



CARIBBEAN EXAMINATIONS COUNCIL

CSEC®

Human and Social Biology

**SYLLABUS
SPECIMEN PAPER
MARK SCHEME
SUBJECT REPORTS**

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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
CSEC®**

HUMAN AND SOCIAL BIOLOGY SYLLABUS

Effective for examinations from May/June 2011



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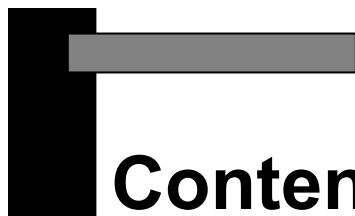
Correspondence related to the syllabus should be addressed to:

The Pro-Registrar
Caribbean Examinations Council
Caenwood Centre
37 Arnold Road, Kingston 5, Jamaica, W.I.

Telephone: (876) 630-5200
Facsimile Number: (876) 967-4972
E-mail address: cxcwzo@exc.org
Website: www.exc.org

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The Garrison, St Michael BB11158, Barbados





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

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Please check the website www.cxc.org for updates on CXC's syllabuses.





Human and Social Biology

◆ RATIONALE

Human beings require knowledge of the ways in which the human body functions, of the interdependence of living things, and of the ways the total environment functions to support life on earth in all its forms, in order to make 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 students at secondary schools with an opportunity to begin acquiring this knowledge.

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 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 functioning of the human body and the application of biological principles to the maintenance of health have relevance. It also helps to provide students with knowledge, skills and *attitudes* that are important for maintaining a healthy lifestyle.

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 and the innovative application of science and technology to problem solving. Based on the UNESCO Pillars of Learning, this course of study will also contribute to a person who will learn how 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 functioning 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. *develop experimental and data interpretation skills*;
5. *increase awareness of technological advances*;
6. provide a foundation for further study or specialised training in fields such as, nursing, physiotherapy or dietetics, which require an understanding of the structure and functioning of the human body and the application of biological principles to the maintenance of health and healthy living.

◆ GENERAL OBJECTIVES

On completion of this syllabus, students should:

1. understand the processes that govern the interactions of organisms in the environment and the processes by which life is perpetuated;
2. understand the nature of the interdependence of the processes, structures and functions of the major systems, within an organism in the maintenance of health;
3. understand *the role of* nutrition *in helping* living organisms *to* obtain their energy and satisfy their physical needs;
4. understand the mechanisms by which characteristics pass from parent to offspring;
5. *become aware of* the importance of genetic variation;
6. understand the basic concepts of human well-being and disease;
7. appreciate the nature of the relationship between human beings and their environment;
8. appreciate that the environment is fragile and there is need to preserve it;
9. appreciate the contribution of modern technology to the maintenance of good health.

◆ SUGGESTED TIME-TABLE ALLOCATION

It is recommended that a minimum of five 40-minute periods per week over two academic years or the equivalent be allocated to the syllabus.

◆ ORGANIZATION OF THE SYLLABUS

The syllabus is organised under five main sections:

1. Living organisms and the environment.
2. Life processes.
3. Heredity and variation.
4. Disease and its impact on humans.
5. The impact of health practices on the environment.

In this syllabus, the Specific Objectives which are denoted by an asterisk are particularly suitable for practical activities. However, the practical activities need not be limited to these objectives.

◆ CERTIFICATION

The syllabus will be examined at the General Proficiency only. Candidates will be awarded an overall grade reported on a 6-point scale. In addition to the overall grade, candidates' performance will be reported by a letter grade under the profile dimensions, 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:

- (i) Knowledge and Comprehension (KC);
- (ii) Use of Knowledge (UK).

Knowledge and Comprehension (KC)

The ability to:

- (i) identify, remember and grasp the meaning of basic facts, concepts and principles;
- (ii) select appropriate ideas, match and compare facts, concepts and principles in familiar situations.

Use of Knowledge (UK)

The ability to:

- (i) use facts and apply concepts, principles and procedures in familiar and new situations;
- (ii) interpret and draw inferences from practical laboratory exercises;
- (iii) analyse, organise and evaluate information in an effort to make reasoned judgements and recommendations.

◆ **FORMAT OF THE EXAMINATION**

Candidates will be required to take Paper 01 and Paper 02.

Paper 01 Sixty multiple-choice items drawn from all areas of the syllabus.
(1 hour 15 minutes)

Paper 02 Section A - four compulsory structured questions drawn from all areas of the syllabus. One question will be an investigative type/practical oriented question. Each question is worth 15 marks (6 KC, 9 UK).
(2 hours)

Section B - two compulsory structured essay questions drawn from all areas of the syllabus. Each question is worth 15 marks (6 KC, 9 UK).

MARK AND WEIGHTING ALLOCATION FOR THE PROFILE DIMENSIONS

Profile dimension	Paper 01		Paper 02		Total	
	Raw Score	%	Raw Score	%	Raw Score	%
Knowledge and Comprehension	60	40	36	24	96	64
Use of Knowledge	-		54	36	54	36
TOTAL	60	40	90	60	150	100

◆ **REGULATIONS FOR PRIVATE CANDIDATES**

Candidates who are registered privately will be required to sit Paper 01 and Paper 02.

Private candidates must be entered through institutions recognized by the Council.

◆ **REGULATIONS FOR RESIT CANDIDATES**

Resit candidates will be required to sit Paper 01 and Paper 02.

Resit candidates must be entered through a school or other approved educational institution.



◆ SECTION A: LIVING ORGANISMS AND THE ENVIRONMENT

SPECIFIC OBJECTIVES

Students should be able to:

1. *describe* the characteristics of living organisms;
2. *compare* the structures of an unspecialized plant and animal cell and selected microbes;
3. state the functions of cell *structures*;
4. identify *selected cells* which make up the human body;
5. explain the importance of cell specialization in humans;
6. distinguish between osmosis and diffusion;*

EXPLANATORY NOTES

Nutrition, respiration, excretion, growth, irritability, movement, reproduction.

Basic structure of unspecialized plant cell, animal cell *and microbes*.

(a) *Labelled* diagrams of plant and animal cell.

(b) Microbes to include:

- (i) virus;
- (ii) bacteria;
- (iii) fungi.

(Link to Specific Objective D7)

Cell wall, cell membrane, nucleus, ribosomes, cytoplasm, mitochondria, vacuoles, chloroplasts, *endoplasmic reticulum*.

Diagrams and features required:

- (a) epithelial cells;
- (b) sperm cells;
- (c) egg cells;
- (d) nerve cells;
- (e) muscle cells.

(a) Cell differentiation.

(b) Relation of cells to the organism as a whole.

LIVING ORGANISMS AND THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

7. explain the importance of osmosis, diffusion *and active transport* in living systems;
8. explain the process of photosynthesis;
9. *investigate the effect of light and chlorophyll on the production of starch;**
10. explain the ways in which other living organisms depend on plants directly or indirectly for food;
11. *explain the principles of* a food chain;
12. *construct* a food chain from a selected habitat;

EXPLANATORY NOTES

Movement of substances across the cells.

- (a) Osmosis as a special type of diffusion.
- (b) Cell membrane as a partially permeable membrane.
- (c) Movement of water from cell to cell.
- (d) Examples of osmosis occurring in plants and animals.
- (e) Diffusion of gases in and out of a living cell.
- (f) Experimental activity to demonstrate osmosis and diffusion in living cells.
- (g) Active transport - *movement of ions against a concentration gradient using energy.*

(Link to Specific Objectives B 1.24, B1.26)

- (a) *Definition of photosynthesis.*
- (b) Simple treatment involving *word* equation to summarize the process.
- (c) Site of photosynthesis (*chloroplast*).
- (d) Fate of products of photosynthesis.

- (a) Plants as producers.
- (b) *Human beings* dependence on plants directly or indirectly for food.

Definition of a food chain and trophic level; names of organisms feeding at each trophic level (omnivore, carnivore, herbivore, *producer, primary and secondary consumers*); reduction of available energy at each trophic level; utilization of energy at each trophic level.

Terrestrial and aquatic (marine and fresh water) habitats.



LIVING ORGANISMS AND THE ENVIRONMENT (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

13. identify the trophic level of organisms in the food chain;
14. describe the recycling of carbon and nitrogen in nature.

The importance of recycling nitrogen and carbon in nature; Nitrogen cycle: the up-take of nitrates by green plants and the formation of plant proteins; inability of plants to use nitrogen in its unreactive forms; the role of plants, animals and micro-organisms in the nitrogen cycle; the role of legumes; the role of herbivores; the role of bacteria and fungi as decomposers.

Carbon cycle: the importance of CO₂ in photosynthesis; carbon as a derivative of carbon dioxide; the transformation of carbon to carbohydrates in photosynthesis; examples of carbon compounds that release carbon when burnt; the release of carbon dioxide during *combustion*, respiration and decomposition.

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 view charts and diagrams on plants and animal cells, microbes and nitrogen and carbon cycles.
2. Arrange for students to view plants and animal cells as projected by a light microscope.
3. Encourage students to construct models of plants *and* animal cells, *carbon and nitrogen cycles*.
4. Conduct laboratory activities pertaining to osmosis and diffusion, *and photosynthesis*.
5. Use video presentations and computer assisted learning (Internet, CDs) to enhance learning.

◆ SECTION B: LIFE PROCESSES

1. NUTRITION

SPECIFIC OBJECTIVES

Students should be able to:

- 1.1 *describe* the major nutrients and their sources;
- 1.2 *state the function and the main sources* of vitamin A, B₁, C, D and *the* minerals calcium and iron;
- 1.3. *state* the cause, symptoms and treatment of deficiency diseases;
- 1.4. *classify* vitamins as fat or water soluble;
- 1.5 *perform* tests to distinguish among food nutrients;*
- 1.6 *state* the functions of water in the body;
- 1.7 *state* the role of dietary fibre in the body;
- 1.8 *describe* the causes and effects of constipation and diarrhoea;
- 1.9 *explain what is meant by* a balanced diet;
- 1.10. *explain* the effects of malnutrition on the human body;
- 1.11 *determine* Body Mass Index (BMI);

EXPLANATORY NOTES

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

Night blindness, anaemia and rickets.

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

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

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

(Link to Specific Objective A8)

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

Including proper hygiene in the preparation of food.

Interpretation of data, *include* Caribbean food groups.

Definition of malnutrition (*over and under nutrition*), obesity, *anorexia and bulimia*, protein and energy malnutrition (*kwashiorkor, marasmus*).

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

LIFE PROCESSES (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 1.12 *use tables, charts and graphs to represent data on nutrition;*
- 1.13 relate the types of teeth present in an infant and an adult human to their roles;
- 1.14 describe the importance of teeth in the process of digestion;
- 1.15 describe the structure and function of a typical tooth;
- 1.16 *relate the structures of the tooth to their functions;*
- 1.17 state the causes of tooth decay;
- 1.18 *describe the process of tooth decay;*
- 1.19 *outline guidelines for the care of the teeth;*
- 1.20 explain the properties, role and importance of enzymes involved in digestion;
- 1.21 investigate the effects of temperature and pH on the activity of the enzymes, amylase and catalase in the digestive process;*
- 1.22 identify the various structures of the digestive system;
- 1.23 relate the structures of the digestive system to their functions;
- 1.24 describe the process of digestion and absorption of food in the alimentary canal;

EXPLANATORY NOTES

Diagrams required.

Internal and external structures; *diagrams required.*

Functions of enamel, dentine, pulp cavity, cement.

Include conversion of food into acids by bacteria.

Include site of production.

Include construction and interpretation of graphs.

Diagram of alimentary canal required.

Include mechanical (mastication) and chemical digestion.

(Link to Specific Objective A7)

LIFE PROCESSES (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 1.25 describe what happens to the products of digestion after their absorption;
- 1.26 describe the structure of a villus in relation to absorption;
- 1.27 distinguish between egestion and excretion.

EXPLANATORY NOTES

Fate of glucose, amino acids, fatty acids and glycerol; assimilation; role of liver.
(Link to Specific Objective B5.2)

Diagram required.

(Link to Specific Objective A7)

(Link to Specific Objective B 5.1)

LIFE PROCESSES (cont'd)

2. THE RESPIRATORY SYSTEM

SPECIFIC OBJECTIVES

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;*
- 2.3 describe the breathing mechanism;*
- 2.4 outline the factors affecting rate of breathing;
- 2.5 *explain the concept of vital capacity;*
- 2.6 *distinguish between gaseous exchange and breathing;*
- 2.7 identify characteristics common to gaseous exchange surfaces;
- 2.8 differentiate between aerobic and anaerobic respiration;
- 2.9 explain the role of adenosine diphosphate (ADP) and adenosine triphosphate (ATP) in the transfer of energy;

EXPLANATORY NOTES

Diagram of respiratory system.

Emphasis on principles involved. Demonstrate using a model.

Exercise, smoking, anxiety, drugs, environmental factors, altitude, weight.

(Link to Specific Objective D5)

Graphical representation required.

Inclusion of gaseous exchange in the alveoli; diagram of alveolus required.

Definition of aerobic and anaerobic respiration; *the products of respiration*; description of industrial and domestic applications of anaerobic respiration; *oxygen debt*; *worded equations to represent the processes of aerobic and anaerobic respiration.*

Adenosine triphosphate as the energy currency of the cell.

LIFE PROCESSES (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 2.10. *explain* the technique of mouth-to-mouth resuscitation;
- 2.11 *explain the effects of cigarette smoking;*
- 2.12 *use tables, graphs and charts to represent data on the respiratory system.*

EXPLANATORY NOTES

Effects of smoking as it relates to nicotine addiction, damage to the lungs, carcinogenic properties and reduction in oxygen-carrying capacity of the blood. Interpretation of data.

LIFE PROCESSES (cont'd)

3. THE CIRCULATORY SYSTEM

SPECIFIC OBJECTIVES

Students should be able to:

- 3.1 explain the need for a transport system in the human body;
- 3.2 identify the materials which need to be transported around the human body;
- 3.3 relate the structures of the heart to their functions;
- 3.4. describe the structure and function of the heart;
- 3.5 *explain the concept of blood pressure;*
- 3.6 describe the structure and function of the circulatory system in humans;
- 3.7 relate the components of the blood to its function;
- 3.8 relate the structures of the arteries, veins and capillaries to their functions;
- 3.9 relate the structures of red blood cells, phagocytes and lymphocytes to their functions;
- 3.10 explain the process and the importance of blood clotting;

EXPLANATORY NOTES

Limitations of simple diffusion; the relationship between surface area and volume.

(Link to Specific Objective A7)

Chambers, valves and blood vessels of the heart (*diagrams required*), *pacemaker*; comparison of the differences in thickness of the right and left ventricles.

The role of the heart as a double pump.

Systole and diastole.

Pulmonary versus systemic circulation.

Plasma, serum, red blood cells, white blood cells, platelets.

Diagrams required; thickness of walls, size of lumen, presence or absence of valves.

Diagrams required.

Role of platelets, *fibrinogen, calcium ions, thrombin in blood clotting.*

LIFE PROCESSES (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 3.11 explain the causes and effects of heart attacks;

Include hypertension (high blood pressure) atherosclerosis, coronary thrombosis, artificial pacemaker. Interpretation of data.

(Link to Specific Objective D6)

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

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

Role of tissue fluid and lymph; location and function of lymph nodes.

- 3.14 describe how tissue fluid and lymph are formed.

Diagram required.

LIFE PROCESSES (cont'd)

4. SKELETAL SYSTEM

SPECIFIC OBJECTIVES

Students should be able to:

- 4.1 identify the major bones of the skeleton;
- 4.2 relate the structure of the skeleton to its functions;
- 4.3 *relate the structure of a typical bone to its functions;*
- 4.4 distinguish between bone and cartilage;
- 4.5 explain the importance of cartilage;
- 4.6 distinguish between tendons and ligaments;
- 4.7 identify a hinge joint, fixed joint, and ball and socket joint;
- 4.8 describe movement in the hinge joint, and ball and socket joint;
- 4.9 identify the biceps and triceps of the upper arm;
- 4.10 explain how skeletal muscles function in the movement of a limb;
- 4.11 explain the importance of locomotion to man;
- 4.12 *evaluate the factors which adversely affect the skeletal system.*

EXPLANATORY NOTES

Cranium, clavicle, scapula, vertebral column, humerus, radius, ulna, rib cage, sternum, pelvic girdle, femur, tibia, fibula.

Movement, protection, support, breathing, production of blood cells.

Diagram of long bone required (internal view).

Comparison of characteristics of bone and cartilage.

Comparison of characteristics and functions of tendons and ligaments.

Diagrams required.
Definition of the term joint; location of joints.

Diagrams required; points of origin (location and definition); points of insertion (location and definition)

Diagrams required; the role of antagonistic muscles in the movement of limbs; *effect of exercise – muscle tone.*

Include posture and poor foot-wear.

LIFE PROCESSES (cont'd)

5. EXCRETION AND HOMEOSTASIS

SPECIFIC OBJECTIVES

Students should be able to:

- 5.1 *explain the importance of excretion in human beings;*
- 5.2 *explain the roles of the organs involved in excretion;*
- 5.3 *relate the structures of the kidney to their function;*
- 5.4 *relate the structures of the skin to their functions;*
- 5.5 *explain the concept of homeostasis;*
- 5.6 *explain the concept of feedback mechanisms;*
- 5.7 *describe the regulation of blood sugar;*
- 5.8 *explain the regulation of water;*
- 5.9 *distinguish between heat and temperature;*
- 5.10 *describe the regulation of temperature.*

EXPLANATORY NOTES

Include definition of excretion.

(Link to Specific Objective B1.27)

Lungs, skin and kidney; examples of metabolic wastes.

Internal structure of the kidney (diagram required), structure and function of the nephron (diagram required); selective reabsorption of substances; composition of urine; mention renal dialysis.

Diagram required.

Definition of homeostasis; examples of homeostasis.

Include regulation of carbon dioxide (CO₂).

Role of insulin and glucagon.

(Link to Specific Objective D6)

LIFE PROCESSES (cont'd)

6. COORDINATION AND CONTROL

SPECIFIC OBJECTIVES

Students should be able to:

- 6.1 *describe* the main divisions of the nervous system;
- 6.2 *describe the functions of the parts of the brain;*
- 6.3 distinguish between a neurone and a nerve;
- 6.4 explain the functions of motor and sensory *neurones* and spinal synapses;
- 6.5 *describe the mechanisms of* a reflex action;*
- 6.6 explain the process by which voluntary actions occur;
- 6.7 *distinguish between a voluntary and involuntary action;*
- 6.8 explain the response of the sense organs to stimuli;

EXPLANATORY NOTES

- (a) *Central nervous system - the brain; spinal cord.*
- (b) *Peripheral nervous system: spinal nerves and cranial nerves, and autonomic nervous system.*
- Cerebrum, cerebellum, medulla oblongata, hypothalamus, pituitary glands.*
- (a) *Diagram of neurones required.*
- (b) Definitions.
- (c) Properties of *neurones*; irritability; conductivity; structures of neurons, cell-bodies, axons and dendrites.
- (a) *Functions and types of nerves: motor, sensory, mixed.*
- (b) Synapse and chemical transmitters.
- Definition; structure of spinal cord (diagram required); the spinal reflex action (for example, knee jerk reflex); *cranial reflex action (for example, pupil reflex)*; reaction to painful stimuli; *Demonstration of knee jerk reflex.*
- Definition; transmission of nerve impulses; involvement of neurones in the brain, spinal cord and effector muscles.
- Names of sense organs; stimuli to which they respond.

LIFE PROCESSES (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

- 6.9. relate the internal structures of the eye to their functions;
- 6.10 explain how images are formed in the eye;
- 6.11 explain accommodation in the eye;
- 6.12 describe the causes of, and corrective measures for eye defects;
- 6.13 distinguish between *endocrine* (hormonal) and nervous control systems;
- 6.14 identify the sites of hormone production;
- 6.15 explain the roles of *selected* hormones in the human body.

EXPLANATORY NOTES

Diagram of eye (internal view) required.

Diagrams required.

Long and short-sightedness (*diagrams required*), astigmatism, *include diseases the glaucoma and cataracts.*

Diagram required.

Pituitary - anti-diuretic hormone (ADH), follicle stimulating hormone (FSH), luteinising hormone (LH), growth hormones; Thyroid – thyroxine;

*Pancreas - insulin, glucagon; Adrenals - adrenaline
Ovary - oestrogen, progesterone; Testes – testosterone.*

LIFE PROCESSES (cont'd)

7. REPRODUCTIVE SYSTEM

SPECIFIC OBJECTIVES

Students should be able to:

- 7.1 distinguish between sexual and asexual reproduction;
- 7.2 describe the structure and function of the reproductive systems in human beings;
- 7.3 describe the menstrual cycle;
- 7.4 explain *ovulation*, fertilisation, implantation and development of the embryo;
- 7.5 describe the birth process;
- 7.6 outline the importance of *prenatal* care;
- 7.7 *explain how birth control methods prevent pregnancy*;
- 7.8 explain the advantages and disadvantages of birth control methods;
- 7.9 *discuss the* issues related to abortion;
- 7.10 explain the importance of family planning;
- 7.11 *use tables, charts and diagrams to represent data.*

EXPLANATORY NOTES

Include the structures of the gametes, diagram of systems required; related disorders such as ovarian, cervical and prostate cancers.

(Link to Specific Objectives A4; D7)

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

(Link to Specific Objective B6.15)

*Diagram of foetus in uterus required; role of placenta, umbilical cord and amniotic sac; **minute details of stages of development are not required.***

Importance of ante-natal and post-natal care including the advantages of breastfeeding.

Natural, barrier, hormonal and surgical.

Include the use of condoms to prevent STIs.

(Link to Special Objectives D8, D9)

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

Social and economic implications.

LIFE PROCESSES (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 view audio visuals showing how the heart beats, how antagonistic muscles work to achieve movement and documentaries on the different birth control methods.
2. Draw and use charts and models to assist students with learning of the structures of different organs.
3. 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.
4. Arrange for students to view displays of specimens of bones, the heart, kidney, stomach and alimentary tract of animals. A convenient source is the local butcher.
5. Conduct demonstrations such as dissection or examination of specimen, for example, eye or brain.
6. *Demonstrate the effects of light in the eye, that is, pupil and spinal reflex.*
7. Arrange field trips to hospitals or clinics to expose students to operations that could assist with understanding some of the life processes.
8. Conduct research on the impact of diet on health, especially in the Caribbean.
9. Use flow charts to illustrate processes such as regulation of body temperature, glucose concentration in blood and osmoregulation.
10. Organise a science fair and invite members of school population or immediate community to view students' displays.
11. Use video presentations and computer assisted learning (Internet, CDs) to enhance learning.
12. Conduct laboratory activities.

◆ SECTION C: HEREDITY AND VARIATION

SPECIFIC OBJECTIVES

Students should be able to:

1. *describe the process of mitosis;*
2. *explain the importance of mitosis;*
3. *describe the process of meiosis;*
4. *explain the importance of meiosis;*
5. explain why genetic variation is important to living organisms;
6. distinguish between genetic variation and environmental variation;
7. explain the inheritance of a single pair of characteristics (monohybrid inheritance);
8. describe the inheritance of sex in human beings;

EXPLANATORY NOTES

Definition of mitosis; movement of chromosomes during mitosis (names of stages not required); *diagrams required*.

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

Definition of meiosis; movement and separation of homologous chromosomes and the subsequent separation of chromatids (names of stages not required); diagrams required.

Importance of halving the chromosome number (*haploid*) in the formation of gametes; importance of meiosis in introducing variation into gametes.

Examples of variation - height, weight, gender (sex), blood type, tongue rolling; *mention antibiotic resistant bacteria*.

Include the difference between continuous and discontinuous variation; Mutation, (Down's Syndrome, albinism).

(a) DNA/RNA, chromosome, allele, dominant, recessive, homozygous, heterozygous, gene, *genotype and phenotype*.

(b) Monohybrid inheritance to include: albinism, sickle cell anaemia, *tongue rolling; sex linkage* (haemophilia, colour blindness)

Include the role of sex chromosomes.

HEREDITY AND VARIATION (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

9. *explain the concept of genetic engineering;*
10. *discuss the advantages and disadvantages of genetic engineering;*
11. *use tables, charts and graphs to represent data on heredity and variation.*

EXPLANATORY NOTES

Changing the traits of one organism by inserting genetic material from another organism.

Include recombinant DNA in the manufacture of insulin; its application in the production of food and medicine.

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 depicting genetic crosses.
3. Encourage students to investigate variation of a particular characteristic for example, height, length of index finger, foot size.
4. Use video presentations and computer assisted learning (Internet, CDs) to enhance learning.

◆ SECTION D: DISEASE AND ITS IMPACT ON HUMANS

SPECIFIC OBJECTIVES

Students should be able to:

1. define *the terms* good health *and* disease;
2. classify diseases;
3. differentiate between the terms signs and symptoms;
4. state the main causes, primary symptoms and possible treatment of asthma;
5. *explain how asthma affects the respiratory tract;*
6. *discuss the causes, signs/symptoms, treatment modality and prevention of chronic/lifestyle related diseases;*
7. *discuss the causative agent, signs, symptoms, prevention and control of infectious diseases;*

EXPLANATORY NOTES

WHO definition which relates to physical, mental and social well being and not just the absence of disease.

Communicable (infectious diseases) and non communicable diseases (chronic or degenerative disease, nutritional deficiency disease, inherited disorders).

- (a) Obesity, diabetes mellitus (type I and type II) and *cardiovascular disease* (hypertension and coronary heart disease).
- (b) Diabetes mellitus (type II) and secondary hypertension as complications of obesity.
- (c) *The importance of diet and exercise.*

(Link to Specific Objective B3.11)

Acute respiratory infection (*influenza, bronchitis, pneumonia*), sexually transmitted infections (*STIs*) (*gonorrhoea or syphilis, herpes*), ringworm, typhoid, tuberculosis, cholera, gastroenteritis.

(Link to Specific Objective A2)

DISEASE AND ITS IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES

Students should be able to:

8. *discuss the cause, symptoms, mode of action, prevention and control of HIV/AIDS.*
9. *describe the effects of sexually transmitted infections (STIs) on the pregnant mother and the foetus;*
10. *discuss the impact of diseases on the human population;*
11. *discuss the effects of malaria and dengue (strain I - IV) on the human body;*
12. *explain the effect of vectors on human health;*
13. *describe the life cycle of the mosquito and housefly;*
14. *explain the importance and methods of controlling vectors which affect human health;*
15. *explain how and why personal hygiene is maintained;*
16. *explain the methods used to control the growth of microorganisms;*

EXPLANATORY NOTES

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

Socio-economic implications, analysis and interpretation of data.

Signs and symptoms, causative agent, method of transmission, prevention/control and treatment.

Definition of vectors: rats, mosquitoes, houseflies. Include mode of action.

Diagrams required.

Spread of communicable fatal diseases, leptospirosis, dengue fever, gastroenteritis.

Elimination of body odours; social acceptance; prevention of infections; prevention of dental carries. Include male circumcision. Care of genitalia.

(Link to Special Objective B7.2)

- (a) *Definition of the term sterilization, methods of sterilization (ultra high temperature, pasteurization, autoclaving, boiling, canning).*
- (b) *Effects of high temperatures, disinfectants and antiseptics in the control of microorganisms.*
- (c) *Disinfection - use of chemical agents (chlorine, disinfectants, antiseptics).*

DISEASE AND ITS IMPACT ON HUMANS (cont'd)

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | | |
|-----|---|--|
| 17. | <i>distinguish between disinfectants and antiseptics;</i> | |
| 18. | explain the use of common antibiotics and antifungal agents; | Definition of antibiotics. Antigen, antibody, anti-toxin. |
| 19. | <i>explain the types of immunity;</i> | |
| 20. | <i>distinguish between immunity and immunization; vaccine and vaccination;</i> | Artificial, active and passive, natural passive, acquired. |
| 21. | discuss the use and <i>misuse</i> of drugs; | <i>Include dependence; Prescription (sedatives, pain killers and antibiotics); Non prescription (cocaine, LSD, heroin, ecstasy, alcohol, marijuana; physiological and psychological effects.</i> |
| 22. | explain the social effects of drug <i>misuse</i> on the individual, family and community; | Analysis and interpretation of data. |
| 23. | <i>use tables, graphs and charts to represent data on disease and its impact on human beings.</i> | |

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 (Internet, CDs) to enhance learning.
3. Demonstrate, for example, the proper use of condoms.
4. Arrange public visits to clinics or national associations, for example, Diabetes Association, Heart Foundation.
5. Assign students to conduct research on *the misuse of substances*.

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

SPECIFIC OBJECTIVES

Students should be able to:

1. identify pollutants in the environment;
2. *discuss* the causes of water *and* air pollution;
3. *describe the effects of pollutants on human beings and the environment;*
4. explain the methods of controlling pollution;
5. describe the water cycle;
6. describe simple ways of purifying water in the home;
7. *test water for bacteria;**
8. *describe the processes involved in large scale water purification;*
9. discuss the impact of human activities on water supplies;
10. explain why contaminated water is detrimental to human beings;
11. distinguish between proper and improper sewage disposal practices;
12. explain the impact of improper sewage disposal practices;

EXPLANATORY NOTES

Definition of pollution and pollutant; including domestic, industrial and agricultural pollutants.

Analysis and interpretation of data.

(Link to Specific Objective B2.4)

Diagram required; include evaporation, condensation, transpiration, respiration, filtration.

Boiling, chlorine/bleach.

Agar plate.

(Link to Specific Objective A2)

Screening, sedimentation, filtration, chlorination.

(Link to Specific Objective D7)

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

SPECIFIC OBJECTIVES

EXPLANATORY NOTES

Students should be able to:

- | | |
|--|---|
| 13. compare the treatment of sewage by biological filter and activated sludge methods; | <i>Include the role of microorganisms in the treatment of sewage.</i>

<i>(Link to Specific Objective A2)</i> |
| 14. relate the parts of a pit latrine to their functions; | <i>Diagram required.</i> |
| 15. explain why the <i>siting</i> of pit latrines is important; | <i>Sandy soil, vicinity to water sources.</i> |
| 16. <i>assess the use of pit latrines in the Caribbean;</i> | <i>Advantages, disadvantages, phasing out.</i> |
| 17. evaluate the efficiency of the methods of domestic refuse disposal; | <i>Analysis and interpretation of data.</i> |
| 18. describe the operations at a <i>landfill</i> ; | <i>Include a description of a landfill.</i> |
| 19. <i>discuss the importance of landfills in the Caribbean;</i> | Function of landfill. |
| 20. evaluate the impact of solid waste on the environment; | <i>Analysis and interpretation of data.</i> |
| 21. analyse measures used to control solid waste volume; | <i>Reduce, reuse and recycle, examples of recyclable materials.</i> |
| 22. <i>distinguish between the terms biodegradable and non-biodegradable;</i> | <i>Include classification of biodegradable and non-biodegradable items.</i> |
| 23. <i>use tables, charts and graphs to represent data on the impact of health practices on the environment.</i> | |

THE IMPACT OF HEALTH PRACTICES ON THE ENVIRONMENT (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 visits to sewage *treatment plants*, *landfills* and water treatment *plants*.
2. Assign students to conduct research on pit latrines, landfills, sewage *treatment* plants and water treatment plants.
3. Assign students to carry out investigation 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 and other audiovisual aids to assist students with learning the processes involved in water treatment and sewage treatment.
6. Use video presentations and computer assisted learning (Internet, CDs) to enhance learning.

