CARIBBEAN EXAMINATIONS COUNCIL

CSEC® Human and Social Biology

SYLLABUS
SPECIMEN PAPER
MARK SCHEME
SUBJECT REPORTS

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CSEC® Human and Social Biology Free Resources

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Human and Social Biology

Human and Social Biology is concerned with the study of the structure and functioning of the human body. It also involves the application of biological principles, knowledge and skills, and technological advances, to the maintenance of health and to solve the problems of living together. 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 is designed to allow students to work individually and cooperatively, utilizing theoretical concepts of the course in interactive and practical activities. Students are expected to apply investigative and problem-solving skills, be effective in communicating scientific knowledge and demonstrate an appreciation for all living organisms in their environment.

The syllabus is organised under five main sections:

- Section 1 Living Organisms and the Environment
- Section 2 Life Processes
- Section 3 Heredity and Variation
- Section 4 Disease and its Impact on Humans
- Section 5 The Impact of Health Practices on the Environment

CARIBBEAN EXAMINATIONS COUNCIL

Caribbean Secondary Education Certificate®

SYLLABUS

HUMAN AND SOCIAL BIOLOGY

CXC 35/G/SYLL 20

Effective for examinations from May–June 2022

CSEC®

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NOTE TO TEACHERS AND LEARNERS

This document *CXC 35/G/SYLL 21* replaces *CXC 35/G/SYLL 09 issued in 2009*. Please note that the syllabus was revised and amendments are indicated by italics.

First Issued 2004
Revised 2009
Revised 2020
Amended 2022

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 the ways in which the human body functions, of the interdependence of living things, and of the ways in which the total environment functions to support life on earth in all its forms. This will aid in making intelligent decisions on matters at home, at work or in society, which routinely affect their health and, therefore, 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 will facilitate 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 in their environment.

The **CSEC®** syllabus in Human and Social Biology provides Caribbean students with a foundation for further study in fields where an understanding of the structure and function of the human body and the application of biological principles to the maintenance of health *are needed*. It also helps to provide students with knowledge, skills and attitudes that are important for maintaining a healthy lifestyle and creates an awareness of the social determinants of disease prevention and control. *This syllabus will also prepare students for careers in 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, learn 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 about the interdependence of living things as they live in harmony with the environment;

3. develop competencies that will enable students to adopt healthy lifestyles;

4. create an 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 an awareness of technological advances, integrate information, communication and technology (ICT); and,

8. provide a foundation for further study and specialised training for *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.

♦ ORGANISATION OF THE SYLLABUS

The syllabus is organised under five main sections:

Section A - Living organisms and the environment.

Section B - Life processes.

Section C - Heredity and variation.

Section D - *Diseases and their impact on humans*.

Section E - The impact of health practices on the environment.

**Denotes Specific Objectives that are suitable for practical work. The practical activities for the Specific Objectives highlighted are listed at Appendix 11. The practical activities need not be limited to these objectives.*

♦ APPROACHES TO TEACHING THE SYLLABUS

It is recommended that Section A be taught first. Teachers should introduce concepts familiar to the students and ensure that their lessons stimulate the use of all of the senses during the teaching and learning process. This will help students view science as a dynamic and exciting 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*.

♦ 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.

♦ DEFINITION OF PROFILE DIMENSIONS

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)

Knowledge	The ability to: identify, remember, and grasp the meaning of basic facts, concepts and principles;
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;
Evaluation	make reasoned judgements and recommendations based on the value of ideas, information and their implications.

♦ FORMAT OF THE EXAMINATION

Candidates will be required to take Paper 01, Paper 02 and Paper 031 or 032.

Paper 01
(1 hour 15 minutes)

Sixty multiple-choice items drawn from all areas of the syllabus.

Paper 02
(2 hours)

Six compulsory questions divided into two sections.

Section A - four compulsory structured questions drawn from all areas of the syllabus. One question will be *a data analysis type question*. Each question is worth 15 marks.

Section B - two compulsory structured essay questions drawn from all areas of the syllabus. These questions will incorporate authentic scenarios to allow candidates to demonstrate knowledge gleaned through experiential learning. Each question is worth 15 marks.

School-Based Assessment (SBA)

Paper 031

The School-Based Assessment will take the form of a research project. *Candidates will be required to conduct research on a current health-related or environmental issue and its socio-economic impacts in their territory. Details of the project are provided on pages 34 – 38.*

Paper 032
(1 hour 15 mins)

Alternative to the School-Based Assessment is for private candidates only. This written paper will take the form of a case study and related questions and will examine the same skills as those tested in Paper 031.

MARK AND WEIGHTING ALLOCATION BY PAPERS AND PROFILE DIMENSIONS

Profile Dimension	Paper 01	Paper 02	Paper 031 SBA	Paper 032 *Alternative to SBA*	Total
Knowledge and Comprehension (KC)	60	36 [40]	-	-	96 [100]
Use of Knowledge (UK)	-	54 [60]	40	40	94 [100]
TOTAL RAW [WEIGHTED] MARKS	60	90 [100]	40	40	190 [200]
TOTAL %	30	50	20	20	100

♦ REGULATIONS FOR PRIVATE CANDIDATES

1. *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 EITHER Paper 031 OR Paper 032.*

2. *Paper 032 is designed for candidates whose work cannot be monitored by tutors in recognised educational and private institutions. The Paper will be of one hour duration and will consist of two questions.*

3. *Candidates entered for the examination through private institutions and who opt to sit the SBA component, Paper 031 must note the following:*

   (a) *Candidates' work must be monitored by tutors in the institution and given feedback before the final assessment of that component. Tutors must also monitor candidates' project to determine the veracity of work submitted. Tutors should not accept projects which were not monitored during development. The marks recorded in the two components will be collated to form the final SBA mark for submission by April 30, in the year of the examination.*

   (b) *Marks must be submitted to the Caribbean Examinations Council on the School-Based Assessment forms provided online. The forms should be submitted electronically via the SBA data capture module on the Online Registration System (ORS) on the Council's website. Candidates who do not fulfil the requirements for the School-Based Assessment will be reported as "ungraded".*

   (c) *Candidates as well as tutors must retain a copy of the completed component as part of their portfolio.*

♦ REGULATIONS FOR RESIT CANDIDATES

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

*For **CSEC®** candidates, SBA scores can be carried forward only ONCE and only during the year immediately following the first sitting and they may reuse any moderated score. Candidates reusing SBA scores should register as "Resit candidates" and must provide the previous candidate number when registering.*

♦ REGULATIONS FOR THE JANUARY SITTING

1. *All candidates sitting **CSEC®** Human and Social Biology at the January examination for the first time MUST write Paper 032.*

2. *There is no SBA option (Paper 031) available for January candidates.*

♦ SECTION A: LIVING ORGANISMS AND THE ENVIRONMENT

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; and,

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.

SPECIFIC OBJECTIVES	EXPLANATORY NOTES
Students should be able to:	
1. describe the characteristics of living organisms;	*Include* nutrition, respiration, excretion, growth, irritability, movement, reproduction. *(Link to Specific Objective B1.27)*
2. * compare the structures of an unspecialised plant and animal cell and selected microbes;	*Include* basic structure of unspecialised *plant and animal cells* and microbes. *Include labelled diagrams of plant and animal cells and microbes which include:* *(i) virus;* *(ii) bacteria; and,* *(iii) fungi.* (Link to Specific Objective D7).
3. state the functions of cell structures *and organelles*;	*Include* cell wall, cell membrane, nucleus, ribosomes, cytoplasm, mitochondria, vacuoles, chloroplasts, endoplasmic reticulum.
4. relate the structure of selected cells to their function;	Include distinguishing features of epithelial, sperm, egg, nerve, muscle and connective tissue cells. Include labelled diagrams.
5. * explain the importance of cell specialisation in humans;	Relate cell differentiation and specialization to the function of the organism as a whole: include cellular organisation and examples of tissues, organs and organ systems.

SECTION A: LIVING ORGANISMS AND THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
6.	*explain the importance of passive and active transport in living systems;*	*Include definition of passive transport (simple diffusion, osmosis) and active transport;* Comparison among *simple* diffusion, osmosis and active transport; *Include* examples of osmosis, *simple* diffusion and active transport occurring in plants and animals. (Link to Specific Objectives B 1.24, B1.26 and *B3.1*).
7.	*conduct simple investigations on osmosis and diffusion;	
8.	explain the process of photosynthesis;	*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.* **Light and dark reactions not required.**
9.	**investigate the effect of light and chlorophyll on the production of starch;*	*Simple starch test on variegated and non-variegated leaves.*
10.	explain the ways in which other living organisms depend on plants directly or indirectly for food;	*Include plants as producers; human beings' dependence on plants directly or indirectly for food.*
11.	*explain the principles of a food chain and food web;*	*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); 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.*
12.	* construct a food chain and food web from a selected habitat; and,	*Include* terrestrial and aquatic (marine and fresh water) habitats.

SECTION A: LIVING ORGANISMS AND THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES	EXPLANATORY NOTES
13. describe the recycling of carbon in nature.	Include the importance of recycling carbon in nature; Carbon cycle: (a) the importance of CO_2 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) *discuss the impact of global warming on the well-being of humans.*

Suggested Teaching and Learning Activities

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

1. Arrange for students to create *charts, models, diagrams, infographics or presentations* on plants and animal cells, microbes *and the carbon cycle*.
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. *Have students discuss ways in which they can reduce their negative carbon footprints/negative impact on the environment.*
6. Use video presentations and computer-assisted learning *tools* to enhance learning.

♦ SECTION B: LIFE PROCESSESS

GENERAL OBJECTIVES

On completion of this section, students should:

1. understand the role of nutrition in helping humans to obtain their energy and satisfy their physical needs;
2. understand that respiration is the means by which energy is made available for carrying out life processes;
3. understand the role of transport and defence in humans;
4. understand the mechanisms of movement and appreciate its role(s) in humans;
5. understand the process by which humans get rid of metabolic waste and maintain homeostasis;
6. understand that humans detect and respond to changes in their external and internal environment; and,
7. understand the processes by which life is perpetuated.

1. NUTRITION

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
1.1	*distinguish between macro and micro nutrients;*	*Include definitions and examples of macronutrients and micronutrients.*
1.2	*discuss* the *functions* of *macro* nutrients;	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*.
1 . 3	*discuss* the *functions of* micronutrients;	Vitamin A, B_1, 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.*

SECTION B: LIFE PROCESSESS (cont'd)

NUTRITION (cont'd)

	SPECIFIC OBJECTIVES	EXPLANATORY NOTES
	Students should be able to:	
1.4	state the cause, symptoms and treatment of deficiency diseases;	Night blindness, *iron- deficiency* anaemia, rickets, *and goitre*.
1.5	classify vitamins as fat or water soluble;	(a) Fat soluble - A, D, E *and* K (b) Water soluble - B, C.
1.6	* perform tests to distinguish among food nutrients;	Starch, reducing sugars, non-reducing sugars, protein and fat. (Link to Specific Objective A8).
1.7	state the functions of water in the body;	Include water as a solvent for hydrolysis and as a transport medium.
1.8	explain the role of dietary fibre in the body;	Including the link between fibre and obesity.
1.9	describe the causes and effects of constipation and diarrhoea;	Including proper hygiene in the preparation of food. [Link to Specific Objectives A2 and *D5* (cholera, gastroenteritis)].
1.10	discuss the importance of a balanced diet;	*Must include definition, food groups, the effects of age, sex and occupation on dietary needs.*
1.11	*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). Include the sources and effects of hidden salt.
1.12	determine Body Mass Index (BMI);	$\frac{Weight\ (kg)}{Height\ (m)^2}$ *Include determination of waist circumference; use of BMI and waist circumference to categorize obesity; factors and implications of obesity.* *(Link to Specific Objectives B3.6, B3.11 and D9).*

SECTION B: LIFE PROCESSESS (cont'd)

NUTRITION (cont'd)

	SPECIFIC OBJECTIVES Students should be able to:	EXPLANATORY NOTES
1.13	use tables, charts and graphs to represent data on nutrition;	Include the prevalence and trends of childhood obesity in Caribbean countries. *Include construction and interpretation of tables, graphs and charts*.
1.14	relate the types of teeth present in an infant and an adult human to their roles;	Include labelling of diagrams of teeth.
1.15	explain the importance of teeth in the process of digestion;	*(Link to Specific Objective B1.24).*
1.16	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*.
1.17	state the causes of tooth decay;	Include the effects of sugar-sweetened beverages (through sugar and carbonation) on tooth decay.
1.18	describe the process of tooth decay;	Include conversion of food into acids by bacteria.
1.19	outline guidelines for the care of the teeth;	Include flossing, brushing at least twice daily, fluoridation, dental check-ups bi-annually and diet.
1.20	explain the properties, role and importance of enzymes involved in digestion;	Include site of production.
1.21	* 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*.
1.22	identify the various structures of the digestive system;	*Include labelling of diagrams of digestive system.*
1.23	relate the structures of the digestive system to their functions;	

SECTION B: LIFE PROCESSESS (cont'd)

NUTRITION (cont'd)

	SPECIFIC OBJECTIVES	EXPLANATORY NOTES
	Students should be able to:	
1.24	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 *A6*).
1.25	*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.
1.26	*relate the structure of a villus to the function of absorption;*	Include labelling of diagram. (Link to Specific Objective *A6*).
1.27	distinguish between egestion and excretion.	*(Link to Specific Objective B5.1).*
2.	**THE RESPIRATORY SYSTEM**	
	Students should be able to:	
2.1	explain the importance of breathing in humans;	
2.2	relate the structures of the respiratory tract to their functions;	Include labelling of diagram of respiratory system.
2.3	*describe the breathing mechanism;	*Include the effects of changes in the volume of the chest cavity on internal air pressure.* Demonstrate using a model.
2.4	*outline the factors affecting *the* rate of breathing;	Exercise, smoking, anxiety, drugs, environmental factors, altitude, weight/obesity. *(Link to Specific Objective D4)*.
2.5	explain the concept of vital capacity;	Interpretation of graphical representation required.

