rare due to the overuse of genetically modified seeds.

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(4 marks)

- (ii) State TWO reasons why a farmer would choose to plant genetically modified crops instead of native varieties.

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(2 marks)

GO ON TO THE NEXT PAGE

- (iii) Only a few companies worldwide are producing genetically modified seeds. Usually the seeds from the previous crop do not grow and the farmer has to purchase more seeds for the next year's crop.

Suggest THREE ethical concerns, regarding genetically modified seeds, of which the people of the Caribbean should be aware.

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(3 marks)

Total 15 marks

6. (a) (i) State TWO differences between a 'landfill' and a 'dump'.

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(4 marks)

- (ii) State TWO disadvantages of disposing solid waste in a dump.

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(2 marks)

GO ON TO THE NEXT PAGE

- (b) The village of St Joseph currently disposes of its solid waste in a dump and the village council is meeting to determine how to manage the village's solid waste problems. Figure 4 shows the components of the village's waste.

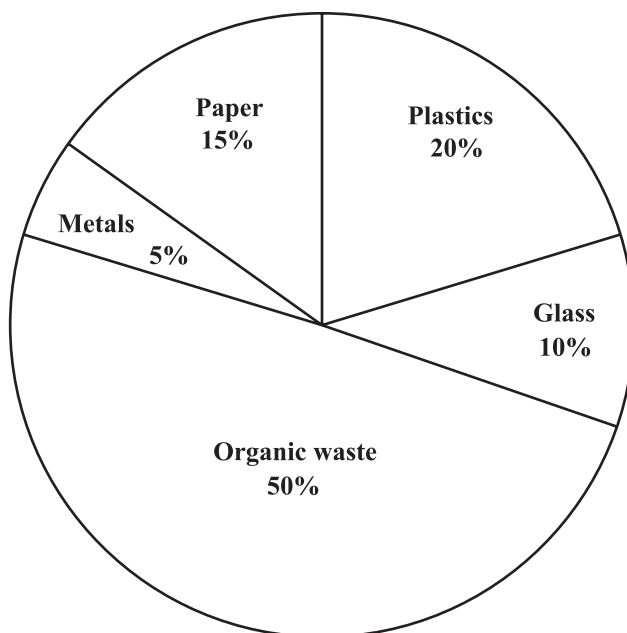


Figure 4. Solid waste components of the village of St Joseph

- (i) Outline THREE strategies that the council of St Joseph could implement to properly manage the village's solid waste.

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(6 marks)

GO ON TO THE NEXT PAGE

- (ii) Ramco Tyres has been fined by the village council for the burning of tyres. The company appeals the fine on the basis that it is on the outskirts of the village and therefore its activities do not significantly affect the neighbouring community.

Suggest THREE ways in which the burning of tyres could negatively affect the village.

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(3 marks)