◆ 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.

Gadd, P.	<i>CXC Human and Social Biology</i> , Oxford: MacMillian Education, 2007.
Pickersing, R. and Robb, D.	<i>Human and Social Biology for Caribbean Schools</i> , Oxford: Oxford University Press, 2006.
Ragoobirsingh, D. and Fullick, A.	<i>Human and Social Biology for CSEC</i> , Essex: Pearson Education Limited, 2007.
Waugh, A. and Grant, A. (Editors)	<i>Ross and Wilson Anatomy and Physiology in Health and Illness</i> , United Kingdom: Churchill Livingstone, 2001.

◆ 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)

WORD/TERM**DEFINITION/MEANING**

deduce	Make a logical connection between two or more pieces of information; use data to arrive at a conclusion.	(UK)
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 analyzed 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)

WORD/TERM**DEFINITION/MEANING**

discuss	Present reasoned arguments; (UK) consider points both for and against; explain the relative merits of a case.
draw	Make a line representation from (In case of drawings from specimens or apparatus that specimens, the magnification shows an accurate relationship must always be stated. A between the parts. diagram is a simplified representation showing the relationship between components. KC/UK)
estimate	Make an approximate quantitative judgment.
evaluate	Weigh evidence and make (The use of logical supporting judgments based on given reasons for a particular point of criteria. view is more important than the view held; usually both sides of an argument should be considered. UK)
explain	Give reasons based on recall; (KC) account for.
find	Locate a feature or obtain as (UK) from a graph.
formulate	To express in a formula or in a (UK) systematic manner.
identify	Name or point out specific (KC) components or features.
illustrate	Show clearly by using (KC/UK) appropriate examples or diagrams, sketches.
investigate	Use simple systematic procedures to observe, record data and draw logical conclusions.

WORD/TERM**DEFINITION/MEANING**

justify	To prove a statement or claim true. (UK)
label	Add names to identify structures or parts indicated by pointers. (UK)
list	Itemize 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 characterize 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).
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)

WORD/TERM**DEFINITION/MEANING**

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.

Western Zone Office
19 May 2009

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

**SECONDARY EDUCATION CERTIFICATE
EXAMINATION**

**SPECIMEN
MULTIPLE CHOICE QUESTIONS
FOR**

HUMAN AND SOCIAL BIOLOGY

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

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.

Sample Item

Abnormally high blood pressure is called

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

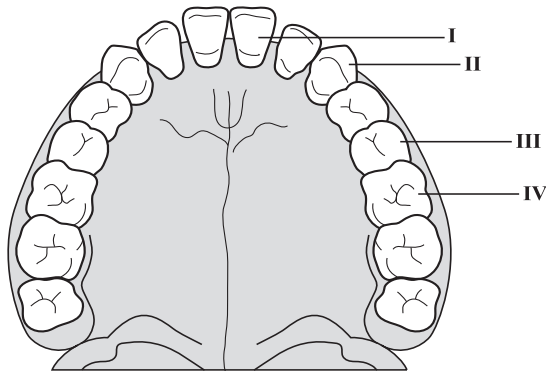
Sample Answer



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

1. All living organisms carry out certain activities which make them different from inanimate objects.
- Which of the following lists shows three activities of all living organisms?
- (A) Movement, decay, synthesis
(B) Respiration, nutrition, preservation
(C) Exercise, irritability, metabolism
(D) Reproduction, excretion, growth
2. Which of the following cell organelles makes proteins for the cell?
- (A) Nucleus
(B) Ribosome
(C) Mitochondrion
(D) Cell membrane
3. The initial energy of a food chain comes from
- (A) the sun
(B) the plant
(C) chlorophyll
(D) carbon dioxide
4. The function of nitrifying bacteria is to convert
- (A) nitrates to protein
(B) nitrites to nitrates
(C) nitrogen gas to urea
(D) nitrogen gas to nitrates
5. Night blindness is caused by a deficiency of
- (A) vitamin A
(B) vitamin B
(C) vitamin C
(D) vitamin D
6. Which of the following foods would MOST likely prevent constipation?
- I. White bread
II. Carrots
III. Water
IV. Cabbage
- (A) I and II only
(B) III and IV only
(C) II, III and IV only
(D) I, II, III and IV
7. Which of the following foods, when consumed in excess, does NOT contribute to obesity?
- (A) Milk
(B) Protein
(C) Roughage
(D) Carbohydrate
8. Which of the following is a definitive sign of malnutrition?
- (A) Shiny hair
(B) Albinism
(C) Dwarfism
(D) Overweight
9. Which of the following formulae is used to determine body mass index (BMI)?
- (A) $\frac{\text{Height}}{\text{Weight}}$
(B) $\frac{\text{Height}}{\text{Weight}^2}$
(C) $\frac{\text{Height}^2}{\text{Weight}}$
(D) $\frac{\text{Height}^2}{\text{Weight}^2}$

Item 10 refers to the diagram below, showing the arrangement of teeth in the upper jaw of an adult human being.



10. Which of the following labelled parts shows an incisor?

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

11. In which part of the tooth are nerves found?

(A) Cement
(B) Dentine
(C) Enamel
(D) Pulp cavity

12. An enzyme shows optimum activity at pH 2.5. In which part of the alimentary canal will this enzyme be MOST active?

(A) Ileum
(B) Mouth
(C) Stomach
(D) Duodenum

13. What is the end product of the digestion of carbohydrate?

(A) Starch
(B) Glucose
(C) Glycerol
(D) Amino acid

14. Which of the following are egested by the human body?

I. Faeces
II. Products of metabolism
III. Undigested food materials

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

15. The trachea is lined with hair-like structures called

(A) cilia
(B) cells
(C) villi
(D) flagella

16. Which of the following BEST describes what happens during exhalation?

	Ribcage	Diaphragm
(A)	Moves up	Flattens
(B)	Moves down	Curves upward
(C)	Moves down and in	Curves upward
(D)	Moves up and out	Does not move

17. Which of the following statements are true of aerobic respiration?

I. Produces a large amount of energy
II. Carbon dioxide is always produced
III. Produces lactic acid

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

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18. Tar is a component of cigarette smoke. What is the MOST likely effect of tar in the body of a cigarette smoker?

- (A) An increase in the absorption of oxygen
- (B) A reduction of oxygen going to the blood
- (C) A reduction of carbon monoxide in the body
- (D) An increase in the amount of carbon dioxide leaving the blood

19. The blood vessel that takes blood from the heart to lungs is called the

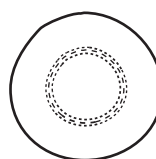
- (A) aorta
- (B) vena cava
- (C) pulmonary vein
- (D) pulmonary artery

Item 20 refers to the following diagrams which show structures found in the blood.

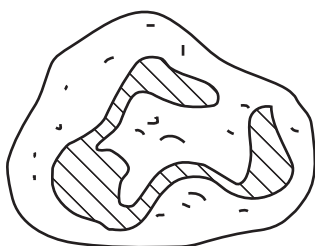
I



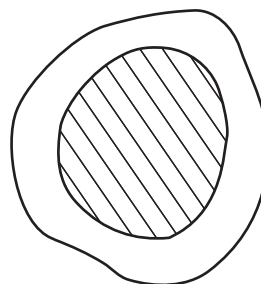
II



III



IV



20. Which structure is phagocytic in nature?

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

21. Zena cuts her finger while peeling an orange. Which of the following components of the blood will assist in reducing bleeding?

- (A) Haemoglobin
- (B) Blood platelets
- (C) Red blood cells
- (D) White blood cells

22. Which of the following results in coronary artery disease?

- (A) Arthritis
- (B) Cirrhosis
- (C) Phagocytosis
- (D) Artherosclerosis

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23. The function of the lymphatic system in the human body is to
- (A) bring nutrients back to the body
 - (B) carry the tissue fluid out of the body
 - (C) remove excess fluid and foreign material from the tissue spaces
 - (D) remove poisonous substances and other waste materials from the blood
24. Which of the following is NOT a function of the human skeleton?
- (A) Produces vitamin D
 - (B) Assists in breathing
 - (C) Produces blood cells
 - (D) Protects the spinal cord
25. Which of the following are functions of cartilage?
- I. Forms a barrier between bones
 - II. Lengthens the space between bones
 - III. Reduces friction between bones
 - IV. Prevents shock between bones
- (A) I and II only
 - (B) I and IV only
 - (C) II and III only
 - (D) III and IV only
26. Which of the following pairs of bones forms a ball and socket joint?
- (A) Femur and pelvic girdle
 - (B) Scapula and clavicle
 - (C) Tarsals and metatarsals
 - (D) Carpals and metacarpals
27. Which of the following pairs of activities occurs when an arm is flexed?
- (A) Biceps relaxes and pulls the radius
 - (B) Biceps contracts and pulls the radius
 - (C) Triceps relaxes and pulls the ulna
 - (D) Triceps contracts and pulls the ulna
28. Which of the following tasks is or are performed by the kidneys?
- I. Elimination of toxins
 - II. Getting rid of all metabolic waste
 - III. Maintaining blood composition
- (A) I only
 - (B) II only
 - (C) I and III only
 - (D) I, II and III
29. Which of the following are functions of skin in human beings?
- I. Produces hair
 - II. Excretes sweat
 - III. Protects from injury
 - IV. Produces body temperature
- (A) I and II only
 - (B) I and III only
 - (C) I, II and III only
 - (D) I, II, III and IV
30. Which of the following substances reduces blood sugar in the human body?
- (A) Insulin
 - (B) Glycogen
 - (C) Glucagon
 - (D) Adrenalin
31. Which of the following actions occurs when a person feels cold?
- (A) Blood vessels dilate.
 - (B) Blood vessels constrict.
 - (C) Hairs on the skin lie flat.
 - (D) Blood vessels move closer to the skin.

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32. Which structure of the brain is responsible for the regulation of water content in the blood?

(A) Cerebrum
(B) Cerebellum
(C) Hypothalamus
(D) Pituitary gland

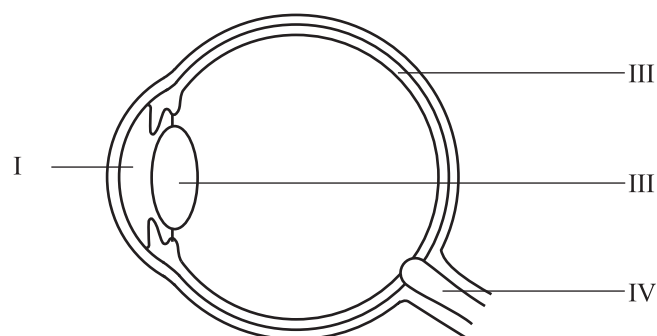
33. The long process of a nerve cell which conducts impulses toward a cell body is called

(A) axon
(B) dendron
(C) ganglia
(D) dendrites

34. What is the correct path of travel for an impulse from the receptor to the effector in a reflex action?

(A) Axon - sensory neurone - intermediate neurone - motor neurone - axon
(B) Axon - motor neurone - intermediate neurone - sensory neurone - dendron
(C) Dendron - motor neurone - intermediate neurone - sensory neurone - axon
(D) Dendron - sensory neurone - intermediate neurone - motor neurone - axon

Item 35 refers to the following diagram of the eye.



35. Which of the labelled parts contains cells called rods and cones?

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

36. Andrea leaves a brightly lit area and ventures into a dark closet. Which of the following changes occur in the eye?

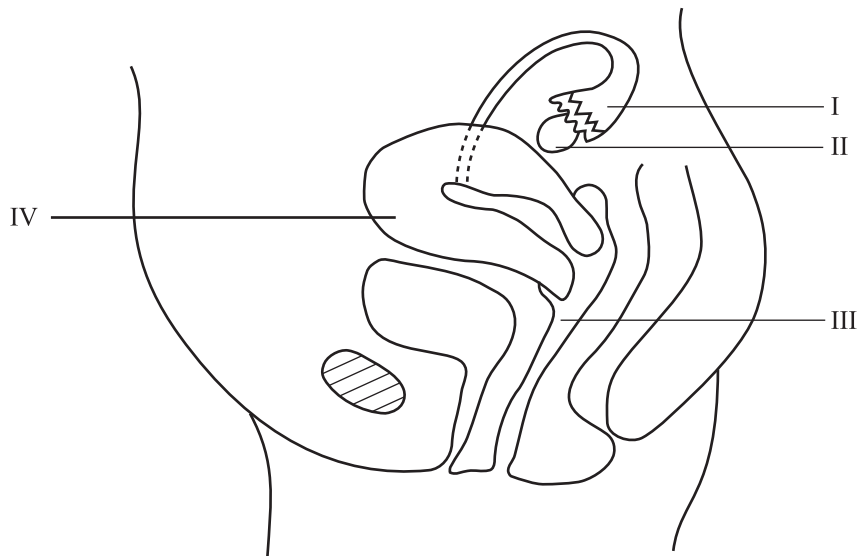
(A) Radial muscles of the iris contract and the pupils become larger.
(B) Circular muscles of the iris contract and the pupils increase in size.
(C) Pupils decrease in size because the radial muscles in the iris relax.
(D) Pupils decrease in size due to the contraction of the circular muscles of the iris.

37. Which of the following shows the correct path for sperms to exit the body?

(A) Testis → epididymis → vas deferens → urethra
(B) Epididymis → testis → vas deferens → urethra
(C) Vas deferens → epididymis → testis → urethra
(D) Vas deferens → testis → epididymis → urethra

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Item 38 refers to the following diagram of the female reproductive system.



38. Which labelled part facilitates the development of the embryo?
- (A) I
(B) II
(C) III
(D) IV
-
39. Fertilization occurs when
- (A) implantation occurs
(B) the sperm enters the oviduct
(C) the sperm fuses with the ovum
(D) semen is expelled into the vagina
40. The contraceptive pill prevents ovulation by
- (A) increasing oestrogen levels
(B) decreasing progesterone levels
(C) facilitating the secretion of follicle stimulating hormone
(D) preventing the release of follicle stimulating hormone
41. Which of the following is NOT true about mitosis?
- (A) Ensures variation
(B) Produces identical cells
(C) Occurs in normal body cells
(D) Results in body growth and development
42. Which of the following processes occur during meiosis?
- I. Two cell divisions
II. Production of four diploid cells
III. Movement of chromosomes
IV. Creation of spindle
- (A) I and II only
(B) II and III only
(C) I, III and IV only
(D) I, II, III and IV

GO ON TO THE NEXT PAGE

43. How many chromosomes are present in the nucleus of a muscle cell in a baby born with Down's Syndrome?
- (A) 23
(B) 24
(C) 46
(D) 47
44. Two normal parents have an albino child. If 'A' represents the normal skin pigment and 'a' represents the albino condition. What may be the possible genotype of the parents?
- (A) aa x aa
(B) Aa x Aa
(C) AA x Aa
(D) AA x AA
45. The World Health Organisation defines good health to include
- (A) the absence of disease
(B) access to potable water
(C) Health Insurance coverage
(D) physical, mental and social well-being
46. Which of the following diseases may be described as chronic?
- (A) Dengue
(B) Cholera
(C) Diabetes
(D) Typhoid
47. Which of the following signs or symptoms occur during an asthmatic attack?
- (A) Wheezing, coughing, vomiting
(B) Shock, coughing, shortness of breath
(C) Chest pains, bronchospasms, vomiting
(D) Shortness of breath, wheezing, bronchospasms
48. Which of the following vectors transmits dengue haemorrhagic fever?
- (A) Bat
(B) Rat
(C) Anopheles mosquito
(D) Aedes aegypti mosquito
49. Which of the following organisms causes malaria?
- (A) Virus
(B) Fungus
(C) Protozoan
(D) Bacterium
50. The correct sequence of the stages in the life cycle of a mosquito is?
- (A) adult, egg, larva, pupa
(B) egg, pupa, larva, adult
(C) larva, pupa, egg, adult
(D) pupa, adult, larva, egg
51. Anthony is vaccinated against a disease on Monday and the antibody concentration increases rapidly. However, there is a gradual decrease in antibody concentration over the next few days. What type of immunity does Anthony experience?
- (A) Active
(B) Passive artificial
(C) Active artificial
(D) Naturally acquired
52. Type 1 diabetes is treated medically by injections of
- (A) insulin
(B) glucagon
(C) thyroxine
(D) adrenaline

GO ON TO THE NEXT PAGE

53. Which of the following activities lead to air pollution?
- I. Burning of rubbish
 - II. Use of pesticides in agriculture
 - III. Release of industrial gases into the atmosphere
 - IV. Release of household detergents into the soil
- (A) I and II only
(B) I and III only
(C) II and III only
(D) III and IV only
54. Water changes into water vapour by the process of
- (A) condensation
(B) precipitation
(C) evaporation
(D) percolation
55. The correct sequence of the processes in the large-scale purification of water is
- (A) screening, sedimentation, filtration, chlorination
(B) chlorination, screening, filtration, sedimentation
(C) screening, sedimentation, filtration, chlorination
(D) filtration, screening, sedimentation, chlorination
56. Which of the following is a sign or symptom of lead poisoning?
- (A) Bronchitis
(B) Lung cancer
(C) Eye irritation
(D) Brain damage
57. Which of the following activities can lead to eutrophication?
- I. Farmers applying fertilizers to crops
 - II. Releasing detergents, sewage and industrial waste into waterways
 - III. Bacteria decomposing organic matter from sewage and other sources
- (A) I only
(B) I and II only
(C) II and III only
(D) I, II and III
58. Which of the following statements is true about pit latrines?
- (A) They should be dug one metre deep.
(B) Disinfectants should be added to the pit.
(C) They should not be placed near wells.
(D) The best soil type for siting a pit latrine is clay.
59. The bottom liner of a landfill serves to prevent
- (A) the trash from flying away
(B) rats and flies from breeding
(C) gases from escaping into the atmosphere
(D) liquid from the trash from drying out
60. Mr Murphy puts all his soda cans in a bin for cans only. Which of the following BEST describes the methods he is employing to control solid waste volume.
- (A) Biodegradable
(B) Recycle
(C) Reduce
(D) Reuse

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

CARIBBEAN EXAMINATIONS COUNCIL

**SECONDARY EDUCATION CERTIFICATE
EXAMINATION**

HUMAN AND SOCIAL BIOLOGY

SPECIMEN PAPER 2009

Item No.	Key
1	D
2	B
3	A
4	B
5	A
6	C
7	C
8	D
9	B
10	A
11	D
12	C
13	B
14	B
15	A
16	C
17	A
18	B
19	D
20	C
21	B
22	D
23	C
24	A
25	D
26	A
27	B
28	C
29	C
30	A

Item No.	Key
31	B
32	C
33	B
34	A
35	B
36	A
37	A
38	D
39	C
40	D
41	A
42	C
43	D
44	B
45	D
46	C
47	D
48	D
49	C
50	A
51	B
52	A
53	B
54	C
55	A
56	D
57	D
58	C
59	D
60	B

TEST CODE: /SPEC

TEST CODE: /01253020

FORM TP /SPEC 2009

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

SECONDARY EDUCATION CERTIFICATE EXAMINATION

HUMAN AND SOCIAL BIOLOGY

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.
Each question is worth 15 marks.

SECTION A

Answer ALL questions in this section.

Write your answers in the spaces provided in this booklet.

1. (a) Define the term 'malnutrition'.

[2 marks]

- (b) (i) State THREE possible causes of obesity.

[3 marks]

- (ii) Healthcare providers have observed that some medical conditions are related to obesity.

Identify ONE of these medical conditions.

[1 mark]

- (c) The Ministry of Health of a Caribbean territory collects data on obesity in children. Table 1 shows the percentage of obese children in the territory over a 50-year period.

**TABLE 1: PERCENTAGE OF OBESE CHILDREN
IN A CARIBBEAN TERRITORY**

Year	Percentage of obese children
1960 – 1969	4
1970 – 1979	5
1980 – 1989	8
1990 – 1999	10
2000 – 2009	15

GO ON TO NEXT PAGE

- (i) On the grid provided in **Figure 1**, construct a bar graph of the data in Table 1. [3 marks]

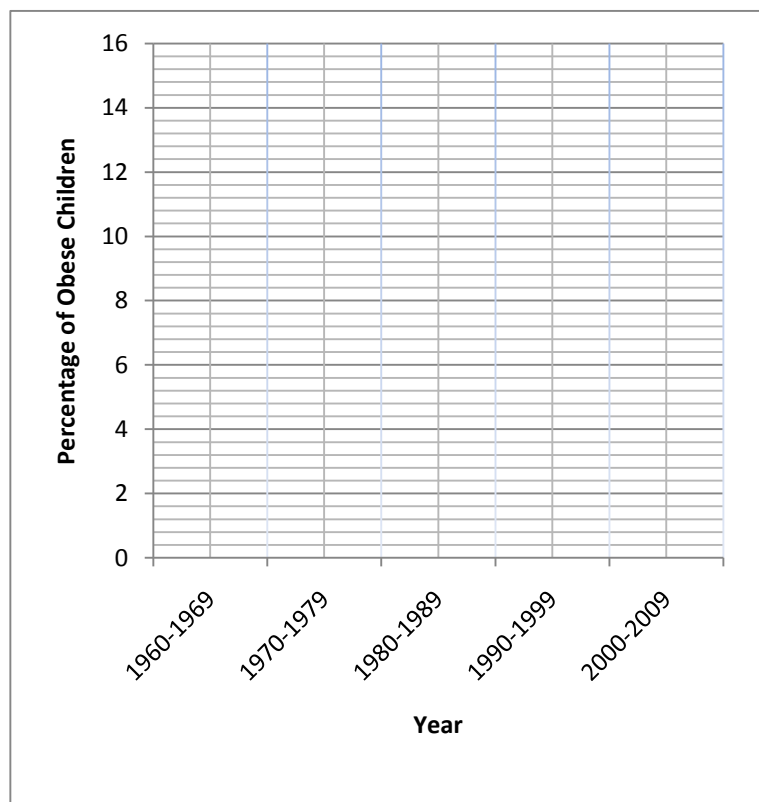


Figure 1. Grid for bar graph

- (ii) Describe the trend in obesity among children in the Caribbean territory as illustrated in Figure 1.

[2 marks]

- (iii) Suggest ONE reason for the difference in the percentage of obese children during the periods 1960 – 1969 and 2000 – 2009.

[2 marks]

- (d) Lana conducts two **food tests** on a sample of food and records the observations in Table 2.

Write the inference for EACH test in the space provided in Table 2.

TABLE 2: TESTS ON FOOD SAMPLE

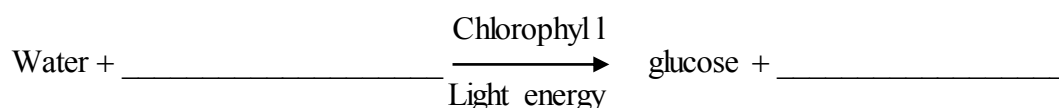
Test	Observation	Inference
1 cm ³ of sodium hydroxide solution is added to a portion of the food sample, followed by 1 cm ³ of copper sulphate solution. The mixture is then shaken.	Colour changed from white to purple.	
3 drops of iodine solution are added to the other portion of the food sample.	Reddish-brown colour observed.	

[2 marks]

Total 15 marks

2. (a) Photosynthesis is the process by which plants manufacture their food.

- (i) Complete the following word equation for photosynthesis.



[2 marks]

- (ii) In which organelle of the plant cell does photosynthesis occur?

[1 mark]

- (iii) State the role of EACH of the following agents in photosynthesis:

Chlorophyll _____

Sunlight _____

[2 marks]

GO ON TO NEXT PAGE

- (b) Why is the process of photosynthesis essential in a food chain?

[2 marks]

- (c) While plants are beneficial to the environment, human beings pollute the environment in many ways.

- (i) What is meant by the term 'pollution'?

[1 mark]

- (ii) Explain how an increase in human population has led to an increase in pollution of the environment. Your answer should include TWO points.

[4 marks]

- (d) Over the years there has been an increasing need for clean drinking water.

- (i) Why is chlorine added to water that has been purified for drinking?

[1 mark]

GO ON TO NEXT PAGE

- (ii) After widespread flooding in a Caribbean territory, health officials advised residents to boil water before drinking it.

Explain why boiling the water is necessary.

[2 marks]

Total 15 marks

3. Respiration occurs in all living cells.

- (a) (i) Complete the following paragraph by writing the correct term chosen from the list provided at the end of the paragraph.

Respiration is the process by which foods are used to make _____. There are two types of respiration, aerobic respiration and anaerobic respiration. Anaerobic respiration does not use _____ but both types of respiration produce ATP molecules.

(carbon dioxide, ethanol, energy, lactic acid, oxygen)

[2 marks]

- (ii) State how energy is obtained from ATP.

[1 mark]

GO ON TO NEXT PAGE

- (b) **Figure 2** shows part of the respiratory system of a human being.

Identify the parts labeled A, B and C. Write your answers in the spaces provided in Figure 2.

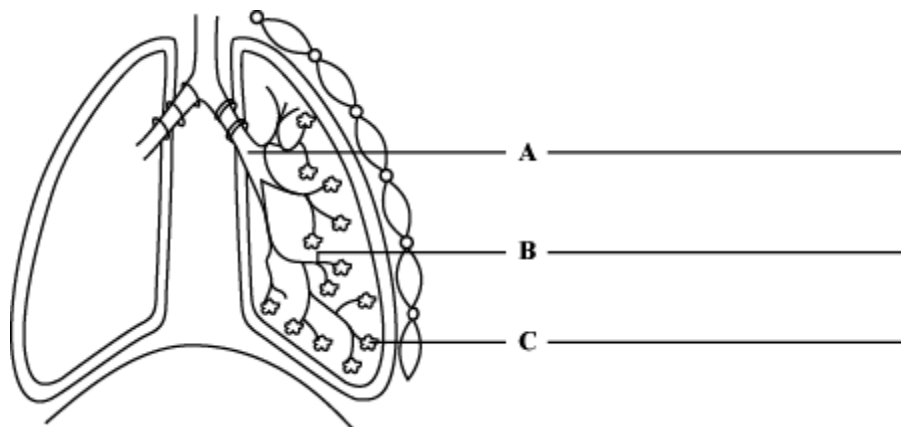


Figure 2. Part of the respiratory system of human beings

[3 marks]

- (c) Explain why breathing and gaseous exchange are essential for respiration.

Breathing: _____

Gaseous exchange: _____

[3 marks]

GO ON TO NEXT PAGE

- (d) Justin lives in a town that has two factories which emit smoke and dust particles over a 24-hour period. His father, with whom he lives, is a chain smoker. Discuss THREE possible effects of Justin's environment on his health.

[6 marks]

Total 15 marks

4. **Figure 3** shows a cross-section of the skin of a human being.

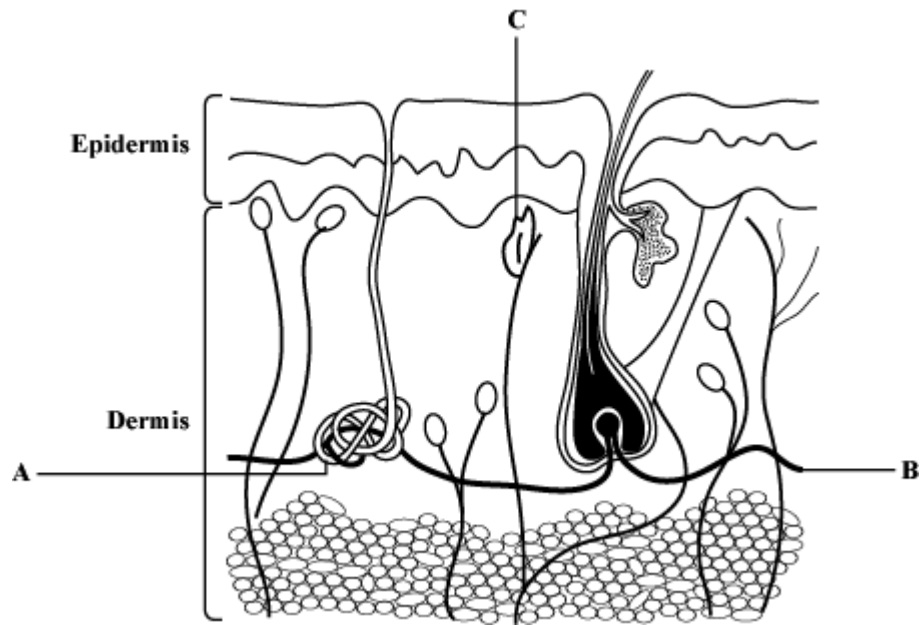


Figure 3. Cross-section of the skin of a human being

- (a) (i) Name the parts of the skin labeled A, B and C in Figure 3.

A: _____

B: _____

C: _____

[3 marks]

- (ii) State ONE function of EACH of the parts, A, B and C.

A: _____

B: _____

C: _____

[3 marks]

GO ON TO NEXT PAGE

- (b) Ryan plays football every afternoon. He perspires very much during the game, and goes directly to evening classes without bathing.

Explain why Ryan should bathe after playing football. Your answer should include THREE points.

[6 marks]

- (c) Ryan's shoes have an unpleasant odour and he experiences itching between his toes.

Suggest the name of the type of microorganism that may be causing the itching, and TWO ways that Ryan can prevent and/or control this condition.

Microorganism: _____

Prevention and/or control: _____

[3 marks]

Total 15 marks

SECTION B

Answer ALL questions in this section.

Write your answer in the space provided at the end of each question.

- 5.** **Figure 4** is a diagram of a developing foetus.



Figure 4. Developing foetus

- (a) (i) Label the placenta and the umbilical cord in Figure 4. [2 marks]
- (ii) State TWO functions of the placenta. [2 marks]
- (b) (i) Amma, the mother of an unborn child, has no knowledge of Human and Social Biology. Explain to her, using a genetic diagram, how the sex of the foetus is determined. [5 marks]
- (ii) State TWO advantages of breastfeeding over bottle feeding with formula. [2 marks]
- (c) Discuss ONE advantage and ONE disadvantage of the use of genetic engineering for medical purposes. [4 marks]

Total 15 marks

GO ON TO NEXT PAGE

Write your answers to Question 5 here.

[illegible]

GO ON TO NEXT PAGE

- (b) The increased incidence of some diseases may be related to social activities, such as, alcohol consumption, drug abuse and promiscuous sexual behaviours.

Marks will be awarded for a coherent essay, including an introduction, and correct spelling, grammar and punctuation. [9 marks]

Write your answers to Question 6 here.