SECTION B: LIFE PROCESSESS (cont'd)

THE RESPIRATORY SYSTEM (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
2.6	distinguish between gaseous exchange and breathing;	Inclusion of gaseous exchange in the alveoli; include labelling of diagram of alveolus.
2.7	identify characteristics common to gaseous exchange surfaces;	Include large and moist surface area and thin membranes; copious blood supply.
2.8	differentiate between aerobic and anaerobic respiration;	*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.
2.9	explain the role of adenosine diphosphate (ADP) and adenosine triphosphate (ATP) in the transfer of energy;	Adenosine triphosphate as the energy currency of the cell.
2.10	*describe* the technique of *Cardiopulmonary Resuscitation (CPR)*;	Include disposal device for applying mouth-to-mouth resuscitation.
2.11	*discuss* the effects of smoking; and,	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. (Link to Specific Objectives D11 and D22)
2.12	use tables, graphs and charts to represent data on the respiratory system.	Construction and interpretation of tables, graphs and charts.

SECTION B: LIFE PROCESSESS (cont'd)

3. THE CIRCULATORY SYSTEM

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
3.1	explain the need for a transport system in the human body;	Include the limitations of simple diffusion; the relationship between surface area and volume. *(Link to Specific Objective A6).*
3.2	identify the materials which need to be transported around the human body;	*Nutrients, gases, hormones, antibodies, blood proteins and metabolic waste products.*
3.3	*relate the components of the blood to its function;*	Plasma, serum, red blood cells, white blood cells, platelets. Differentiation between plasma and serum.
3.4	relate the structures of red blood cells, phagocytes and lymphocytes to their functions;	Include labelling of diagrams.
3.5	*relate the structures of the arteries, veins and capillaries to their functions;*	*Include labelling of diagrams; thickness of walls, size of lumen, presence or absence of valves.*
3.6	*relate the structures of the heart to their functions;*	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;
3.7	*explain the concept of blood pressure;*	*Systole and diastole.* *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.* *(Link to Specific Objectives B1.11, B1.12 and D9).*
3.8	*describe the structure and function of the circulatory system in humans;*	*Pulmonary versus systemic circulation.*

THE CIRCULATORY SYSTEM (cont'd)

	SPECIFIC OBJECTIVES	EXPLANATORY NOTES
	Students should be able to:	
3.9	*discuss blood groups;*	Include A, B, AB and O: antigen and antibody for each group, precaution in transfusion and handling; Rh factor risk in pregnancy and precautions.
3.10	explain the process and the importance of blood clotting;	*Role of platelets, calcium ions, Vitamin K, thromboplastin, prothrombin, thrombin, fibrinogen and fibrin.* (Link to Specific Objective *C6* [haemophilia]).
3.11	*discuss the causes and effects of heart diseases;*	*Include hypertension (high blood pressure), atherosclerosis, coronary thrombosis, and obesity.* *(Link to Specific Objectives B3.7 and D9).*
3.12	use tables, charts and graphs to represent data on diseases of the circulatory system;	*Construction and interpretation of tables, graphs and charts.*
3.13	describe the structure and function of the lymphatic system; and,	Include the role of tissue fluid and lymph; location and function of lymph nodes.
3.14	describe how tissue fluid and lymph are formed.	Differentiation between tissue fluid and lymph. Include labelling of diagrams.

4. SKELETAL SYSTEM

	Students should be able to:	
4.1	identify the major bones of the skeleton;	Cranium, clavicle, scapula, vertebral column, humerus, radius, ulna, *carpals, metacarpals*, rib cage, sternum, pelvic girdle, femur, tibia, fibula, *patella, tarsals, metatarsals and phalanges*.
4.2	relate the structure of the skeleton to its functions;	Movement, *locomotion*, protection, support, breathing, production of blood cells, *storage of minerals*.

SECTION B: LIFE PROCESSESS (cont'd)

SKELETAL SYSTEM (cont'd)

	SPECIFIC OBJECTIVES	EXPLANATORY NOTES
	Students should be able to:	
4.3	relate the structure of a *long* bone to its functions;	*Include the labelling of diagram (internal and external view).*
4.4	distinguish between bone and cartilage;	*Include characteristics and functions.*
4.5	distinguish between tendons and ligaments;	*Include characteristics and functions.*
4.6	*discuss the types of joints;*	*Include definition.* *Types, location and characteristics of joints - hinge, fixed, synovial and ball and socket.* Include labelling of diagrams.
4.7	*describe movement in the hinge and ball and socket joints;*	*Include flexion and extension.*
4.8	discuss the three types of muscles;	Include location and function of cardiac, skeletal and smooth muscles.
4.9	explain how skeletal muscles function in the movement of a limb;	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. *(Link to Specific Objective B4.7).*
4.10	identify the biceps and triceps of the upper arm;	Include labelling of diagrams; points of origin (location and definition); points of insertion (location and definition).
4.11	explain the importance of locomotion to man; and,	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.
4.12	evaluate the factors which adversely affect the skeletal system.	Include posture and inappropriate foot-wear to the activity, lifting heavy objects.

5. EXCRETION AND HOMEOSTASIS

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
5.1	*discuss* the importance of excretion in human beings;	Include definition of excretion. (Link to Specific Objective B1.27).
5.2	explain the roles of the organs involved in excretion;	Lungs, skin and kidney; *Include* examples of metabolic wastes.
5.3	relate the structures of the kidney to their function;	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*. *(Link to Specific Objective B3.7)*.
5.4	relate the structures of the skin to their functions;	*Include dermis, epidermis, adipose tissue, sweat glands, erector muscles, hair, hair follicles, nerve endings and capillaries.* Include labelling of diagrams.
5.5	explain the concept of homeostasis;	*Include a definition and examples.*
5.6	explain the concept of feedback mechanisms;	Include positive and negative feedback and give examples.
5.7	*discuss* the regulation of blood sugar;	Role of insulin and glucagon. *(Link to Specific Objective D9).*
5.8	explain the regulation of water;	Include the role of Anti-diuretic hormone (ADH).
5.9	distinguish between heat and temperature; and,	
5.10	*discuss* the regulation of temperature.	Include vasodilation and vasoconstriction. *Include diagrams.* *(Link to Specific Objectives B5.4 and B5.6).*

SECTION B: LIFE PROCESSESS (cont'd)

5. COORDINATION AND CONTROL

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
6.1	describe the main divisions of the nervous system;	Central nervous system – the brain, and spinal cord. Peripheral nervous system: spinal nerves and cranial nerves, and autonomic nervous system.
6.2	*distinguish between a neurone and a nerve;*	*Include definitions;* *Properties of neurones; irritability; conductivity; structures of neurones: cell- bodies, axons and dendrites.* *Include labelling of diagrams.*
6.3	*explain the functions of motor and sensory neurones and spinal synapses;*	*Include labelling of types of neurones (motor, relay, sensory), and their functions.* *Include labelling of synapses.* *Include examples and functions of chemical transmitters.*
6.4	*describe the functions of the parts of the brain*	*Cerebrum, cerebellum, medulla oblongata, hypothalamus, pituitary gland.*
6.5	*describe the mechanisms of a reflex action;	*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.
6.6	explain the process by which voluntary actions occur;	*Include a* definition; transmission of nerve impulses; involvement of neurones in the brain, spinal cord and effector muscles.
6.7	distinguish between a voluntary and involuntary action;	Include examples of these actions.
6.8	explain the response of the sense organs to stimuli;	*Include the names* of sense organs and stimuli to which they respond.

SECTION B: LIFE PROCESSESS (cont'd)

COORDINATION AND CONTROL (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
6.9	relate the internal structures of the eye to their functions;	*Include labelling of the diagram of the eye (internal view).*
6.10	explain how images are formed in the eye;	Include labelling of diagrams.
6.11	explain accommodation in the eye;	*Include the role of ciliary muscle and the suspensory ligaments.*
6.12	*discuss* the causes of, and corrective measures for eye defects and diseases;	*Include myopia (short sightedness) and hyperopia/hypermetropia (long sightedness) and astigmatism, glaucoma, and cataracts.* Include effect of diabetes on eyesight. *(Link to Specific Objective D9).* Include labelling of diagrams.
6.13	*compare and contrast endocrine (hormonal) and nervous control systems*;	
6.14	identify the sites of hormone production; and,	*Include labelling of location of endocrine glands*.
6.15	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; *Adrenal glands* – adrenaline; Ovary - oestrogen, progesterone; Testes – testosterone. *(Link to Specific Objectives B5.7, B5.8, B6.13, B7.3 and D9).*

7. REPRODUCTIVE SYSTEM

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
7.1	distinguish between sexual and asexual reproduction;	Sexual: meiosis, gametes, variation in offspring, two individuals involved. Asexual: mitosis, identical offspring, one individual involved. *(Link to Specific Objectives C3 and C5).*
7.2	describe the structure and function of the reproductive systems in human beings;	Include the structures and adaptation of the gametes, related disorders such as ovarian, cervical and prostate cancers. *Include labelled diagram of systems.* *(Link to Specific Objective D10).*
7.3	describe the menstrual cycle;	*Include the use of* diagram for illustration; role of hormones: follicle stimulating hormone (FSH), luteinising hormone (LH), oestrogen, progesterone. (Link to Specific Objective B6.15).
7.4	explain ovulation, fertilisation, implantation and development of the embryo;	*Include* diagram of foetus/fetus in uterus; role of placenta, umbilical cord, amniotic sac *and amniotic fluid;* **Minute details of stages of development are not required.**
7.5	describe the stages of the birth process;	Stage 1: contraction, dilation. Stage 2: *contraction,* crowning, expulsion of foetus/fetus. Stage 3: *contraction*, expulsion of the placenta. Include the role of oxytocin.
7.6	discuss pre-natal/ante-natal and post-natal care for mother and baby;	Include the advantages of breastfeeding, immunisation, medical visits, proper diet; *Include* conditions associated with the use of drugs, alcohol and smoking.

(Link to Specific Objective D22).

SECTION B: LIFE PROCESSESS (cont'd)

REPRODUCTIVE SYSTEM (cont'd)

	SPECIFIC OBJECTIVES	EXPLANATORY NOTES
	Students should be able to:	
7.7	explain how birth control methods prevent pregnancy;	*Include* natural, barrier, hormonal and surgical *methods*.
7.8	*discuss* the advantages and disadvantages of birth control methods;	
7.9	discuss the issues related to abortion;	Include spontaneous abortion (miscarriage); *reasons for;* advantages and disadvantages and *ethical concerns*.
7.10	*discuss* the importance of family planning; and,	*Include* social and economic implications.
7.11	use tables, charts and diagrams to represent data on diseases of the reproductive system.	*Construction and interpretation of tables, graphs, and charts.*

Suggested Teaching and Learning Activities

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

1. Teachers should present authentic scenarios for students to discuss. For example, a family with different age groups and suggested meals; different *groups of* women and suggested contraceptives.

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. 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.