Total 15 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

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HUMAN AND SOCIAL BIOLOGY

PAPER 02

SPECIMEN

KEY AND MARK SCHEME

- 2 -

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

SECTION A

MODULE 1: ORGANISMS AND METABOLISM

Question 1.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Definition of malnutrition: Malnutrition is a state of health that occurs when there is a lack of balance in the diet caused either by a shortage of certain nutrients (1) or by eating too many nutrients (1).	1 mark each to a maximum of 2	2	
(ii)	Macronutrient: Carbohydrates, fats, proteins. (Any 1) Micronutrient: Any one vitamin or mineral named. (1)	1 mark each	2	
(iii)	Any ONE ground provision identified, for example, yam, eddo, sweet potato. OR Any ONE grain identified, for example, oats, corn, barley, wheat, rice.	Any ONE, 1 mark	1	
(iv)	Any ONE fruit or vegetable source identified such as guava, mango, cabbage, carrots. OR Any ONE dairy source identified such as eggs, milk, cheese, butter.	Any ONE, 1 mark	1	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 1. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (i)	Kwashiorkor (1)	1 mark		1
(ii)	Child R (1)	1 mark		1
(iii)	Nutrient lacking in Child P – Vitamin C (1) Nutrient lacking in Child S – Vitamin A (1)	1 mark each		2
(iv)	Other ways in which malnutrition could affect the growth and development of children: • Stunted growth (1) • Delayed physical development (1) • Weakened immune system (1) • Poor brain development/learning difficulties (1) Accept any other reasonable response	Any TWO, 1 mark each		2
(c) (i)	Student D is underweight (1).	1 mark		1
(ii)	Student B is overweight (1).	1 mark		1
(iii)	Reasons why BMI alone may not have been an accurate measure of health: • BMI does not distinguish between muscle and fat (1). • Athletic individuals may be classified as overweight despite being healthy (1). • BMI does not consider age, sex, or body fat distribution (1).	Any ONE, 1 mark		1
Specific Objective: 1.2.1, 1.2.2, 1.2.4, 1.2.13, 1.2.14			6	9

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 2.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Blood pressure is the force needed (1) to pump blood to all parts of the body (1) .	1 mark each to a maximum of 2	2	
(ii)	Systole: Contractions of the heart chambers (1) . Diastole: Relaxation of the heart chambers (1) .	1 mark each	2	
(iii)	120 - systole (1)	1 mark	1	
(iv)	Modifiable risk factors for high blood pressure: • Lack of physical activity/exercise (1) • Stress • Smoking/tobacco use (1) • Abuse of alcohol (1) • High cholesterol (1) • Poor diet (high salt, high fat) (1) • Obesity (1)	Any ONE, 1 mark	1	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 2. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (i)	John's diet is rich in saturated fats (1) and high in salt (1) . These factors contribute to hardening of the walls of the arteries (1) in addition to plaque formation, (1) thus resulting in high blood pressure. Although James smokes, not eating meat means he has a lower risk of plaque formation (1) resulting in a lower blood pressure.	1 mark each to a maximum of 4		4
(ii)	John's heart rate increases (1) and at the end of the exercise, it does not return to its basal rate (1) .	1 mark each to a maximum of 2		2
(iii)	John's heart rate is consistently higher than James'/James' heart rate is consistently lower than John's (1) .	1 mark		1
(iv)	The possibility of John developing heart disease (1) may explain why his heart did not return to its basal heart rate. John can improve his diet (1) or begin an exercise program (1) .	1 mark for explanation 1 mark for lifestyle change		2
Specific Objective: 1.2.15, 1.3.7, 1.3.11			6	9

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HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

SECTION B

MODULE 2: LIFE PROCESSES

Question 3.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Structure X: Fallopian tube or oviduct (1) Structure Y - Ovary (1) Structure Z - Vagina (1)	1 mark each	3	
(ii)	Hormones: Oestrogen (1) Progesterone (1) Function: Helps thicken the lining of the uterus (1).	1 mark each	3	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 3. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (i)	Condoms (1) Reason: Condoms have a high percentage reliability rate as they provide a physical barrier to prevent sperm from entering the cervix (1).	1 mark each		2
(ii)	Reasons why family planning is important: • Family planning allows a woman to have a baby when her body is physically ready for it (1). • Family planning allows couples to be emotionally/psychologically ready before having a child (1). • Family planning allows individuals to complete education and pursue career goals (1). • Family planning allows families to plan financially for having a child (1). • Family planning allows parents to provide more time and emotional support for each child (1). • Family planning reduces strain on community/government resources (1). Accept any other reasonable response	Any THREE, 1 mark each		3