[illegible]

01253020/SPEC CSEC 2009

[illegible]

01253020/SPEC CSEC 2009

01253020/MS/SPEC 2009

CARIBBEAN EXAMINATIONS COUNCIL
HEADQUARTERS

SECONDARY EXAMINATION CERTIFICATE

HUMAN AND SOCIAL BIOLOGY

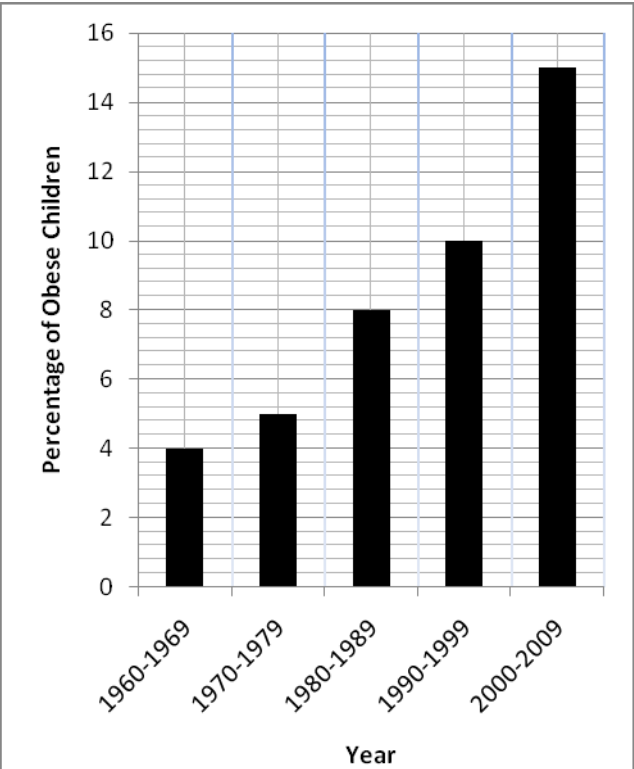
PAPER 02

GENERAL PROFICIENCY

SOLUTIONS AND MARK SCHEME 2009

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 1

Ques No.	Possible Answer	Instructions	KC	UK
(a)	Malnutrition – the lack of balance in the diet caused by eating either too little (1) or too much (1) food	2 marks	2	
(b) (i)	<u>Possible causes of obesity</u> <ul style="list-style-type: none"> • Eating too much food • Eating too many fatty food • Lack of exercise • Hormonal imbalance • Genetic predisposition • Some kinds of medication, for example, steroids. 	1 mark each to a maximum of 3	3	
(ii)	<ul style="list-style-type: none"> • Hypertension • Diabetes • Heart problems 	1 mark for any one	1	
(c) (i)	 <p>Percentage of Obese Children</p> <p>Year</p>	5 bars = 3 marks 3 – 4 bars = 2 marks 1 – 2 bar(s) = 1 mark		3

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 1 (Cont'd)

Ques No.	Possible Answer	Instructions	KC	UK
(c) (ii)	<ul style="list-style-type: none"> Increasing percentage of obese children over the 40-year period Although there is a steady increase in the percentage of obese children, the nineties showed the greatest increase (from 9% to 15%) 	1 mark each		2
(iii)	Difference in percentage <ul style="list-style-type: none"> Too many 'fast' foods available in 2000 but not in 1960. Sedentary lifestyle of children (because of television, computer, vehicular transportation, etc) in 2000; children more active in 1960 	2 marks for each point to a maximum of 2		2
(d) (i)	Protein is present	1 mark		2
(ii)	Starch is not present	1 mark		
Specific Objective(s): B1.10, 1.12, 1.5, D6			6	9

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 2

Ques No.	Possible Answer	Instructions	KC	UK
(a) (i)	<ul style="list-style-type: none"> Carbon dioxide Oxygen 	1 mark each	2	
(ii)	Chloroplast	1 mark	1	
(iii)	<ul style="list-style-type: none"> Chlorophyll traps light energy Sunlight provides energy for the reaction 	1 mark each	2	
(b)	<ul style="list-style-type: none"> Plants are the producers in a food chain (1), manufacturing food through the process of photosynthesis (1) All other organisms rely on the food produced by plants (1). 	Any 2 marks		2
(c) (i)	Pollution – harming of the environment because of the activities of human beings.	1 mark	1	
(ii)	<p>Increased population and pollution</p> <ul style="list-style-type: none"> More food is required so greater use of agricultural chemicals which result in water pollution. Greater need for transport, thus greater use of fossil fuels, the combustion of which produces pollutants, like carbon dioxide, lead, etc. More heavy industry which produces pollutants like heavy metals, etc. <p>Any other correct answer (for example, more sewage, solid waste, etc)</p>	2 marks for each point explained to a maximum of 4 (1 mark if point stated only)		4

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 2 (Cont'd)

Ques No.	Possible Answer	Instructions	KC	UK
(d) (i)	Chlorine – to destroy microorganisms.	1 mark		1
(ii)	Boiling <ul style="list-style-type: none"> The water may be contaminated/contain disease pathogens. Boiling destroys these pathogens, thus preventing diseases like cholera 	1 mark each		2
Specific Objective(s): A8, 10, E1, 2, 6			6	9

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 3

Ques No.	Possible Answer	Instructions	KC	UK
(a) (i)	<ul style="list-style-type: none"> • Energy • Oxygen 	1 mark each	2	
(ii)	ATP releases energy when the phosphate bond is broken.	1 mark	1	
(b)	A : bronchus B : bronchiole C : alveolus	1 mark each	3	
(c)	<u>Breathing</u> Brings O ₂ (fresh air) into the lungs/takes CO ₂ out of the lungs. <u>Gaseous exchange</u> Allows O ₂ to be absorbed into the blood to be transported to cells (1) for respiration to occur (1) .	1 mark 2 marks		3
(d)	Impacts <ul style="list-style-type: none"> • Difficulty breathing because of the build-up of tar from the cigarette (narrowing of bronchiole tubes) • Development of a cough because of the accumulation of dirt/dust from the factories. • Lung damage caused by mucus (chronic bronchitis)/dust and chemicals prevent the removal of mucus. • Bacterial infections increase because mucus interferes with the lung defenses. • Carcinogenic effect of tar-cancer of the lungs, lips, tongue, pharynx, larynx. Any other reasonable answer.	2 marks for each point explained to a maximum of 6 (1 mark for point stated only)		6
Specific Objective(s): B2.8, 2.9, 2.6, 2.11			6	9

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 4

Ques No.	Possible Answer	Instructions	KC	UK
(a) (i)	A : Sweat gland B : Blood capillary C : Nerve ending	1 mark each	3	6
(ii)	Function <ul style="list-style-type: none"> Sweat gland - temperature control Blood capillary - blood supply/temperature control Nerve ending - facilitates reception of stimuli/sense of touch. 	1 mark each	3	
(b)	<u>Reasons for bathing</u> <ul style="list-style-type: none"> To limit the growth of bacteria and fungus that thrive in moist conditions. To remove waste products, such as urea and salts, from the body. For social acceptance - his classmates will shun him if he has a high body odour. For a feeling of well being/ sweat makes one feel uncomfortable. Any answer that reflects the above.	2 marks for each point explained to a maximum of 6 (1 mark for partial explanation)		

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 4 (Cont'd)

Ques No.	Possible Answer	Instructions	KC	UK
(c)	<u>Microorganism</u>	1 mark		1
	Fungus/Athletes foot <u>Prevent and/or control</u> <ul style="list-style-type: none"> • Bathe regularly, paying attention to cleaning between the toes. • Dry feet properly • Wear clean socks daily and wash shoes regularly. • Do not share socks, towels or shoes. • Fungal treatment (ointments) 	1 mark each to a maximum of 2 marks		2
Specific Objective(s): B5.4, D15, 7			6	9

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 5

Ques No.	Possible Answer	Instructions	KC	UK						
(a) (i)	Correct labeling of the placenta and umbilical cord	1 mark each	2	5						
(ii)	Functions of the placenta <ul style="list-style-type: none">Facilitates the exchange of nutrients and waste materials.Prevents the entry of bacteria.Acts as a barrier to prevent the mixing of material and foetal blood	1 mark each to a maximum of 2	2							
(b) (i)	<ul style="list-style-type: none">Male sex chromosomes - XYFemale sex chromosomes - XX <div><div>X</div><div>Y</div><table><tr><td>X</td><td>XX</td><td>XY</td></tr><tr><td>X</td><td>XX</td><td>XY</td></tr></table></div>	X	XX		XY	X	XX	XY	1 mark 1 mark Diagram - 2 marks 1 incorrect cross, deduct 1 mark > 1 incorrect, 0 marks	
X	XX	XY								
X	XX	XY								
	<ul style="list-style-type: none">When gametes fuse, here is a 50% chance of the foetus being male or female.	1 mark								
(ii)	<u>Breastfeeding</u> <ul style="list-style-type: none">Milk contains antibodies which give passive immunityContains all the nutrients required in the correct proportions.Facilitates bonding between mother and childCheaper than formulaMore convenient <p>Any other correct answer</p>	1 mark each to a maximum of 2	2							

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 5 (Cont'd)

Ques No.	Possible Answer	Instructions	KC	UK
(c)	<p>Genetic engineering</p> <ul style="list-style-type: none"> • Useful in medicine, for example, in producing insulin which humans require to treat diabetes. • Not enough is known about the technology re adverse effects on humans. • Animals suffer when sequencing of the DNA goes wrong/unpredictable side effects/systems malfunction. • Effects on the environment/wildlife are unknown. 	<p>2 marks for any advantage and 2 marks for any disadvantage discussed to a maximum of 4 marks</p> <p>(1 mark for partial discussion)</p>		4
Specific Objective(s) : B7.4, C8, B7.6, C10			6	9

Human and Social Biology
Paper 02 – General Proficiency
Solutions and Mark Scheme 2009

Question 6

Ques No.	Possible Answer	Instructions	KC	UK
(a) (i)	Sewage – faeces, urine and waste domestic water.	1 mark	1	
(ii)	<u>Biological filter</u> <ul style="list-style-type: none"> Concrete tank about 2 m above the ground, filled with clinker coke or small stones. The coke or stones become covered with bacteria and protozoa. 	1 mark each	2	
(ii)	Operation at a landfill <ul style="list-style-type: none"> Top soil is removed and a pit is dug. Waste is thrown into the pit. Machinery is used to compact the volume of waste. 	1 mark each	3	
(b)	Impact of HIV/AIDS <ul style="list-style-type: none"> A disease caused by HIV which destroys the T lymphocytes, thus weakening the immune system resulting in weight loss, dementia, other infections. 	2 marks for explanation of AIDS (1 mark for partial)		2
	<ul style="list-style-type: none"> Transmitted <ul style="list-style-type: none"> mainly sexually contaminated needles blood transfusion (contaminated blood) mother to foetus 	2 marks for transmission methods		2

Question 6

Ques No.	Possible Answer	Instructions	KC	UK
	<ul style="list-style-type: none"> Impact <p>Social</p> <ul style="list-style-type: none"> - Loss of lines to families, communities. - Infected persons shunned/ stigmatized, sometimes ostracized for promiscuous behaviour. <p>Economic</p> <ul style="list-style-type: none"> - Reduced labour force - Loss of working hours (sick days off) - Cost of medication for other infections that are easily contracted. - Cost of medication for HIV/AIDS. <ul style="list-style-type: none"> • Introduction • Coherency • Correct spelling, grammar, and punctuation 	<p>1 mark for any point up to a maximum of 3 (Both social and economic impact must be included for full marks)</p> <p>3 marks</p>		<p>3</p> <p>3</p>
Specific Objective(s): D21, 8, 10, E13, 18			6	9

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

JUNE 2005

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY**JUNE 2005**

Human and Social Biology has been introduced as a subject offered at General Proficiency level in June 2005. The examination comprises an objective test of 60 multiple choice items and a Paper 02.

Paper 02 consists of Section A, 10 compulsory structured items, and Section B, four essay items, from which the candidates are expected to answer any two.

DETAILED COMMENTS**PAPER 02**Question 1

This question required that candidates have a knowledge of the principles of transport of materials into and out of the cell.

The answers given were generally poor.

Part (a) was not well done with most candidates showing little knowledge of the need for a concentration gradient in diffusion.

In Part (b)(i), many candidates showed very little knowledge of active transport. Some knew that it was related to energy in some way but they were not clear on what was being transported. Many candidates also associated 'active transport' with movement of substances around the body.

In Part (b)(ii), very few candidates gained this mark, mostly because they stated a site of active transport rather than an example of the process, such as $\text{Na}^+ \text{K}^+$ ATPase pump.

In (c), many did not relate osmosis to water and also did not outline the details of the concentration gradient that were required.

In Parts (d) and (e) many candidates were able to gain some of the marks in these sections especially in Part (e).

The responses show that greater emphasis is required on the principles involved in transport in and out of cells, and on more practical work to demonstrate the theory.

Question 2

This question tested candidates' knowledge of structure and functions of bones. Overall performance on the question was poor.

In (a)(i) more candidates gained the mark given for 'cartilage' than the other structures. Labelling guidelines were often unclear, as they did not touch the structure being identified.

In (a)(ii), the function of cartilage was better known than the other parts. Candidates seemed very unclear as to the function of cancellous bone.

In Part (b), very few candidates ventured to give reasons why cartilage is elastic. Most candidates who attempted this question stated what elasticity did for the cartilage, rather than cartilage owes its elasticity to protein fibres secreted by its cells, and to the fact that it does not contain calcium salts. Weaker candidates felt that this gave bones the ability to 'stretch'.

Question 3

This question tested the candidates' knowledge of the structure and function of the eye.

In Part (a), most candidates were able to identify the parts of the eye.

In Part (b), most candidates scored the one possible mark.

For Part (c), most candidates knew about the presence of rods and cones but were unsure about their location and function.

In Part (d), candidates were generally unfamiliar with how the eye is nourished. The accepted response was 'the choroid contains capillaries supplying food and oxygen' or 'nutrients such as carotene/Vitamin A being present in the diet.'

In Part (e), most candidates had some knowledge of how images are formed on the retina. Some concentrated on 'image focussed on retina' rather than 'the eye lens forming an inverted image on the retina'. They also referred to rods/cones receiving the image. Candidates should have said that light enters the eye through the pupil and is refracted by the lens onto the retina.

Overall, few candidates were able to write clear and concise statements, or give a step-by-step description of an occurrence.

Common misconceptions were:

- Tears nourished the eye;
- 'Images entered the eye' and not 'light rays entered the pupil';
- The iris decreased in size when bright light is shone into the eye.

Question 4

This question tested the candidates' knowledge of the composition of blood as well as how O₂ is transported in red blood cells and the differentiation between function and circulation of blood.

In Part (a), most candidates were able to identify the different types of blood cells.

For Part (b), candidates should have mentioned that 'the transport of O₂ is accomplished by the formation of oxy-haemoglobin' and 'O₂ is released at the peripheral tissues'.

In Part (c), the majority of candidates were unable to distinguish between plasma and serum. Candidates were expected to write that serum is blood plasma from which the fibrinogen has been removed.

Most candidates viewed function and circulation of blood as the same. Circulation is the means by which blood is distributed.

Common misconceptions were:

- Plasma is the liquid part of blood while serum is the solid part
- Plasma is liquid, serum has antibodies/vaccine.

Question 5

This question assessed candidates' knowledge of aerobic and anaerobic respiration, and oxygen debt.

Candidates demonstrated a lack of understanding of respiration, as the process which results in the production of energy.

They did indicate a knowledge of the terms aerobic and anaerobic but as breathing and not as respiratory processes. They were able to link aerobics to fitness and exercise, and anaerobic to the fermentation process – breathing in oxygen, breathing out carbon dioxide. There was little transfer of knowledge to the activities of respiration in the human body. Most candidates were totally lost at the concept of ‘oxygen debt’.

Teachers are hereby encouraged to help their students make the necessary link between their real-life experiences and the physiological processes.

Question 6

This question assessed candidate’s knowledge of the alimentary canal and digestion.

In Part (a), the partial diagram of the digestive system was described as the reproductive system, and even the inner ear. The gall bladder was identified as the testis, the oesophagus was called the vagina. The basic shapes of the organs were not known. The stomach is sac-like and drawn as such, yet candidates identified the liver as the stomach. Candidates also named the oesophagus as the trachea. Candidates used colloquial names to describe bile – bitter gall, whilst the gall bladder was invariably named the bald bladder whose function was to store urine.

Several misconceptions were noted in responses to this question:

- Bile helped with the actual digestion of fats.
- Bile disinfected faeces.
- Bile purges the liver.
- Bile purges the blood.
- Bile contains enzymes.
- Insulin was named as an enzyme.
- Maltase digested partial maltose in the duodenum.
- Pancreatic juice was an enzyme.

Candidates were unable to name a second function of bile. Many ascribed the function of bile to giving colour to faeces. The candidates did not refer to the neutralising function of bile in the duodenum.

Many candidates did not know the enzymes contained in pancreatic juice. There was also some confusion shown in the description of carbohydrates in the duodenum. A number of candidates referred to the partially digested starch as partial maltose.

Question 7

This question tested candidates’ knowledge of the menstrual cycle, birth control, and the structure and function of the placenta.

Part (a) was done well. It required candidates to state what type of contraceptive the rhythm and contraceptive pills were.

The rest of the question was poorly done. In Part (b), candidates were expected to state that the safe period was the time during which pregnancy would not occur if couples have sexual intercourse.

Misconceptions were:

- This was a period when it was safe to have a baby.
- This was a safe time to have sex (without mentioning pregnancy).

For Part (c), most candidates were unable to give the days of the menstrual cycle considered unsafe.

Acceptable answers for this section included: 11th – 17th day after the start of menstruation; 3 days before or after the start of menstruation; 3 days before or after ovulation.

Misconceptions were:

- Candidates did not seem to realise that the menstrual cycle begins at the start of the menstrual period or menstruation.
- Candidates used the term menstruation or period instead of menstrual cycle.
- Candidates did not mention specific days.

In Part (d), candidates were able to gain marks when they stated that:

- contraceptive pills contained hormones mainly oestrogen and progesterone which inhibit the release of FSH;
- ovulation does not occur and hence fertilisation cannot occur;
- egg development is suppressed.

Misconceptions or misinterpretations:

- Candidates confused how the contraceptive pill works with spermicides, the barrier methods and even the IUD.
- Candidates wrote about suppression of egg **production** instead of **maturation**.
- Candidates described how to use the pill instead of how it works.
- There was little knowledge of how normal hormone production is affected by the pill.

In Part (e), candidates generally did not relate the structure of the placenta to the function. They confused the functions of the placenta with the amnion and amniotic fluid as well as with the umbilical cord. Candidates wrote that blood passed from the mother to foetus or believed the placenta prevented harmful substances from passing from mother to foetus.

Expected answers were:

- The placenta has a thickened wall in which the foetus is embedded.
- A rich supply of blood capillaries which allows food, nutrients and oxygen to diffuse from maternal blood capillaries to the embryo.
- Carbon dioxide and other waste products move from the foetus to the mother.
- Villi in the placenta provide a large surface area for the passage of food.
- The villi have thin walls for the easy diffusion of food.
- The placenta provides a secure attachment between mother and foetus.
- Within the placenta's structure, the mother and foetal blood cannot mix or the foetus is protected from the high blood pressure of the mother.

A general comment which could be made about Parts (b) to (e) is that candidates' expression and use of correct terminology were poor.

Question 8

This question tested the candidates' knowledge of the function of DNA, the meaning of genetic terms and the ability of the candidate to complete a diagram for a genetic cross for monohybrid inheritance and to extract information from it.

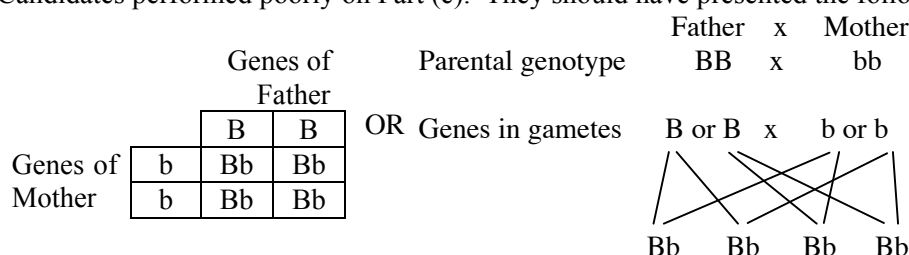
In Part (a), candidates were expected to state that DNA is deoxyribonucleic acid that it is found in the nucleus of cells and that it stores genetic information to be passed on to offspring.

Most candidates were unable to spell deoxyribonucleic acid or state where it was found. Most candidates had an understanding that it was involved in the inheritance of traits. Many candidates confused the function of DNA with the function of a DNA test (paternity and blood tests).

Some candidates wrote about sexual intercourse.

For Part (b), some candidates were able to gain marks for defining the terms homozygous and dominance but there were few precise, well expressed definitions.

Candidates performed poorly on Part (c). They should have presented the following diagram:



Common misconceptions were:

- Candidates drew eyes or stick figures.
- A small portion of the candidates linked the genes for eye colour to sex chromosomes.
- Even candidates who gave excellent genetic drawings seemed unable to extract the relevant information from them. This indicated a lack of knowledge of the terms phenotype, homozygous recessive or even F_1 generation.
- Candidates were unable to write ratios correctly.

Generally it was found that expression and knowledge of the use of genetic terminology were poor.

Question 9

This question assessed candidates' knowledge of commonly abused drugs and their effects on family life and on the human body.

Part (a) was well done. Candidates were able to correctly state three commonly abused drugs.

Candidates, however, often referred to the drugs by their 'street' names rather than accepted scientific names, for example, ganga or weed for marijuana; dope or coke for cocaine; cigarette for nicotine.

Part (b), candidates were well acquainted with the social impact of alcohol abuse, but did not know that the effective ingredient in alcohol was ethanol or ethyl alcohol.

Responses to Part (c) were not as good as expected. Candidates were required to explain how alcohol acts on the body.

Common incorrect responses were:

- alcohol impregnates the body
- cuts your inside
- burns out the lung/liver/kidney

- alcohol and nicotine.

General Comments

Generally teachers are encouraged to ensure that their students understand what the question asks so that they give the required content.

Spelling is another sore point of the responses, especially in the names of the drugs. For example, cocaine – cokecane; heroin – erowine; marijuana – mariwanna.

Question 10

This question tested candidates' knowledge of air pollution, mainly the greenhouse effect and the destruction of the ozone layer.

In Part (a)(i), candidates were unable to identify an accumulation/excess of CO₂ in the atmosphere as the cause of the greenhouse effect. Generally, candidates stated that this phenomenon was caused by 'pollution of gases' and not specifically CO₂. Candidates also need to know the difference between a greenhouse and the 'greenhouse effect'.

Part (a)(ii) was not well answered. A common misconception was that an initial consequence of the greenhouse effect is the thinning of the ozone layer. Very few candidates were able to identify the trapping of heat as one of the initial consequences of the greenhouse effect.

One consequence of the thinning of the ozone layer is skin cancer. Candidates were sometimes vague in indicating the type of cancer.

Part (b)(i) was generally well answered. However, some candidates identified the air pollutants instead of the sources of air pollution.

In Part (b)(ii), candidates were unable to identify an acid produced by water. Some candidates incorrectly identified hydrochloric acid, phosphoric acid and carboxylic acid as products, instead of the correct answer, carbonic acid, nitric acid and sulphuric acid.

Generally, this question was poorly done. More time needs to be allocated towards syllabus coverage as the topics tested should have been basic knowledge.

Question 11

This question tested the candidates' knowledge of hormones and their role in the regulation of the menstrual cycle, as well as how nervous control compares with hormonal action.

In Part (a), most candidates had some understanding of hormones, but could not provide a precise definition. Candidates were expected to give the following:

- Hormones are chemical substances which are secreted by endocrine or ductless glands directly into the bloodstream
- They travel to target organs causing specific effects on the body.

In Part (b), many candidates correctly described the role of estrogen and progesterone in the menstrual cycle. However, too many candidates thought hormones were 'feelings'.

For Part (c), most candidates knew that nervous control was faster than hormonal action, but could not provide correct explanations.

Common misconceptions were:

- Hormones are enzymes which speed up chemical reactions.
- Hormones are substances which stimulate sexual activity or sex organs.
- Hormones produce body odour.
- Hormones are 'feelings' that humans cannot control.
- Hormones are genes responsible for gender.
- Shedding of uterine lining is viewed as removal of waste from the body.
- Hormonal control is faster than nervous control using adrenalin as an example.

Question 12

This question assessed candidates' knowledge of the structure and function of the heart. It was poorly answered by most candidates who attempted it.

Teachers need to stress to their students, the importance of carefully reading and following instructions given. For Part (a), many candidates did not follow instructions to COPY the diagram onto their writing paper and then answer the questions asked. Many candidates labelled the diagram as given in the question, and proceeded to answer the questions in the small spaces left between the sections of the question.

The basic structure of the heart was not known. Candidates labelled the top left-hand chamber as the right ventricle, yet proceeded to label the bottom right-hand chamber as the left ventricle.

For Part (b), the relative thickness of the chambers was not known, and many candidates stated that the atria were thicker because they 'received the blood from the body'.

For Part (c), many candidates incorrectly interpreted the roles of the different parts of the heart as the flow of blood through the vessels and chambers of the heart. There were some good responses which described the flow of blood around the body, as was required.

Teachers should enhance reading and comprehension skills in the classroom through the different levels of questioning practised during the presentation of concept materials.

Question 13

This question tested candidates' knowledge of the processes of meiosis and mitosis, as well as gender determination in humans.

The performance of candidates was generally unsatisfactory.

In Part (a), candidates gained marks on the written description of mitosis more readily than on the diagrams they drew. The diagrams often did not represent what was explained in writing.

Misconceptions about the two processes, mitosis and meiosis, were revealed in Part (b). Candidates confused meiosis with fertilisation.

Expected responses for the differences between mitosis and meiosis were:

- One stage of cell division in mitosis; two stages of cell division in meiosis.
- Mitosis produces identical numbers of chromosomes as the parent; meiosis produces half (haploid) number of chromosomes.

For Part (c), candidates who attempted to explain gender determination were able to gain marks. Many weaker candidates, however, stated that the genitals were used to determine sex/gender.

Recommendations:

1. Students might be encouraged to pay more attention to the details of diagrams representing these processes.
2. There is a need for a greater understanding of the place of meiosis in sexual reproduction.

Question 14

A popular question with the candidates. This question tested candidates' knowledge of the main signs and symptoms, causes and treatment of hypertension and obesity.

In Part (a), candidates correctly stated that obesity was a condition in which the weight (mass) of subjects was excessive. Most failed to relate this excess to height.

For Part (b), candidates were able to accurately identify causes of obesity. Many identified psychological factors, for example, depression, alienation and low self-esteem. Where reference was made to 'poor diet' they often failed to relate this to fat and carbohydrate intake. Often candidates identified "eating then going to bed", "eating after 6 pm" as causes of obesity. Candidates must understand the relationship between energy (food) intake and energy output (metabolic and physical activity) as the determinant in weight control.

Part (c) tested the candidates' understanding of how hypertension could become a complication of obesity. Few candidates accurately linked fat deposition in artery walls, to the reduction of internal diameter and consequent increase in blood pressure within the arteries. Many incorrect references were made to fat deposits **around** the heart or blood vessels causing hypertension. Psychological factors were also identified as causes of hypertension.

Several candidates failed to accurately distinguish between arteriosclerosis and atherosclerosis or used the term arteriosclerosis and described atherosclerosis.

In Part (d), candidates were required to explain the meaning of the term "lifestyle changes" and to discuss how these could be used in treating obesity. Most candidates were able to correctly identify changes in diet and exercise as essential. Few stated that these should represent a new **daily routine** for obese individuals. Some candidates described "changes in the lifecycle" instead of "lifestyle changes". Many definitions involved transposing the words "lifestyle" and "changes" and replacing these with synonyms.

Candidates failed to describe clearly how the changes in diet and exercise would treat obesity.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

JUNE 2006

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY

June 2006

This was the second year in succession that Human and Social Biology was offered at the General Proficiency Level. The examination format was the same as obtained in 2005:- Paper 01 an objective test of 60 multiple choice items.

Paper 02 consists of Section A, ten compulsory structured items and Section B, four essay items, from which the candidates are required to answer any two.

DETAILED COMMENTS

PAPER 02

Question 1

This question tested candidates' knowledge of an animal cell and sub-cellular organelles. Candidates' responses given were fairly good.

Part (a) was attempted by most candidates. However more correct responses were given for the identification of structure Y, the cell membrane, than structure X the ribosome.

Responses to Part (b) (i) showed that there is still much confusion in candidates' minds concerning the function of the cell membrane as opposed to the cell wall.

In Part (b) (ii), candidates answered the question on the function of the mitochondrion with much greater success.

Part (c) was generally unsatisfactory since many candidates assumed that the question referred to plant and animal cells and not to plants and animals as organisms.

It was also found that candidates did not give two matching differences but rather attempted to give as many random differences as they could between plant and animal cells.

In Part (d) candidates seemed deficient in the knowledge of how fungi obtain food. In most instances, mention was made of the commonly known substrates that fungi are found on, for example, bread and not on the method of obtaining food. More emphasis needs to be placed on the types of nutrition of fungi, that is, saprophytic and parasitic.

Candidates who scored well on this question displayed some analytical skills, an ability to interpret the question as intended and were also well informed on topics tested.

Misconceptions

1. Candidates' thinking that the cell membrane was alive while the cell wall was dead.
2. Plants do not respond to stimuli at all while only animals do.

Recommendations

Emphasis needs to be placed on:

1. The types of nutrition of fungi in greater detail even as it relates to mineral cycles and disease.
2. The structure and function of the cell and its organelles.
3. That candidates pay attention to the terms used in any question given and particularly on the instructional words used so as to elicit the correct understanding.

Question 2

The question tested candidates' knowledge of:

- (a) The structure and function of the nervous system
- (b) Defects/ailments of the nervous system

About 70% of the candidates gave satisfactory responses. Part (a) of the question was generally well done, with the weaker candidates showing lack of knowledge of the topic.

Part (b) overall was not well done. It was clearly observed that too many candidates are going to examinations unprepared, and it is very alarming how many candidates chose not to follow the instructions given in the question.

Recommendations

- 1. Students should be encouraged to read widely in relation to the subject.
- 2. The teaching of drug abuse should be linked to the topic on the nervous system to incorporate the effects of drugs on the nervous system
- 3. Teachers should encourage students to make use of external resources, for example, Internet, Ministry of Health, Hospitals.

Question 3

This question tested the candidates' knowledge of the pacemaker, its role in the cardiac cycle, and the events occurring in the heart during a heart attack.

It was attempted by 91.3% of the candidates, with 21% gaining 4 marks and over. Parts (a) and (b) were Knowledge and Comprehension based questions while Part (c) was a Use of Knowledge question.

Part (a) was poorly done. Most candidates did not appreciate that there was a natural pacemaker in the right atrium of the heart. As a result, most of the responses focused on the artificial pacemaker placed in the heart whenever the heart malfunctions. A small percentage of the candidates recognized that the pacemaker is also called the sinoatrial node.

Part (b) was not attempted by a large percentage of the candidates, and of those who did, they simply provided a detailed outline of the flow of blood through the heart, instead of the cardiac cycle, which was required. The SA node sends an electrical impulse to the left atrium and so the atria contract together and the AV bundle sends an impulse to the ventricles to contract to send the blood through the artery and out of the heart.

Part (c) was generally well done. However, several misconceptions were detected. For example, blood stops flowing through the heart, backflow of blood occurs, overflowing of the heart, during a heart attack. Few candidates stated that the heart muscle and the arteries were under pressure. Coronary arteries may be obstructed by a deposition of fatty material in it. If these arteries are blocked, then the flow of blood is slow. As a result, the oxygen carrying capacity of blood is reduced and the heart is deprived of oxygen as well as food. This leads to a heart attack.

Recommendations

Teachers could utilize the following strategies to reinforce students' understanding of these concepts:

- 1. Media presentations of the heart.
- 2. Invite a medical professional, with slides, charts, to give lectures on this topic.

Question 4

The question tested candidates' knowledge of the characteristics and function of enzymes.