SECTION B: LIFE PROCESSESS (cont'd)

7. *Have students visit websites such as http://sciencespot.net/ to better understand the mechanism for blood typing.*

8. *Arrange for students to view audio visuals, computer-assisted learning for reinforcement of content.*

9. Draw and use charts, models, *infographs, and concept maps* to assist students with learning of the structures of different organs *and processes*.

10. 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.

11. *Have a display of the methods of contraception, to include demonstrations where possible.*

12. Arrange for students to view displays of specimens of bones, the heart, kidney, stomach, and *digestive system* of animals. A convenient source is the local butcher.

13. Conduct demonstrations *or show simulations* of dissections or examination of specimens, for example, eye or brain.

14. Demonstrate the effects of light in the eye, that is, pupil and spinal reflex. Use of the pin hole camera.

15. Conduct research on the impact of diet on health and the effects of smoking especially in the Caribbean.

16. 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.

17. Invite personnel from the Red Cross Society or other health personnel to demonstrate *Cardiopulmonary Resuscitation (CPR).*

18. Obtain graphs/data, which depict the prevalence of obesity, smoking, hypertension, and diabetes and analyse them.

19. Obtain data on modifiable risk factors and determine their link to the incidence of obesity, hypertension, diabetes, and cardiovascular diseases.

20. Have students create model *of* arms to demonstrate the working of antagonistic muscles.

21. Use flow charts to illustrate processes such as regulation of body temperature, glucose concentration in blood and osmoregulation.

22. Organise a science fair and invite members of *the* school population or immediate community to view students' displays.

23. Conduct laboratory activities.

♦ SECTION C: HEREDITY AND VARIATION

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; and,*

4. *appreciate the social and ethical implications of genetic engineering.*

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
1.	*distinguish among DNA, chromosomes, genes and alleles;	*Include the definitions of genetic terms.* Haploid as the 'n' number of chromosomes. Diploid as the '2n' number of chromosomes.
2.	*describe the process of mitosis;	*Include the definition of mitosis; movement of chromosomes during mitosis (include names of stages); labelling of diagrams.*
3.	explain the importance of mitosis;	*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.
4.	*describe the process of meiosis;	*Include* the definition of meiosis; movement and separation of homologous chromosomes and the subsequent separation of chromatids (*include names of stages*); labelling of diagrams.
5.	explain the importance of meiosis;	*Include the* importance of halving the chromosome number (haploid) in the formation of gametes; importance of meiosis in introducing variation into gametes. *(Link to Specific Objective B7.1).*

SECTION C: HEREDITY AND VARIATION (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
6.	explain the inheritance of a single pair of characteristics (monohybrid inheritance);	*Include* dominant, recessive, homozygous, heterozygous, genotype and phenotype. *Monohybrid inheritance to include: albinism and tongue rolling.* *Include the use of the Punnett Square to determine genotypic and phenotypic ratios obtained from crossing homozygous and heterozygous parental and genotypes.*
7.	describe the inheritance of sex in human beings;	Include the role of sex chromosomes *in determining sex and the inheritance of genetic diseases.* *Include genetic diagrams for sex-linkage (haemophilia and colour blindness).*
8.	*explain why genetic variation is important to living organisms;	*Include* examples of variation - height, weight, *sex*, blood type, tongue rolling; antibiotic-resistant bacteria.
9.	distinguish between genetic variation and environmental variation;	Include the difference between continuous and discontinuous variation; Mutation, (Down Syndrome, *Klinefelter's, Turner's Syndrome,* and albinism).
10.	discuss natural selection;	Include the development of antibiotic-resistant bacteria; *the prevalence* of sickle cell anaemia in people of African descent.
11.	explain the concept of genetic engineering;	*Include the definition and examples.*
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.*
13.	use tables, charts and graphs to represent data on heredity and variation.	*Construction and interpretation of tables, graphs and charts.*

SECTION C: HEREDITY AND VARIATION (cont'd)

Suggested Teaching and Learning Activities

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

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.

♦ SECTION D: DISEASES AND *THEIR* IMPACT ON HUMANS

GENERAL OBJECTIVES

On completion of this section, students should:

1. understand the basic concepts of human well-being and disease; and,
2. appreciate the social and economic importance of disease control.

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
1.	define the terms health and disease;	*Include the World Health Organisation (WHO)* definition.
2.	*classify the types of diseases*;	*Include* communicable/pathogenic/infectious diseases: sexually transmitted infections (STIs), fungal infections, and vector-borne diseases. *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).
3.	differentiate between signs and symptoms of diseases;	*Include the definitions and examples of signs and symptoms of diseases.*
4.	*discuss respiratory diseases;*	*Include asthma, influenza and bronchitis;* *Include causes, signs/symptoms, treatment, modality, prevention and the effect of these diseases on the respiratory tract.* *(Link to Specific Objectives B2.4 and B2.11).*
5.	*discuss gastrointestinal diseases;*	*Include cholera and gastroenteritis;* *Include causes, signs/symptoms, treatment, modality and prevention of these gastrointestinal diseases.* *(Link to Specific Objective B1.9)*

SECTION D: DISEASES AND *THEIR* IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
6.	*discuss sexually transmitted infections (STIs);*	*Include gonorrhoea, syphilis, Human Papillomavirus (HPV), herpes, and chlamydia.* *Include causes, signs/symptoms, treatment, modality and prevention of these sexually transmitted infections (STIs).*
7.	*discuss Human Immuno deficiency Virus/Acquired Immune Deficiency Syndrome (HIV/AIDS);*	*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.*
8.	*describe the effects of sexually transmitted infections (STIs) on the pregnant mother and the foetus/fetus;*	*Include gonorrhoea, syphilis, and herpes.*
9.	*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;* *Include causes, signs/symptoms, treatment, modality and prevention of these diseases.* *Include the importance of diet and exercise.* *(Link to Specific Objectives B1.12 and B3.11).*
10.	*discuss cancers;*	*Include cancers associated with respiratory tract; cervical, breast, ovarian, uterine, colon and prostate.* *Include causes, signs/symptoms, treatment, modality and reduction of the risk of these cancers.*
11.	discuss the impact of diseases on the human population;	Include socio-economic implications. *Include definitions of epidemic and pandemic.* *Include how NCDs affect personal productivity; assess how these affect goal- setting, occupation, and exercise.*

SECTION D: DISEASES AND *THEIR* IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES	EXPLANATORY NOTES
Students should be able to:	
12. *discuss* the effect of vectors on human health;	*Include the definition and examples of vectors (rats, mosquitoes, houseflies).* Include transmission of pathogen. *Analysis and interpretation of data.*
13. describe the life cycle of the mosquito and housefly;	Include labelling of diagrams.
14. *discuss mosquito-borne diseases;*	*Include malaria, dengue (strains I - IV), Zika, chikungunya.* *Include signs, symptoms, causative agent, method of transmission, prevention/control, and treatment of mosquito-borne diseases.*
15. 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.
16. *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.* *(Link to Specific Objectives B1.19 and B7.2).*
17. 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.
18. distinguish between disinfectants and antiseptics;	*Include* definitions.
19. explain the use of common antibiotics and antifungal agents;	*Include definitions and functions* of antibiotics, antigen, antibody, anti-toxin. (Link to Specific Objective C8).

SECTION D: DISEASES AND *THEIR* IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
20.	*explain the types of immunity;*	*Include artificial (active and passive); natural (active and passive). (Link to Specific Objective B3.3).*
21.	*distinguish between immunity and immunisation; vaccine and vaccination;*	*Include definition of terms.*
22.	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. (Link to Specific Objective B2.11).
23.	explain the social and economic effects of drug misuse on the individual, family and community; and,	Analysis and interpretation of data. *(Link to Specific Objective B2.11).*
24.	use tables, graphs and charts to represent data on *diseases and their* impact on human beings.	*Construction and interpretation of tables, graphs and charts.*

Suggested Teaching and Learning Activities

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

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. For example, STIs, HIV/AIDS.*
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, infographs, and pamphlets.

♦ SECTION E: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT

GENERAL OBJECTIVES

On completion of this section, students should:

1. appreciate the nature of the relationship between human beings and their environment;
2. understand that the environment is fragile and there is need to preserve it; and,
3. appreciate the contribution of modern technology to the maintenance of good health.

SPECIFIC OBJECTIVES	EXPLANATORY NOTES
Students should be able to:	
1. identify pollutants in the environment;	*Include* definition of pollution and pollutant; including domestic, industrial (thermal, heavy metals, dumping of oils) and agricultural pollutants.
2. discuss the causes of water and air pollution;	Include combustion, improper disposal of sewage.
3. describe the effects of pollutants on human beings and the environment;	Include eutrophication; social and economic effects. Analysis and interpretation of data. (Link to Specific Objective B2.4, *B5.2*).
4. explain the methods of controlling pollution;	*To include methods of controlling water, air, noise and land pollution. For example, the use of renewable energy sources*.
5. describe the water cycle;	Include evaporation, condensation, run-off, transpiration, respiration *and* filtration through the layers of limestone. Include labelling of diagrams.
6. describe simple ways of purifying water in the home;	*Include* boiling, purification tablets and addition of chlorine/bleach.
7. *describe the process of testing water for bacteria;*	Include use of Agar plate. Include labelling of diagrams.

SECTION E: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES	EXPLANATORY NOTES
Students should be able to:	
8. describe the processes involved in large-scale water purification;	*Include* screening, sedimentation, filtration, chlorination. Include labelling of diagrams.
9. discuss the impact of human activities on water supplies;	(Link to Specific Objective E2).
10. explain why contaminated water is detrimental to human beings;	*(Link to Specific Objective D5).*
11. distinguish between proper and improper sewage disposal practices;	(Link to Specific Objective E2).
12. *discuss* the impact of improper sewage disposal practices;	
13. *outline the methods used for the treatment of sewage;*	*Include biological filter and activated sludge methods.* *Include the importance of screening and filtration.* *Include the role of microorganisms in the treatment of sewage.*
14. evaluate the efficiency of the methods of domestic refuse disposal;	Include composting, separation of waste, bio-diesel, dumping, burning, garbage collection. *Include ethical considerations.* Analysis and interpretation of data.
15. differentiate between a dump and a landfill;	
16. describe the operations at a landfill;	Include a description of a landfill.
17. discuss the importance of landfills in the Caribbean;	Include the function of landfill.

SECTION E: THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES		EXPLANATORY NOTES
Students should be able to:		
18.	evaluate the impact of solid waste on the environment;	Analysis and interpretation of data.
19.	analyse measures used to control solid waste volume;	*Include* reduce, reuse and recycle; examples of recyclable materials. Include operations at a recycling centre.
20.	distinguish between the terms biodegradable and non-biodegradable; and,	Include classification of biodegradable and non-biodegradable items.
21.	*discuss the impact of environmental issues on humans.*	*Include food security, land security and health as it relates to environmental issues (for example, global warming).* *(Link to Specific Objective A13).*
22.	use tables, charts and graphs to represent data on the impact of health practices on the environment.	*Construction and interpretation of tables, graphs and charts.*

Suggested Teaching and Learning Activities

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

1. *Arrange visits to landfills, sewage treatment, water treatment and recycling plants*.
2. Assign students to conduct research on landfills, sewage treatment plants and water treatment plants.
3. 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.
4. Conduct brainstorming and discussion sessions to ascertain students' knowledge on topics.
5. Use charts, *models* and other audio-visual aids to assist students with learning the processes involved in water treatment and sewage treatment.
6. *Have students engage in panel discussions or debates on ethical behaviours in managing garbage disposal.*
7. Use video presentations and computer-assisted learning *tools* to enhance learning.

♦ GUIDELINES FOR THE CONDUCT OF THE SCHOOL-BASED ASSESSMENT IN HUMAN AND SOCIAL BIOLOGY

School-Based Assessment (SBA) 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 activities for the School-Based Assessment should form part of the learning activities to enable the student to achieve the objectives of the syllabus. Group work is encouraged.

During this course of study, students obtain marks for the competencies they develop and demonstrate in undertaking their SBA assignments. These marks contribute to the final marks and grades that are awarded to students for their performance in the examination.

The guidelines provided in this syllabus for selecting appropriate tasks are intended to assist teachers and students in the selection of assignments that are valid for the purpose of School-Based Assessment. The guidelines provided for the assessment of these assignments are intended to assist teachers in awarding marks that are reliable estimates of the achievement of students in the School-Based Assessment component of the course. In order to ensure that the scores awarded by the teachers are consistent with the Caribbean Examinations Council's standards, the Council undertakes the moderation of a sample of the SBA assignments marked by each teacher.