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 3. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(c) (i)	Risk factors that may have contributed to her aunt's development of cervical cancer: • Exposure to the human papillomavirus (1) • Having a weakened immune system (1) • Multiple sex partners (1) • Smoking (1) • Exposure to other STIs (1) • Having many children at an early age (1) • Long-term use of contraceptive pill (1) • Lack of regular screening (pap) (1) • Family history (1) Any other reasonable response	Any TWO, 1 mark each		2
(ii)	Ways in which the risk of cervical cancer can be reduced: • Regular cervical screening or pap smear (1) • Fidelity between sexual partners (1) • Use of condoms (1) • HPV vaccine (1) • Stop smoking (1) Accept any other reasonable response	Any TWO, 1 mark each		2
Specific Objective: 2.4.2, 2.4.3, 2.4.7, 2.4.8, 2.4.12, 2.4.14			6	9

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 4.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Bone B: Scapula (shoulder blade) (1) Bone C: Humerus (1)	1 mark each	2	
(ii)	Joint A: Ball-and-socket joint (1) Area of the body: Hip (1)	1 mark each	2	
(iii)	Types of movement that are possible at Joint A: • Flexion (1) • Extension (1) • Abduction (1) • Adduction (1) • Rotation (1) • Circumduction (1)	Any TWO, 1 mark each	2	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 4. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (i)	To pull the forearm upward, the biceps will contract (1) while the triceps relaxes (1) . To straighten the forearm, the triceps will contract (1) and the biceps will relax (1) ; this causes the arm to move.	1 mark each to a maximum of 4		4
(ii)	Antagonistic	1 mark		1
(iii)	How features of the elbow joint allow for ease of movement and reduction of injury: • Synovial fluid (1) lubricates the joint (1). • Synovial fluid (1) absorbs shock (1). • Articular cartilage (1) allows the bones to glide smoothly (1). • Articular cartilage (1) prevents bone ends from rubbing/prevents wear and tear (1).	Any TWO, 1 mark for feature 1 mark for explanation		4
Specific Objective: 2.2.1, 2.2.6, 2.2.7, 2.2.9			6	9

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HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

SECTION C

MODULE 3: HEREDITY, DISEASES AND THE ENVIRONMENT

Question 5.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	At the equator of the cell/ at the middle of the cell (1)	1 mark	1	
(ii)	Chromosomes are duplicated (1) and are held together at a central point by a centromere (1) .	2 marks	2	
(b) (i)	Type of inheritance: Sex-linked	1 mark		1
(ii)	Female 1, 8 or 14	1 mark		1
(iii)	Colour blindness, Haemophilia	1 mark	1	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 5. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(c) (i)	Reasons why native crops are becoming rare due to the overuse of genetically modified seeds: - Because GMOs can be grown under extreme conditions (1), they may outcompete native plants for resources (1). - If farmers are not growing native plants, fewer <u>viable</u> seeds will be produced (1) for the growth of subsequent crops (1). Accept any other reasonable response	Any TWO, 2 marks each		4
(ii)	Reasons why a farmer would choose GMOs instead of native varieties: GMOs: - Give a higher yield (1) - Are resistant to pests (1) - Can tolerate poor soil conditions (1) - Are drought resistant (1) - Produce crops where ripening is delayed (1) - May provide tastier fruits and vegetables (1)	Any TWO, 1 mark each	2	
(iii)	Since only a few companies are in control of our seeds, this means that - what we potentially grow is controlled by external entities/ there is weakened food security (1). - these companies can potentially control the cost of food/there is low supply, resulting in higher prices (1). - there is a reduction in the diversity of food (1).	Any THREE, 1 mark each		3
Specific Objective: 3.1.4, 3.1.5, 3.1.7, 3.1.12			6	9

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 6.

	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Differences between a landfill and a dump: - Landfills are lined (1) to prevent water contamination but dumps are not lined (1). - Landfills are covered with dirt (1) while dumps are found on the open ground (1). - Landfills contain nonhazardous waste (1) while dumps are a mixture of hazardous and nonhazardous waste (1).	Any TWO, 2 marks each	4	
(ii)	Disadvantages of disposing solid waste in a dump: - Contaminates groundwater - Provides home for vectors - Produces an unpleasant smell - Produces carbon dioxide and methane gas which contribute to global warming	Any TWO, 1 mark each	2	