Part (a) of the question was well done. Several candidates demonstrated an unclear understanding of the terms denature, destroy and inactivate as they pertain to the effect of temperature and pH on enzyme activity.

In Part (b) (i), candidates ably responded as to the effect of boiling the milk, for example, destroying bacteria and denaturing enzymes. Very few, however, addressed the effect of covering re excluding aerial bacteria.

Part (b) (ii) was poorly done. Candidates often saw the placement of meat in the refrigerator as presenting a physical barrier to bacteria. It must be emphasized that plant and animal products contain enzymes, which are not preservatives. Bacteria are also a natural part of the environment.

Candidates were expected to state that bacteria or enzymes were responsible for the breakdown of meat, lower temperatures in the refrigerator affecting their ability to function.

Part (b) (iii) was poorly done by candidates who misinterpreted the questions and focused more on the effect of temperature on the fish, rather than the removal of water and the effect this has on enzyme action. That bacteria or enzymes responsible for the breakdown of fish function more efficiently in the presence of water would be an expected response.

The terms denature and inactivate are to be clearly defined and used correctly.

Recommendations

A practical approach, utilizing readily available household materials is to be encouraged for relevant aspects of the syllabus. For example students could be directed to culture yogurt as a means of demonstrating the role of bacteria and conditions suitable for bacterial growth. This is an example of a suitable investigation, relevant to the objectives tested by Question 4.

Students must be guided in the interpretation and answering of questions. They are to be encouraged to respond concisely in answering structured questions.

Question 5

Part (a) (i) of this question tested candidates understanding of excretion and homeostasis and tested their ability to distinguish between heat and temperature. Most candidates were unable to do so. Heat should be defined as a form of energy.

Part (a) (ii) tested candidates' knowledge of the variables to be used to determine the amount of heat associated with a body. Many candidates had an idea of temperature change but were unsure from which perspective, especially as it relates to the temperature change of the body on the environment. Some alluded only to temperature. Heat was also given seemingly because of the confusion between heat and temperature. Less candidates knew about heat capacity. Even fewer mentioned mass.

Acceptable options are:

- Mass
- Temperature Change
- Heat Capacity

In Part (a) (iii), some candidates gave the appropriate response, but many responses had sexual connotations as 'man' seemed to have been interpreted as 'male'. An acceptable response is respiration.

Part (b) tested candidates' knowledge of the normal body temperature of human beings.

- Many responses were correct when quoting °C(37°C). Many were incorrect in quoting °F(98.4). 98.6 was very popular.
- Where °C had been used, often an interval was given, for example, 36°C - 39°C
- Use of specific values should be encouraged

Part (c) tested candidates' application of the principles of temperature control in two contexts:

- (i) in an extremely cold air-conditioned room
- (ii) outdoors on a very hot day

Part (c) was answered best.

General Misconceptions

- Blood capillaries 'contracting' rather than 'constricting'
- Confusion between:
 - temperature control and water control
 - heat and heart
 - respire and perspire
 - heat and temperature
 - vasodilation and vasoconstriction
- pores constrict
- heat evaporates
- 'Vaso' followed by a wide range of suffixes, for example, 'vasoconstriction'
- Replacing 'sweat glands' by 'hair pores'
- Restriction to fat under the skin to be 'burnt up' to release energy
- Pores open and close to release and retain heat, respectively
- In interpreting 'heat' as 'heart', blood pressure readings were given in (b)

Question 6

This question tested candidates' understanding of the birthing process in pregnancy and associated events in the uterus and cervix. It also tested candidates' knowledge of the types of abortion, treatment for women prone to spontaneous abortion and justifiable acceptable reasons for induced abortion in the Caribbean.

Part (a) of the question was generally poorly answered. Candidates had a general misinterpretation of the question confusing what takes place "just before" birth with what happens when a woman "just becomes pregnant". In some instances, candidates went as far back as to explain copulation and fertilization, and the processes leading up to birth. Weaker candidates did not know the location and function of the uterus and cervix. Often times the uterus was referred to as the stomach.

Part (b) (i) posed a great deal of difficulty. Most candidates who attempted this part of the question were not able to properly define the term. A major misconception was the word "spontaneous", as many candidates viewed this as a woman who when she finds out she is pregnant, "immediately" does an abortion, giving the view of a "spur of the moment" idea. The "premature birth of a baby" was often given without any reference to the stage of the pregnancy or that the baby is too young or underdeveloped to survive. The causes of spontaneous abortion were often given with candidates using culturally based or common terms to describe the process. Appropriate responses would include "the premature death of an underdeveloped foetus usually occurring in the gestation period"

Part (b) (ii) was generally well done but in some instances the misconceptions viewed in Part b(i) were carried over to this part of the question. Candidates thus gave contraceptive as a means of treatment but often times were referring to prevention of unwanted pregnancy instead. The words uterus and cervix were interchanged referring to the same structure. Some expected answers included "hormonal injections, bed rest, and cervical stitching".

Part (c) was for the most part well done but posed a problem particularly to candidates who misinterpreted Part (b). As such reasons given to induce abortion included “overpopulation, too many teenaged mothers and financial difficulties”. A very common response was because of religious beliefs/background. Candidates were not able to adequately answer this section as they many times confused the terms “induced abortion” with “induced labour”. Expected answers were “rape/incest, risk to the mother’s life, deformation/malformation of the foetus”.

Recommendations

- Reading the questions carefully and looking for key word, for example, “just before and during” in Part (a)
- Use correct biological terms in descriptions, for example, dilated cervix as opposed to swollen or bigger cervix
- Know the expectations of a question when certain terms are used, for example, define, describe, name
- Pay attention to the marks allocated as this may be a guide to the number of points required to gain full marks
- Focus on details and include a more detailed explanation suited to the question.

Question 7

This question tested the candidates’ knowledge, understanding and use of knowledge of the concepts – chromosomes, dominance and monohybrid inheritance as specified by the syllabus. The question generally was poorly done.

Part (a) was better answered than the others. The candidates had the basic knowledge of chromosomes, genes, DNA and transferring of characteristics.

In Part (c), the candidates were able to supply the correct genetic diagram and appropriate letters to represent the genotype of the parents. The good candidates supplied concise explanation for the possibility of a dwarf child.

For Part (b), a number of candidates did not understand the concept in terms of ‘genetics’. In many cases, the candidates lacked the scientific vocabulary to supply concise and correct responses. The examples supplied were often incomplete, which indicated a lack of knowledge.

Candidates worked out the crosses, but failed to include the gametes, ratio of phenotype and phenotype of offspring. In a number of cases, candidates interpreted the question to show only the genotype for ‘dwarf’ with ‘wordy explanation’. The question did not explicitly ask for the phenotypic ratio.

In a number of cases candidates misinterpreted the phrase ‘with the aid of a diagram’ to mean other drawings outside of the genetic concept.

Recommendations

- More teaching time should be allocated to this section of the syllabus.
- Teach the topic early in the course in order to integrate and associate it with relevant topics, for example, reproduction
- Provide adequate activities for ‘hands on’ and ‘minds on’, for example, models
- Encourage the students to see the relevance of genetics in their daily lives by making journal entries and doing simple projects (constructing the family tree).
- Provide worksheets for practice for Part (c)

Question 8

In this question, candidates were required to demonstrate

- an understanding of the term “immunity” in relation to diseases
- knowledge of passive and active methods of natural immunity
- an understanding of the process involved in active acquired immunity

Candidates’ overall performance was poor

Part (a) (i) was well answered. Most candidates clearly understood the term ‘immunity’ to be the ability of the body or a tissue to resist infectious diseases.

In Part (a) (ii), however, many candidates stated that natural immunity is acquired by drinking herbal preparations, taking vitamins, regular exercise and practising good hygiene, as opposed to through breast-feeding or recovering from an illness for the first time. Others stated that immunity is acquired through sexual intercourse, thus being faithful and using condoms were provided as methods for remaining disease free.

In Part (b), misconceptions included the following:

- The use of the term ‘antibiotic’ instead of ‘antibody’ was common.
- Many candidates stated that “the vaccine stayed in the body to attack the germs”
- Quite a number of responses provided immunization schedules, as opposed to outlining the immune response.
- Another common response was that babies are unable to make antibodies because their immune systems are weak, therefore they must be given antibodies in the vaccines.

Recommendations

- Teachers should provide more detailed instructions in this area, especially concerning the immune response.
- Greater emphasis must be placed on distinguishing between the terms ‘antigen’ and ‘antibody’ and ‘immunity’ and ‘immunization’.
- Teachers should encourage students to read questions carefully and identify the key terms, so that responses could be more focused.

Question 9

Part (a) (i) required candidates to differentiate between sign and symptom. Most candidates were only able to give one answer for each part. They indicated that a sign is seen, but failed to mention that it is measurable by a trained health professional. Candidates indicated that a symptom is felt but did not continue to explain that it can be described to others.

Part (a) (ii) was generally well done, but some candidates are still not sure as to what is a sign and symptom because they mixed up the examples.

Part (b) (i) was poorly done. Some of the acceptable responses were:

- Increased responsiveness of the bronchi to the stimulus
- Constriction of air passage (tightness)
- Increased mucus
- Difficulty in breathing/wheezing

In Part (b) (ii) most candidates got one mark instead of two because the question tested categories of stimuli such as:

- Allergens (dust, pollen, smoke)
- Infections
- Emotional stress
- Temperature change
- Bee sting
- Low oxygen content
- Altitude

Many of the answers given by the candidates were vague like cold, weather condition and exercise.

Question 10

This question dealt with contamination of water and its effect on human health.

In Part (a), too many candidates either misread or misinterpreted the question to refer to methods of purifying water instead.

Partial descriptions of the testing process were given. Hardly any candidates fully described the entire process using agar medium and incubation. Most who scored mentioned use of the microscope.

In Part (b), most candidates demonstrated some knowledge of the various sources of water contamination. The most popular answers were sewage and garbage. Thermal, industrial/chemical sources along with water wastage were less popular responses. Three different problems needed to be mentioned in order to gain the full three marks. This was the section which was best done.

Responses to Part (c) saw too many candidates concentrating only on bacterial contamination. To obtain the full five marks some reference to industrial/chemical pollution was needed.

Question 11

This question tested candidates' understanding of the interdependence of living organisms, their feeding relationships and how processes keep balance in the physical environment.

Part (a) of the question was not generally well done when it was attempted. The weaker candidates were unable to write the correct formulae of the compounds and/or correct equations. Some candidates had some idea of the importance of photosynthesis in keeping the balance of gases in air but most could not explain this concept.

Part (b) was generally well done. Very few candidates were unable to define the terms. A few candidates mixed up definitions, particularly those for omnivore and carnivore.

Part (c), the food chain, was generally well done. Some candidates erroneously used physical elements such as water, soil and the sun as links in the food chain. It seems the candidates were confusing food chains with cycles. Many candidates did not put arrows to indicate energy flow, for example, plant ← cow ← man ← lion. Some of the candidates used unrealistic link sequences, like plant → kiskedee → hawk → man. Other candidates used general classes of organisms when specific ones should have been used: plant → small bird → big bird → man. Most candidates were able to draw the pyramid of energy but unable to label it properly or place the cow as the herbivore. Most candidates were able to say that plants had the most energy, which decreased at each trophic level. However, they were unable to explain why.

Question 12

This question tested candidates knowledge on the following:

- The role and importance of enzymes
- Digestion of proteins and the adaptations of the villis for absorption.

This question was not a popular one.

Parts (a) and (b) were done the best. Candidates were able to give the site of pepsin production (stomach) and fat digestion (small intestine).

In Part (b), candidates often wrote the names of sugars instead of the enzyme, for example, sucrose instead of sucrase.

In Part (c) (i), candidates were not specific. They described the digestion of carbohydrates and fats when only protein digestion was required, that is, mechanical digestion; the role of pepsin in the stomach; trypsin in the duodenum and peptidase in the ileum. Candidates also need to learn the substrate and product of each enzyme.

In Part (c) (ii), some candidates misinterpreted the question and described the role of proteins in the body rather than the adaptations the villi had for the absorption of proteins.

Question 13

This question dealt with the reproductive system and problems associated with it.

Part (a) dealt with labelling the parts of the developing foetus as well as the uterus. This part was fairly well done. A common misconception was confusing the amniotic fluid with the placenta as well as labelling the vagina as the cervix.

In Part (b) candidates were well aware of the effects of STD's on the foetus but were unsure of the effects on the pregnant mother. Most referred to the symptoms of HIV/AIDS. Expected answers for effects on mother were: blindness, arthritis, sterility, itching.

Part (c) was well done.

For part (d) most candidates confused urinary tract infections with yeast infections. Expected answer was the close proximity of the anal and vaginal (urethral) orifices and the easy transfer of pathogens.

Part (e) was well done. However, some candidates confused circumcision with vasectomy. Expected answers:

- Bacteria (pathogen) accumulate under foreskin
- Foul scent, smegma occurs; infection of male and his partner

For the most part, errors made were as a result of lack of knowledge and not because of interpretation.

Recommendations

- Students should be taught using models.
- The rules of labeling should be emphasized.
- Read carefully and follow instructions. This maxim should be taught.
- Topics like HIV lend themselves to project work.

Question 14

This question tested candidates understanding of the following:

- Structure of the pit latrine
- Function of the components of a pit latrine
- Impact of pit latrine on the quality of water supply
- Importance of phasing out pit latrines

It was attempted by 50% of the candidates and the overall performance was fair.

Part (a) of the question was generally well done as candidates were able to label the diagram. Candidates were not able to differentiate between concrete base and concrete lining, nor were they able to identify the cover in most cases.

Part (b) was fairly well done, as candidates were able to compare the latrines, selecting L as the better one, and suggesting the functions of the labeled parts made it better.

Part (c) was generally poorly done and candidates failed to explain the importance of porous soil for soakaways. They were, however, aware of social issues concerning the location of the latrine.

Part (d) posed a great deal of difficulty as candidates were generally unaware of the role of bacteria in the decomposition of faeces. They suggested that the disinfectant be used to eliminate the odors or clean surfaces within the latrine. The use of disinfectants was also given as a way to eliminate bacteria in the pit, and thus eliminate odors.

Generally, candidates confused the disinfectant with a deodorizer.

Candidates were expected to recognize that disinfectants kill microorganisms like bacteria and that the role of microorganisms is to break down excreta. In their absence decomposition will be slow, causing an accumulation of sewage. This will result in the need to build new pit latrines or the frequent cleaning of the pits.

Conclusion

Comparison of performance in a question by question analysis between examinations convened in 2005 and 2006 showed that in almost every instance, with few exceptions, the mean score was higher in 2006. This is most encouraging. The syllabus is evolving and is less than two years old. Clearly the increased exposure for teachers and students was beneficial.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION
JANUARY 2007**

HUMAN AND SOCIAL BIOLOGY

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HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION

JANUARY 2007

GENERAL COMMENTS

The January 2007 examination in Human and Social Biology at General Proficiency level was the fourth sitting of this subject offered by CXC. Human and Social Biology is offered at both the January and June sittings of the examinations. The first Human and Social Biology examination was offered in June 2005. The January 2007 examination was the second sitting for the January population.

Candidate entry increased by approximately 82 per cent in January 2007 over January 2006.

The examination consists of two papers: Paper 01 comprises 60 Multiple Choice items; Paper 02 comprises 10 compulsory structured questions and four optional extended response questions, of which candidates are required to answer two. There is no School-Based Assessment.

The overall performance of candidates in January 2007 improved over January 2006. However, there is much evidence that candidates are not prepared for the examination. Even though the syllabus clearly outlines the content required in Section A, Living Organisms and the Environment, candidates' responses to questions on this section were superficial and sometimes non-existent. Genetics continue to prove challenging to most candidates. In some instances, candidates knew the content but were unable to select, organize and synthesize the required answer.

Candidates need to use the correct jargon when answering questions, Spelling of biological terms is presenting difficulties for candidates. Candidates are advised to read the questions carefully, underline key words, take note of the number of marks allotted to parts of the question, and where relevant, the space allocated for the answer. These should be used as guidelines when formulating an answer.

DETAILED COMMENTS

Paper 01- Multiple Choice

Paper 01 consisted of 60 multiple-choice items. Performance on this paper was better than performance on Paper 01, January 2006. This paper tested candidates' knowledge of all five sections of the syllabus.

Some topics that presented the most difficulties for candidates were:

- The nature and structure of viruses
- The structure of plant cells
- The passage of a nerve impulse in a reflex action
- Exocrine and endocrine function of the pancreas
- The function of FSH (follicle stimulating hormone)
- Variation in genetics

Paper 02 – Structured and Extended Response Questions

Paper 02 consisted of two sections: Section A – ten compulsory short-answer structured questions; and Section B – four optional essay questions, from which candidates were required to answer any two. Each question in Section A was worth 10 marks, and each question in Section B 20 marks. The two Profiles, Knowledge and Comprehension, and Use of Knowledge, were tested on this paper.

Even though candidate performance on this paper was slightly better in January 2007 than in January 2006, candidate performance was poor. The mean was greater than 50 per cent on only one question on the paper. Candidates were able to attain marks across the allotted range for nine out of ten of the structured questions. However, candidates did not access all the marks allotted to the essay questions.

Question 1

This question dealt with photosynthesis and food chains. Part (a) (i) required a balanced chemical equation for photosynthesis. Most candidates did not know this. Part (a) (ii) required candidates' knowledge of the process of photosynthesis – the location, stages and organelles involved. This was poorly answered. Part (b) required candidates to construct a food chain. This was generally well done. However, some candidates presented a cycle rather than a chain, by including an arrow linking man to cabbage.

Question 2

This question dealt with muscles and joints. For Parts (a) and (b), candidates were presented with a diagram of the upper arm, to identify the biceps and triceps muscles, and to explain how these muscles function to raise and lower the arm, engaging the concept of muscles working in opposing pairs. Part (a) was well done. Part (b) was fairly well done. However, candidates omitted details for which they lost marks. For example, candidates said that Muscle X contracts, but omitted that muscle fibers become shortened. Similarly, for Muscle Y, the fibers become elongated. Candidates were able to identify the ball and socket, and hinge joints, and to say how they differed on movement.

Question 3

This question tested candidates' knowledge of a simple spinal reflex and the effects of heroin and alcohol on the body.

Part (a), requiring candidates to draw three neurones which make up the simple spinal reflex arc and to label the motor neurone, was well done by the few candidates. In Parts (b) (i) and (ii), candidates were able to state that heroin was addictive and that increasingly large doses were needed to produce the same results.

Part (c) was not well done. Candidates should have named two regions of the body affected by alcohol, for example, the heart and the brain (among others), and describe the effect, for example, the heart rate is increased, the brain slows down the passage of nerve impulses.

Question 4

This question was based on knowledge of hormones in the human body. For Part (a) candidates were expected to identify the hormones associated with the pancreas and adrenal bodies, as presented on a sketch of the human body. Most of the candidates could not name insulin or glucagon as the pancreatic hormone. Most of them identified adrenalin.

Some candidates correctly named adrenalin as a rapid-acting hormone but few were able to name a slow-acting hormone, such as insulin, or thyroxin, for Part (b). Performance in Part (c) was unsatisfactory. Candidates should have given the gland responsible for thyroxin production as the thyroid gland, and the location as the base of the neck. In Part (c) (iii), candidates did not know the effect of normal levels of thyroxin, which include: control growth, affect metabolism, development of personality. The effects of abnormal levels of thyroxin were fairly well known by candidates.

Question 5

Part (a) assessed candidates' knowledge of mechanisms of inspiration (breathing) as presented in a table. This was fairly well done. "The diaphragm muscles and the external intercostals muscles contract" were stated by most candidates. Many of them, however, failed to relate to the larger volume – low pressure concept of the thorax as itemized in the table. As a result, candidates failed to gain the full score of four.

Part (b), which required candidates to give a reason for the difficulty in breathing at high altitudes, was fairly well done. For Part (c), candidates were able to give "the abdominal muscles" as the muscles which contract to force air out of the thorax during deep breathing. In Part (d), candidates demonstrated little understanding of the link between breathing rate and the nervous system. A good answer should have included:

A respiratory centre in the medulla of the brain controls the reflex breathing movements (which occur unconsciously). The brain initiates the respiratory movements.

Question 6

Knowledge of the circulatory system was required in this question. For Part (a), candidates were expected to identify the left pulmonary artery and the right ventricle from a representation of the external structure of the heart. This was poorly done. Part (b) was also poorly done. Candidates should have outlined how the structure of the left ventricle assists with its function. Candidates were expected to present any of the following:

- The walls are thick and muscular.
- Contraction of the thick ventricular walls builds up the pressure.
- This pressure is required to pump oxygenated blood around the body.

Part (c) was also poorly done. Candidates were expected to relate the structure of the arteries and veins to their respective functions. Their responses should have included: *the arteries must have thick elastic walls to withstand the high pressure and pumping action of the heart, to facilitate the movement of blood from the heart; the veins have thinner walls because they carry blood under lower pressure; also veins have valves to prevent the back-flow of blood.*

Question 7

This question tested candidates' knowledge of the structure and function of the kidney.

In Part (a), candidates were required to identify the cortex and the medulla from the given representation of the kidney. Most candidates identified the cortex. Many candidates did not identify the medulla. For Part (b), candidates could not describe the functions of the medulla and ureter, often confusing the medulla of the kidney with the medulla of the brain, and the ureter with the urethra.

For Part (c), very few candidates were able to explain that death occurs after ten days of kidney failure because of the accumulation of toxins/urea/excess potassium ions in the blood.

Question 8

This item tested the knowledge of genetic terms. This was followed by items related to the application of the knowledge that the presence of the sex-linked genes on the X chromosome of the male leads to the more common occurrence of sex-linked diseases in males than in females, the latter being carriers. A genetic diagram was required to further test candidates' ability to apply information to determine the physical and genetic make-up of the offspring.

For Part (a) (i), candidates did not know the term 'sex-linked genes'. 'Heterozygous' and 'genotype' in Parts (a) (ii) and (iii) were better known. Parts (b) and (c) were poorly done.

Part (b) required candidates to explain why colour blindness was more common in males than in females; and Part (c) required candidates to show the genotype and phenotype of offspring from a father with normal vision and a mother who was heterozygous for colour vision.

The concepts in genetics seem to be difficult for candidates to grasp. Perhaps the topic should be taught early during the course of study, and reviewed and integrated with other topics, where relevant. For example, when studying the eye various crosses on eye colour and colour vision may be done. Haemophilia may be reviewed when the section on blood is being studied.

Question 9

Candidates' knowledge of two diseases – dengue and leptospirosis – was tested in this question. Candidates performed well, demonstrating knowledge of symptoms, methods of spread and methods of prevention of the diseases.

Question 10

Candidates demonstrated familiarity with the topic of this question – water pollution and water treatment for drinking purposes. Parts (a) (i) and (ii) were generally well done. Candidates' responses correctly included: *heavy industry and agricultural activity caused pollution; used large quantities of water, thus depleting water resources.*

Part (b) (i) was not well known. Parts (b) (ii) and (iii) were fairly well known. Candidates should have stated: *exposure to UV light – destroys microorganisms; fluoridation – prevents dental decay; chlorination – destroys microorganisms.*

Part (c) required candidates to describe the process of aerification and give two benefits of the process. Candidates demonstrated a lack of knowledge of this process. A good answer should have been:

Tiny bubbles of air are blown into the water. The benefits of this process are (any two): displaces carbon dioxide; raises the pH/removes acidity; removes iron and manganese as hydroxides; assists the sludge to rise prior to its removal; provides oxygen for aerobic bacteria to assist in purifying the water.

Question 11

This was the least popular of the four optional questions. It tested candidates' knowledge of the nitrogen cycle.

In Part (a), candidates were required to give two uses of nitrogen in living organisms. Most candidates knew synthesis of protein, but could not give synthesis of DNA/ATP as another use.

For Part (b), a part of the nitrogen cycle was given, and candidates should have identified 'lightning/rain', 'nitrogen-fixing bacteria' and 'denitrifying bacteria'. This was poorly done.

In Part (c), candidates were required to use their knowledge of the nitrogen cycle to explain why it is unwise to destroy all bacteria on earth. Candidates demonstrated their inability to apply knowledge to a given situation. Candidates should have included:

- Bacteria convert trapped nitrite to nitrate;
- Some bacteria are responsible for returning nitrogen gas to the atmosphere, to ensure that it is not depleted;
- Bacteria are involved in processes that convert nitrogen to a usable form (nitrates);
- Nitrates are used by plants in synthesizing proteins;
- Bacteria decompose dead plants and animals, converting them to nitrates;
- Bacteria convert nitrogen-containing waste products (urea) from animals to nitrates.

Question 12

Candidate performance on this question was fair. For Part (a), candidates gave three use of water in the human body, choosing from: *as a solvent; transport; osmoregulator; excretion; main constituent of the body.*

For Part (b), the response to the correct sequence of structures through which water passes from the mouth to the circulation of the blood should have been: *mouth!oesophagus!stomach!duodenum!small intestine!large intestine/colon.*

For Part (c), candidates were unfamiliar with why prolonged diarrhoea could be dangerous: loss of water leads to dehydration; loss of electrolytes/salt/ions leads to shock; changes in osmotic pressure lead to organ failure.

For Part (d) (i), candidates were required to draw a section through a villus and label some given parts. This was not well done. Part (d) (ii) required candidates to give two functions of the epithelial cells of the villus: secrete mucus; protection; facilitate absorption.

Water must be recognized as one of the essential nutrients that has the same passage as solid foods, through the digestive systems. Water is a solvent for other simple, soluble nutrients and therefore, undergoes the process of absorption in the villus along with the other nutrients. Further, water and ions are absorbed from faeces in the colon.

Question 13

This question tested candidates' knowledge of diabetes mellitus. It was not very well done.

For Part (a) (i), candidates should have said that diabetes mellitus is a clinical disorder/condition/disease where high blood sugar persists or where there is low/no insulin. Candidates identified two symptoms of the disease in Part (a)(ii), from among thirst; increased urine output; recent weight loss; increased appetite; blurred vision; lethargy/tiredness. Differentiating between Type I and Type II of the disease (Part (b)) presented difficulties.

Some possible responses included: *Type I versus Type II: lean versus obese; treated with insulin versus managed by diet; exercise versus tablets; more prone to coma versus less prone; less likely to have family history of the disease versus more likely.* For Part (c), candidates generally did not know how obesity may possibly bring about diabetes, namely: as weight increases the receptors for insulin become adversely affected in terms of both numbers and effectiveness; thus insulin produced by the pancreas cannot bind effectively; there is insulin resistance; glucose persists in the blood and cannot pass to the body cells, resulting in high blood sugar levels.

Part (d), requiring how therapy is used to manage diabetics, was fairly well answered.

Question 14

This was the most popular question, of the four optional questions. This question tested candidates' knowledge of recycling and garbage disposal.

Part (a) (i), naming three materials commonly recycled, was fairly well known. For Part (a) (ii), most of the candidates could not explain that recycling meant reduced chemical processes needed for production of the material, hence industrial waste is decreased.

Part (b) required candidates to discuss the proper handling and disposal of refuse. Most of the candidates concentrated on two points – burying refuse; harbouring vectors for spreading diseases. This part of the question was worth 15 marks. Therefore, candidates should have been aware that more was required of them. They should have included; *scattered garbage presents a threat to health, provides a breeding ground for rats, flies, mosquitoes, roaches, become a reservoir for water collection and water-borne diseases; faeces present lead to parasitic infections like hook worm, schistosoma*. To reduce the risk of diseases construct pit latrines and keep them covered; create areas for burial of organic waste; top soil should be removed and replaced after burial of material, construct a brick furnace for other refuse that could not be buried, use bins with tightly fitting covers.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2007

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION

MAY/JUNE 2007

The 2007 examination was the third June sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 Multiple Choice items. Paper 02 consisted of ten compulsory structured questions in Section A, and four essay questions in Section B, of which candidates were required to answer any two.

General Comments

Candidate performance on the overall examination was poor. Performance on Paper 01, the Multiple Choice paper was better than performance on Paper 02, the structured essay paper. Also, candidates performed better on Profile 1, Knowledge and Comprehension, than on Profile 2, Use of Knowledge.

The Examining Committee believes that poor performance was to some extent, as a result of the following:

1. The population of candidates attempting this subject is drawn from all walks of life.
2. Some of these candidates feel that Human and Social Biology is an 'easy' subject and, therefore, do not spend as much time studying. This was especially apparent from candidates' inadequacies in basic knowledge of major organs and systems of the human body, such as the heart and eye.
3. It appears that some schools view Human and Social Biology as second rate science subject, and in so doing little resources are allocated to the teaching of the subject.

DETAILED COMMENTS

Paper 01

Candidate performance on this paper was average. Candidates experienced difficulties with the following topics:

- The nitrogen cycle
- The structure of the upper arm
- Functions of the endocrine glands
- Vital capacity as defined by a graph
- Negative feedback to control blood glucose levels
- Genotype of offspring, given the genetic cross/diagram
- Advantages of solid waste disposal in a landfill

Paper 02

Question 1

This question tested candidates' knowledge of food chains. Performance was poor.

In Part (a), candidates were not able to identify the principles of a food chain as:

- plants form food for small animals;
- small animals form food for larger animals.

Accounting for the variation of available energy in a food chain, a few candidates correctly stated that the least energy is at the level of the consumer, and the most energy at the level of the producer.

For Part (b), candidates were able to give an example of an aquatic food chain.

However, for Part (c), many candidates did not know that the lion would have the highest accumulation of pesticide.

Question 2

This question tested candidates' knowledge of the structure of a long bone, functions of the skeleton and characteristics of bones. Candidates' weakest answers were in Part (a), identifying the labelled parts of the long bone, namely the spongy bone, compact bone and the marrow. In Part (c), many candidates were under the misconception that bone is a dead tissue, only the marrow is alive.

Teachers need to emphasize that although bone stores calcium it is a living tissue due to the presence of bone secreting blood cells and nerves; also growth and repair take place. Students must also be taught the jargon of the subject. More hands-on teaching should be done.

Question 3

Candidates' knowledge of reflex actions was assessed by this question. Performance was fair but responses were marred by poor expression and poor spelling.

For Part (a) (i), only the better candidates gave an accurate and succinct definition for a reflex action – a quick, automatic response to a stimulus. Weaker candidates defined it as reflection of an object, reflection as in deep thoughts, flexing a muscle or reflex angles.

As an example of a reflex action in Part (a) (ii), a stimulus was given instead of the response to the stimulus. A common misconception among the weaker candidates is that all involuntary actions are reflex actions. Therefore, they gave incorrect examples of actions controlled by the autonomic nervous system and the brain.

For Part (b), many of the responses were vague and lacked structure. Some candidates incorrectly stated that the brain was directly involved in the reflex arc. Others focused on the word 'hot' and wrote detailed accounts of homeostatic control of the body's temperature by the hypothalamus.

In order to assist the students to conceptualise this content, it may be useful to engage them in the following activities:

- Build models to represent the pathway (for example, simple circuitry)
- Construct flow charts of the pathway
- Do worksheets – word find puzzles and crossword puzzles.

The majority of candidates were able to answer Part (b) (ii). They easily recognised that reflex actions are important to protect the body quickly from danger.

Question 4

This question assessed candidates' knowledge of gaseous exchange and breathing in human beings. It was poorly done.

In Part (a), most candidates were unable to clearly articulate the concept of gaseous exchange – the movement of oxygen across the alveoli into the red blood cells for circulation, while carbon dioxide is removed.