School-Based Assessment provides an opportunity to individualise a part of the curriculum to meet the needs of students. It facilitates feedback to the student at various stages of the experience. This helps to build the self-confidence of students as they proceed with their studies. The SBA also facilitates the development of critical skills and abilities and enhances the validity of the examination scores on which candidate performance is reported. School-Based Assessment, therefore, makes a significant and unique contribution to both the development of relevant skills and the testing and rewarding of students for the development of those skills. The guidelines provided in this syllabus are intended to assist students and teachers in undertaking the SBA.

RESEARCH PROJECT

The School-Based Assessment component of the Human and Social Biology Syllabus is a single guided research project for school candidates.

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.*

SBA REQUIREMENTS

All candidates who enter for the **CSEC®** Human and Social Biology examination **must** submit an *individual* report on a project. *While* students may work individually or in *small* groups *ranging from 3-5* to **gather data, given** *the nature of the subject, if candidates work in groups, it is important that* each *member of the group does his/her own write up and submission. Note also where candidates work in groups each group member must be identified on the cover page of the report.* The report should not exceed 1,000 words, excluding bibliography, charts, graphs, tables, pictures, references and appendices. Wherever a report exceeds the maximum length for the project by more than 150 words, the teacher must impose a penalty of 10 per cent of the score achieved on the project. On the report, the teacher should clearly indicate the original score – that is, the score before the deduction is made – the marks which are to be deducted, and the final score awarded after the deduction has been made. Only the final score is to be indicated on the record sheets which are submitted to **CXC®** electronically via the SBA data capture module on the Online Registration System (ORS) on the Council's website.

FORMAT OF THE REPORT

A student's report should be presented electronically and 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 to be applied to the Use of Knowledge (UK) profile. 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)**
1. Background/Overview of Issue	***(2)***
• *Provides a clear, detailed description of a current health-related or environmental issue*	***2***
• *Description is detailed but lacks clarity*	***1***
2. Problem Statement	***(2)***
• *Research problem is stated clearly*	*1*
• *Research problem is in an appropriate form – an observation or question*	*1*
3. Research Objective	***(2)***
• *Objective of the research is linked to the issue*	*1*
• *Objective of the research is realistic/feasible*	*1*
4. Methodology	***(8)***
• *Sample used is identified and clearly described*	*2*
• *Data collection instrument is identified and clearly described*	*2*
• *Method of data collection is identified and clearly described*	*2*
• *Method of data collection is adequately justified*	*1*
• *ONE limitation of data collection method clearly stated*	*1*
5. Presentation of Data	***(5)***
• *Data is presented in an appropriate form using tables, graphs and charts*	*1*
• *Data is presented in at least TWO forms*	*2*
• *Form(s) used for presentation of data is correctly labelled*	*1*
• *Data presented are accurate*	*1*

ASSESSMENT CRITERIA	PROFILE Use of Knowledge (UK)
6. Analysis and Interpretation of Data	**(5)**
• *Data is analyzed using appropriate calculations/statistics/themes*	*1*
• *Data is summarized accurately*	*1*
• *At least TWO statements of findings based on data presented*	*2*
• *Findings are consistent with analyses*	*1*
7. Conclusion	**(2)**
• *Conclusion succinctly summarizes the project*	*1*
• *Conclusion is logical and based on findings*	*1*
8. Recommendations	**(4)**
• *At least TWO recommendations proposed*	*2*
• *Recommendations are realistic*	*1*
• *Recommendations are informed by findings*	*1*
9. Reflection: *Candidate states the following information:*	**(6)**
• *TWO lessons learnt after undertaking the project.*	*2*
• *ONE way in which the lesson learnt could be applied to his/her personal life.*	*1*
• *ONE way in which the project could be improved.*	*1*
• *ONE social impact and ONE economic impact the issue could have on his/her school or community if not rectified.*	*2*
10. Overall Presentation	**(4)**
• *Layout of report follows the correct format inclusive of cover page, table of contents, bibliography and appendices* ***If layout includes only two elements – 1 mark only***	*2* *1*
• *Bibliographic information contains names of authors, publishers and dates of publication*	*1*
• *Consistent use of correct spelling and grammar*	
TOTAL	**40**

MANAGEMENT OF THE PROJECT

The research project is worth 20% of the candidate's total mark. *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.*

School-Based Assessment tasks 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.

Planning

An early start to planning project work is highly recommended. A schedule of the dates for submitting project work (agreed by both teachers and candidates) should be established.

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.

GUIDELINES FOR THE ALTERNATIVE TO SCHOOL-BASED ASSESSMENT

Paper 032 is the Alternative to School-Based Assessment (SBA) of the **CXC®** examination in Human and Social Biology. Paper 01 is a multiple-choice paper and Paper 02 is a structured essay paper. Paper 031 is the SBA for school candidates and Paper 032 is for private candidates only.

The Alternative to the School-Based Assessment in Human and Social Biology (Paper 032), takes the form of a written examination. This paper will consist of a case study and related questions involving a health related issue in a named Caribbean territory.

Please note that candidates taking Paper 032 are NOT required to submit a report.

MODERATION OF SCHOOL-BASED ASSESSMENT

School-Based Assessment Record Sheets are available on the **CXC®**'s website (www.cxc.org). All School-Based Assessment Record of marks must be submitted online using the SBA data capture module of the Online Registration System (ORS). A sample of assignments will be requested by **CXC®** for moderation purposes. These assignments will be reassessed by **CXC®** Examiners who moderate the School-Based Assessment. Teachers' marks may be adjusted as a result of moderation. The Examiners' comments will be sent to schools.

Copies of the students' assignment that are not submitted must be retained by the school until three months after publication by **CXC®** of the examination results.

♦ 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.

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

Websites

Sections	Topic	URLS
A: Living Organisms and the Environment	Structure of the cell Osmosis, diffusions, and Active transport	https://www.cellsalive.com/StudyAids.htm https://www.centreofthecell.org/learn-play/games/explore-a-cell/ 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
B: Life processes	Nervous system Digestive System	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/ https://digestivesystemwebinquiry.weebly.com/group-activities.html https://wartgames.com/themes/humanbody/digestivesystem.html https://classroom.kidshealth.org/classroom/prekto2/body/systems/digestive.pdf
C: Heredity and Variation	Basic Genetics	https://www.biologyjunction.com/biology_games.htm https://learn.genetics.utah.edu/content/basics/
D: Disease and Their Impact on Humans		Infectious disease activity: https://www.windows2universe.org/?page=/teacher_resources/infectious_disease.html Mosquito-borne disease: https://www.hhmi.org/biointeractive/stopping-mosquito-borne-disease Malaria: https://www.hhmi.org/biointeractive/stopping-mosquito-borne-disease Infection prevention: http://www.pkids.org/infection_protection/infectious_disease_workshop.html Cancer basics: https://www.cancer.org/cancer/cancer-basics.html What is cancer? http://www.scholastic.com/browse/article.jsp?id=3751444 Games - drug use and effects https://teens.drugabuse.gov/games https://www.educationworld.com/a_tech/archives/webquest.shtml

E: The Impact of Health Practices on the Environment	Human impact on the environment	https://www.teachertube.com/video/human-impact-on-the-environment-gcse-biology-293011 Air pollution: https://kidsenvirohealth.nlm.nih.gov/generic/2/games 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.	(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.	

APPENDIX II

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) *or prepared slides.*
	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 PROCESSESS	1.6	• Starch: Iodine Test. • Protein: Biuret Test (sodium hydroxide and copper sulfate 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	*Construct models of the stages of mitosis.*
	4	*Construct models of the stages of meiosis.*
	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 cm3 (graduated)*
2. *Beakers 250 cm^3 (graduated)*
3. *Bell jars with bungs*
4. *Bottles (reagent), assorted*
5. *Bunsen Burners*
6. *Borers, cork*
7. *Charts and models*
   - *(a) Eye, human*
   - *(b) Skeleton, human*
   - *(c) Skin, human*
   - *(d) Female and male reproductive systems, pregnancy*
   - *(e) Respiratory system*
   - *(f) Digestive system*
   - *(g) Circulatory system*
   - *(h) Excretory system*
   - *(i) Cell structure*
   - *(j) Cell division – mitosis and meiosis*
8. *Coverslips or cover glasses*
9. *Measuring Cylinders (assorted)*
10. *Petri Dishes*
11. *Watch glasses*
12. *Conical Flasks, 250 ml*
13. *Filter Funnels (assorted)*
14. *Forceps*
15. *Test tubes*
16. *Test tube brushes*
17. *Test tube holders*
18. *Test tube racks*
19. *Knives or scalpels*
20. *Hand lenses*
21. *Microscope, light. Magnification x 40 objective, x 10 eyepiece*
22. *Plane mirrors*
23. *Refrigerator, small*
24. *Metre rules*
25. *Scissors*
26. *Microscope slides*
27. *Retort stands with clamps*
28. *Tripod stands*
29. *Stop Clocks*
30. *Stoppers or bungs, assorted cork, rubber*
31. *Measuring tapes*
32. *Thermometers, -10 to 110^{O}C (Spirit)*
33. *Boiling tubes*
34. *Tubing (glass), assorted*
35. *Tubes, Y-piece connector*
36. *Tubing (rubber), normal and heavy wall*
37. *Wire Gauzes, with insulated centers*
38. *Spatulas*
39. *Dissecting pan and mat*

♦ *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
29 August 2022

CARIBBEAN EXAMINATIONS COUNCIL

Caribbean Secondary Education Certificate®
CSEC®

HUMAN AND SOCIAL BIOLOGY

Specimen Papers and Mark Schemes/Keys

Specimen Paper: - Paper 01
Paper 02
Paper 032

Mark Scheme and Key: - Paper 01
Paper 02
Paper 032

TEST CODE **01253010**

SPEC 2019/01253010

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

HUMAN AND SOCIAL BIOLOGY

SPECIMEN PAPER

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.

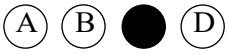
4. On your answer sheet, find the number which corresponds to your item and shade the space having the same letter as the answer you have chosen. Look at the sample item below.

   Sample Item

   Abnormally high blood pressure is called

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

   Sample Answer

   The correct 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.

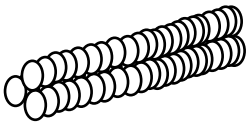
DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO.

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

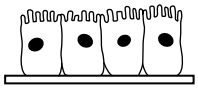
(A) Nucleus
(B) Lysosome
(C) Cytoplasm
(D) Chloroplast

2. Which of the following specialized cells is found in the gut?

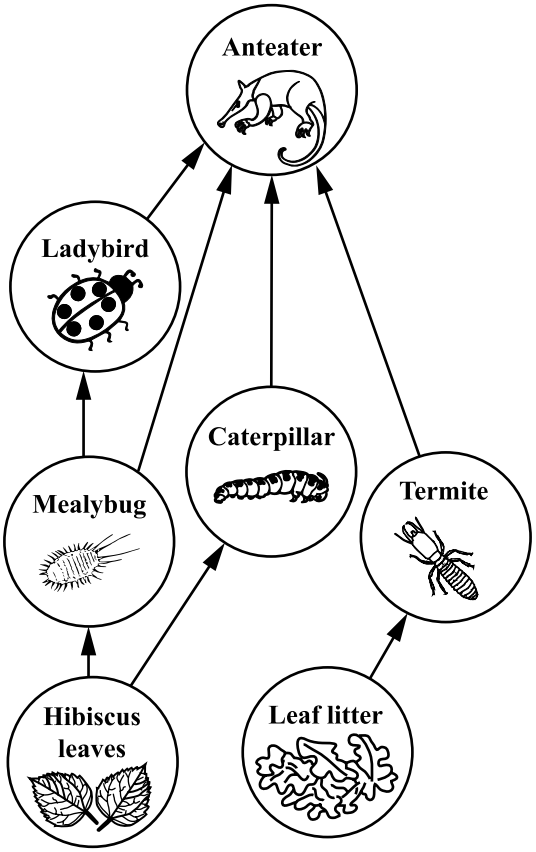
(A) 

(B) 

(C) 

(D) 

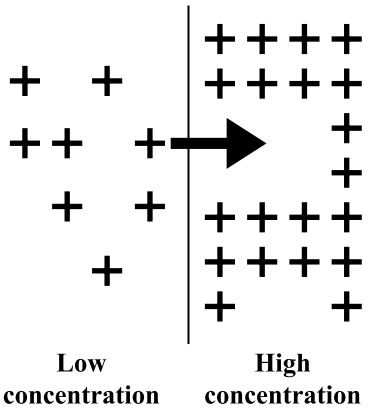
Item **3** refers to the following food web which shows the feeding relationships for animals in a forest.



3. 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.