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 6. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (i)	Strategies to manage the village's solid waste: • The council could implement a new waste disposal policy (1) which requires residents to sort their garbage at home into the categories of waste (1). • Residents could be encouraged to sort their waste (1) which could be collected by recycling companies or placed in appropriate recycling bins (1). • The council could also create a recycling policy (1) and impose fines and penalties for non-compliance (1). • Recycling bins could be placed at various locations within the village (1) to encourage the proper disposal of plastics, paper and metals (1). • Organic waste can be composted (1) and the compost sold or used for fertilizing the village's gardens/parks (1). • The council could impose a ban on Styrofoam products and plastic bottles (1) to reduce the volume of plastic waste generated (1). • The council could introduce an educational campaign (1) to teach residents to appreciate their environment/the importance of appropriate waste disposal (1). • The villagers could store organic waste such as used cooking oil (1) which could then be collected by the government and used in the production of biodiesel (1). Accept any other reasonable response	Any THREE, 2 marks each		6

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Question 6. (continued)

	Possible Answers	Instructions	Marks	
			KC	UK
(b) (ii)	Ways in which the company's activities could negatively affect the village: • Long-term exposure to the particles from the burning tyres could cause cancers in the residents. • The smoke from the burning tyres could irritate the respiratory system and trigger asthmatic attacks. • The smoke could contribute to acid rain. • The smoke could irritate the eyes, skin and mucous membranes of the villagers. • The smoke renders the atmosphere unpleasant. • The burning of tyres would introduce heavy metals into the village's environment. Accept any other reasonable response	Any THREE, 1 mark each		3
Specific Objective: 3.3.15, 3.3.16, 3.3.22			6	9

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HUMAN AND SOCIAL BIOLOGY - SPECIMEN PAPER

TABLE OF SPECIFICATIONS

Paper 032 – Case Study

Question Number	Specific Objectives	Mark
		UK
1 – 13	3.3.2, 3.3.3, 3.3.4, 3.3.7, 3.3.10, 3.3.11	40
Total		40

KC – Knowledge and Comprehension

UK – Use of Knowledge

SPECIMEN 2026



TEST CODE **01253032**

C A R I B B E A N E X A M I N A T I O N S C O U N C I L

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E X A M I N A T I O N**

HUMAN AND SOCIAL BIOLOGY

Paper 032 – General Proficiency

Alternative to School-Based Assessment

1 hour 15 minutes

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of a case study and THIRTEEN related questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You may use a silent, non-programmable calculator to answer questions.
5. You are advised to take some time to read through the paper and plan your answers.
6. If you need to rewrite any answer and there is not enough space to do so on the original page, you must use the extra lined page(s) provided at the back of this booklet. **Remember to draw a line through your original answer.**
7. **If you use the extra page(s), you MUST write the question number clearly in the box provided at the top of the extra page(s) and, where relevant, include the question part beside the answer.**

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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“*”Barcode Area”*”
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INSTRUCTIONS: The following case study contains information for a research project.
Read the case and answer the questions that follow each section.

CASE STUDY

Background

The town of Castries, located at the base of a mountain range, is usually supplied with water from a well. The well has run dry and an alternative water source is needed. The government is considering five rivers that run through the mountain range as potential sources of potable water. Each river differs primarily on land usage patterns as follows.

- The Chan Chich River flows through an area where there are many pig farms.
- The Black Bay River flows through an untouched forest, that is, it has not been disturbed in any way.
- The Caroni River flows through two other towns before reaching Castries.
- The Douce River flows through a deforested region where logging occurs.
- The Demerara River flows through agricultural land.

You are employed by the Government of Castries to investigate the quality of water in these rivers and to make a recommendation as to which river should be used to supply the town's water.

1. Write a suitable statement of the problem.

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(2 marks)

2. State the objective of the investigation.

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(2 marks)

GO ON TO THE NEXT PAGE

Methodology

In conducting your research, you tested the water in each river for the presence of the following contaminants: nitrates, phosphates, suspended sediments, *E. coli* bacteria.