In Part (c) (i), candidates were under the misconception that high altitude and smoking were responsible for arrest (stoppage) of breathing movements, instead of events like partial drowning and electric shock.

It is recommended that teachers use computer simulation models, practical activities and videos to demonstrate gaseous exchange and the process of resuscitation, effectively. Students need to have access to a wide variety of textbooks to grasp the essence of gaseous exchange rather than regurgitating bits and pieces which are not coherent.

Question 5

Knowledge of vitamins was assessed by this question, which was poorly done by the candidates.

For Part (a) (i), most candidates named fat-soluble vitamins. However, some named sources of vitamins, while others named Vitamins A to H, instead of A, D, E and K.

Part (a) (ii) required candidates to say that fat-soluble vitamins are absorbed with products of fat digestion in the presence of bile salts. Most candidates discussed the digestion of fats and the absorption of glycerol, without linking the absorption of fat-soluble vitamins.

For Part (c), only a few candidates knew that enzymes oxidise Vitamin C. However, most knew that enzymes were destroyed by boiling. Some of the misconceptions which candidates had were:

- hot water preserves Vitamin C
- less Vitamin C is lost because hot water destroys bacteria
- vitamins are lost due to osmosis
- minerals and vitamins used interchangeably
- Vitamin C is sunshine vitamin so it is not easily destroyed by heat
- water increases the volume of Vitamin C.

For Part (c), candidates generally could not differentiate between symptoms and the names of deficiency diseases. Many stated beri-beri, scurvy, and listed treatment of these conditions, instead of writing the symptoms of a deficiency of Vitamin C.

Question 6

This question was designed to test the candidates' knowledge of, and use of knowledge on the topic 'excretion', as outlined in the syllabus. It was not very well done.

Part (a) (i) of the question was generally well done. The weaker candidates confused 'egestion' with 'excretion'. In many cases the candidates defined excretion as metabolic waste or metabolic activity.

Part (a) (ii) was also generally well done. In many cases the candidates named the liver and intestine as excretory organs.

Part (b) (i) was fairly well done. The majority of the candidates indicated that urea and salt were removed, but not excess salt as expected. The removal of glucose was included in many responses.

For Part (b) (ii), the candidates failed to provide the expected response, which was that the kidneys assist in maintaining blood pH by excreting excess hydrogen ions.

Part (c) posed difficulty. In many cases the candidates explained 'heat loss' instead of 'how sweating occurs.' The most frequent response was: sweat is formed in the sweat gland and reaches the surface of the skin through the pores. The candidates who gave complete responses were able to make the association between blood capillaries and sweat glands. Candidates confused sweat glands with sebaceous glands.

Question 7

This question tested candidates' knowledge of the effects of alcohol on the human body. Performance was not very good.

Most candidates responded very well to the effects of alcohol in an expectant mother and foetus, Part (b). Candidates had difficulty in naming the symptom and condition of an alcoholic in Part (a). Most responses were on the social effects of alcohol rather than symptoms such as hallucinations, reduced alertness and lack of co-ordination. There were misconceptions about the effects of alcohol on the heart rate and nerve impulses. Candidates should note that alcohol may cause the heart rate to increase; it is also a depressant drug which slows down the passage of nerve impulses. It is recommended that teachers use video presentations and invite guest lecturers to discuss alcohol abuse. An emphasis should also be placed on the physiological effects of alcohol on an individual, instead of only the common knowledge, such as, bad odour and frequent urination.

Some candidates had the misconception that an expectant mother was not a pregnant woman but one who plans to be pregnant in the future.

Question 8

This question assessed candidates' knowledge of a sewage treatment plant and solid waste management in a landfill. Candidate performance was average.

In Part (a), a diagram representing a sewage treatment plant was presented, and required candidates to explain what happened at three labelled points. The role of anaerobic bacteria in the first settling tank and aerobic bacteria in the filter bed was discussed by only a few strong candidates.

In Part (b) (i), most candidates were able to provide an explanation of the term 'disinfectant' as a chemical/substance used to kill bacteria/microorganisms.

For Part (b) (ii), candidates were, for the most part, able to explain why spraying a landfill with disinfectant was not advisable, discussing the effect on decomposers; failure of decomposition and landfill ultimately. The effect on the water table/water pollution was also accepted.

Some weaker candidates discussed, instead, the effect of disinfectants on sewage treatment plants and others atmospheric/air pollution, clearly as a result of failure to read the question properly.

In Part (c) (i), most candidates were able to explain that plastics were inorganic and not biodegradable and, as such, a problem in landfills.

For Part (c) (ii), the role of recycling/reduction in the use of plastics, use of alternative packing material and biodegradable plastics was understood by most candidates. It is to be emphasized that burning is not a recommended method for the disposal of plastics.

Recommendations

Field trips to landfills and sewage treatment plants are suggested to give students a first hand view of these facilities.

Simple composting activities are suggested as a means to demonstrate the role of decomposers and as a useful means of managing household waste.

School recycling projects are to be encouraged.

Students can undertake garbage audits in their homes or schools in order to develop an awareness of their role in waste management.

Question 9

Generally, the question was poorly done.

In Part (a) of the question, most candidates were unable to define a “carrier” as it relates to cholera. It was expected that candidates would state that a carrier is a person who carries the bacteria/pathogen for the disease, cholera. Many failed to mention that the carrier in this case is a person/human and instead referred to the carrier as “host”, “vector”, “agent” or “organism”. In some cases the carrier was said to have the disease “instead of carrying the pathogen which causes the disease”. Many candidates confused it with the genetic term, some said it is a “disease carried in the genes”. The second mark was awarded for stating that a carrier shows no signs or symptoms. A number of candidates were aware that a carrier is not affected by the pathogen he/she is carrying.

Part (b) required the candidates to describe the link between carriers, flood and disease outbreaks. A number of candidates attempted this section but most were unable to show the appropriate link, especially between the carrier and flood. The responses were generally vague and ambiguous. Many said that the “water carried the disease”. Very few mentioned how the bacteria from the carrier get into the water. Many spoke of mosquitoes and the transmission of malaria, and rats and leptospirosis. Some candidates believed that cholera was contracted through cuts and from bathing/playing in dirty water.

Part (c) (i) dealt with the treatment that should be administered to Sushma, a victim of cholera, before she visited the hospital, while (c) (ii) asked why the treatment is necessary. Evidently, candidates did not read the question carefully and as such gave answers such as “saline drip”, “antibiotics” and “injection”. Other responses mentioned that the treatment could be “eating solid food” which would “reduce vomiting” and “boil (drinking) water” instead of “drinking water”, “purging– to get rid of bacteria” and, give “dehydration salts” – which “prevent dehydration”, “bathing – to remove germs from skin” or “wearing protective clothing” such as “face mask” to prevent “infecting others” by way of “coughing/sneezing” – here suggesting that cholera is an airborne/infectious disease.

It is recommended that teachers:

- emphasize the ‘social’ aspect of the syllabus and possibly teach it at the beginning of the course instead of at the end or not at all;
- emphasize key terms/ definitions relating to each topic;
- teach students to interpret questions more effectively using past paper questions.

Question 10

This question tested candidates’ knowledge of the structure and function of veins and arteries, and of the right atrium and right ventricle.

Candidate performance was poor.

In Part (a), candidates wrote the correct structure and function for both arteries and veins but they did not compare, as the question required.

In Part (b), candidates did not interpret the question correctly, so they compared the right side with the left side of the heart.

Some common misconceptions were:

- veins are larger than arteries
- arteries are larger than veins
- arteries and veins pump blood
- veins carry only deoxygenated blood
- arteries carry only oxygenated blood
- ventricles are valves which stop the backflow of blood.

Question 11

This was a popular question with 50 per cent of the candidates attempting it. The performance on the question was average.

Candidates were able to describe the plant cell exceptionally well for Part (b) (i), and to state characteristics that were similar in both plants and animals in Part (a).

In Part (b) (ii), candidates had difficulty defining the processes, diffusion, osmosis and active transport, the most difficulty being encountered with osmosis. The terminology of high concentration to low concentration or vice versa with respect to osmosis was vague and lead to misinterpretation. Many candidates were unable to give specific examples of materials being transported by these processes, and the use of these materials in the plant. A common misconception was that sunlight diffuses unto the leaf. Weaker candidates thought that energy is transported in active transport and that the energy used is derived from sunlight. Strong candidates were able to give examples of minerals that were actively taken up and then used in the plant, for example, K^+ was used in metabolic activities. Stronger students were also able to realize that a living membrane is needed as well as carrier molecules.

Candidates must be able to appreciate that these processes are all movement of particles from one area to another, and in plants from cell to cell so that materials can move to where they are needed. Candidates should be taught to use the term “area of more water molecules to area of less water molecules”, when defining osmosis.

Question 12

This question was not a popular question. It was attempted by about 13 per cent of the candidates. Most of the candidates who attempted the question did very poorly. Teachers need to spend more time teaching the eye, ensuring that all the objectives are fully covered in the syllabus, especially:

- control of light entering the eye and
- formation of images.

Most candidates knew that the process described in (a) (ii) was accommodation. They also knew at least one cause of long sightedness and how it could be corrected in (c) (i) and (ii).

Candidates had difficulties in interpreting (a) (i), where they described the formation of images rather than describing how adjustment is made to see near and distant objects. The correct response should have included the following:

- contracting/relaxing of the ciliary muscle
- tightening or loosening of the suspensory ligaments
- the lens become thicker or thinner.

It is evident that candidates are not clear about what astigmatism is and how it can be corrected. Candidates thought that it is caused by old age, water in the eye or burned muscle. They also felt that the problem can be corrected with the use of a contact lens, surgery, concave and convex lenses or bifocal lens.

The correct response expected for this question should have included the following:

- vertical or horizontal planes appear to bend and
- curvature of the cornea and lens.

Astigmatism can be corrected by wearing a cylindrical lens or by lens that will compensate for the defect which will refract the light in one plane only.

Question 13

This question was based on the topic, AIDS.

The overall performance on this question was fair. Part (a) (i) required candidates to say what is AIDS. Many candidates' responses were not specific, stating that AIDS is a sexually transmitted disease. A more detailed answer recognised the syndrome as a combination of illnesses resulting from a weakened immune system. Parts (a) (ii) and (a) (iii) were well done with most candidates knowing the virus which caused AIDS, and the methods of spread of the virus.

Part (b) (i) required candidates to identify how the virus entered the body. Many candidates were not sure about entry of the virus and repeated response to (a) (iii). Candidates were expected to say:

- the living virus in an infected person makes contact with the lining of the vagina/urethra or other body parts like bodily ulcers.

Part (b) (ii) required candidates to explain how full-blown AIDS developed from the time the virus enters the blood. Candidates scored marks for explaining that the virus destroyed the lymphocytes weakening the immune system, leaving the body vulnerable to secondary infections. However, details involving the replication of the virus in the lymphocyte were generally not addressed. Part (c) required candidates to give reasons why Caribbean people must be concerned about the AIDS epidemic. It was generally well done. However, there were a few misconceptions. Some candidates responded by highlighting precautions as opposed to identifying causes for concern about the epidemic.

Misconceptions

Part (a) (iii): some misconceptions included the AIDS could be spread by mosquitoes, sharing utensils, deep kissing and swallowing of saliva. In addition, oral sex and sexual intercourse were used interchangeably. Some candidates also incorrectly responded that AIDS is spread by inheritance by babies from infected mothers.

In part (b) (ii), the virus ‘eats’ or ‘feeds on’ the white blood cells was a common response. Some candidates stated that the HIV attacks the red blood cell.

In part (c), the most common misconception was that black races are more prone to HIV infection. Increasing homosexual activity was also stated as a cause for concern.

Recommendations

Teachers should encourage students to:

- pay attention to key words in the question to ensure more focused responses, in order to obtain full marks.
- provide details when asked to explain the development of a diseased condition. For example in this question, details expected were
 - (i) attachment of the virus to the lymphocyte;
 - (ii) shedding of the protein coat;
 - (iii) entry or injection of viral RNA into the lymphocyte;
 - (iv) multiplication of virus particles which destroy other lymphocytes.

Teachers should:

- use research projects and posters;
- invite health resource persons to provide students with expert information.

Question 14

This question assessed candidates' knowledge of water purification methods in the home, and the activities of man which negatively affect our water supply. It was a popular question with the candidates and was moderately well done.

In (a), most candidates were able to give two correct methods of purifying water. Marks were awarded for adding a small amount of bleach, boiling or filtering. Candidates were not awarded points for large scale or industrial methods of purifying water such as desalination or distillation. Misconceptions were that freezing or putting water in the sun purifies it.

In (b) (i), most candidates were able to state three activities of man which negatively affect water supplies. Acceptable answers included: water wastage; garbage disposal or sewage disposal in water sources; pesticide and fertilizer runoff from agriculture, oil spills, industrial pollution, industrial accidents (nuclear) and power plants (thermal effects).

Some candidates did not realize that sewage includes faeces and urine. Other candidates wrote three methods of water wastage and were only awarded one mark.

In (b) (ii), some candidates did not thoroughly discuss how the activities of man affected water supply. Instead they described general ecological effects. Many candidates did not always link effects to water supply.

Candidates confused the greenhouse effect with acid rain and some candidates stated that burning garbage would lead to water pollution.

It was pleasing that some candidates were able to describe the effects of eutrophication in some detail.

Suggestions to teachers

- A visit to the local sewage plant
- A project
- Making a flow chart poster
- A practical approach to purifying water

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE
JANUARY 2008**

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY

GENERAL PROFICIENCY EXAMINATIONS

JANUARY 2008

The 2008 examination was the third January sitting of Human and Social Biology offered at the General Proficiency level.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 Multiple Choice items. Paper 02 consisted of ten compulsory structured questions in Section A, each worth ten marks, and four essay questions in Section B, each worth 20 marks. Candidates were required to answer any two of the four essay questions.

General Comments

There was significant improvement in candidate performance in 2008. Seventy-seven per cent of the candidates achieved Grades I – III in 2008 compared with 47 per cent in 2007. This improvement was also reflected in the performance in both profiles, Profile 1, Knowledge and Comprehension, and Profile 2, Use of Knowledge.

While performance on Paper 01, the Multiple Choice paper, declined slightly, analysis of the equating items reveals that except for two items, the profiles are parallel and at the same level in 2008 and in 2006 (the year with which the items were equated).

Candidate performance on Paper 02 improved significantly. This may be attributed to at least two factors:

1. This is the third sitting of the January examinations. In addition, there have also been three sittings of the June examinations. This means that a number of past papers are available which help students in their preparation for the examination.
2. The questions were structured such that they were able to better elicit from the candidates the required answer. Also, more attention was paid to the social aspects of the syllabus, with an attempt to integrate the social with the human biology.

DETAILED COMMENTS

Paper 01

Candidate performance on this paper declined slightly in 2008 over 2007. Candidates experienced difficulties with the following topics:

1. Identifying the organelle in which photosynthesis occurs (in a diagram of a plant cell)
2. Processes in which enzymes play a role
3. Function of the bile duct
4. How an intra-uterine device functions
5. Stages of meiosis

Paper 02

Question 1

The question tested candidate knowledge of the characteristics of living things; muscle structure and features that allow for its function, as well as respiration as the means by which energy is supplied for muscle function.

Candidates' performance was good.

In Part (a), candidates were able to correctly identify characteristics of living organisms. In several instances 'breathing' was incorrectly offered rather than 'respiration'.

This suggests the need for teachers to reinforce that breathing is not the same as respiration; the first being a mechanical process and the second a chemical reaction releasing energy in all cells.

Part (b)(i) was generally correctly answered when candidates stated that the muscle 'contracts'.

For Part (b)(ii), features of the arm muscle that allowed for the pulling away of the arm were often not correctly identified. Expected answers were that it consisted of muscle fibres or specialized muscle cells, connective tissue, had a good blood supply and nerve fibres. Explanation of the relationship between structure and function in the teaching of concepts related to human systems is encouraged.

For Part (b)(iii), candidates for the most part were able to identify respiration as the process by which energy needed for the movement of the arm was provided. A description of the process in terms of the combination of glucose with oxygen to produce energy, as well carbon dioxide and water as waste was expected. It is to be noted that the term 'describe' should prompt candidates to provide some detail in their explanation.

In Part (b)(iv), most candidates were able to identify aerobic respiration as the process they had described in the preceding part of the question.

Question 2

This question assessed candidates' knowledge of:

- (a) Fertilisation as it relates to reproduction
- (b) The placenta and its role in passing on food to the foetus
- (c) Parental care following birth

Candidate performance was fair.

Few candidates scored full marks on (a)(i).

Many made mention of fertilisation in plants instead of in humans. Most responses were vague, for example, the “male sperm and female egg meet”. Nothing was mentioned about fusing or penetration of the egg by the sperm, a key concept in fertilisation. Many of the responses were incomplete.

Fertilisation and reproduction were often confused, so too ovary and ova.

Some candidates mentioned male cell and female cell, instead of sperm and egg respectively.

Although the question specifically stated “as it relates to reproduction”, some candidates completely ignored this and went on to write about the plants obtaining nutrients from fertilisers.

In Part (ii) of the question, most candidates knew that fertilisation occurred during sexual reproduction.

Part (b)(i) was poorly done. Most candidates failed to recognise the key word “placenta” in the question and wrote about the umbilical cord, and waste matter which was not required.

Many candidates could not provide two reasons why it was essential that the foetal circulatory system is never directly connected to the mother’s blood vessels (Part (b)(ii)). They were required to say that the mother’s blood pressure is too high for the foetus’ blood vessels, and that waste in the mother’s circulatory system would harm the foetus.

For Part (c), most candidates were able to give examples of parental care following birth. However, a few candidates misinterpreted the question and wrote about the care that the parent (the mother) should take of herself after birth.

Question 3

This question required candidates’ knowledge of red blood cells, blood clotting, and the role of white blood cells in fighting infections.

Candidate performance was fair.

Most candidates answered Part (a) correctly, giving plasma as the liquid part of the blood, haemoglobin as the oxygen-carrying pigment, and white blood cells assist in fighting infections.

Part (b)(i), which required candidates to explain blood clotting, presented some difficulties since candidates were not specific or detailed enough in their responses.

Candidates’ responses should have included:

- Platelets stick to the damaged area
- Fibrinogen in the plasma is converted to fibrin
- Fibrin appears as fibres
- This network of fibres across the wound, makes a plug

In Part (b)(ii), candidates were required to say:

- Certain white blood cells leave the capillaries
- They engulf and digest damaged tissues and bacteria
- Pus is found at the site of the wound,

Question 4

This question tested candidates' knowledge of nutrition and diet. Overall, the performance was good.

Part (a), malnutrition, was widely known and the majority of the candidates scored marks in this part. Part (b)(i) presented a challenge to many candidates who misinterpreted the question because they referred to the preamble instead of stating that roughage/dietary fibre was needed in the diet. In (b)(ii), most candidates scored the mark for naming a food. However, some candidates gave 'fibre' and 'roughage' instead of giving a named food.

In (c)(i), (a) and (b), some candidates confused the vitamins, stating that a deficiency of Vitamin A caused rickets, and Vitamin D deficiency caused night blindness.

In (c)(ii), (a) and (b), many candidates were unable to name three nutrients required in the children's diet. However, some of them referred to the preamble and gave food groups and named foods which were not provided in the children's diet.

Recommendations

Teaching/learning strategies which include the activity, meal planning, could serve to reinforce concepts of food groups, nutrients, nutrition and diet. Emphasis must be placed on sources of various nutrients.

Question 5

This question tested candidates' knowledge of the life cycle of the mosquito, the role of the mosquito in dengue fever, and controlling mosquitoes.

Candidate performance was very good.

For Part (a), some candidates had difficulties completing the life cycle of the mosquito. Terms such as "baby mosquitoes", "children mosquitoes", "foetuses", "worms", "maggots", "tadpoles", and "embryo" were used for larvae and pupae.

Part (b)(i) required candidates to describe how the mosquito transmits the dengue fever virus to human beings. Candidates' responses should have included:

- Mosquitoes feed on the blood of live animals
- They transfer the virus from infected to uninfected persons when they feed subsequently

Part (b)(ii) and (iii), requiring methods of preventing the spread of dengue fever, were well answered. Two misconceptions which some candidates had were:

- Vaccine for dengue
- Drinking dirty water and eating contaminated food caused dengue fever

Question 6

This question tested candidates' knowledge of the water cycle and water purification methods.

Overall, the performance was satisfactory.

In Part (a), candidates were required to label the process occurring in the water cycle. Process E, infiltration, presented a challenge. Many candidates described the process from the stimulus material but could not name the process. Part (b)(i), two methods of purifying water in the home, was widely known and most candidates secured these marks. In (b)(ii), many candidates did not know why screening was performed in water treatment plants and gave answers which included removal of bacteria or microorganisms, instead of the correct answer – removing large substances.

In Part (c), most candidates did not know what was involved in demonstrating the presence of bacteria in the water. Many of them gave microscopic observation and chemical testing as their answer. Only a few candidates were able to describe the following:

- Place a sample of water on agar in a petri dish
- Check for bacterial growth after a few days

Recommendations

- (i) Field trips to water treatment plants
- (ii) Use of models of water purification systems can assist in reinforcing the processes involved.
- (iii) Laboratory demonstration, using the agar plates, can show the presence of bacteria in water.

Question 7

This question tested meiosis and mitosis in genetics.

It was poorly done and most candidates scored between 0-3 marks out of a total of 10.

In Part (a), candidates were able to achieve most of their marks by correctly answering and giving the definitions of mitosis and generic inheritance. Candidates had difficulty defining meiosis as cell division where the chromosome number is halved.

Part (b) required candidates to sequence the stages of mitosis. This was not known by most of the candidates. Candidates were able to score by placing only one of the stages in the correct position, or by stating that Stage A followed Stage B. Not many were able, however, to gain full marks.

For Part (c), many candidates were not sure of the importance of mitosis, did not know where it occurred in the body or how the process was applied to the medical field.

Question 8

This question tested candidates' knowledge of bones, cartilage, diffusion and photosynthesis.

Candidate performance was fair.

Candidates seemed au fait with the functions of bone and cartilage, and performed very well on (a)(i) and (a)(ii). They also performed well on (b)(i), where they were required to select the correct word from the bracket, as most of them could identify diffusion as the process by which oxygen enters the blood.

Candidates were able to define diffusion but failed to link the process to the given situation in (b)(ii). A significant number of candidates did not understand what the question was asking. They provided information that was not required of them. The question asked for a description of the diffusion of oxygen into the blood from the alveoli. Most candidates however, described the general circulation of blood or the ventilation of the lungs.

In (b)(iii), a number of candidates confused the process of respiration and photosynthesis. Whereas they demonstrated keen knowledge of the raw materials and products and could write the equation, they were not familiar with the process.

Misconceptions

- Plants breathe (b)(iii)
- Plants do not need oxygen (b)(iii)
- Respiration takes place only at night (b)(iii)
- Oxygen is produced only at night (b)(iii)
- Bone is a source of calcium (a)(i)
- Cartilage connects bone to bone (a)(ii)

Recommendations

To teachers

- Teach examination skills with regard to question interpretation
- Encourage students to apply knowledge to processes, for example, (b)(ii)
- Distinguish between raw materials and products of respiration and photosynthesis
- Provide students with ample opportunity to apply the concept of diffusion to life processes. In each case, they should identify regions of high and low concentration, and direction of particle movement.
- Use 'real' examples, take bone to class so students see the real specimen.

To students

- Pay keen attention to interpretation
- Use the syllabus to assist with studying, see, for example, page 41 of the 2004 syllabus, where a glossary outlines the meanings of the verbs used in the questions

Question 9

This question tested candidates' knowledge of pollution.

Candidate performance was satisfactory.

For Part (a), candidates were able to define 'pollution' and give two causes of water pollution.

For Part (b)(i), most candidates could name an activity which produces carbon monoxide. However, for Part (b)(ii), candidates had difficulty explaining that carbon monoxide would cause death because it binds irreversibly with haemoglobin, thus reducing the amount of oxygen that can be transported by the blood.

For Part (b)(iii), most candidates could suggest ways of reducing carbon monoxide poisoning, for example:

- Legislation to reduce cigarette smoking in public places
- Decrease burning plastics and rubber openly
- Improve the quality of vehicles on public roads

Candidates were familiar with Part (c) – causes of increased levels of carbon dioxide in the atmosphere.

Question 10

This question tested candidates' knowledge of AIDS.

Candidate performance was very good.

Part (a)(i) and (ii), which required candidates to name the organism which causes AIDS, and two methods of spread, were well answered. Part (a)(iii) was also well answered, in that candidates knew how AIDS could be managed or treated.

In Part (b), candidates were required to say that the immune system of persons suffering from AIDS was weakened.

In Part (c), many candidates confused social impact with economic impact.

Social impacts are:

- Children lose parents, thus they are denied proper care
- Affected persons are ostracized

Economic impacts are:

- Increased spending on health
- Loss of part of the workforce
- Loss of work hours

Question 11

This question covered Section B2.11 and B2.12, B6.5 and B6.7, and dealt with hormones, homeostasis and the regulation of blood sugar. It was answered by about 30 per cent of the candidates. Candidate performance was poor.

Part (c), concerned with blood sugar levels, was well known.

For Part (a), while some candidates were able to define homeostasis as the ability to maintain conditions in the body, some candidates confused homeostasis with homeothermy. Few candidates were able to state that homeostasis ensured the proper functioning of the body.

In Part (b), only some candidates were able to state that homeothermy was the control of temperature or maintenance of a constant temperature. Most candidates were aware that the skin was mainly responsible for it. A few candidates stated brain or hypothalamus.

In Part (d), most candidates were aware that insulin worked in the pancreas to control blood sugar levels in the blood. Some were unable to state that it converts glucose to glycogen, hence lowering glucose levels in the blood. The role of glucagons, converting glycogen back to glucose, was not well known.

Some candidates described digestion, instead of the homeostatic control of sugar.

Question 12

The question assessed candidates' knowledge of food chains, energy flow within a food chain and water pollution. It was answered by about 52 per cent of the candidates.

Candidate performance was average. The areas which were well done included:

- Part (a), drawing the food chain and answering questions pertaining to it
- Part (b)(i), where candidates understood that the concentration of weedicide moved up the food chain
- Part (b)(ii), the effects of removing sea weed on small animals and fish

Misconceptions

- Part (b)(i): candidates were generally unable to state that persons eating larger fish would ingest a larger concentration of the weedicide
- Part (b)(ii): candidates did not recognize that levels of microorganisms would increase without small fish and animals or that nitrogen from dead fish and animals would also contribute to an increase in microorganism populations

- Part (c): some candidates answered this well but misconceptions included the following:
 - Crops would “suck up” all the water
 - Dirt would run into the water making it muddy
 - Candidates discussed tourism in detail
 - Candidates omitted to mention oxygen depletion

Question 13

This question assessed candidates’ knowledge of sterilization, control of microorganisms, antibiotics and vectors. The question was attempted by about 37 per cent of the candidates. It was poorly answered.

For Part (a), most candidates were able to define sterilization.

Difficulties and misconceptions

- Part (b): Whereas candidates stated that heat destroys organisms, they failed to recognize that heat destroys the enzymes which cause spoilage or that air is removed when fish is canned. Candidates also confused the term high heat with freezing.
- Part (c)(ii): Candidates were unable to give an example of an antibiotic. Acceptable answers included penicillin/chloramphenicol, tetracycline. Candidates gave pain killers, panadol and cold remedies, as examples, which were not acceptable.
- Part (c)(iii): Ways in which antibiotic treatments can adversely affect microorganism population in the intestine include:
 - antibiotics can kill the microorganisms in the gut
 - these microorganisms are not harmful but help synthesize riboflavin, Vitamin B12 and K, thus fewer of these supplies would be available
- Part (c)(iv): Why antibiotic treatment should be regulated by a physician was not well known. Acceptable answers included:
 - sensitivity of some people to some drugs
 - ensuring the correct concentration of antibiotic
 - the use of synthetic drugs or alternative antibiotics and the fact that improper use may be fatal
- Part (d): Candidates did not read the question carefully. They either only defined terms or drew a poster.

Question 14

This was a very popular question (approximately 72 per cent of the candidates attempted it) which dealt with the structure and role of the teeth, as well as tooth decay.

Candidate performance was good.

Most candidates were able to answer (a)(i), (iii) and (b) well, that is, they were able to state the functions of the parts of the tooth, state how to prevent cavities and state the functions of the canine and molar teeth.

Candidates experienced some difficulties with (a)(ii) – explaining how bacteria cause tooth cavities. Candidates' responses should have included:

- Bacteria in the mouth use sugar in the diet to produce acid waste
- The acid dissolves the enamel coating on the teeth
- The bacteria then gains access to the dentine inside the tooth
- The bacteria reproduce and feed until they reach the nerves of the pulp cavity, causing pain.

CARIBBEAN EXAMINATION COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2008

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION
MAY/JUNE 2008

Structure of the Examination

This is the fourth June sitting of the Human and Social Biology examination.

The examination consisted of two external papers. Paper 01 consisted of 60 Multiple Choice items, each worth one mark. Paper 02 consisted of ten structured compulsory questions, each worth ten marks, and four optional structured essay questions, each worth 20 marks. Candidates were required to answer two out of the four optional structured essay questions. There was no School-Based Assessment.

General Comments

A total of 25,017 candidates registered for the examination. This represents an increase of approximately 17 per cent.

Approximately 64 per cent of the candidates achieved acceptable grades, Grades I to III. This is an improvement in candidate performance over 2007.

DETAILED COMMENTS

Paper 01 – Multiple Choice

There was a significant improvement in candidate performance on Paper 01. However, the following topics presented some challenges to the candidates:

- Blood clotting mechanism – fibrinogen changing fibrin in the presence of thrombin.
- Test for protein.
- Siting of a pit latrine.

Paper 02 – Structured Essay

Candidate overall performance improved on Paper 02 in 2008 when compared with 2007. However, candidates need to improve on the Use of Knowledge Profile when answering questions.

Question 1

This question tested candidates' knowledge of photosynthesis. For Part (a), candidates were required to complete a word equation for photosynthesis, and to give one condition necessary for photosynthesis to occur (apart from chlorophyll). This was well done.

For Part (b) (i), candidates were asked to list the steps involved in testing a leaf for the presence of starch, given an experiment to investigate photosynthesis. Part (b) (i) required candidates to suggest the results of the experiment. Candidates performed poorly on this part of the question, demonstrating a lack of knowledge.

Recommendations

Candidates are advised to:

- prepare thoroughly for the examination
- follow the instructions given
- pay attention to the number of marks for each part of the question, as well as use the spaces provided for the answers as a guide in answering the question
- express themselves clearly
- answer the questions asked.

Question 2

Candidates' knowledge of plant and animal cells was required in this question. Candidate performance was satisfactory to good. For Part (a), candidates were given a table to complete to show the differences between a plant and an animal cell. This was a recall question, since candidates were given the words from which to choose the correct answers. Candidate performance was good.

Part (b) required candidates to describe the structure and function of the cell wall and cell membrane. This proved difficult for candidates. Most were more familiar with the function than with the structure.

Part (c) was known by most of the candidates. It tested candidates' knowledge of the energy requirement of muscle cells.

Recommendations

- Teach structure using models.
- In assessing students, teachers should place more emphasis on structure since function is widely known.
- Teachers need to develop more hands-on skills in the teaching and learning process.
- Teachers need to develop critical thinking skills, so that students will be able to analyze information.
- The learning experience should be both theoretical and practical.
- Teachers should encourage students to read widely on the topic, in order to garner as much information as possible.