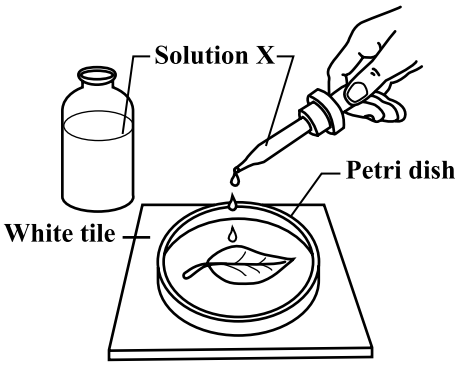
Item **4** refers to the following diagram which shows a process that occurs in the human body.



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

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

Item **5** refers to the following diagram which shows the final step involved in testing for the presence of starch in a leaf.



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

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

6. 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

7. Which of the following vitamins is classified as water soluble?

(A) A
(B) D
(C) C
(D) K

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

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

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

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

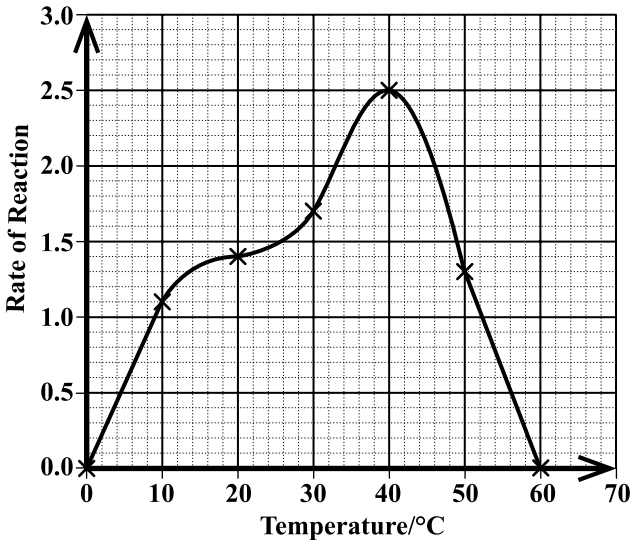
10. Which of the following teeth, present in children and adults, is responsible for grinding food into smaller pieces?

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

11. 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

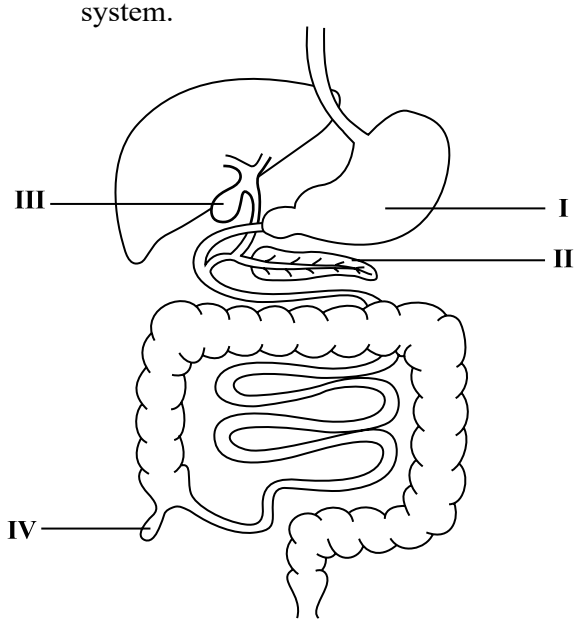
Item **12** refers to the following graph which shows how the rate of reaction varies with temperature for a certain enzyme.



12. Which of the following conclusions can be deduced from the graph above?

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

Item **13** refers to the following diagram which shows the organs of the digestive system.



13. Which of the labelled organs above is the pancreas?

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

14. A villus is BEST 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

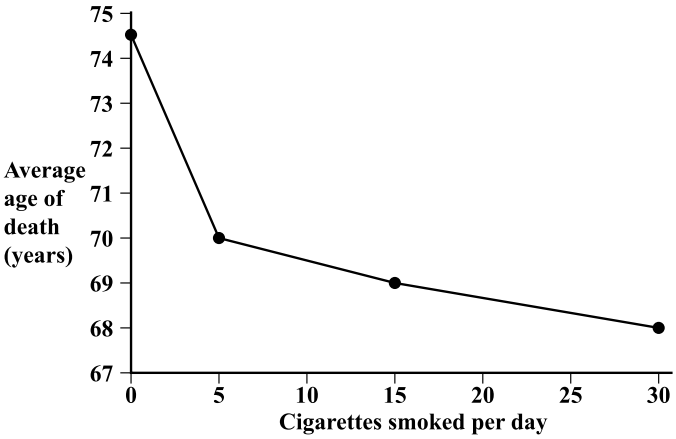
15. In which of the following organs does chemical digestion occur **only**?

(A) Mouth
(B) Stomach
(C) Small intestine
(D) Large intestine

16. Which of the following factors may NOT affect the breathing rate of an individual?

(A) Drugs
(B) Height
(C) Weight
(D) High altitudes

Items **17–18** refer to the following graph which shows the relationship between the average age of death and the number of cigarettes smoked per day.



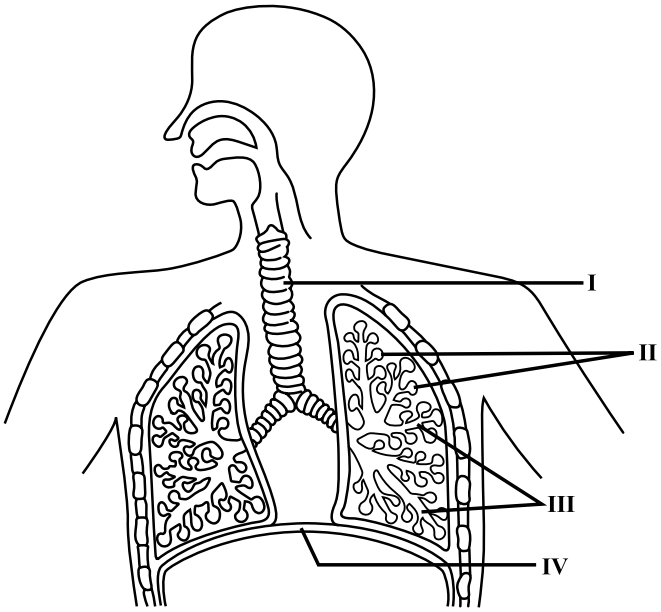
17. If an individual died at 70 years old, how many cigarettes did he/she smoke per day?

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

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

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

Item **19** refers to the following diagram which shows the structures of the human respiratory system.



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

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

---

20. Which chamber of the heart has the **thickest** wall?

(A) Left atrium
(B) Right atrium
(C) Left ventricle
(D) Right ventricle

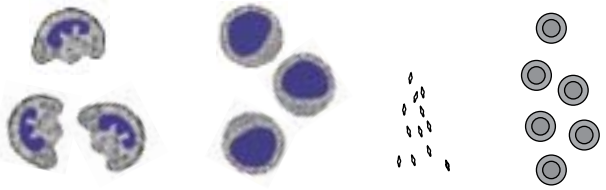
21. Systolic pressure is defined as the

(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

22. 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

Item **23** refers to the following diagrams which show four components of the blood.



Q **R** **S** **T**

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

	Q	R	S	T
(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

---

24. The role of an artificial pacemaker is to

(A) control the heartbeat
(B) initiate the heartbeat
(C) speed up the heartbeat
(D) slow down the heartbeat

25. 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

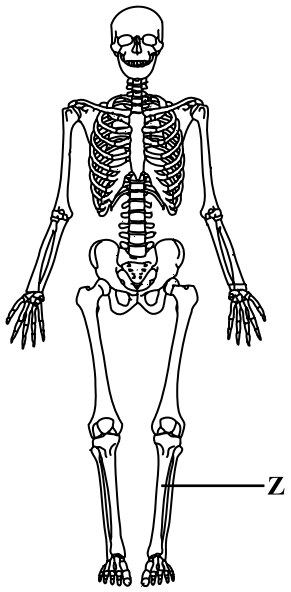
26. Which row in the following table describes the action of the antagonistic muscles when flexing the lower arm?

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

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

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

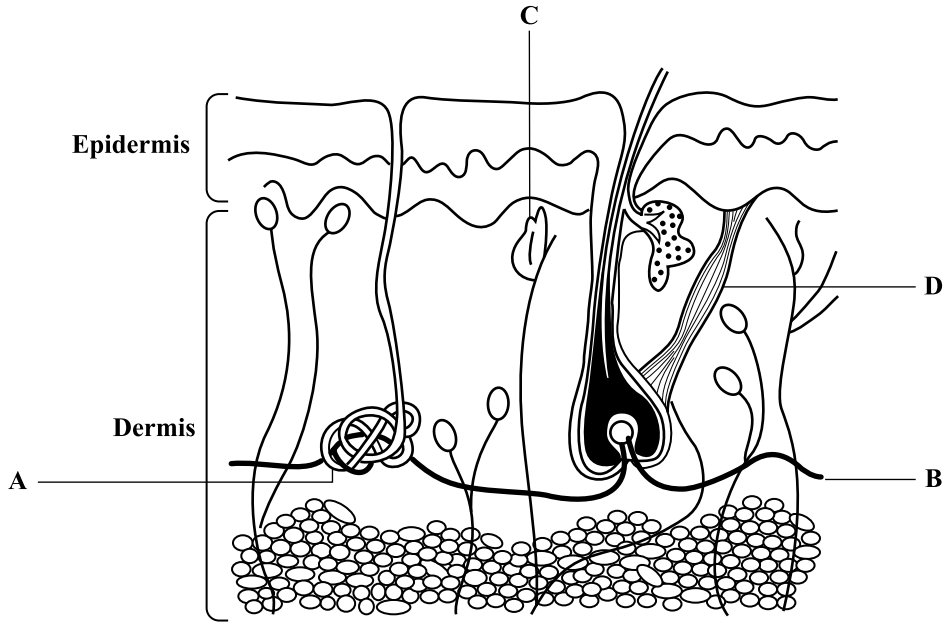
Item **28** refers to the following diagram of a skeleton.



28. The bone labelled Z is the

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

Items **29–30** refer to the following diagram which shows the internal structure of the skin.

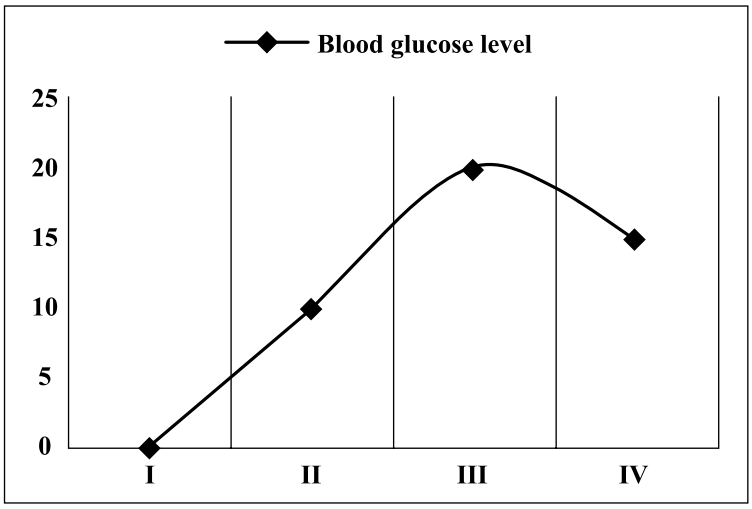


In answering Items **29–30**, each option may be used one, more than once or not at all.

29. Which of the structures above secretes sweat?

30. Which of the structures above is stimulated when a person feels cold?

Item **31** refers to the following graph which shows the level of glucose in the blood of an individual at various times throughout the day.



31. Which of the following activities is MOST likely occurring during Phase III?

(A) Sleeping.
(B) Fasting between meals.
(C) Vigorous exercise was just completed.
(D) A meal rich in carbohydrates was just consumed.