3. Identify the primary method of data collection used in the study.

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(1 mark)

4. Describe the process by which the water in the rivers could be tested to determine the presence of *E. coli* bacteria.

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(8 marks)

5. State ONE limitation of the method of data collection used.

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(1 mark)

Presentation of Data

The results of the tests carried out on the water from each river are presented in Table 1.

TABLE 1: RESULTS OF TESTS OF WATER FROM RIVERS

Contaminant	River				
	Chan Chich	Black Bay	Caroni	Douce	Demerara
Nitrates (mg/L)	1.34	0.94	1.15	1.06	1.21
Phosphates (mg/L)	0.63	0.18	0.40	0.24	1.4
Total sedimentation suspension (mg/L)	19.36	7.3	15.55	31	24
<i>E. coli</i> colonies (per 100 mLs)	900	130	560	120	300

6. On the grid provided **on page 5**, using a scale of 2 cm to represent 100 mL, draw a bar graph of the data for *E. coli* colonies (per 100 mLs) presented in Table 1. (4 marks)
7. Suggest ONE **other** way in which the data could be presented.

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(1 mark)

[illegible]

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Analysis and Interpretation of Data

The acceptable levels of phosphates in potable water should NOT exceed 14 mg/L.

The acceptable levels of nitrates in potable water should NOT exceed 50 mg/L.

The acceptable levels of suspended sediments in potable water should NOT exceed 10 mg/L.

Table 2 categorizes the quality of river water by the number of colonies of *E. coli* bacteria per 100 mL.

TABLE 2: QUALITY OF RIVER WATER BASED ON NUMBER OF *E. COLI* COLONIES

Category	Number of Colonies of <i>E. coli</i> bacteria per 100 mL
Excellent	0–49
Good	50–99
Fair	100–199
Intermediate	200–299
Poor	> = 300

8. Using the information in Table 1 and Table 2, complete Table 3 by using a tick (✓) to indicate where the levels of contaminants in EACH river meet acceptable levels.

TABLE 3: RIVER PROFILES OF ACCEPTABLE LEVELS OF CONTAMINANTS

Contaminant	Chan Chich River	Black Bay River	Caroni River	Douce River	Demerara River
Nitrates					
Phosphates					
Total suspended sediments					
<i>E. coli</i> bacteria					

(5 marks)

GO ON TO THE NEXT PAGE

9. (a) (i) Identify the river which has the HIGHEST level of *E. coli* bacteria present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

- (ii) Identify the river which has the HIGHEST level of suspended sediments present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

- (iii) Identify the river which has the HIGHEST level of phosphates and nitrates present in the water and suggest ONE likely reason for this occurrence.

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(2 marks)

- (b) In the river with high levels of nitrates and phosphates, eutrophication is likely to occur. Suggest ONE social and ONE economic implication for the town of Castries.

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(2 marks)

GO ON TO THE NEXT PAGE

Recommendations and Conclusion

10. Recommend, to the Government of Castries, the river that would be BEST suited to provide potable water to the town. Justify your recommendation.

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(3 marks)

11. Suggest ONE **other** river that the Government of Castries could utilize to provide the town with potable water. Justify your recommendation.

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(3 marks)

12. Suggest ONE **other** way in which the waterways of Castries could be improved.

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(1 mark)

13. State ONE conclusion that can be drawn from the research.

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(1 mark)

Total 40 marks

END OF TEST

IF YOU FINISH BEFORE TIME IS CALLED, CHECK YOUR WORK ON THIS TEST.

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HUMAN AND SOCIAL BIOLOGY

PAPER 032

SPECIMEN

KEY AND MARK SCHEME

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Specific Objectives: 3.3.2, 3.3.3, 3.3.4, 3.3.7, 3.3.10, 3.3.11

Background1. Problem statement:

Human activity **(1)** affects the quality of river water **(1)**.