Question 3

Candidates' knowledge of the nervous system was required in this question. Performance was average.

For Part (a), candidates were required to say what is a reflex action, and for Part (b), the difference between a reflex action and a voluntary action. Most candidates were able to correctly answer these

two parts of the question. Some candidates, however, defined a reflex action as the antagonistic action between muscles that move the limbs.

For Part (c), candidates were given two scenarios, for them to explain the action of the nervous system to produce the responses (the knee jerk and blinking). This required a description of the spinal reflex and the cranial reflex. Many candidates were not able to 'describe' the actions. Many candidates were too general in their responses and did not use the biological terms necessary in their answers, for example, stimulus, sensory neurone, motor neurone.

Recommendations

- A glossary of the terms (measureable verbs) is provided in the syllabus. Teachers are encouraged to use these terms to give students the practice they require in answering questions.
- Teachers must emphasize biological terms during their instruction.

Question 4

This question tested candidates' knowledge of the circulatory system. This question was poorly done.

Parts (a) (i) and (ii) were both poorly done. Candidates defined lymph as 'drained tissue fluid' and did not state the acceptable answer – lymph is the liquid in lymph vessels. Part (a) (ii) posed even more difficulty, as candidates confused the formation of lymph with the production of white blood cells and sometimes phagocytosis.

Parts (b) (i) and (ii) were fairly well done. Weaker candidates failed to state that the tonsils contain lymph which have lymphocytes to fight bacteria, and had the misconception that the tonsils produce lymph and white blood cells.

Part (c) (i) required candidates to describe the function of the tricuspid valve. This part was generally well answered.

For (c) (ii), candidates were unable to relate the structure of the tricuspid valve to its function. Candidates failed to state that the tricuspid valve tendons are tough connective tissues which prevent the flaps from being forced back into the atrium. Instead, candidates compared the structure of the tricuspid valve to a doorway or gate.

Candidates also incorrectly answered that the tricuspid valve is made up of three valves rather than three flaps.

For (c) (iii), candidates vaguely responded that a weak tricuspid valve causes a 'lack of energy' or 'lack of oxygen': A detailed response expected for this question is as follows:

- less blood is pushed into the lungs by the ventricle
- therefore, less oxygenated blood will reach the cells for respiration, producing less energy.

Recommendation

- Teachers need to emphasize the structure and function of the lymphatic system and use video presentations so that this topic can be better understood.

Question 5

Candidates' knowledge of respiration was required in this question. Performance was average.

Part (a) (i) asked candidates to complete the word equation for aerobic respiration. Part (a) (ii) tested candidates' knowledge of the definition for anaerobic respiration. Both parts were well answered.

Part (b) required the application of knowledge of respiration. Performance was below average. Part (b) (i) tested candidates' knowledge of the effects of cigarette smoking. This was more widely known than (b) (ii), which tested knowledge about the causes and symptoms of asthma. In many of the responses, it was evident that candidates did not pay attention to the stem of the question. Therefore, responses outlining the effects of cigarette smoke were given for (b) (ii).

In each case, candidates tended not to explain why a chronic smoker (b) (i) or an asthmatic person (b) (ii) may have difficulty in breathing. Instead the effects of each, and in some cases the treatment for asthma, were given.

A number of candidates misunderstood the term 'chronic smoker'. They wrote about smoking marijuana, which in some cultures is colloquially called 'chronic'.

Candidates wrote extensively on the effects of nicotine.

A good response should have included:

- (b) (i) A chronic smoker has difficulty breathing because the build-up of tar can lead to a breakdown in the alveolar structure, and the development of much larger air spaces. This results in the drastic reduction in the surface area of the lung. As a result the person is always short of oxygen.
- (ii) 'Free flow of air is restricted; the bronchial tubes constrict, thus affecting breathing; increased mucus secretion also blocks the air passage'.

Misconceptions

There were a number of misconceptions including:

- Smoke directly affects the circulatory system, liver and kidneys.
- Animals breathe in oxygen. Oxygen was used interchangeably with air.
- Cilia referred to as villi.
- Bronchi/bronchioles referred to as blood vessels.
- Trachea referred to as oesophagus.
- Asthma is an illness resulting from getting wet, doing exercise and inhaling allergens.
- Asthmatics have difficulties breathing if they are not using a 'pump' or asthma inhaler.
- Asthmatics have smaller or underdeveloped lungs.
- Candidates confused the absence of oxygen with the absence of light in photosynthesis.

- Anaerobic respiration occurs in the absence of light.
- Anaerobic respiration occurs only in plants.
- Anaerobic respiration takes place in the absence of energy.
- Anaerobic respiration takes place only during aerobic exercise.
- In anaerobic respiration, food is combined with carbon dioxide instead of oxygen.

Suggestions for teachers

- Invite resource persons to/for talks/workshops.
- Use visual aids, for example, films or models.
- Allow students to be involved in role play.
- Allow students to do research project followed by meaningful worksheets.

Question 6

This question tested the candidates' knowledge and use of knowledge of homeostasis, feedback mechanism, and water and temperature control as outlined in Section B 6.5, 6.6, 6.8, 6.10 of the syllabus.

This question was attempted by the majority of candidates. The performance on the question was poor.

In Part (a), the candidates restricted their responses to the maintenance of body temperature, instead of the expected all encompassing definition of homeostasis. Homeostasis is the maintenance of a constant internal environment in the human body.

In Part (b), the majority of the candidates' explained gaseous exchange without reference to the correct response to feedback mechanism – faster and deeper breathing; increased supply of oxygen, and the removal of carbon dioxide. Many mentioned increased heart rate and circulation. Many candidates explained anaerobic respiration, production of lactic acid, and pulmonary circulation, for which they were not awarded any marks.

In Part (c) (i), the majority of the candidates were able to state the use of water to 'cool the body through sweating'. Most candidates did not explain evaporation of sweat as a means of cooling the body. Two common misconception: drinking water cooled the organs in the body; and 'body heat leaves the body through the pores with the sweat'. Few candidates stated that increased breathing and water vapour lost through the lungs, as a method of controlling body temperature.

In Part (c) (ii), the majority of the candidates explained that less urine was produced because the water was used for 'sweating' and for 'cooling down the body'. Candidates did not state that the kidneys produced less urine to preserve the ions and salts, which are lost by sweating. Many lengthy responses were given explaining how less urine was produced—the role of ADH and the re-absorption of water, and this was not asked in the question.

Recommendations

- Emphasize
 - (i) breathing as a means of controlling body temperature
 - (ii) the function of the kidney to conserve water.
- Provide ample opportunities for students to practise answering questions to differentiate between 'how' and 'why' responses.
- Use varied methods of teaching the concept of negative feedback and provide many examples to aid understanding.
- Use experiments and models to explain temperature control.

Question 7

This question was designed to test the candidates' knowledge of the reproductive system. Candidate performance was average.

In Part (a), a diagram representing the female reproductive system was presented, and candidates were required to identify two labelled points. Most candidates were able to identify the ovary. However, weaker candidates identified the ovary as an egg and the cervix as the uterus.

Generally, Part (b) was well done, as candidates were able to identify, one birth control method for males.

In Part (c) (i), candidates were required to outline the process of fertilization. Most candidates were able to identify that the sperm swims up to the oviduct and if the female gamete is present, one sperm may penetrate the egg. There were few responses which indicated that semen is released on ejaculation and that the sperm combines with the nucleus of the egg. There were misconceptions that fertilization takes place inside the ovary, as well as that the fallopian tube and oviduct are two different structures. Candidates used the word ovary, instead of ova or egg to describe the female sex cell. They also used the term fertilized egg for mature egg.

Part (c) (ii) required candidates to explain how a female can become pregnant on the first occasion she has sexual intercourse. Many failed to mention that once sperms are present and a female ovulates, pregnancy can occur. There were misconceptions that a female can become pregnant at any stage during the menstrual cycle, as well as engaging in sexual intercourse without using contraceptive would most likely result in pregnancy.

Recommendation

It is recommendation that students familiarize themselves with the spelling of biological terms. Also, teachers use visual aids so that students can conceptualise the content.

Question 8

This question assessed candidates' knowledge of genetics. Performance was below average.

Part (a) required candidates to complete sentences based on information about cells. Candidates performed well.

In Part (b), candidates were asked to deduce the genotype of individual. Guidelines were given for the genetic cross for candidates to sequence their responses logically. Many candidates were able to derive the F₁ generation. However, some difficulties were observed:

- Some candidates did not complete the information for ‘gametes’.
- Some candidates did not understand the word ‘genotype’ and hence answered with words such as ‘heterozygous dominant’ or ‘heterozygous recessive’.
- Even though candidates were asked to use ‘D’ to represent the dominant gene for dimples, some candidates used ‘T’.
- A few candidates assumed that the characteristic was sex-linked.

In Part (c), candidates were required to say whether the genes determining the presence or absence of dimples also determined the gender of a person. This was poorly done. Most candidates did not know that gender was determined by sex chromosomes. Many candidates wrote that the male chromosome was ‘superior’, ‘dominant’ or ‘stronger’ compared to the female chromosome, and was the sole factor for sex determination. Acceptable responses included: sex is determined by sex chromosomes/presence of X and Y chromosomes/the 23rd chromosome/XY chromosomes in males and the XX in females.

Recommendation

Teachers should:

- Expose students to a wider range of genetic crosses, using different symbols.
- Spend more time explaining and using the terminology, such as, dominant versus recessive, heterozygous versus homozygous, genotype versus phenotype, and sex-linked characteristics.

Question 9

This question assessed candidates’ knowledge of AIDS, tuberculosis, and reducing the spread of mosquitoes. Performance was good. In Part (a) (i), which required candidates to state two methods of limiting the spread of AIDS and tuberculosis, candidates generally, responded well.

Part (a) (ii) presented difficulties for the candidates, as most of them could not suggest how tuberculosis was related to AIDS.

A good response should have included:

With AIDS the human immune system is compromised, hence a number of diseases which the body would normally fight off, takes hold. Tuberculosis is one such disease.

Candidates performed very well on Part (b) – controlling the spread of mosquitoes.

Recommendation

Teachers should:

- not teach the diseases in isolation, but should teach students to make the connections
- reinforce concepts taught, to assist students in the learning process.

Question 10

This question was based on Section E of the syllabus, and tested Syllabus Objectives 13, 15, 16 and 26. In general the question was poorly done, as the mean score was four out of the ten marks allotted for the question.

Part (c) of the question was done well as most candidates were able to identify that the microorganisms would be killed if disinfectant was added to the sewage. Some candidates, however, had the misconception that the plant being referred to was a producer rather than the sewage plant.

Parts (a) and (b) of the question were poorly done by most candidates. They were only able to identify faeces as a part of sewage, and did not give the definition of sewage as faeces, urine and household waste water. Candidates were unable to differentiate between sewer and sewage, as most students saw sewage as a place rather than what it is. For Part (a) (ii), candidates were unable to define biodegradable. Most candidates had the misconception that it meant non-biodegradable. An acceptable answer would have been, 'being able to be broken down by microorganisms'.

For Part (b), candidates viewed the question in terms of pollution. They did not apply their knowledge of the concept to explain how the oxygen content, the water and the food chain were affected. Some had a misconception of the sewage preventing oxygen from diffusing into the water.

An acceptable answer in terms of oxygen content is:

Sewage provided food for microorganisms and microorganism populations expand rapidly. This depletes the oxygen in the water, causing life in the water to die.

An acceptable response for food chain should include:

Sewage can block out the sunlight, and this will cause plants in the water to die. This destroys the starting point of some food chains, thus affecting plant and animal life.

Recommendation

Take students on a field trip to sewage plant. This concretizes the concept.

Question 11

This question tested Section B, Syllabus Objectives 4.1 to 4.12, and Section D, Syllabus Objective 9 (i). Generally, candidates' performance was below average. Parts (a) and (c) were done creditably. Part (b) presented the most challenge. Candidates focused more on breathing mechanism as opposed to gaseous exchange. Some candidates paraphrased the preamble given in the question. Under the heading 'the role of blood in the lungs', candidates did not confine their answers to the lungs but also included circulation of the blood to the heart and around the body. Many candidates described the respiratory system, without relating the structure of the lungs to its function in gaseous exchange.

Misconceptions

- Characteristics of respiratory surface, the alveoli, were applied to the lungs generally.
- Many candidates confused gaseous exchange of oxygen and carbon dioxide and indicated the 'used oxygen' becomes carbon dioxide.

- Candidates were unable to identify the causative organism of the flu as a virus. Many responses named bacteria, pathogen, and weather conditions.
- Part (c) (iii), was generally well done. However, some candidates indicated that exercising and 'sweating out' the fever would relieve symptoms of the cold/flu.

Recommendation

- Use internet to promote greater understanding of the structure of the lungs and how it relates to its function in breathing and gaseous exchange.
- Use models of alveoli to show increase in surface area.
- Invite expert personnel/resource persons to discuss/eliminate misconceptions about what would relieve of the symptoms of the flu.
- Debates on 'home remedies' and their effectiveness versus modern medicine.

Question 12

This question assessed candidates' knowledge of digestion and constipation. Performance was satisfactory.

For Part (a) (i), most candidates knew the function of HCl, (kills bacteria/stop the action of salivary amylase), pepsin (breaks down protein to polypeptides) and renin (helps in the digestion of milk).

For Part (a) (ii), some candidates thought that bile was produced in the gall bladder, instead of in the liver.

Part (b) (i) presented some difficulty for candidates who could not distinguish between egestion and excretion.

A correct response should have included:

Faeces consists of food materials that have not been metabolized, therefore, egestion occurs, not excretion.

In Part (b) (ii), candidates were vague in their responses as to what occurs in the colon to cause constipation. Candidates should have said:

When faeces remain in the large intestines for too long, too much water is removed from it. This then becomes hard, compacted and difficult to evacuate from the body.

Candidates were well able to explain the effects of constipation, Part (b) (iii), and ways to ease constipation (more roughage and water needed in the diet).

Recommendation

- Students need to use biological terms, not colloquialism.
- A distinction should be made when using the term 'carbohydrate', since cellulose/fibre is required to prevent constipation.

Question 13

This question tested Syllabus Objectives B 5.4, B 6.6 and B 6.7 of the syllabus. The question was poorly done with a mode of approximately 5. Candidates found it difficult to recognize the links between the topics nutrition and homeostasis, tested in the question.

Part (a) (i) tested the candidates' ability to identify food nutrient. In this part of the question, candidates had difficulty in identifying the food nutrient tested, as a result this part was poorly done. The food nutrient tested was reducing sugar.

Part (a) (ii) tested candidates' ability to identify the correct colour change for the food nutrient tested. The expected colour change for the food nutrient tested with Benedict's solution was brick-red.

Part (a) (iii) asked candidates to identify the colour change expected with a negative test, using Benedict's solution. The correct response expected was a blue colour.

Part (b) of the question asked candidates to explain how a healthy body maintains its blood sugar levels after a meal rich in carbohydrates is eaten and several hours after the meal. This part was highly misinterpreted. Candidates wrote extensively on the digestion of carbohydrates before, in some cases, discussing the homeostatic mechanism of the glucose. A typical example:

After a meal rich in carbohydrates is eaten, salivary amylase in the mouth begins to break down the starch. The food then travels to the duodenum via the oesophagus and stomach. In the duodenum the pancreas secretes pancreatic juice which further digest starch breaking it down to simpler sugar (glucose) so that the body can absorb it in the blood. The pancreas secretes the hormone insulin which regulates the blood sugar.

The correct response should have explained the negative feedback mechanism of glucose level in the blood. A typical answer should have included:

- After a meal rich in carbohydrate is eaten the blood glucose level increases, insulin is released from the pancreas.
- The uptake of glucose by the body cells is increased.
- Excess glucose is converted to glycogen in the liver facilitated by insulin.
- Insulin also converts some glucose to fat and increases the oxidation of sugar.
- Several hours after the meal is eaten the blood glucose level starts to fall.
- The pancreas secretes the hormone glucagon which acts on the liver cells to cause the breakdown of glycogen to glucose, thus restoring normal sugar levels.

Part (c) of the question tested candidates' knowledge of the symptoms and management of the disease diabetes mellitus. Most candidates were able to gain marks in this part of the question. However, there were a few misconceptions. One such misconception is that diabetes results from eating too much sweet.

Candidates also had difficulty in differentiation between signs and symptoms.

Question 14

This question tested Syllabus Objectives E 2, 5, 9, 11, 12; D. 9

Question 14 was a popular question but it was not well done.

Part (a) (i) and (ii) were well answered. Candidates were able to state how water is purified in the home; they were also able to list sources of water pollution.

A few candidates had the misconceptions that straining and filtering were the same and that freezing could be used to purify water. Purification methods that were accepted included: boiling, adding bleach, purification tablets and filtration systems.

Part (b) (i) was badly done. Candidates were unable to state the causative agents of diseases spread via faecal matter or diseases caused by parasites. Some misconceptions included:

- Diarrhoea is a disease.
- Tapeworm infestation can occur by drinking contaminated water.

Candidates did not read the question carefully and most of them wrote about diseases spread by mosquitoes.

Diseases which were accepted were as follows:

- by drinking contaminated water – typhoid, cholera, amoebic dysentery, poliomyelitis
- by parasites – anaemia, schistosomiasis, ringworm.

In Part (b) (ii), candidates were not able to list treatments of diseases. The answers were vague, for example, stating ointment instead of antifungal cream, medicine from the doctor instead of antibiotics, water instead of rehydration fluids. Home remedies were not accepted.

In Part (c), many candidates did not realize that the question was asking about the role of plants in the water cycle. Candidates wrote about deforestation and its environmental impact in a general way, with no links to the water cycle, even though the question clearly asked for the impact on the water cycle.

Recommendation

- Improve on spelling. The spelling was particularly poor, especially of cholera and diarrhoea. Teachers should encourage students to learn the causative agents, specific symptoms and treatments of the diseases listed in the syllabus. The use of crossword puzzles and similar activities would be useful.
- Students need to practise their analysis and interpretation skills when answering questions.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION
MAY/JUNE 2009**

HUMAN AND SOCIAL BIOLOGY

HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION
MAY/JUNE 2009

The 2009 examination was the fifth June sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 multiple-choice items. Paper 02 consisted of ten compulsory structured questions in Section A and four essay questions in Section B, of which candidates were required to answer any two.

General Comments

Candidate performance improved significantly over performance in 2008. Seventy-eight per cent of the candidates achieved acceptable grades, Grades I to III in 2009, as compared with 68 per cent in 2008.

This improved performance was due largely to improved performance in Paper 02. Performance on Paper 01 declined, from a mean of 62 per cent in 2008 to a mean of 56 per cent in 2009.

DETAILED COMMENTS

Paper 01

Candidate performance declined in 2009. Responses showed that candidates found difficulties with the following topics:

- Osmosis and diffusion
- Identifying a tendon of origin of the triceps
- Homeostasis
- Inheritance of characteristics – genetics
- Identifying an example of a degenerative disease – arthritis
- The specific nature of antibodies
- Polluting activities of human beings
- Biological filter method

Paper 02

Question 1

This question tested candidates' understanding of the carbon and nitrogen cycles as well as the part of the respiratory system responsible for gaseous exchange.

Candidates were unable to differentiate between the processes of nitrification and denitrification and the role of bacteria in these processes.

It is recommended that models be used when teaching these concepts. Role-playing activities can also be used with students acting the parts of the bacteria in the different processes.

Question 2

This question tested candidates' knowledge of the endocrine system in general and its association with diabetes mellitus in particular.

Some candidates unfortunately named the hormone associated with the glands instead of the glands themselves. They were also unable to say what makes a gland an exocrine or an endocrine one.

Part (ii) of this question was poorly done. Candidates were able to obtain only one of the three marks allocated to this part of the question. A common misconception was the use of glucagon and glycogen interchangeably.

It is recommended that

- (i) human models be used when teaching the location of these glands
- (ii) students be exposed to how glands themselves are formed so that they can clearly understand that ducts are associated with exocrine glands while endocrine glands are ductless.

Question 3

This question tested the candidates' knowledge of the importance of certain nutrients in the diet, as well as the importance of water in the human body.

Responses were satisfactory. Most candidates had a fair idea of what malnutrition is. However, the responses to the effects of anorexia nervosa were inaccurate. Some common misconceptions were that fear of obesity, shaky hands and tiredness were effects of anorexia nervosa. Another common misconception was that water is an energy source and provides nutrients.

Recommendations: Guest lecturers could be invited to the school to discuss these disorders. Students could also be given class projects to determine the functions of water, thus encouraging them to read more. The biological terms should be emphasized.

Question 4

This question tested candidates' knowledge of the methods of birth control, abortion, how the contraceptive pill functions to prevent pregnancy and the benefits of having few children in a family.

It was fairly well done. However, candidates had difficulties in differentiating between natural and artificial methods of birth control.

Some common misconceptions were that abortion, salt, Pepsi, Epsom salts, vaccines and hot Guinness can be used as artificial methods of birth control.

Candidates were unable to say how the pill prevents pregnancy. Some misconceptions were as follows:

- ATP is a hormone found in the pill.
- The pill prevents the sperm from developing.
- The pill blocks the ovary.
- The pill kills the sperm.
- The pill washes the sperm from the womb.

Recommendations: Personnel from the Family Planning Association could be invited to give lectures on methods of contraceptives and family planning.

Question 5

This question tested candidates' knowledge of diseases,

Performance was satisfactory.

Some common misconceptions were:

- Global warming destroys the ozone layer and causes skin cancer and a lack of oxygen.
- A pollutant is any material which affects the environment.

A good response would have been:

Pollution is the harming of the environment due to the activities of human beings.

Recommendations: Encourage students to participate in group discussions to promote a clear understanding of the concepts.

Invite resource persons to give lectures on global warming and its effects.

Use audio-visual aids to help to clarify misconceptions and emphasize key terms.

Question 8

This question addressed waste disposal, its effects on the environment and the difference between the terms 'biodegradable' and 'non-biodegradable'.

It was well done. However, some common misconceptions were:

- Non-biodegradable meant 'can be recycled'.
- Anything that is degradable is biodegradable.

Acceptable responses were:

Non-biodegradable means that something cannot be broken down or decayed.

Recommendations: Experts in areas of solid waste management could be invited to have discussions with students.

Video presentations and visits to landfills will provide students with concrete exposure to how solid waste is treated.

Question 9

This question tested the candidates' knowledge about bacteria, cholera and HIV/AIDS.

Overall performance on this question was satisfactory.

Part (b) of the question was very poorly done. Candidates showed that they were unaware about culturing bacteria and the concept of 'controls'.

Some common misconceptions about the methods of preventing the spread of HIV were:

- Isolation of HIV victims
- Usage of contraceptives.

A good answer should have been 'Practise safe sex/ Avoid contact with human blood/ body fluids'.

Recommendations: Simulations of experiments should be done so that students would observe how laboratory exercises should be conducted. This will also expose them to key concepts without having to actually conduct the experiment.

Video presentations on HIV and the development of AIDS should be shown, following which there should be class discussions.

Question 10

This question tested candidates' knowledge of locomotion and its importance, functions of the skeleton, cartilage, ligaments and tendons. The question was relatively well done.

Some common misconceptions were:

- Locomotion has to do with any movement and not necessarily movement from one place to another.
- Thin cartilage will cause bones to break.

A good response would have been:

- Locomotion is the ability to move from place to place.
- Worn, thin cartilage can
 - a) make walking difficult or make it harder for joint movement;
 - b) result in pain when the bones rub against each other.

Recommendations: Invite medical personnel to give lectures on the subject areas. Models should be used so that students have a clearer idea of the effects of worn, thin cartilage.

Question 11

This question tested the candidates' knowledge of genetics. Not many candidates attempted this optional question.

Parts (a) and (b) were fairly well done. Part (c) was well done while Part (d) was poorly done.

Some common misconceptions were:

- Mitosis/ meiosis can be used interchangeably with asexual/ sexual reproduction.
- Antibiotics, wrapping cuts tightly, applying pressure to wounds and using Vitamin K are all methods for treating hemophilia.

A good answer for method of treating hemophilia would be 'treating with clotting agents'.

Recommendations: Teachers must be very careful about not giving students misinformation.

Question 12

This question dealt with microorganism and sterilization methods, personal hygiene and its maintenance and the housefly and how it transmits disease.

This was the most popular question of the four optional questions and it was relatively well done. Parts (a) and (c) (i) presented some difficulties to the candidates.

Some common misconceptions were:

- Antibiotics and antibodies can be used interchangeably.
- Antibiotics can be used to treat viruses and other microorganisms.
- Fly detection is related to egg-laying.

Candidates were also unsure of the meaning of the term ‘sterilization’. A good answer would have been ‘the destruction of microorganisms present’.

Recommendations: Use audio-visuals so that students can clearly see how flies transmit microorganisms.

Use microscopes so that students can have a clearer vision of bacteria.

Prepare agar cultures for the visualization of the growth of bacteria.

Question 13

This question tested the candidates’ knowledge of large-scale water purification, lifestyle diseases and sexually transmitted infections.

Some common misconceptions were:

- Fluoride is added to drinking water to improve its taste/ to destroy bacteria.
- Lung cancer can be caused by alcohol consumption.

Most candidates wrote that chlorination is important for water purification. A good answer would have been that it is used to remove harmful bacteria.

Candidates were also confused about the signs/ symptoms of gonorrhea and syphilis. Good answers for signs/ symptoms of gonorrhea would have been blocked oviducts, discharge of pus from the penis, and arthritis, while those for syphilis would have been body rashes, red ulcers, and fatigue.

Recommendations: More emphasis should be placed on differentiating between the signs/ symptoms of various sexually transmitted infections.

Medical personnel should be invited to give lectures/ group discussions on the effects of alcohol, obesity and sexually transmitted infections.

Question 14

This question tested the candidates’ knowledge of the heart, blood vessels, atherosclerosis, vasodilation and vasoconstriction.

This was not a very popular question but it was relatively well done.

Candidates were unable to tell the difference between the right and left sides of the heart and could not correctly spell the names of the vessels. Explaining how the heart functions as a double pump also posed a problem.

Regarding differences between arteries and veins, candidates focused on the fact that arteries carry oxygenated blood while veins carry deoxygenated blood only. A good answer to this part of the question could have been: 'larger lumen in veins/ smaller lumen in arteries; or veins may have valves/ valves are not present in arteries'.

Recommendations: Use DVDs/ human models as teaching aids.

Emphasis should be placed on correct spelling of terms and anatomical structures.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION
JANUARY 2010**

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2010 examination, offered at the General Proficiency Level, was the fifth January sitting of Human and Social Biology.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 multiple-choice items. Paper 02 consisted of ten compulsory structured questions in Section A and four essay questions in Section B, of which candidates were required to answer any two.

The overall performance of candidates improved when compared with the January 2009 examination. The percentage of candidates achieving Grades I–III was approximately 50.7 when compared with 44.93 per cent for January 2009.

However, an assessment of the individual performance of Papers 01 and 02 found that there was a decrease in the performance of candidates on Paper 01 and an increase in the performance on Paper 02. The analysis showed that there was an improvement in the Use of Knowledge skill (UK), and a decline in the Knowledge and Comprehension skill.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance declined in 2010. Responses showed that candidates had difficulties with the following topics:

- The structure of the plant cell
- Comparison of the plant and animal cells
- Nature of the transmission of nerve impulses at synapses
- Function of the lymphatic system
- Cardiovascular system
- Renal system
- Reproductive system
- Determination of genotypes

Paper 02 – Structured/Essay Questions

Question 1

This question tested candidates' understanding of the structure of the plant and animal cell, as well as the function of organelles. Also tested was the causative agent of ringworm, its associated signs and symptoms, good hygiene practices to avoid its occurrence and possible treatment.

Candidates' responses indicated that they knew the functions of the cell organelles but were unclear as to the organelles common to bacteria, plant cells and animal cells.

Candidates showed knowledge of the signs and symptoms of ringworm, even though at times there was still confusion between the two terms. They were also aware of possible forms of treatment and were able to name over-the-counter medications.

It is recommended that candidates read the questions carefully and follow instructions explicitly.

Question 2

This question tested candidates' understanding of the process of photosynthesis, sources of major nutrients, the use of major nutrients in the human body and the carbon cycle.

Candidates were able to identify the sources of carbohydrates and proteins and knew the functions of these nutrients in the human body. Unfortunately, it appears that many of them did not read the questions carefully and stated sources of these nutrients that were animal-based instead of plant-based. Most candidates were knowledgeable about the return of carbon dioxide to the atmosphere.

Candidates seemed to have difficulty in correctly stating the word equation for photosynthesis. Many believed that oxygen and water give glucose and energy. Many candidates were also unaware of the storage form of sugar in plants.

Question 3

There were three main parts to this question. Part (a) required candidates to label a diagram of the thoracic cavity; Part (b) involved defining a reflex action and giving examples of such an action based on a scenario, while Part (c) focused on the image formation associated with long-sightedness and the type of corrective lens that should be used in such situations.

Responses were satisfactory for Parts (a) and (b) except that candidates did not include that reflex actions are involuntary actions. Very few candidates were able to accurately show by drawing where the image is formed during long-sightedness and most did not know the difference between a convex and a concave lens.

Candidates should again be encouraged to read the question carefully. For example, when asked to choose between two examples given as to which was a voluntary and which was a reflex action, candidates gave their own examples.

Question 4

This question tested candidates' knowledge of the main blood vessels of the heart, the importance of a circulatory system to humans, the effect of a deficiency of iron and how it affects the transport of oxygen by red blood cells, and signs/symptoms associated with that deficiency.

While candidates knew the names of the blood vessels, most were unable to accurately label the structures identified. Candidates also confused 'iron' with 'iodine'.

Candidates were unable to explain why a circulatory system was necessary in the human but not necessary in the amoeba. Most were unaware of the concept of surface area to volume ratio. Candidates were also unable to link a deficiency of iron with a lack of haemoglobin.

Some common misconceptions were:

- Iron strengthened the blood, therefore, insufficient iron makes the blood weak and cells unhealthy.
- Insufficient iron resulted in reduced red blood cells which were 'outnumbered' by the white blood cells.
- Lack of iron reduced the transport of oxygen by the red blood cells causing shortness of breath.
- Lack of iron caused a reduction in haemoglobin which affected the shape of the red blood cells.

It is recommended that PowerPoint lectures be used so that students have a visual representation of the connection between iron/haemoglobin/red blood cells.

Question 5

This question involved the labelling of structures of the skin and the skin's involvement in sweating, in addition to the role of the kidney in the homeostasis process.

Most candidates were able to explain that excess water is lost by the skin as a result of sweating but were unable to accurately label a diagram of the skin, mistaking the dermis for the epidermis. They also attributed the 'flushed' appearance to the sun's heat, blood vessels moving closer to the surface of the skin and an allergic reaction to the grass. They also believed that sweat cools down the body instead of the evaporation of sweat cooling down the body.

Question 6

This question tested the candidates' knowledge of asexual reproduction and its genetic consequences. It also required use of knowledge on abortion and contraceptive methods.

Most candidates were familiar with the association of mitosis and asexual reproduction but were unaware of plants using bulbs as a method of asexual reproduction.

While candidates were relatively comfortable with tubal ligation, most thought the 'rhythm' method involved 'beat' as it relates to music and were unable to differentiate between the rhythm and withdrawal methods.