---

32. Which of the following activities would cause the body to release antidiuretic hormone?

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

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

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

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

I. Warn of danger
II. Detection of stimuli
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

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

(A) 

(B) 

(C) 

(D) 

36. 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

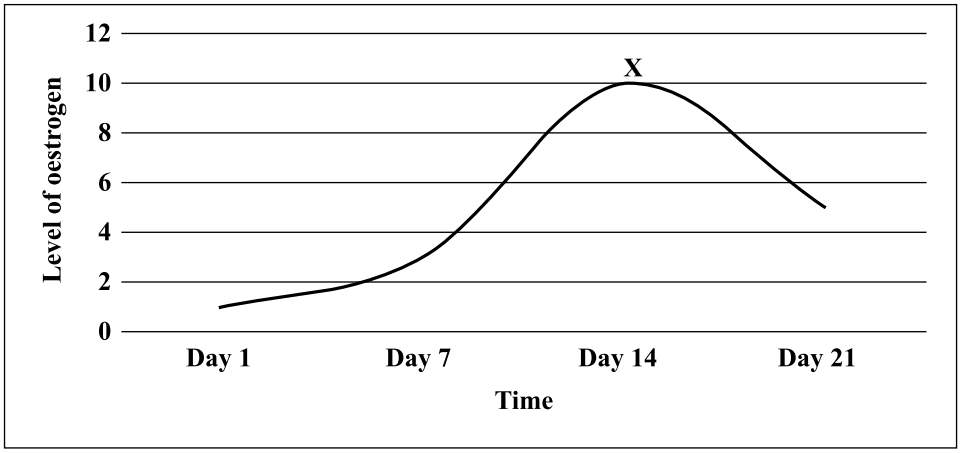
37. Michael has diabetes mellitus. Which of the following vision disorders is he at risk of developing?

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

38. 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 **39** refers to the following graph which shows the level of oestrogen produced during the menstrual cycle.



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

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

40. Which of the following structures is expelled from the vagina shortly after childbirth?

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

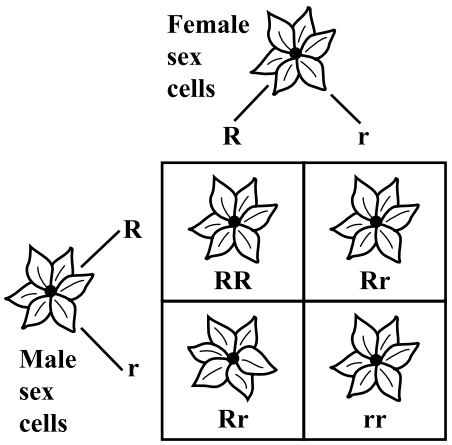
41. Which of the following methods of birth control prevents ovulation and implantation?

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

42. 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 NOT finishing her course of antibiotics?

(A) She is feeling well, nothing else should happen.
(B) She is likely to contract another type of infectious disease.
(C) Resistant bacteria in her body are left to grow and multiply.
(D) Resistant viruses in her body are left to grow and multiply.

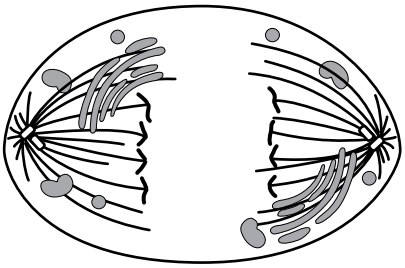
Item **43** refers to the following Punnett square for flower colour where R = red and r = white.



43. 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

Item **44** refers to the following diagram which shows a cell undergoing the process of mitosis.



44. Which of the following phases of mitosis is occurring in the cell above?

(A) Prophase
(B) Anaphase
(C) Telophase
(D) Metaphase

45. Alternative genes for eye colour are referred to as

(A) alleles
(B) mutations
(C) chromatids
(D) chromosomes

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

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

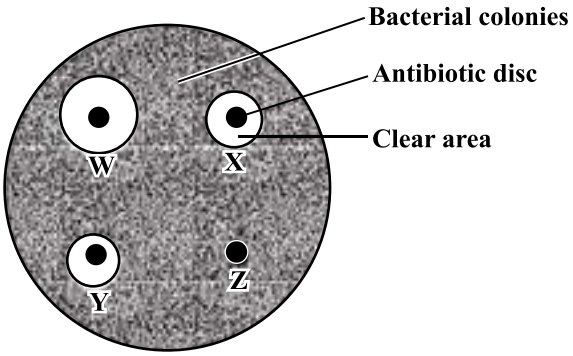
47. Organisms that transmit disease-causing microbes to other organisms are called

(A) vectors
(B) infectors
(C) parasites
(D) pathogens

48. Glucose is found in the urine of diabetics because

(A) stored fats in the body are being oxidized
(B) too much glucose is absorbed by the kidney cells
(C) not enough glucose in the blood is converted to glycogen
(D) there is an increased uptake and use of glucose by body cells

49. Bacteria were grown on an agar plate, until the plate was covered with visible bacterial colonies. Four discs containing equal amounts of different antibiotics were then placed on the agar plate. After two days, clear areas had formed around some of the discs, as shown in the diagram below.



Which of the following conclusions about the experiment is correct?

(A) Antibiotic Z is the most effective of the four antibiotics.
(B) Antibiotic W is more effective against these bacteria than Antibiotic X.
(C) Antibiotic Y is more effective against these bacteria than Antibiotic X.
(D) Antibiotic Y is more effective against these bacteria than Antibiotic W.

50. 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

51. Which of the following factors contributes MOST to the development of obesity?

(A) Age
(B) Gender
(C) Lifestyle
(D) Genetics

52. 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

53. 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

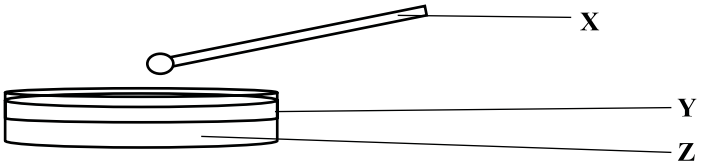
54. What is the correct order of the processes involved in large-scale water purification?

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

55. 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

56. A student used the apparatus below to test water for bacteria.



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

57. 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 MOST likely reason the fish died is due to

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

Item **58** 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

58. 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

59. Surav burns his household garbage every weekend. Which of the following is an effect of the smoke?

(A) Silicosis
(B) Eutrophication
(C) Global warming
(D) Ozone depletion

60. Which of the following components is common to both the biological filter method and activated sludge method?

(A) Grit pit
(B) Aeration tank
(C) Percolating filter
(D) Stones covered with aerobic bacteria

END OF TEST

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

SPECIMEN 01253010 KEY

Item Number	Key	Specific Objective	Item Number	Key	Specific Objective
1	A	A.3	31	D	B5.7
2	D	A.4	32	B	B5.8
3	C	A.11	33	B	B6.5
4	D	A.6	34	C	B6.8
5	B	A.9	35	D	B6.10
6	D	B1.3	36	B	B6.15
7	C	B1.5	37	A	B6.12
8	A	B1.7	38	C	B7.1
9	D	B1.12	39	A	B7.3
10	D	B1.14	40	A	B7.5
11	C	B1.20	41	D	B7.7
12	C	B1.21	42	C	C.10
13	B	B1.22	43	C	C.6
14	D	B1.26	44	B	C.2
15	C	B1.24	45	A	C1
16	B	B2.4	46	D	D.6
17	B	B2.12	47	A	D.2
18	C	B2.12	48	C	D.9
19	B	B2.2	49	B	D.19
20	C	B3.6	50	D	D.2
21	D	B3.7	51	C	D.9
22	B	B3.14	52	A	D.13
23	A	B3.4	53	B	D.20
24	A	B3.6	54	D	E.8
25	D	B4.5	55	C	E.13
26	C	B4.9	56	B	E.7
27	A	B4.6	57	A	E.21
28	B	B4.1	58	C	E.14
29	A	B5.4	59	C	E.2
30	D	B5.4	60	D	E13

FORM TP 2019/SPEC

TEST CODE **01253020**

CARIBBEAN EXAMINATIONS COUNCIL

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

HUMAN AND SOCIAL BIOLOGY

SPECIMEN PAPER

Paper 02 – General Proficiency

2 hours

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. This paper consists of SIX questions in TWO sections. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. 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.**
5. **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.

"*"Barcode Area"*"
Sequential Bar Code

SECTION A

Answer ALL questions in this section.

1. Figure 1 illustrates the processes occurring in the carbon cycle.

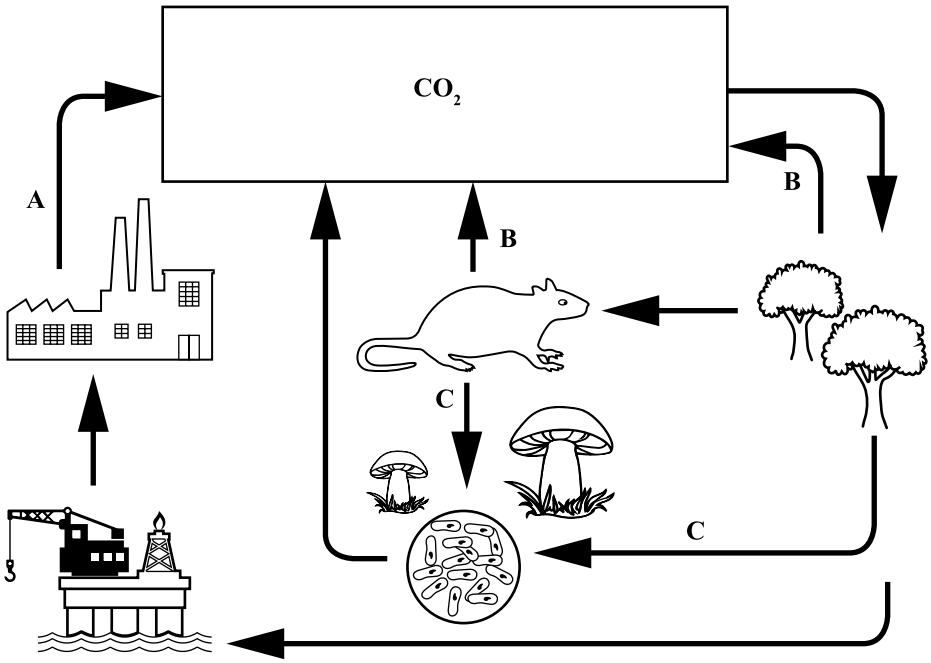


Figure 1. Carbon cycle

(a) Identify EACH of the processes occuring at A, B and C.

A .....

B .....

C .....

(3 marks)

(b) Carbon dioxide is removed from the atmosphere during the process of photosynthesis. Complete the following equation by inserting the missing reactant and products of photosynthesis.

_____ + carbon dioxide $\xrightarrow{\text{light}}$ + _____ + _____

(3 marks)

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(c) Figure 2 shows the changes in the hurricane intensity index (which accounts for hurricane frequency, duration and strength) and sea surface temperatures over time.

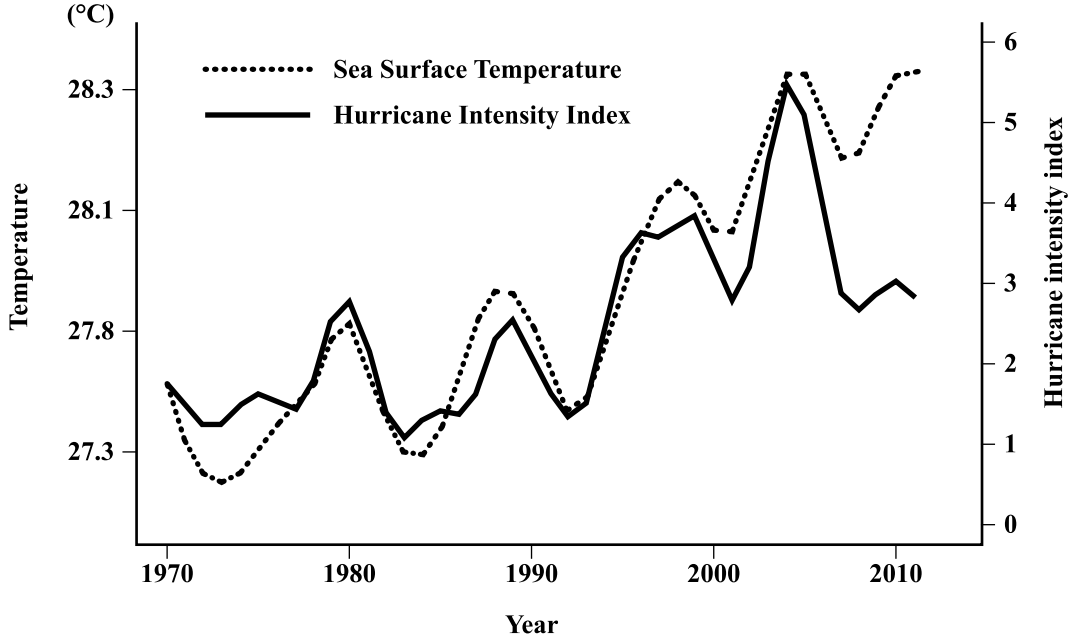

Figure 2. Changes in hurricane intensity index

(i) State the relationship between sea surface temperature and the intensity of hurricanes.