1 mark for each point

(2 marks)

2. Research objective/Aim of the investigation:

To determine the quality of water in each of the five rivers in the town of Castries **(1)** for suitable sources of potable water **(1)**.

Aim is related to the problem statement (1) and is precise (1).

(2 marks)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Methodology3. Method used to collect the data:

The data was collected primarily using experimentation.

1 mark for the method stated

(1 mark)

4. Steps to test river water for *E. coli*:

1. Obtain samples of the water from each of the five rivers **(1)**.
2. Using a sterilized inoculating loop or swab **(1)**, transfer a sample of water from one river to an Agar plate, making zigzag streaks across the surface of the Agar **(1)**.
3. Close the lid of the plate as quickly as possible to avoid contamination **(1)**.
4. Secure the lid with adhesive tape **(1)**.
5. Incubate at 25° for 48 hours **(1)**.
6. Observe and count the number of *E. coli* colonies **(1)**.
7. Repeat Steps 2 - 6 using samples from the other rivers **(1)**.

1 mark for EACH point given

(1 × 8 = 8 marks)

5. Limitation of data collection method:

The data collected is dependent on the time of year it was collected, that is, wet vs dry season.

1 mark for the limitation stated

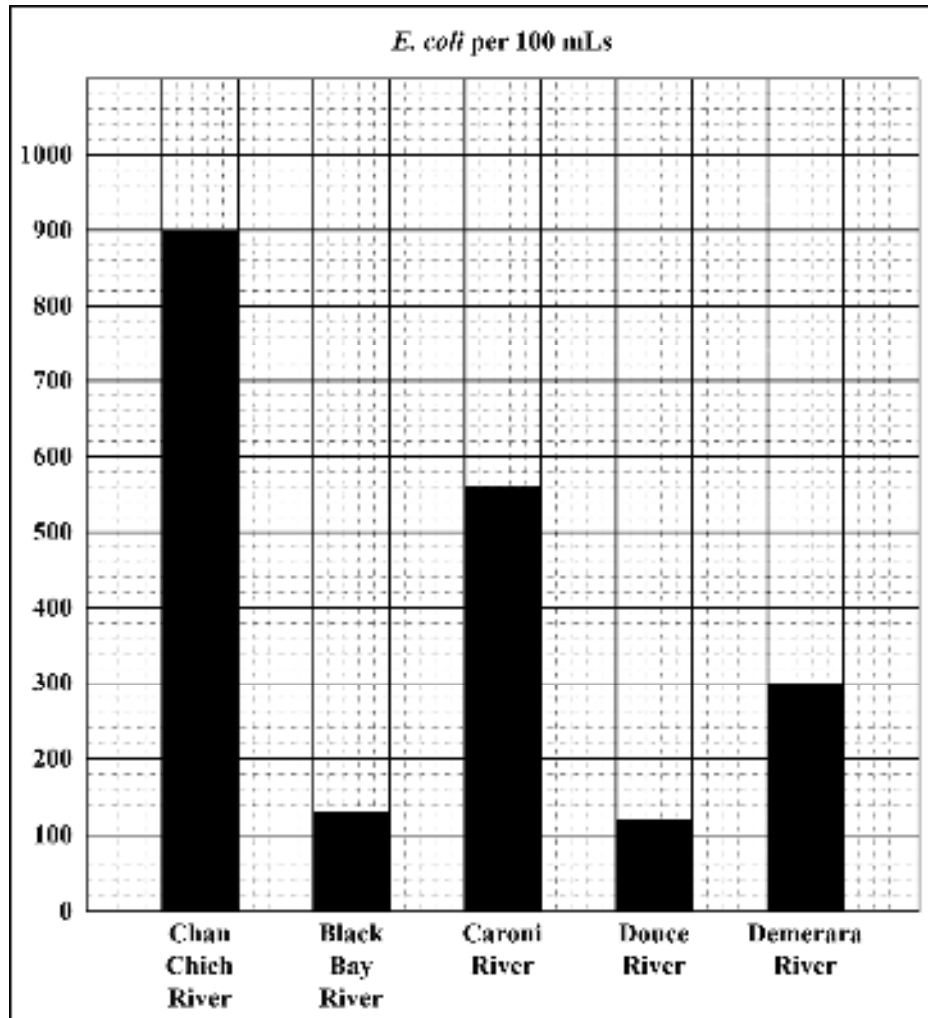
(1 mark)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Presentation of Data

6.