Question 7

This question required candidates to differentiate between genetic and environmental variation, the benefits of genetic variation, the chemical that forms a gene and how gender is inherited in humans.

Most candidates knew the chemical that forms a gene but were unable to differentiate between genetic and environmental variation. Very few were able to state the gametes derived from the male and female and, therefore, were unable to show the gender of the resulting offspring.

This topic continues to pose a major problem for candidates. It is therefore strongly recommended that this topic be taught during Form 4 and that it be thoroughly revised before the examination date. Perhaps scenarios/skits could be developed so that candidates have a visual representation of what occurs during the process of gender determination.

Question 8

This question tested candidates' knowledge and use of knowledge of the cause, symptoms, and treatment of dengue fever and methods of controlling rats.

Most candidates knew the vector responsible for the transmission of dengue, its symptoms and methods of controlling rats. However, many candidates stated that the microorganisms responsible for causing dengue fever were bacteria, mosquitoes and protozoa. They also stated that the use of antibiotics and vaccinations were recommended for treating dengue fever.

The correct spelling of terms also continues to be a major problem.

It is recommended that lessons pay special attention to the correct spelling of biological terms. Lectures/ discussions could also be conducted on these diseases and their effects on the community, and the use of audiovisual aids/puzzles/worksheets be used to enhance learning.

Question 9

This question tested candidates' understanding of two of the most common sexually transmitted infections; their mode of transmission; effects on developing fetuses; the change in human behaviour that may have resulted in the increase of sexually transmitted infections; and advice that could be given to teenagers so as to reduce the spread of sexually transmitted infections.

Candidates were able to give advice on reducing the spread of sexually transmitted infections but gave erroneous responses such as transmission via kissing, and sharing of clothing and utensils.

Candidates were unaware of the effect of gonorrhoea on the developing foetus and believed that it was the mixing of blood and not the transmission of the virus that caused the damage to the developing foetus.

It is recommended that accurate information be given to candidates via classroom lectures/discussions because a lot of knowledge that candidates possess is learnt 'off the streets'. Emphasis should also be placed on the fact that it is contact between broken skin and virus-contaminated blood that is responsible for the contraction of HIV.

Question 10

This question dealt with pollutants, their origin and effects; method of purification of water using specific materials and diseases contracted from water-borne pathogens.

Most candidates were able to give boiling as a method of purifying water but were unable to establish the link between simple distillation and the apparatus shown in the question.

While candidates were knowledgeable on pollutants, most were unable to identify lead as the pollutant from car exhaust which is toxic to the nervous system.

It is recommended that more practical teaching methods be employed so as to emphasize the social effects of the concepts mentioned in this question.

Question 11

This question focused on nutrition, food groups, digestion and absorption of nutrients.

Candidates were very knowledgeable about balanced diets and sources of vitamin A, although they were unaware that a lack of Vitamin A causes night blindness.

Most candidates were unable to accurately draw the digestive system and were unable to discuss the stages of protein digestion and absorption of amino acids.

It is highly recommended that charts, diagrams and visual aids be employed in the teaching of this topic. Candidates should also be taught how to draw and label diagrams.

Question 12

This question required candidates to give the functions of the testes, prostate and ovary; to identify the dates on which different aspects of the menstrual cycle occur; and the benefits of family planning.

Most candidates were knowledgeable about the functions of the reproductive system and the benefits of family planning. Unfortunately, most were of the opinion that the baby developed in the ovary; that fertilization occurs in the ovary and that the prostate gland produces sperm. Candidates also erroneously thought that family planning prevented the spread of sexually transmitted infections.

It is strongly recommended that more innovative methods be utilized to fully explain the reproductive process and to clear up these common misconceptions.

Question 13

This question tested candidates' knowledge of the structure and functions of the respiratory system under normal and stressful conditions.

Candidates were very conversant with mouth-to-mouth resuscitation and the signs/methods of the spread of tuberculosis but were unable to correctly label the diagram of the respiratory system and define the term 'vital capacity'. They were also unable to suggest factors, other than illness, that could affect breathing rate.

It is recommended that models be used to teach the systems of the human body. Presentations/discussions/lectures could be given on the breathing process and factors that affect its rate. First aid personnel could also be employed to give demonstrations on the practical aspects of first aid.

Question 14

This question tested candidates' knowledge on herbivores, carnivores and omnivores; primary producers; food chains; the adverse effects on pesticides; the advantages of using biological control and their effects on the food chain.

Most candidates were able to correctly define the terms mentioned in the question. However, they defined the term 'primary producer' as a Social Studies candidate should. When drawing food chains, candidates are still unsure of the direction in which the arrows should be drawn.

Candidates also believe that insecticides affect plants and not insects and were unable to analyse the food chain and the effects of biological control on it.

It is recommended, therefore, that deductive reasoning methods be employed when teaching this topic. Projects could also be given to candidates whereby they could study the school's garden/playfield and develop a species list, identify niches and construct food chains. Trophic levels could also be identified and compared. Field trips could be made to farms and discussions held with farmers as to their methods of pest control and the possible effects on the environment.

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

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2010

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY**

GENERAL COMMENTS

The 2010 examination was the sixth June sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 multiple-choice items. Paper 02 consisted of ten compulsory structured questions in Section A and four essay questions in Section B, of which candidates were required to answer any two.

Candidate performance in 2010 declined significantly over performance in 2009. Sixty-eight per cent of the candidates achieved acceptable grades, Grades I – III, in 2010 compared with 78 per cent in 2009. This decline in performance was largely due to poor performance on Paper 02, which declined from a mean of 42 per cent in 2009 to a mean of 37 per cent in 2010.

Poor spelling and the lack of use of scientific terms continued to be prevalent. It also seemed that candidates were not reading the questions carefully and, therefore, provided answers that were in no way related to the questions.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance on Paper 01 improved in 2010. However, in spite of this overall improvement, responses showed that candidates had difficulties with the following topics:

- *Blood clotting mechanism*
This question tested candidates' knowledge of what is necessary for the conversion of fibrinogen into fibrin. The correct answer was 'Thrombin and Calcium ion', but most candidates chose "Thrombin".
- *Food tests*
This question tested candidates' knowledge of the results of food tests, given four tests and observations.
- *The menstrual cycle*
This item tested candidates' knowledge of the beginning of the cycle. While many candidates knew that the correct answer was 'With the breakdown of the uterine wall', a large percentage chose "At ovulation".
- *Stage of the life cycle of the housefly at which pesticides are most effective*
This item tested candidates' knowledge of the stage of the housefly at which pesticides are most effective. The correct answer is at the "Larval stage", but the majority of candidates chose the "Adult stage".
- *Natural active and natural passive immunity*
This topic was tested using two items. The first involved a young lady having had typhoid as a child, recovering, but never getting it again even after repeated exposure. While most candidates knew that this was "natural active immunity", a large percentage chose "natural passive immunity". The second item involved a baby being born with antibodies to typhoid. The correct answer was "natural passive immunity". However, most candidates chose "natural active immunity".

- *Cost effective methods of disposal of solid waste*

This item tested the most cost effective method of disposal of solid waste. The correct answer was “Using landfills”, however, most candidates chose “Recycling”.

Paper 02 – Structured Essays

Section A comprised ten questions, each worth 10 marks.

Question 1

Mean: 4.78 Standard deviation: 1.92

This question tested candidates’ knowledge of life processes. A graph was used to test candidates’ knowledge of the differences between the growth rates of males and females, it was expected that they would use their knowledge about puberty to help them with this part of the question. They were also required to know the role of the nucleus in mitosis.

Most candidates were able to state the life processes. Some, however used the term ‘breathing’ rather than ‘respiration’ and ‘nutrients’ and ‘digestion’ instead of ‘nutrition’. A diagram was used to test candidates’ knowledge of the position of the nucleus. While most candidates did know this, they did not follow instructions, and so, labelled the entire cell. Some knew the nucleus was responsible for mitosis but did not label the correct organelle and others labelled the nucleus wrongly.

Recommendation to teachers

Where possible, teachers should use diagrams and graphs in teaching. Students need to be taught how to analyse and interpret graphs. PowerPoint presentations could be used to present diagrams and graphs more effectively.

Question 2

Mean 1.61 Standard deviation: 1.67

This question tested candidates’ knowledge of the structure of the eye, the effects of a change in the amount of light in the environment on the eye, and accommodation.

Most candidates were able to label the lens on the diagram of the eye and knew the definition of accommodation. However, they were unable to label the sclera or choroid layer and were generally not able to describe the functions of the rods and cones in the eye.

Recommendations to teachers

Diagrams should be used for students to practise labelling the eye. Videos and practical exercises can be used to show how the eye works.

Question 3

Mean : 4.35 Standard deviation: 2.89

Performance on this question was fair. The question tested candidates' knowledge of joints, muscles, tendons and ligaments. Candidates were able to state the functions of cartilage and its location in the body, for example, at the end of long bones, trachea and earlobe. They were unable, however, to state a difference between tendons and ligaments. A correct response would have been that tendons join muscle to bone, and ligaments join bone to bone.

In Part (b), many candidates correctly identified and located the hinge or the ball and socket joint. Part (c) (i) presented the most difficulty as candidates were unable to give the meaning of the term 'antagonistic muscles'. In Part (c) (ii), they identified the biceps and the triceps but could not explain how these muscles function to facilitate movement.

Recommendations to teachers

To demonstrate how 'antagonistic muscles' work, practical activities, using model arms and interactive videos, could be used. Candidates should be encouraged to use scientific terms in answering questions, for example, 'inelastic' and 'fibrous' instead of 'tough'.

Question 4

Mean: 3.26 Standard deviation: 1.92

This question, which tested candidates' knowledge of active immunity and typhoid was poorly done.

Candidates were able to identify a symptom of typhoid and suggest a drug for its treatment but were unable to differentiate between signs and symptoms of typhoid. Goitre was given as a common symptom of typhoid. Typhoid was confused with thyroid. Organisms that cause typhoid were named as flies, rats, worms and mosquitoes. Candidates were also unable to state the type of drug used to treat typhoid. They used antibodies interchangeably with antibiotics.

Recommendations to teachers

Teachers should place emphasis on the differences between signs and symptoms. Students should be encouraged to learn the scientific names of organisms. Public health personnel could be invited to discuss diseases such as typhoid with candidates.

Question 5

Mean: 4.00 Standard deviation: 2.27

This question tested candidate's knowledge of aerobic and anaerobic respiration, how adenosine triphosphate (ATP) is utilized and the function and sources of vitamin A. It was poorly done.

Candidates knew that vitamin A improve night vision and were also able to name good sources of it. Most candidates were unable, however, to adequately give the meaning of aerobic and anaerobic respiration. They were also unable to name water and carbon dioxide as waste products of cellular respiration, or suggest fats and carbohydrates as substrates that could be used for energy. Most candidates did not know that respiration occurs in mitochondria. Explaining the role of ATP in energy transfer was also difficult for candidates.

A correct answer could have been: *ATP loses a phosphate (P) to release energy (bonds break) for use by the cell; adenosine diphosphate (ADP) is thus formed.*

Recommendations to teachers

Teachers could use multimedia presentations to teach the topic so that candidates can visualize the role of ATP in energy transfer. Students should be encouraged to learn definitions accurately.

Question 6

Mean: 3.48 Standard deviation: 2.43

This question included a graph from which candidates had to answer questions on enzyme action. It tested candidates' knowledge of enzymes present in the stomach and the action of salivary/pancreatic amylase. Overall, the question was poorly done.

Most candidates were able to identify pepsin as one of the two enzymes present in the stomach. They were also aware that starch is broken down by salivary amylase and were able to identify at least one pH value from the graph at which salivary amylase or pancreatic amylase worked best.

A large number of candidates were unable to describe the effect of acidity in the stomach on salivary amylase. Some stated that the enzyme stopped working because of a high temperature, indicating that they did not use the graph to help them. When asked to state the conditions, acidic or alkaline, under which pancreatic amylase worked, Part (b) (iv), many candidates simply stated 'yes' or 'no', even though the two possible answers were in the question. Candidates were also unable to state the chemical – pancreatic juice – that helps provide the ideal pH for pancreatic amylase to function.

Recommendation to teachers

Teachers should give students the opportunity to practise interpreting graphs.

Question 7

Mean: 4.28 Standard deviation: 2.11

This question assessed candidates' knowledge of the male reproductive system, birth control methods and family planning.

Candidates were able to state the effect of prostate cancer on urination. They were also able to state the benefits of family planning. Candidates were unable, however, to label the drawing of the male reproductive system. There was some confusion about how the contraceptive pill and the rhythm method worked.

Recommendations to teachers

It is suggested that models of the male and female reproductive systems be used in teaching. Resource persons from family planning associations should be invited to talk about contraceptive practices and general misconceptions about these practices.

Question 8

Mean: 2.01 Standard deviation: 2.02

This question required candidates to define genetic terms, answer questions on sickle-cell anaemia and to do a simple genetic cross. It was poorly done, twenty-eight per cent of the candidates scored zero marks.

Candidates were knowledgeable about the effects of sickle-cell anaemia on an individual, Part (c) (ii). They were also able to work out the genetic cross using a Punnett square (Part (d)). They lost marks however, in being unable to state the phenotypes of the offspring. Also, there was a misconception that albinism was sex-linked (used in the introduction of the question).

Candidates were not able to define genetic variation or environmental variation; they were also unable to give the meaning of DNA and to state the difference in shape between normal red blood cells and sickle red blood cells.

Recommendations to teachers

More intensive teaching needs to be done on this topic. It is suggested that it be done early and referred to, as it comes up in other topics. The candidates should be allowed to practise working out genetic crosses and encouraged to learn definitions of genetic terms.

Question 9

Mean: 5.12 Standard deviation: 1.94

This question tested candidates' knowledge of sexually transmitted infections. It was fairly well done.

Candidates answered questions on the effect of Herpes on babies fairly well, as well as the questions pertaining to limiting the spread of AIDS and use of antiviral drugs. Candidates had difficulty with the term 'causative agent', stating instead how the diseases were transmitted. The causative agent of Herpes is a virus; a bacterium causes Gonorrhoea.

Recommendation to teachers

Candidates should be encouraged to use scientific terms instead of slangs, slogans and advertisements, especially as it pertains to AIDS. Some candidates used the term 'condomize' and 'pinch, leave an inch and roll' instead of simply stating that condoms should be used during sexual intercourse. Students should be given the opportunity to answer different types of questions.

Question 10

Mean: 4.37 Standard deviation: 1.74

This question was only moderately done. It tested candidates' knowledge of pollution, eutrophication and disposal of sewage.

Candidates were able to list types of pollution and diseases associated with coming into contact with untreated sewage. However, most candidates were unable to explain the term 'eutrophication', or how detergents, sewage and agricultural activities lead to it.

Candidates were expected to say that *eutrophication is the massive growth of plants in water courses, which leads to a depletion in oxygen and hence death of aquatic organisms*. The phosphates in detergents, the nutrients released when bacteria decompose sewage, and the fertilizers from agricultural activities lead to this massive growth.

Recommendation to teachers

Some time should be spent teaching students the chemicals present in common substances such as detergents and fertilizers and their effects on the environment.

Section B comprised four structured essay questions, each worth 20 marks. Candidates were required to answer any two questions.

Question 11

Mean: 5.11 Standard deviation: 2.99

The question tested candidates' knowledge of chronic diseases, high blood pressure, diabetes mellitus and alcoholism. Candidates were able to name three chronic diseases other than diabetes mellitus and identify two non-drug forms of therapy used in the treatment of chronic diseases. For Part (b), candidates were unable to suggest why blood pressure increases as weight increases above normal and were not able to explain how high blood pressure may affect a person.

A good answer to Part (b) (i) could have been: *As weight increases fat is laid down on the walls of arteries and this reduces the diameter of the arteries. As blood flows through the arteries, the smaller diameter causes the blood pressure to increase.*

Candidates did not limit their answers about alcohol to its role as a depressant drug but instead included effects of alcohol on the entire body. As a depressant drug, alcohol slows down the passage of nerve impulses causing slow reaction times, poor muscle coordination and slurred speech, among other things.

Recommendations to teachers

Students should be encouraged to accurately learn about the effects and treatment of chronic diseases. Health-care personnel as well as persons suffering from diseases such as diabetes and hypertension could be invited to talk to students about chronic diseases.

Question 12

Mean: 8.18 Standard deviation: 3.73

Candidates' knowledge of sexual reproduction, prenatal care and care of the teeth were being assessed in this question. Performance was good. Candidates were able to list methods of preventing cavities and gum diseases but did not expand or explain them. Most candidates had a good knowledge about pregnancy with regard to diet and health. However, some candidates were not specific in their responses.

Most candidates were unable to give the meaning of the terms 'fertilization', 'sexual reproduction' and 'ovulation'. In many responses, candidates used ovary and ovum incorrectly. They also confused ovulation with menstruation or the period during which the female is able to become pregnant. A few candidates confused the term fertilizers (agricultural) with fertilization.

Recommendations to teachers

Students should be encouraged to learn definitions. Charts, diagrams and videos could be used to teach the menstrual cycle. Health-care personnel could be invited to discuss the reproductive system and how it functions.

Question 13

Mean: 9.42 Standard deviation: 4.04

Candidates' performance on this question was good. Their knowledge of the life cycle of the housefly and reasons for the outbreak of diseases like cholera and gastroenteritis after a hurricane were required. Candidates were also tested on ringworm and athlete's foot.

Most candidates were able to name the stages in the life cycle of the housefly and to describe athlete's foot, the control and treatment of ringworm.

Candidates were not able to identify the feeding and non-feeding stages of the housefly. The word 'pupil' was used instead of pupa. Most candidates were unable to describe the appearance of ringworm. Many of them simply described the shape. Many candidates also failed to recognize that cholera and gastroenteritis could be spread via water. Too many candidates wrote that ringworm is caused by tapeworms and round worms rather than by a fungus.

Recommendation to teachers

Teachers should discourage students from suggesting home remedies instead of scientifically proven treatments for an illness or condition.

Question 14

Mean: 6.76 Standard deviation: 4.44

This question was not well done. Candidates were tested on their knowledge of digestion, excretion and the role of the skin in temperature control and protection from pathogens.

Most candidates were able to define digestion, state the function of roughage and give an example of a good source of roughage. Many were also able to state why infections by pathogens will occur if the skin is damaged.

Candidates were not able to define excretion and egestion. They were expected to state that excretion was removal of *metabolic* waste rather than just waste. Some candidates confused 'egestion' with 'ingestion'. Though the question simply asked to state how the end products of digestion are used by the body, candidates described the entire process of digestion.

Candidates erroneously stated that blood vessels move closer to or away from the surface of the skin as opposed to vasodilation and vasoconstriction.

Recommendations to teachers

Animations and videos can be used to reinforce concepts. Teachers should stress the relationship between structure and function. Visual aids could be used to teach the skin and its role in temperature control.

‘CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES’ WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

JANUARY 2011

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2011 examination was the sixth January sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was the same as in previous years. Paper 01 consisted of 60 multiple-choice items. Paper 02 consisted of ten compulsory structured questions in Section A and four essay questions in Section B, of which candidates were required to answer any two.

Candidate performance declined in 2011. Fifty-one per cent of the candidates achieved Grades I–III in 2011, while 54 per cent achieved Grades I–III in 2010. This decline in performance was evident in both Paper 01 and Paper 02.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidates had difficulties with the following topics:

- Identification of the region where a neurotransmitter is released on arrival of an impulse
- Adaptations of the villi to facilitate absorption
- Identification of a fixed joint
- Function of endocrine glands
- Definition of a landfill

Paper 02 – Structured and Extended Essays

Question 1

This question tested candidates' knowledge of infectious diseases, the pathogens which cause them, the differences between bacteria and viruses, signs/symptoms of diseases and measures to control their spread.

Most candidates knew the signs/symptoms of the particular disease as well as measures of control. However, most candidates were unaware of differences between bacteria and viruses. Some common misconceptions were: both bacteria and viruses can be cured using antibiotics; bacteria are found outside the body while viruses are found inside the body; bacteria can be seen with the naked eye while viruses cannot.

Suggestions to Teachers

Where possible, diagrams should be used while teaching. Students need to be taught how to determine the differences between bacteria and viruses. It is also strongly recommended that topics which are covered earlier in the year be revisited prior to the examination.

Question 2

This question tested candidates' knowledge of the nervous system and its components; the functions of various areas of the brain, and the effects upon the body when there is insufficient thyroid hormones.

Most candidates knew the components of the nervous system and the effects on the body as a result of insufficient thyroid hormones. They were, however, unable to correctly label the hypothalamus, and instead of using the words cerebrum and cerebellum, quite a few candidates used the terms, forebrain and hindbrain.

Some common misconceptions were the reference of goitre as a result of overproduction of thyroxine and that damage to the hypothalamus affects one's ability to balance.

Suggestions to Teachers

Correctly labelled charts and diagrams should be used to ensure that students know the exact location of structures in the brain. Drawing activities along with labelling and annotating of diagrams should be done on a regular basis.

Question 3

This question was fairly well done. It tested candidates' knowledge of the function of blood as well as the function of the components of blood.

Most candidates were able to give two functions of blood and were well aware of the differences between white and red blood cells. While candidates were aware of the function of platelets, they were unable to say how they can be identified on a blood smear.

Some common misconceptions involved using the terms atherosclerosis and arteriosclerosis interchangeably and some candidates confused atherosclerosis with arthritis. Candidates also stated that platelets were fragments of blood, and not fragments of blood cells.

Suggestions to Teachers

Teachers must include brainstorming questions during the teaching/learning process. Drawing and labelling of diagrams should be done on a regular basis. PowerPoint presentations should also be used so that students will have a mental picture of the concepts being taught.

Question 4

This question was poorly done. It tested candidates' knowledge of the respiratory system, the logistics of mouth-to-mouth resuscitation and a respiratory infection (influenza).

Candidates were able to name the organism that causes influenza, say how it is spread and identify signs/symptoms associated with it. However, they were unable to correctly label the region of the lung where gaseous exchange takes place and were completely unaware of the reasons associated with the actions involved in mouth-to-mouth resuscitation.

Some common misconceptions included pressing down on the victim's chest during mouth-to-mouth resuscitation being necessary in order to get the heart pumping and to remove water from the lungs. Candidates also believed that H1N1 causes influenza.

Suggestions to Teachers

Teachers should place emphasis on proper labelling of diagrams. Members of the Red Cross Society could be invited to schools in order to demonstrate life-saving skills such as CPR and mouth-to-mouth resuscitation.

Question 5

This question was relatively well done. It tested candidates' knowledge of the functions of nutrients in the body, what is meant by a balanced diet and the major mineral needed for proper growth of teeth and a vegetable source for this nutrient.

Most candidates knew the functions of the nutrients and were able to differentiate between a balanced and an unbalanced diet. However, quite a few candidates used the terms food and nutrients interchangeably and were of the opinion that a balanced diet consists of only the macro-nutrients.

Suggestions to Teachers

Teachers need to emphasize the importance of linking nutrients to their sources as well as the differences between food groups and nutrients.

Question 6

This question tested candidates' knowledge of the production of oestrogen and its function, the stages of the birth process and the causes of growth deficiencies associated with babies while developing in the uterus.

This question was not well done, in spite of the fact that diagrams were used to guide the candidates into giving appropriate responses. Few candidates knew the organ responsible for the production of oestrogen and were equally unaware of its (oestrogen) function.

While most candidates were aware of a drug that could cause babies to be underweight at birth, almost no candidate knew the term 'foetal alcohol syndrome'.

Some common misconceptions included dwarfism and Down syndrome as growth deficiencies and that oestrogen controlled growth.

Suggestions to Teachers

Teachers should encourage students to be specific when answering questions and avoid giving vague responses. Discussions on the components of tobacco should also be encouraged so that students are made aware of the effects these components have on developing babies. Charts and diagrams can be utilized while teaching reproduction so that students fully understand the birth process.

Question 7

This question was poorly done overall. It tested candidates' knowledge of the use of terms associated with genetics, the number of chromosomes associated with muscle cells in the human body and the inheritance of height in humans.

Most candidates were unable to explain the common terms associated with the study of genetics and were totally unaware of the chromosome number found in somatic cells of humans. The section of the genotype from the genetic cross diagram was relatively well done and most candidates performed relatively well on this section.

Suggestions to Teachers

It is suggested that concepts be reviewed and reinforced and terms such as 'chromosome' and 'heterozygous' be well explained. Still more emphasis should be placed on Punnett squares and being able to explain the results obtained from such diagrams.

Question 8

This question was relatively well done. It required candidates to define the term 'vector'; give an example of a vector; outline measures to control the spread of leptospirosis and a method of treatment; state how AIDS could be confirmed; identify signs/symptoms of this disease and explain how the virus that causes it could be spread.

Candidates were very knowledgeable about AIDS and most of them scored full marks on this section of the question. Unfortunately, most candidates are still unaware of what a vector is. This occurs in spite of this question being asked quite often. The misconception that vectors are carriers of disease instead of being carriers of the organism that causes the disease still occurs to a high degree.

Suggestions to Teachers

More intensive teaching needs to be done on this topic. It is suggested that it be done early and referred to as it arises in other topics. Students should be allowed to practise working out genetic crosses and encouraged to learn definitions of genetic terms.

Question 9

This question was poorly done. It tested candidates' knowledge of diseases and their impact on humans, and the impact of health practices on the environment and immunity.

Candidates correctly answered questions on the meaning of the term 'sterilization' and two methods of sterilizing food. They were also aware of the effect of chlorine on drinking water. However, they were unable to explain the function of chlorination in large-scale water purification. The section on artificial passive versus artificial active immunity was not well done. Most candidates failed to make true comparisons of the two types of immunity. There were no misconceptions associated with immunity. Candidates simply did not know the answers.

Suggestions to Teachers

More time needs to be spent teaching this topic. Field trips/visits by resource personnel should be encouraged as this would promote more discussion on the topic. Regarding immunity, students could make charts and place them on science notice boards or on the walls of the labs and constant reference could be made to these charts.

Question 10

This question was relatively well done. It tested candidate's knowledge of structures common to plant and animal cells and the process of osmosis and diffusion.

Most candidates were able to list structures common to plant and animal cells. Regarding the explanation of the term osmosis, candidates continued to omit the very necessary part of the explanation that it is the movement of water molecules from an area of high concentration of *water molecules* to an area of low concentration of *water molecules* through a selectively permeable membrane. Most candidates got the marks for movement of water molecules through a selectively permeable membrane but consistently lost a mark for omitting 'water molecules'. This is a misconception that continuously occurs.

Suggestions to Teachers

Students should be encouraged to carefully read questions before responding because the majority of them did not respond to Part b (i).

The terms 'osmosis' and 'diffusion' should be carefully explained by using charts or even by performing skits during class sessions in order to make the material more interesting.

Question 11

This question was moderately done. It tested candidates' knowledge of diabetes mellitus, hypertension and obesity. There was also a section in which a graph was used to show the relationship between obesity and diabetes mellitus.

Candidates were unable to explain what was meant by the term 'diabetes mellitus'. Some common misconceptions associated with this disease were that diabetes and obesity are contagious diseases; that diabetes develops because the body stops producing sugar; and that the pancreas is a hormone.

The section on the graph was poorly done. This shows that candidates are still unable to properly understand graphs and answer questions related to them.

Candidates were unable to properly explain how obesity may affect blood pressure. They spoke about fat being laid down on arteries; fat covering the heart and generally being everywhere *except* on/in the walls of the arteries.

Suggestions to Teachers

Students should be encouraged to use rulers while answering questions related to graphs. They should be encouraged to carry rulers with them to an examination. More emphasis should be placed on differences between hormones and the organs that produce them.

Health care professionals should be invited to schools so that lectures on lifestyle diseases and their causes can be properly explained and discussed.

Question 12

This question was moderately done. It tested candidates' knowledge of landfills; activities involved in treating solid waste at landfills; the processes of incineration, recycling and composting and advantages associated with them; and how water pollution could be prevented.

Most candidates were able to list methods used to prevent water pollution. Those who earned marks did so from this section as they were able to state three methods. Some candidates however, responded in terms of water purification methods. Those types of responses were not accepted.

Candidates were unable to explain the processes involved in creating a landfill. Most candidates described the formation of a pit latrine while attempting to explain how a landfill is formed. Candidates were able to explain the processes of incineration, recycling and composting. However, they were either unable to give advantages associated with each of those processes or their attempts at giving advantages were too superficial. Suitable answers should have included "production of heat to generate electricity" as an advantage for the incineration process, for example. A common misconception about recycling was that it saves costs. The correct answer should have been that it saves resources.

Weaker candidates mentioned water purification methods and/or methods of cleaning water after pollution has occurred instead of discussing preventative methods.

Suggestions to Teachers

Teachers should allow ample time for teaching this topic properly, as very often it is assumed that the topic is widely/commonly known. Field trips to landfills, sewage plants, recycling plants and garbage dumps should be planned in order to reinforce what is taught in the classroom. Students should be encouraged to do practice questions on these topics, thus guiding them into giving responses with sufficient depth.

Question 13

This question was moderately done. It tested candidates' knowledge of the kidney; the formation of urine; the effects of alcohol on the liver; and social effects that arise as a result of alcoholism.

Most candidates were able to correctly label the diagram of the nephron of the kidney and to state the functions of the labelled parts. However, they were unable to correctly explain the

terms ‘ultra-filtration’ and ‘selective re-absorption’. These terms were used interchangeably by most candidates.

Candidates were knowledgeable about the functions of the liver and were fully aware of the physiological and social effects of alcoholism.

Suggestions to Teachers

Teachers should use more visual aids when demonstrating how urine is formed.

Question 14

This question tested candidates’ knowledge of various hormones and their functions; sexual versus asexual reproduction and their advantages; how semen is produced; and the advantages associated with teenage pregnancy.

Most candidates responded well in the section on pregnancy among teenagers and were able to identify variation as an advantageous outcome of sexual reproduction. Spontaneous abortion was also accurately linked to miscarriages.

Most candidates, however, ignored the section on hormones and where responses were given, they were inaccurate. Hormones were often linked to the onset of sexual activity or described as ‘chemical reactions’ occurring in the body. The regulatory role of hormones was largely ignored and hormones were described as products of exocrine glands.

Sexual reproduction was equated with copulation; asexual reproduction was often linked to persons being single parents.

Regarding the production of semen, few candidates used the diagram given (which was an excellent stimulus) in explaining the production of semen.

Suggestions to Teachers

Teachers need to place more emphasis on the endocrine system, ensuring that there is differentiation between endocrine and exocrine glands. The specific physiological activity of hormones should also be included, for example, adrenaline causes glycogen to be converted to glucose. The role of hormones should be emphasized. The use of case studies and role play might be useful in exploring the consequences of early/unplanned sexual activity.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2011

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2011 examination was the seventh June sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was different from that of previous years. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefited from the opportunities of learning, provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Overall, candidate performance on this paper was good. Areas of difficulty were as follows:

- Osmosis
- Vital capacity
- Composition of lymph
- The pathway for nitrogenous compounds to exit the body
- Understanding the term ‘allele’
- Similarity in the life cycles of the mosquito and housefly

Paper 02 – Structured Essays

Question 1

This question was only moderately done. Signs and symptoms of dengue, identification of a method of preventing the spread of dengue and plotting of the graph were done well. Many candidates were unable to name the types of mosquitoes that cause dengue and malaria. Part (b) (ii) gave information on tourist arrivals and the number of persons contracting the flu virus. Candidates were required to describe the trend in the population contracting the flu virus in Countries X and Y.