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(2 marks)

(ii) Explain how increasing levels of carbon dioxide could contribute to more intense hurricanes.

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(3 marks)

Figure 3 illustrates an energy-inefficient kitchen.

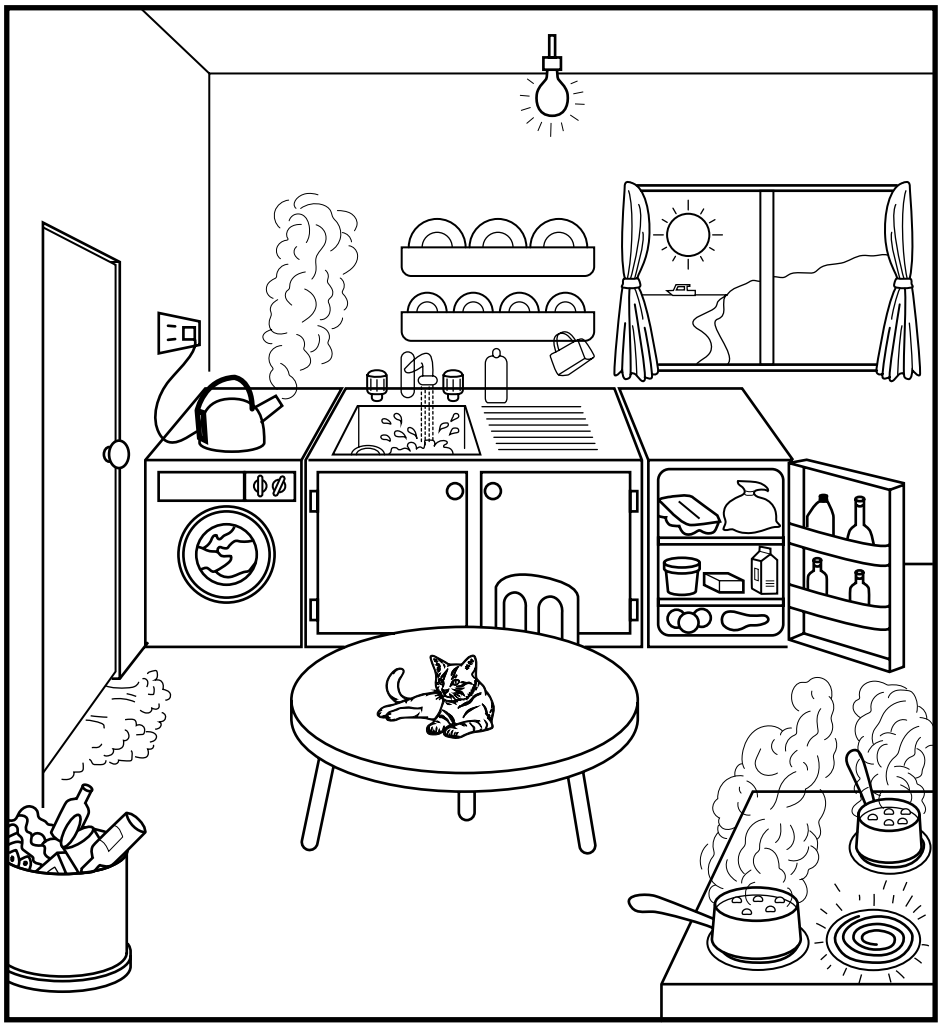

Figure 3. Energy-inefficient kitchen

(d) The burning of fossil fuels to produce electricity contributes to atmospheric carbon dioxide.

Suggest TWO ways in which the kitchen in Figure 3 could be made more energy-efficient. Give ONE reason for EACH way suggested.

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(4 marks)
Total 15 marks

GO ON TO THE NEXT PAGE

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

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(2 marks)

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

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(2 marks)

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

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(1 mark)

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

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(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 1 shows the blood pressure readings of Peter, James and John.

TABLE 1: 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)

(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 exercised for four minutes and the changes in their heart rates per minute were recorded in Table 2.

TABLE 2: 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 of 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

3. (a) Our foods are made up of macronutrients and micronutrients, both of which are necessary for good health.

(i) Name ONE macronutrient and ONE micronutrient found in foods.

Macronutrient .....

Micronutrient .....

(2 marks)

(ii) Identify ONE element that is common to ALL macromolecules.

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(1 mark)

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

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(1 mark)

(b) Benita and Benny are both concerned about their weight. Benny eats large amounts of food and then attempts to forcibly get it out of his system. Benita eats a minimal amount of food, but when she looks in the mirror, she sees a fat person.

(i) Define the term 'malnutrition'.

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(2 marks)

(ii) Name the eating disorders that Benita and Benny have.

Benita .....

Benny .....

(2 marks)

GO ON TO THE NEXT PAGE

(iii) Benny wants to become a professional basketball player. Explain TWO effects his eating disorder could have on his body, thereby affecting his ability to take part in this sport.

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(4 marks)

(iv) Benita wants to start a family but her menstrual period is irregular. Explain why Benita will MOST likely find it difficult to conceive.

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(3 marks)

Total 15 marks

4. (a) (i) State the location of the chromosomes in the cytoplasm of 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 4 is a pedigree that shows the inheritance of a genetic disorder.

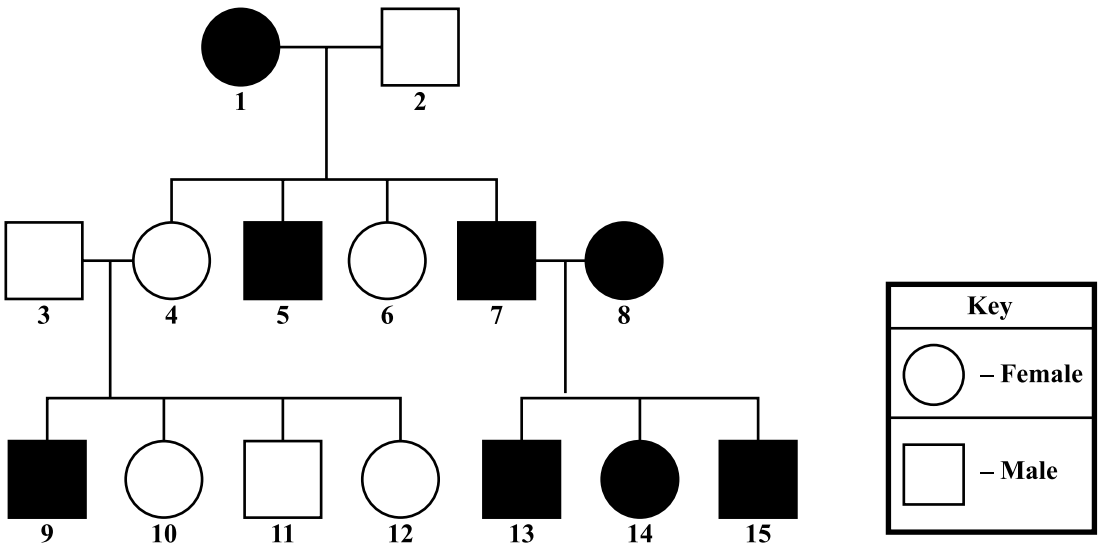

Figure 4. Pedigree of a genetic disorder

(i) Identify the type of inheritance illustrated in the pedigree in Figure 4.

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(1 mark)

(ii) Identify, by number, ONE female in Figure 4 who has developed the disorder.

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(1 mark)

(iii) State ONE **other** example of a genetic disorder that displays the type of inheritance depicted in Figure 4.

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(1 mark)

(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)

(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

SECTION B

Answer ALL questions in this section.

5. Cancer is a very difficult disease to manage and often results in death.

(a) (i) Define the term 'cancer'.

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(2 marks)

(ii) Identify TWO organs in which cancer is **most** common in the Caribbean.

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(2 marks)

(iii) State TWO forms of treatment for **most** cancers.

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(2 marks)

GO ON TO THE NEXT PAGE

(b) Communicable diseases are diseases which are caused by pathogens and they can be passed from one person to another. Diseases can be classified as being either epidemic or pandemic.

For EACH of the following situations, explain whether an epidemic or a pandemic disease is indicated.

- Situation I — Over 20 million people worldwide died from influenza in 1925–1926.
- Situation II — 22 cases of leptospirosis occurred within three weeks among residents of a particular neighbourhood (usually zero or one case per year).

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(6 marks)

(c) Suggest TWO ways in which ONE **named** non-communicable disease (NCD) can affect the socioeconomic status of a developing country.

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(3 marks)
Total 15 marks

GO ON TO THE NEXT PAGE

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)

(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 5 shows the components of the village's waste.

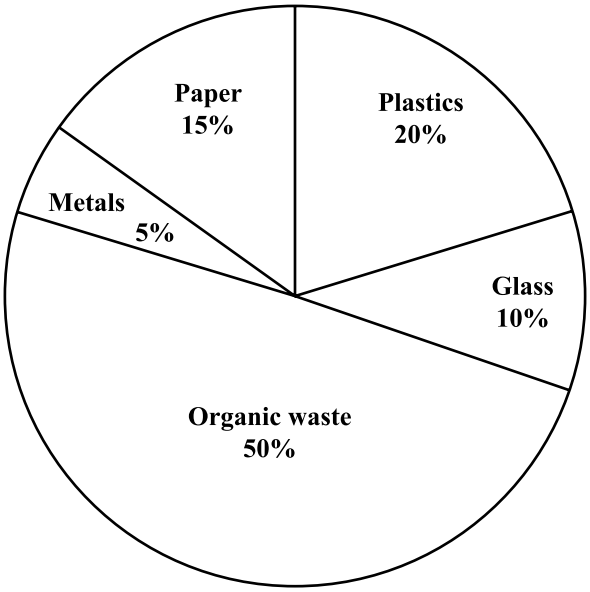

Figure 5. Solid waste components of the village of St Joseph

(i) Propose a solid waste management plan that the council could implement for the village of St Joseph.

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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 really affect the neighbouring community.

Suggest THREE ways in which the company's activities 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.

EXTRA SPACE

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Question No. ☐

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CARIBBEAN SECONDARY EXAMINATION CERTIFICATE®

HUMAN AND SOCIAL BIOLOGY

PAPER 02

SPECIMEN

KEY AND MARK SCHEME

Human and Social Biology
Paper 02 – General Proficiency

Question 1	Possible Answers	Instructions	Marks	
			KC	UK
(a)	A: Combustion **(1)** B: Cellular Respiration **(1)** C: Death **(1)**	**1 mark each to a maximum of 3**	**3**	
(b)	water **(1) – reactant** oxygen **(1)** sugars/glucose **(1)** } **products**	**1 mark each to a maximum of 3**	**3**	
(c) (i)	An increase in sea surface temperature **(1)** results in an increase in the intensity of hurricanes **(1).** OR Sea surface temperature is directly **(1)** proportional **(1)** to the intensity of hurricanes.	**2 marks**		**2**
(ii)	An increase in CO_2 levels results in global warming **(1)** which causes surface sea temperatures to rise **(1)** resulting in more intense hurricanes **(1)**	**1 mark each to a maximum of 3**		**3**

Human and Social Biology
Paper 02 – General Proficiency

Question 1 cont'd	Possible Answers	Instructions	Marks	
			KC	UK
(d)	• Turn off the light during the day **(1)** as the window provides light and this will save energy (**1**) • Unplug the kettle **(1)** - when the kettle is not in use, when plugged in it is using electricity **(1)** • Air dry the clothes instead of using a dryer **(1)**- the dryer uses large amounts of electricity **(1)** • Turn of the water faucet **(1)** - it takes energy to make clean water. By not wasting water we conserve electricity **(1).** • Close the refrigerator door **(1)** - leaving the refrigerator door open results in the use of more energy/electricity **(1)** • Seal the door **(1)** - escaping cool air causes the AC unit to use more energy/electricity **(1)** • Recycle bottles **(1)** – recycling results in less energy/electricity being used to create new bottles **(1).** • Turn off stove burner when not in use **(1)** - when it is on it uses energy/electricity. **(1)**	**Any point and appropriate explanation = 2 marks** **Maximum of 4 marks**		**4**
Syllabus Objectives: A 8, A 13			**6**	**9**