- Axes correctly labelled (2)
- Bars drawn correctly: all 4 - 5 correct (2)
1 - 3 bars correct (1)

(4 marks)

7. Other way the data could be presented:

The data could be presented using a line graph.

1 mark for the other way suggested

(1 mark)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Analysis and Interpretation of Data8. River profiles of acceptable levels of contaminants

Contaminant	Chan Chich River	Black Bay River	Caroni River	Douce River	Demerara River
Nitrates	✓	✓	✓	✓	✓
Phosphates	✓	✓	✓	✓	✓
Total Suspended Sediments		✓			
<i>E. coli</i> bacteria		✓		✓	

1 mark for each correct river profile

(1 × 5 = 5 marks)

HUMAN AND SOCIAL BIOLOGY

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9. (a) (i) River which has the HIGHEST level of *E. coli* bacteria present in the water, with reason:

The Chan Chich river **(1)** since it runs through a pig farm and large amounts of faecal matter, which contains *E. coli*, is likely to be washed into the river. **(1)**

1 mark for identifying the river

1 mark for a reason

- (ii) River which has the HIGHEST level of suspended sediments present in the water, with justification:

The Douce river **(1)** since it runs through a deforested area and there will be higher levels of soil erosion and these particles are likely to be washed into the river **(1)**.

1 mark for identifying the river

1 mark for a reason

- (iii) River which has the HIGHEST levels of phosphates and nitrates present in the water, with reason:

The Demerara river **(1)** since it runs through agricultural land and fertilizers which contain nitrates and phosphates are likely to be washed into the river **(1)**.

1 mark for identifying the river

1 mark for a reason

(2 × 3 = 6 marks)

- (b) River with high levels of nitrates and phosphates, in which eutrophication is likely to occur:

Economic implications

- Reduction in income from activities such as fishing as the fish die out in significant proportions
- Increase in healthcare costs as algae produce toxins that make the water unsafe

Social implications

- Loss of tourism since recreational activities that usually take place on the river can no longer occur because the water is toxic
- Loss of local aesthetics as a result of the breakdown of the quality of the environment

1 mark for an economic implication +

1 mark for a social implication

(2 marks)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Recommendations and Conclusion

10. River that would be BEST suited to provide potable water to Castries, with reasons:

The Black Bay River **(1)** is best recommended to supply the town of Castries with potable drinking water. This is because this river has the least amount of the four contaminants of the rivers investigated **(1)**. Therefore, it will be less expensive for the government to produce potable water from that river. **(1)**

1 mark for naming river +

2 marks for complete justification

(3 marks)

11. ONE **other** river that the Government of Castries could utilize to provide the town with potable water:

The Douce River **(1)** because it has three out of four contaminants present at acceptable levels **(1)**. The only contaminant at an unacceptable level (suspended sediments) is relatively easy to remove **(1)**.

1 mark for naming river +

2 marks for complete justification

(3 marks)

12. Ways in which the waterways of Castries could be improved:

- Move pig farms further away from the river.
- Regulate logging activities to reduce deforestation.
- In the urban areas, ensure that sewage systems are properly functioning.

1 mark for a plausible recommendation

(1 mark)

13. Conclusion that could be drawn from the research:

- The Black Bay and Douce rivers are suitable sources of potable water for the town **(1)**.
- The Chan Chi, Caroni or Demara rivers are of poor quality and are not suitable sources of potable water for the town **(1)**.

(1 mark)

Total 40 marks



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