Human and Social Biology
Paper 02 – General Proficiency

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)	• Lack of physical activity/exercise • Stress • Smoking/tobacco use • Abuse of alcohol • High cholesterol • Poor diet (high salt, high fat) • Obesity	**1 mark**	**1**	
(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. James, although he smokes, not eating meat means he has a lower risk of plaque formation **(1)** therefore, 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)	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 rate. John can change his diet **(1)** or begin an exercise program **(1)**	**1 mark for explanation** **1 mark for lifestyle change**		**2**
Syllabus Objectives: B. 3.7; B. 3.11, D. 9			**6**	**9**

Human and Social Biology
Paper 02 – General Proficiency

Question 3	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Macronutrients: Carbohydrates, Fats, Proteins **(Any 1)** Micronutrients: Any one vitamin or mineral named	**1 mark each to a maximum of 2**	**2**	
(ii)	Carbon, Hydrogen, Oxygen **(Any 1)**	**1 mark**	**1**	
(iii)	Any ground provision (sweet potato, eddo, yam) Any grain (oats, corn, barley, wheat, rice)	**1 mark**	**1**	
(b) (i)	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)	Benita has anorexia nervosa **(1)** Benny has bulimia nervosa **(1).**	**1 mark each to a maximum of 2**		**2**
(iii)	• Muscle loss and wastage **(1)** due to a lack of protein in the diet **(1)** • Lethargy **(1)** due to a lack of carbohydrates and fats in the diet **(1)** • Brittle bones **(1)** due to a lack of calcium **(1)** • Swelling in his hands and feet **(1)** due to a lack of protein/electrolyte imbalance **(1)** • Irregular heartbeat **(1)** due to insufficient electrolytes **(1)** • Mental alertness **(1)** as a result of a lack of vitamins and minerals in the diet **(1)**	**1 mark each to a maximum of 4**		**4**

Human and Social Biology
Paper 02 – General Proficiency

Question 3 cont'd	Possible Answers	Instructions	Marks	
			KC	UK
(iv)	Because Benita does not consume a diet rich in lipids/fats **(1)** she unable to produce oestrogen and progesterone **(1)** resulting in an irregular menstrual cycle. As a result of this hormone imbalance, the uterine lining cannot develop as it should **(1)** affecting her ability to conceive.	**1 mark each to a maximum of 3**		**3**
Syllabus Objectives: B1.1, 1.2, B1.11, B 6.15			**6**	**9**

Human and Social Biology
Paper 02 – General Proficiency

Question 4		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)	Sex linked	**1 mark**		**1**
	(ii)	Female 1, 8 or 14	**1 mark**		**1**
	(iii)	Colour blindness, Haemophilia	**1 mark**	**1**	
(c)	(i)	Because GMOs can be grown under extreme conditions**(1)**, they may out compete native plants for resources **(1)**	**1 mark each to a maximum of 2**		**2**
		If farmers are not growing native plants, fewer viable seeds will be produced **(1)** for the growth of subsequent crops **(1)** **Accept any other reasonable response.**	**1 mark each to a maximum of 2**		**2**
	(ii)	**GMOs** • Give a higher yield **(1)** • Are resistant to pests**(1)** • Can tolerate poor soil conditions **(1)** • Drought resistant**(1)** • Produce crops where ripening is delayed **(1)** • May provide tastier fruits and vegetables **(1)**	**1 mark each to a maximum of 2**	**2**	

Human and Social Biology
Paper 02 – General Proficiency

Question 4 cont'd	Possible Answers	Instructions	Marks	
			KC	UK
(iii)	Since only a few companies are in control of our seeds, this means that • what we potentially grow is controlled by external entities/ weakened food security **(1).** • these companies can potentially control the cost of food/low supply resulting in higher prices **(1).** • there is a reduction in the diversity of food **(1).**	**1 mark each to a maximum of 3**		**3**
Syllabus Objectives: C 4,5, 7, 12			**6**	**9**

Human and Social Biology
Paper 02 – General Proficiency

Question 5	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Cancer is the abnormal uncontrolled **(1)** division of cells **(1)**	**1 mark each to a maximum of 2**	2	
(ii)	Prostate, Cervix, Breasts, Lung **(Any 2)**	**1 mark each to a maximum of 2**	2	
(iii)	Surgical removal of growth/tumour **(1)** Radiation therapy to destroy the Tumour **(1)** Chemotherapy **(1)**	**Any 2 points = 2 marks**	2	
(b)	• In Situation I, influenza is considered to be a pandemic disease **(1)** because it was spread over a wide geographic area/worldwide **(1)** and every time the disease is manifested, it is considered a new disease **(1)**	**1 mark each to a maximum of 3**		**6**
	• In Situation II, leptospirosis is considered to be an epidemic disease **(1)** because it was localised/spread over a small geographical area/neighbourhood **(1)** and there were an unusual number of cases that occurred at the same time **(1)**	**1 mark each to a maximum of 3**		

Human and Social Biology
Paper 02 – General Proficiency

Question 5 cont'd	Possible Answers	Instructions	Marks	
			KC	UK
(c)	Ways in which a non-communicable disease can affect a developing country: NCD: AIDS **(1)** • Loss of productivity **(1)** • Stigma attached to the disease **(1)** • Death of parents leaving children orphaned **(1)** NCD: Cancer **(1)** • Reduced population **(1)** • Loss of productivity **(1)** • Drain on country's resources **(1)** **Any other reasonable response**	**1 mark for naming disease** **1 mark for each way to maximum of 2**		**3**
Syllabus Objectives: D.10; D.11			**6**	**9**

Human and Social Biology
Paper 02 – General Proficiency

Question 6	Possible Answers	Instructions	Marks	
			KC	UK
(a) (i)	Landfills are lined **(1)** to prevent water contamination 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 hazardous and nonhazardous waste **(1).** Landfills are controlled and highly regulated **(1)** while dumps are unregulated **(1).**	**For each comparison, 2 marks each to a maximum of 4**	**4**	
(ii)	• Contamination of ground water • Provides home for vectors • Produces an unpleasant smell • Produces carbon dioxide and methane gas which contribute to global warming	**1 mark each to a maximum of 2**	**2**	
(b) (i)	Your proposal should include the following points: • The council could implement a new waste disposal policy which requires residents to sort their garbage at home into the categories of waste **(1)** • Recycling companies could be invited to collect the sorted waste **(1) OR** residents can place their sorted waste into appropriate recycling bins **(1)** • The council could impose fines for non-compliance with the new policy **(1)** • Recycling bins could be placed at various locations within the village to encourage the proper disposal of plastics, paper and metals**(1)** • Organic waste can be composted and the compost sold or used for fertilizing the village's gardens/parks **(1)**	**1 mark each to a maximum of 6**		**6**

Human and Social Biology
Paper 02 – General Proficiency

Question 6 cont'd	Possible Answers	Instructions	Marks	
			KC	UK
	• The council could impose a ban on Styrofoam products and plastic bottles to reduce the volume of plastic waste generated **(1).** • The council could introduce an educational campaign to teach residents to appreciate their environment and the importance of appropriate waste disposal **(1).** • The villagers could use their organic waste to produce biodiesel **(1)** **Accept any other reasonable response**			
(ii)	• 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.	**1 mark each to a maximum of 3**		**3**
Syllabus Objectives: E 14,15,21			**6**	**9**

FORM TP 2019/SPEC

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

CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

HUMAN AND SOCIAL BIOLOGY

SPECIMEN PAPER

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 TWELVE questions. Answer ALL questions.
2. Write your answers in the spaces provided in this booklet.
3. Do NOT write in the margins.
4. You are advised to take some time to read through the paper and plan your answers.
5. 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.**
6. **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.

"*"Barcode Area"*"
Sequential Bar Code

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	0.4	0.24	1.4
Total sedimentation suspension (mg/L)	19.36	7.3	15.55	31	24
E. coli colonies (per 100 mLs)	900	130	560	120	300

6. Using the grid provided **on page 7**, plot 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)

GO ON TO THE NEXT PAGE

GO ON TO THE NEXT PAGE

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 *E. coli* 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					
E. coli 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 amount 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)

Recommendations

10. Recommend, to the Government of Castries, the river that would be BEST suited to provide potable water to the town and give TWO reasons for 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 TWO ways in which the waterways of Castries could be improved.

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(2 marks)

Total 40 marks

END OF TEST

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

EXTRA SPACE

If you use this extra page, you MUST write the question number clearly in the box provided.

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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

CARIBBEAN SECONDARY EXAMINATION CERTIFICATE®

HUMAN AND SOCIAL BIOLOGY

PAPER 032

SPECIMEN

KEY AND MARK SCHEME

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

Specific Objectives: E 1, 2, 3, 4, 7, 9, 10

Background

1. Problem Statement

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

(2 marks)

2. To determine the quality of water **(1)** in each of the five rivers in the town of Castries **(1).**

(2 marks)

Methodology

3. The data was collected primarily using experimentation.

(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 sterilised 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 x 8 = 8 marks)

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

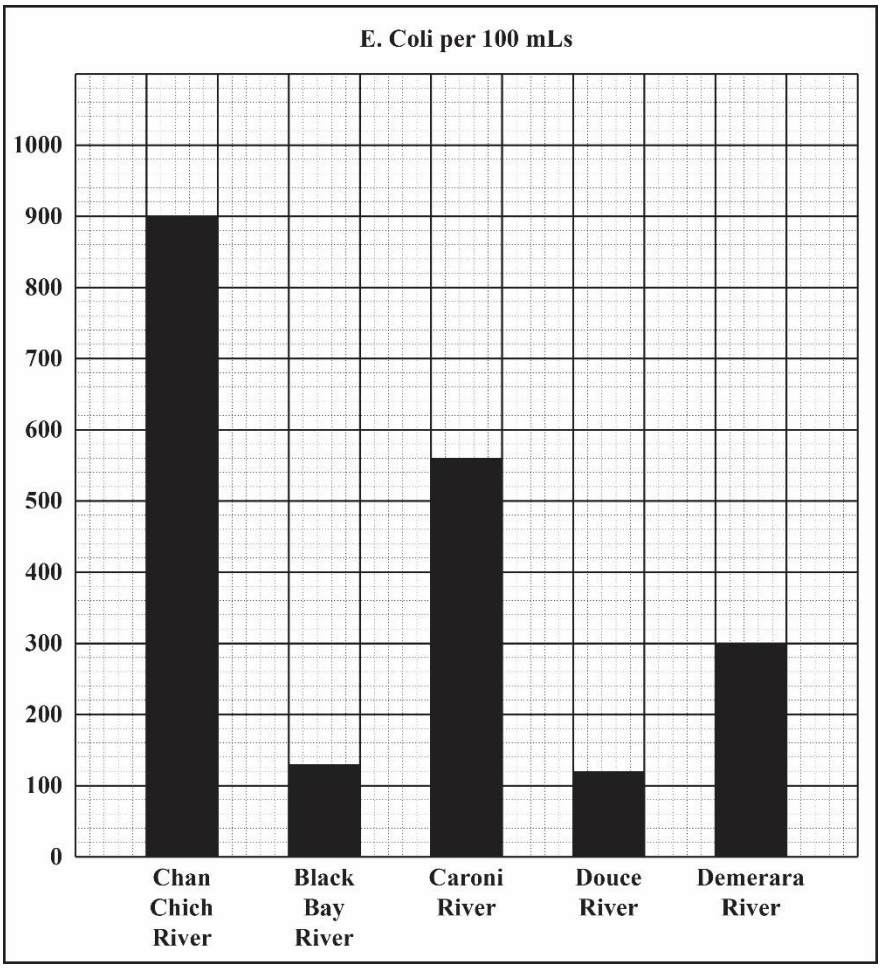
5. Limitation of study

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

(1 mark)

Presentation of Data

6.



1 mark for each axis correctly labelled, 2 marks

2 marks for all 5 bars plotted accurately

-1 mark for any one bar plotted incorrectly

(4 marks)

7. The data could be presented using a line graph. **(1 mark)**

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

Analysis and Interpretation of Data

8. 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		✓			
E.coli bacteria		✓		✓	

1 mark for each correct river profile (1 x 5 = 5 marks)

9. (a)(i) The Chan Chich river **(1)** since it runs through a pig farm 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) 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) The Demerara river **(1)** since it runs through agricultural land and fertilisers 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

HUMAN AND SOCIAL BIOLOGY

Key and Mark Scheme

Paper 032

(b) Economic Implications:

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

Social Implications:

- Loss of tourism because 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 a social implication
1 mark for an economic implication
(2 marks)

Recommendations

10. 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)**

(3 marks)

11. The Douce River **(1)** because it has 3 out 4 contaminants present at acceptable levels **(1)**. The only contaminant at an unacceptable level (suspended sediments) is relatively easy to be removed **(1)**

(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 each plausible recommendation(1 x 2 = 2 marks)

Total 40 marks

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