Many candidates were unable to correctly interpret the data presented in the table and the graph. They gave general responses such as ‘increase’ and ‘decrease’ without making any reference to a particular month or period. In several cases when the month or period was stated, it did not correspond with the figure stated or description given.

In Part (b) (iii), candidates were asked to describe the relationship between tourist arrivals and the spread of the flu virus. Very few candidates were able to establish the link. In many instances, they mainly restated the information shown in the table and graphs, for example, ‘more tourists arrived in Country X than Country Y’ or vice versa.

Recommendation to Teachers

Teachers should guide students in the use and interpretation of statistical data, for example, graphs, charts and tables.

Question 2

This question tested candidates' knowledge and understanding of nutrients, digestion and the digestive system. Performance was average.

Parts (a) (i) and (ii) were well done. Most candidates knew the vitamins and minerals that, when absent from the diet, could cause Peggy to feel weak and tired. The minerals mentioned were iron, calcium and phosphorus. In addition, most candidates knew that Vitamins B and C are water soluble vitamins.

Part (b) was poorly done. For Part (b) (i), candidates were required to state the function of the two parts of the digestive system which were labelled. Most candidates were unable to identify the function of the stomach and the small intestines, either because they could not identify the structures or they did not know the function.

Most candidates had difficulties with Part (b) (ii) which required them to describe protein digestion in the stomach and small intestine. They did not link the substrate to the correct product and the appropriate enzyme. Some candidates had the misconception that enzymes change into products.

Recommendations to Teachers

Students should practise drawing and labelling diagrams of the digestive system. Emphasis should be given to specific digestive activities occurring in each organ of the digestive system including enzymes, their substrates and products.

Question 3

This question tested candidates' knowledge of diffusion, osmosis, active transport, systemic and pulmonary circulation, as well as the lymphatic system.

This question was poorly done. Most candidates were able to score between 1 and 3 marks out of the possible 15 marks.

Fairly good performance was seen in Part (a) (i) — recognizing the process as diffusion; Part (b) (i) — the definition of active transport; Part (b) (ii) — naming sites where active transport occurs and Part (c) (iii) — stating two functions of the lymphatic system.

For Part (b) (iii), candidates did not specify the type of membrane. 'Cell' membrane was the correct answer. Candidates found Parts (c) (i) and (c) (ii) very challenging. These questions asked candidates to suggest how problems with the pulmonary circulation and systemic circulation could account for difficulties in breathing after running long distances. Many of them described pulmonary and systemic circulation but did not relate it to the question. Some of them wrote about obesity, poor diet and atherosclerosis as answers to the question. Other candidates gave the answer for Part (c) (ii) in Part (c) (i).

Ideal answers for Part (c) (i) would have been that *the valves which regulate the flow of blood from the heart to the lungs and from the lungs into the heart may be faulty or there would be less blood going to the lungs to be oxygenated resulting in a decrease in blood flow to the lungs*. For Part (c) (ii), an ideal answer would have been that *if the muscles are weak then less blood would be pumped out of the heart and around the body, thus the body would not receive adequate nutrients*.

In Part (c) (iii), many candidates stated that the function of the lymphatic system was to get rid of waste. Correct answers should have included the following: *the lymphatic system transports fats from the small intestines to the circulatory system, it has an immune function, it removes or drains tissue fluid from tissues and returns it to blood, and it transports lymph.*

Recommendations to Teachers

The definition of osmosis must include *movement of water molecules from a high concentration of water to a low concentration of water*. Teachers should put greater emphasis on the use of knowledge to interpret novel situations. More practice questions in this area would be useful. For active transport, teachers should emphasize that active transport involves movement against a concentration gradient and energy is absolutely necessary. A practical approach could be used to teach this topic using easily available plant material like potatoes and cucumber.

Question 4

This question tested candidates' knowledge of respiratory structures, breathing, and aerobic and anaerobic respiration. Performance was average.

Most candidates were able to label some parts of the respiratory system and describe the mechanics of breathing. Parts (b) (ii), (iii) and (iv) were generally well done. These parts tested candidates' ability to explain why heart rate increases during a sprint; to account for pain that might be experienced by some athletes during a race and why an athlete might breathe through his mouth.

Part (b) (i) required candidates to state that *at the beginning of the race, the athlete respire aerobically to provide energy but that this switches to anaerobic respiration when the oxygen supply cannot keep up with the rate of use*. Candidates misinterpreted the question and simply stated the difference between aerobic and anaerobic respiration.

A good answer for Part (b) (v) should have included any of the multiple effects of cigarette smoke which could affect breathing, for example, *damage to the cilia due to nicotine, accumulation of mucus, emphysema or the reduction in oxygen absorption*. Most candidates simply stated that the lungs were damaged without giving any details of how.

Recommendations to Teachers

Teachers should include more practical activities to teach this topic, for example, examining the effect of exercise on breathing rate; using a tape measure to measure the changes in chest circumference during inhalation and exhalation; making use of practical laboratory exercises involving respiration.

Question 5

This question tested candidates' knowledge of the structures and functions of the reproductive systems, the birth process, the importance of family planning and the advantages and disadvantages of natural birth control methods. Candidate performance was moderate.

Candidates were generally able to describe the birth process and the benefits of family planning, Parts (b) and (c) (ii).

Parts (a) (i) and (ii) required candidates to label the oviduct, vagina, prostate gland and urethra on diagrams. Some candidates did this poorly, using arrows and lines which did not reach the specific structures and labelling lines which crossed each other.

Part (a) (iii) required candidates to state one major difference between the male and female reproductive systems concerning the passage of gametes and urine. In a number of cases, candidates presented the vagina as the passage for urine in females. They also described fertilization and how males urinated compared to how females urinated. An ideal answer would have been that *in males there is one passage for sperm and urine to exit the body, whereas in females there is one passage for eggs and another for urine.*

Part (c) (i) required candidates to suggest one natural method of birth control and to give one disadvantage of using this method. Candidates confused natural birth control with artificial birth control and sometimes even surgical methods. The rhythm and withdrawal methods were also confused with each other.

Recommendations to Teachers

Students need more practice in drawing and labelling diagrams of reproductive systems. Videos could be shown illustrating the birth process. 'You Tube' on the Internet as well as several health websites are possible sources of information. Suitable resource persons can be used to teach family planning.

Question 6

This question tested candidates' knowledge of environmental terms, waste disposal, pit latrines and cholera. It was moderately done. Part (a) (ii) which required candidates to identify ways of decreasing the volume of solid waste was well done. Candidates' knowledge of cholera was good. They were able to state how the disease is caused, the signs and symptoms of the disease and ways to avoid contracting it.

There were some misconceptions concerning environmental terms in Part (a) (i). Some candidates stated that biodegradable included materials that could not be broken down. Dumps were described as landfills. The latter is an area where solid waste may be sorted, compacted and buried.

It should be emphasized that a term cannot be used to define itself. A classic example was seen when candidates in defining the term 'pollutant' stated that 'a pollutant was something which polluted the environment'. They should have specified that *pollutants result from man's activities and cause harm to the environment.* Though most candidates were able to state that pit latrines when sited in the wrong location could cause the spread of some diseases, some candidates did not state how this could be avoided. They could have given a number of possible answers, for example, *pit latrines should be at least 3–6 feet deep; a concrete base should prevent vectors that spread disease; a lid would keep in the scent/odour and keep out flies; they should be built away from rivers and streams to prevent water from being contaminated.*

Recommendations to Teachers

Emphasis should be given to covering the material in Sections D and E of the syllabus. To achieve this objective, various types of projects could be given to students. Possible projects could include the creation of posters, pamphlets or flyers to educate the public about diseases. Health inspectors could be invited to talk to students about their jobs in preventing the spread of common diseases in their territories. Field trips to landfills and recycling plants could be undertaken. The topics could be dramatized by students in the form of jingles and skits. When there are International Days for some diseases or environmental issues, newspapers are usually very informative and students can be referred to them.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
SECONDARY EDUCATION CERTIFICATE EXAMINATION**

JANUARY 2012

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2012 examination was the seventh January sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was different from that of previous years. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefited from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance was average. The areas that presented difficulties were:

- Osmosis
- Food tests
- The structure of mature red blood cells
- The function of a motor neurone
- Identifying endocrine glands
- Methods of controlling tuberculosis
- Impact of organic fertilizers on a river

Paper 02 – Structured Essay

Question 1

This question tested candidates' knowledge of the water cycle, agricultural activities that may cause water pollution and waterborne diseases. The data analysis section of the question dealt with the relationship between pollutants and percentage increase of cancers. There was also a diagram of an experiment about bacterial growth being conducted.

This question was relatively well done. Most candidates were familiar with the water cycle and waterborne diseases. However, they were unsure about agricultural activities and focused on pollution to rivers instead. Most candidates thought that the Petri dish from the experiment would break but did not mention the likely effect on the individual conducting the experiment.

The construction of the histogram for the data analysis section of the question was well done by most candidates. However, linking the data between the graph and the questions asked posed a problem for the majority.

Recommendations to Teachers

Teachers should guide students in the use and interpretation of statistical data, for example, graphs, charts and tables. More attention should also be given to practical activities as well as cause and effect.

Question 2

This question tested candidates' knowledge and understanding of the cardiovascular system, and involved labelling the parts of the heart, differentiating between arteries and veins, relating the functioning of the heart to that of a pump and problems associated with weak heart muscles.

This question was poorly done. While most candidates were able to correctly label the diagram of the heart and were aware of the differences between arteries and veins, they discussed the effects of hypertension on the individual rather than on the left side of the heart.

Some common misconceptions included confusing the bicuspid for the tricuspid valve, and using the term 'aorta' interchangeably with 'atrium'.

Recommendations to Teachers

Students should practise drawing and labelling diagrams of the cardiovascular system. Emphasis should be given to the proper functioning of the heart, how blood flows through the heart and the pressure differences associated with the right side versus the left side of the heart and the associated reasons. Health professionals could also be invited to give presentations on the effects of hypertension on the individual as well as on the heart itself.

Question 3

This question tested candidates' knowledge of the advantages and disadvantages of sexual and asexual reproduction, examples of asexual reproduction, the relationship between oestrogen and ovulation, the role of the lining of the uterus in pregnancy and the hormone which causes the lining of the uterus to thicken. Candidates were also asked to respond to ways in which a new contraceptive, that was specifically designed to target the lining of the uterus, would prevent pregnancy.

This question was poorly done. Most candidates were only able to score between 1 and 3 marks out of the possible 15 marks.

Most candidates viewed sexual reproduction as sexual intercourse/family planning and thus gave advantages and disadvantages relating to humans and family life. Regarding asexual reproduction, they associated it with same-sex relationships, artificial insemination or the absence of sexual intercourse in order for offspring production.

While most candidates were aware of the relationship between oestrogen and ovulation, they simply did not know the effects that hormones have on the lining of the uterus.

Ideal answers for (b) (iv) would have been that *the new drug could directly prevent the lining of the uterus from becoming thick, therefore making implantation improbable* or *the new drug could have caused the progesterone levels to remain low, and therefore the lining would not have developed*.

Recommendations to Teachers

Teachers need to stress the differences between types of reproduction and the difference between reproduction and intercourse (copulation). Models should be used to highlight the structure and associated function of the parts of the reproductive system. The meanings of terms, for example, *describe, suggest, define*, should be taught and emphasized.

Question 4

This question tested candidates' knowledge of homeostasis, excretion, the functions of the renal tubule, and the path of carbon dioxide from the time it is produced by the cells in the body to the time it reaches the air sacs in the lungs.

Candidate performance was poor. Most candidates scored between 0 and 6 out of a possible 15 marks.

Most candidates were unable to define the term *homeostasis*. They referred to it as having to do with temperature only. Some common misconceptions were: 'Homo' referred to sexuality; Homeostasis versus heterozygous; Homeostasis dealt with functions of hormones; Excretion could be equated with ejaculation or erection; Excretion meant getting rid of faecal matter.

Regarding the path of carbon dioxide from its production to its excretion, this was explained in the reverse, that is, the path of inspired air from the nasal passage to the lungs.

An ideal answer should have been as follows:

When carbon dioxide is produced, it is transported in the blood within veins until it enters the heart. The carbon dioxide is then transported in the blood via the pulmonary artery to the lungs, passes through the bronchial tree until it enters the capillaries surrounding the air sacs in the lungs.

Recommendations to Teachers

Teachers should include more practical activities to teach this topic. Structure and function need to be linked. The phases of urine production need to be clearly taught.

Question 5

This question tested candidates' knowledge of the definition of health, categories of diseases and treatment and immunity.

The performance on this question was poor. Candidates were unable to give a comprehensive definition of health and were unaware of the categories of diseases. It was pleasing to note that they were very familiar with asthma, its triggers and forms of treatment.

Candidates were also knowledgeable about the necessity of vaccinations but were unable to describe types of immunity. Part (c) presented the most difficulty. Some common misconceptions were as follows: the mother passes her immunity as a disease to the child and this disease is cured by the vaccination; vaccinations are injections containing antibodies.

A model answer to this question would have been:

Natural passive immunity: this type of immunity involves antibodies being produced by the mother which are then passed onto the developing foetus.

Recommendations to Teachers

Teachers should ensure that students know the meaning of the following terms: *antigen*, *antibodies*, *vaccination*, *immunity* and the context in which these terms are used.

When studying the systems of the body, the diseases associated with these systems should also be discussed concurrently.

Question 6

This question tested candidates' knowledge of functions of the skeleton other than movement, joints and movements associated with joints, the interactions between muscles, bones and tendons, and the functions of synovial fluid.

Performance on this question was poor. Few candidates were able to state the functions of the skeleton and were familiar with different types of joints and their associated movements. Candidates mentioned face joints, back joints and double joints. They were also confused about the difference between ligaments and tendons and thought that tendons were actual blood vessels which carried nutrients.

A good response to Part b (i) would have been:

The radius is one of two long bones of the lower arm. Lifting the lower arm involves contraction of the biceps muscle. The lower end of the biceps is joined to the radius by tendons. Since the tendons are severed, the radius (the arm) would not be pulled up when the biceps contract and Tdoosy would not be able to lift anything.

Recommendations to Teachers

When teaching the skeletal system, students should be encouraged to draw and label diagrams on this system. There are also excellent presentations on YouTube which clearly illustrate the interaction between muscles, bones and tendons. More visual aids should be utilized when teaching these systems so as to ensure that students thoroughly understand what is being taught.

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

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE[®] EXAMINATION**

MAY/JUNE 2012

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2012 examination was the eighth June sitting of Human and Social Biology, offered at the General Proficiency level.

The format of the examination was different from that of previous years. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefitted from the opportunities of learning, provided by field trips and laboratory work.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 — Multiple Choice

Candidate performance was fair; there was a decline when compared to the previous years. The topics that posed the most difficulties for the candidates were as follows:

- Nitrogen-fixing bacteria in the nitrogen cycle
- The formula for calculating body mass index (BMI)
- The structure of red blood cells
- Food tests
- Methods used to correct short sightedness
- Similarities of the life cycles of the mosquito and housefly
- The means by which water enters the atmosphere in the water cycle

Paper 02 — Structured Essays

Question 1

This data-analysis question tested candidates' knowledge of the respiratory system and the effect of tobacco smoke on it. Performance was fair.

For Part (a), many candidates were able to identify the *trachea*, the *left lung* and the *diaphragm* in the diagram given on the paper. They also located the alveolus, and described its structure as related to its function for Part (b).

For Part (c), candidates were given a bar chart with data about smoking and the incidence of lung cancer. In Part (c) (i), candidates were asked to state the year in which the total number of smokers was the highest. A number of candidates gave a range of years instead of a single year.

For Part (c) (ii), candidates were asked to state the period in which there was the greatest increase in the total number of smokers. Most did not give the period, *1970–1980*.

A comparison of the pattern of smoking in men and women between 1990 and 2000 was required for Part (iii). This was not well done; candidates quoted numbers without relating the numbers to the time period.

For Part (iv), candidates were asked to compare the pattern of cancer in females to that of smoking in females. Some candidates compared smoking in males with smoking in females or wrote about males instead of females.

Parts (v) and (vi) were moderately well done as most candidates were able to suggest reasons for the pattern of smoking seen in men and women, respectively.

Recommendations to Teachers

Teachers need to provide students with sufficient practice to enable them to understand graphs and analyse data. This can be done using relevant topics within the Human and Social Biology syllabus.

Question 2

Candidates' knowledge of food chains, energy relationships, the carbon cycle and photosynthesis was required. This question was poorly done.

Part (a) (i) required candidates to construct an aquatic food chain using three organisms from a coral reef. The responses indicated that many candidates did not respond satisfactorily to this part of the question. Many used freshwater fish instead of marine fish. Some drew arrows in the wrong direction or used lines instead of arrows. Some did not begin the food chain with the producer, a *water plant*. A few candidates produced terrestrial food chains.

In Part (ii), most candidates were able to identify the herbivore from the food chain they produced in Part (a) (i).

For Part (iii), most candidates knew that the *first trophic level* usually contains the largest number of organisms, and some correctly discussed energy losses between trophic levels in Part (iv).

Candidates were expected to complete a sentence using the words 'parasite' and 'predator', in Part (b). Many gave **examples** of parasites and predators rather than supplying the appropriate terms.

Part (c) required candidates to write an equation for photosynthesis and explain what would happen if all the plants in the world were destroyed. Most knew the equation for photosynthesis, and, as part of their discussion, stated that *animals depended on plants for food, hence humans as well depended on plants*.

Recommendations to Teachers

Students seemed to be ignorant about reefs and the types of organisms that inhabit them. Videos on nature, visits to marine research stations and presentations done by marine biologists would provide candidates with more exposure to marine life.

Question 3

This question tested candidates' knowledge of the nervous system. Performance was poor.

For (a), many candidates were able to name the two subdivisions of the nervous system, namely the *central nervous system* and the *peripheral nervous system*.

Part (b) (i) required candidates to label an axon and a nerve ending, given the diagram of a neurone. Most mistook the nerve endings for dendrites and consequently gave an inappropriate answer for the role of the nerve endings, as required in Part (ii). For example, many candidates responded that the axon acted as a pathway for nerve impulses and did not state the direction of the nerve impulse.

In Part (c), some candidates knew that the *hypothalamus* was responsible for intermittent fever, and the *medulla oblongata* for irregular heartbeat and breathing.

Candidates were also able to explain differences between and give examples of voluntary and involuntary actions, in Part (d).

For Parts (e) (i) and (ii), very few candidates were able to name and spell neurotransmitter correctly. Some stated that neurotransmitters crossed the synapse but failed to mention what their post-synaptic role involved, that is, *they cause an impulse to flow in the other neurone*.

Recommendations to Teachers

Teachers should encourage students to make models of nerves and the brain and use them to explain the roles of each region. Videos illustrating nervous transmissions and functions of nerves can be accessed on the Internet.

Question 4

This question tested candidates' knowledge on genetic engineering, atherosclerosis and hypertension. Candidates performed poorly.

In Part (a), most candidates were unable to properly define the term 'genetic engineering'. For example, candidates wrote that 'Genetic engineering is when you make something stronger, when genes are passed from mother to child, where organisms can be produced or improved without the use of sexual reproduction, and a modern way in which food is produced for human consumption'. A good answer would have been *Genetic engineering is the direct manipulation of an organism's genetic material in a way that does not occur under natural conditions*.

Part (b) required candidates to explain biotechnology involving recombinant DNA. Responses were poor. Most candidates were unable to state how insulin is made through genetic engineering. A good response would have been as follows: *The gene which codes for insulin production is removed from a human chromosome using enzymes. It is then placed in the plasmid of E. Coli. The bacterium in which it is placed then begins to manufacture insulin*.

In Part (c), candidates were required to state one advantage and or disadvantage of using genetic engineering for food production. While advantages such as *pest-resistant crops*, *higher yields* and *better quality crops* were known, most candidates were unable to correctly state a disadvantage. Some poor responses included: 'death', and 'hormones affecting growth'. Moral implications of genetic engineering were stated but not accepted as a correct response. A disadvantage is that *introducing genetically modified genes could produce disastrous results yet unknown*.

For Part (d) (i), candidates should have stated that atherosclerosis is a condition which occurs when fat *is deposited on the walls of the arteries thus reducing the internal diameter of the artery*. For Part (d) (ii), most gave at least one effect of hypertension on the cardiovascular system. Responses to Part (d) (iii) were better. Most candidates were able to suggest at least two lifestyle changes which could be made in order to control hypertension.

Recommendations to Teachers

Teachers should use diagrams when teaching about the procedure for genetic engineering. Emphasis should be placed on the use of biotechnology/genetic engineering through projects, debates and Internet research.

Question 5

This question tested candidates' knowledge of the endocrine system, the hormonal control of reproduction and the nervous system. Candidates did not seem to know these topics very well.

In Part (a), candidates were asked to name the hormones produced by the thyroid and adrenal glands. Most were able to state thyroxine and adrenaline respectively. They were also able to state the functions of these hormones.

For (b) (i), the hormones produced by the pituitary, *follicle-stimulating hormone (FSH)* and *luteinizing hormone (LH)*, affect both the testes and the ovaries. Candidates did not know the negative effects of underproduction of these hormones (FSH and LH) either on the human body, required for Part (b) (ii), or on the Ukraine population presented in the stimulus, as required for Part (b) (iii).

In Part (c), candidates were unable to make good comparisons between the nervous and endocrine systems. For example, candidates wrote that the nervous system was controlled by the brain whereas the endocrine system controlled the rest of the body; the nervous system was at the top whereas the endocrine system was at the bottom; the nervous system has two main divisions whereas the endocrine system has many parts and the nervous system deals with external whereas the endocrine system deals with the internal. Examples of good comparisons would have been: *In the nervous system, messages are sent via impulses whereas in the endocrine system messages are sent via hormones; the nervous system tends to work quickly whereas the endocrine system is generally slow*.

Recommendations to Teachers

Teachers should encourage students to learn the endocrine hormones and the organs within which they are made. Teachers should also show the inter-relatedness between various topics and world events especially as they relate to environmental issues and their effects on human health. Students should also be taught how to make comparisons with the use of tables.

Question 6

This question assessed candidates' knowledge and understanding of diseases and vaccines. Performance was fair.

Candidates were able to name the vector responsible for dengue fever, and to give signs or symptoms of dengue fever, for Part (a) (i). They also correctly stated measures which health authorities and households could take to control the spread of dengue fever, for Part (a) (ii).

Responses to Part (b) were fair. Too many candidates were not aware that the vector of malaria is the *Anopheles* mosquito. Some of the misconceptions included: coughing, sneezing, touching and sexual intercourse as well as transmission through eggs during reproduction. A good response was:

Mosquitoes acquire the pathogen (plasmodium) when they bite and feed on the blood of an infected person. They then transmit the plasmodium when they bite another person.

Part (c) required candidates to explain how the knowledge of passive and active immunity may be used to protect an individual from contracting malaria. Candidates were also expected to compare the advantages and disadvantages of the approaches. Most candidates limited passive immunity to the passage of antibodies from mother to child during breastfeeding which was not relevant to malaria.

Most candidates demonstrated a lack of knowledge about the concept of immunity. Others misinterpreted the question giving suggestions of preventative measures. Some of the candidates who demonstrated a good grasp of the concept of immunity confused the terms active and passive. The terms antibodies, antibiotics and antigens were commonly used incorrectly or interchangeably.

A good response would have been as follows:

In passive immunity, antibodies to a particular disease are given as a vaccine. If the body becomes exposed to the antigens, the antibodies will immediately attack and destroy them. Unfortunately, the antibodies given will eventually be lost from the body and the person will once again be susceptible. In active immunity, the person is exposed to a weakened form of the pathogen. The body responds by producing antibodies. When the body encounters the real disease, it activates its antibodies' production more quickly.

Recommendations to Teachers

Teachers could utilize the services of health professionals to speak to the students on diseases in general. They should also encourage research work. Dramatization could also be explored as a possible means of learning about the diseases.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

JANUARY 2013

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2013 examination was the eighth January sitting of Human and Social Biology offered at the General Proficiency level.

The format of the examination was the same as that of 2012. Paper 01 consisted of 60 multiple-choice items and Paper 02 consisted of six compulsory questions, four of which were structured (Section A) and two of which were essay questions (Section B). Each question was worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate more than one area of the syllabus.
- The questions in this paper assume that students would have benefitted from the opportunities of learning provided by field trips.
- Question 1 in Paper 02 always involves the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance improved on this paper. However, candidates had difficulties with the items that tested the following topics:

- Function of calcium ions
- Positive test for protein
- Reasons for the need for a transport system in the human body
- The part of the heart that pumps deoxygenated blood to the lungs
- The events that occur during inhalation
- Structures connecting two bones of a synovial joint

Paper 02 – Structured Essay

Question 1

Specific Objectives: B. 6.15, 7.4, 7.11, 2.11

This question tested candidates' knowledge of the reproductive system; the hormones produced by the testis and ovary and the relationship between still-born babies and mothers who smoke tobacco. Candidate performance was good.

Candidates were able to state the hormones produced by the testis and ovary. They were also knowledgeable about the functions of the placenta and the amnion as well as diseases that are caused as a result of smoking tobacco. However, they had difficulty with Part (c). They were unable to construct a bar graph in some instances and few were able to draw it using a correct scale.

In Part (c) (i) b), candidates were unable to describe the trend as was required by the question. Many referred to the risk of mothers having still-births instead of the increase in still-births among the stated age groups. A good answer would have been *As women age, the percentage of still-born babies increases*.

In Part (c) (ii), no candidate was able to show the link or establish the effect of nicotine on blood vessels, that is, *vasoconstriction*. Most candidates referred to the baby being suffocated by smoke from the mother's smoking or the baby being unable to breathe. They also generally referred to chemicals instead of naming nicotine.

Recommendations to Teachers

- Teachers should teach the fundamentals of graph construction and interpretation.
- Students should be made to practise the construction/interpretation of graphs.
- Accurate spelling of technical terms should be encouraged.
- The use of technical terms in their proper context should be emphasized.
- Critical thinking skills should be developed in students.

Question 2

Specific Objectives: B1.2, 1.9, 1.10, 1.11, 1.13

This question tested candidates' knowledge of types of teeth and their functions; the source and function of vitamins; body mass index and portions of food ingested so as to avoid the occurrence of obesity. Candidate performance was fair. Most candidates were able to give a source of Vitamin A from a selected list of foods given. They were also able to state why Vitamin A was needed by the human body. They accurately stated the factors that would negatively affect body mass index (BMI). Correct answers given were *lack of exercise, heredity and an underactive thyroid gland*.

Part (a) required candidates to identify a molar tooth from a diagram of the upper jaw. Most candidates incorrectly named the tooth ‘pre-molar’ or ‘canine’.

For Part (b) (ii), candidates were unable to give a definition for BMI. Most thought that BMI was only concerned with weight while others stated that it was either the product or the sum of a person’s weight and height. Regarding the calculation of a person’s BMI, candidates were unable to substitute the values given into the formula and thus had difficulty arriving at the correct answer.

In Part (b) (iv), explanations or reasons given for adjustments to the amount of proteins, starches and vegetables in school feeding menus, by many candidates, focused on the function of these nutrients as opposed to reasons for adjustments.

Recommendations to Teachers

- Students should be trained to identify stimulus material and to focus their attention on specific details provided so as to enhance the clarity and accuracy of their responses.
- Models, charts and computer-generated simulations should be used to enhance students’ capabilities in identifying the types of teeth and their positions in the human jaw.
- Students should get more practice in calculating BMI and analysing data relating to same.

Question 3

Specific Objectives: B 4.1, 2, 4, 12; B 1.2, 3

This question tested candidates’ knowledge of the skeletal system. They were required to name specific bones and state their functions, differentiate between bone and cartilage, explain the relationship between lower back pain and poor posture and improper footwear, and the diseases that develop in the skeletal system as a result of a deficiency of certain vitamins and minerals. Candidate performance was fair.

Candidates were able to correctly label the bones and state their functions. They were also able to give distinguishing features of bone and cartilage.

Part (c) (i) required candidates to explain how poor posture and wearing high-heeled shoes could contribute to lower back pains. Most candidates were unable to explain how standing improperly would shift one’s centre of gravity and thus place unnecessary strain on one’s back muscles. While they were aware that wearing high-heeled shoes were not good for one’s arches, they were unable to explain why.

Recommendations to Teachers

- Teachers should encourage students to make use of models of the various systems of the body and help them to identify the organs of each system.
- Role-modelling could also be used to help students to better understand how poor posture would put a strain on back muscles.

Question 4

Specific Objectives: B 6.8, 6.10, 6.11, 6.12

This question tested candidates' knowledge of sense organs and the stimuli that they detect; accommodation, astigmatism and glaucoma. Candidate performance was poor. Most candidates were able to state the sense organs and the stimuli that they detect. However, some candidates listed the sense organ and sense instead of the sense organ and the stimulus that it detects, for example, 'eye – see' instead of the correct answer, *eye – light*. They were also knowledgeable about accommodation.

Part b (i) was hardly attempted by candidates. They seemed about the meaning of *annotated*.

In Part (c), most candidates were unable to name the eye defect that is caused by an irregularly curved cornea. They were also unable to explain what causes glaucoma. Several candidates related glaucoma to diabetes and hypertension rather than a build-up of the fluid in the eyes. Those that mentioned fluid in the eyes stated that fluid accumulated in front of, over or behind the eyes. A good answer would have been *blockage of channels/ducts/tubes to drain aqueous humor/fluids leads to a build-up in front of the lens thus causing a build-up of pressure*.

Most candidates knew that surgery was recommended as treatment for cataract but were unable to describe what is a cataract. They mentioned that it was a growth of fleshy tissue in or over the eyes.

Recommendations to Teachers

- Key terms should be thoroughly explained to students.
- Students should be taught how to draw annotated diagrams.
- Medical personnel should be utilized to explain eye diseases and defects.

Question 5

Specific Objectives: C 7, 8

This question tested candidates' knowledge of genes, dominance, carriers and phenotypes of offspring from an individual with haemophilia and one without. This question was done very poorly.

Parts b (ii) and (iii) were well done. Most candidates were able to do a cross between a parent with haemophilia and one without. They were also able to describe the possible phenotype of their offspring.

Parts (a) and b (i) were badly done. Most candidates were unable to define the terms *gene*, *dominance* and *carrier*. Candidates stated that carriers carry diseases, foetuses and things for people. They also stated that carriers were women who had multiple partners and therefore contracted the disease. They believed that dominance had to do with strength and conquering. Individuals developed sex-linked diseases by having sex and contracting the gene as a result. A good answer would have been *A carrier is an individual who has the recessive gene for a characteristic/condition but is not affected by it*.

Recommendations to Teachers

- Students should be taught to use both the Punnett square and the “cross” method to determine offspring.
- Terms should be clearly defined for students.
- Clear references and discussion should be used to ensure that students do not confuse the term *carrier* in genetics and development of diseases.

Question 6

Specific Objectives: E 1, D 16, E 6, 8, 18, 19

This question tested candidates’ knowledge of pollutants, disinfectants, antiseptics, water purification and landfills; it was poorly done.

Part (a) was well done. Candidates were able to define the term *pollutant* and sources of chemical pollutants. Parts (c) and (d) were badly done. For Part (c), many candidates were not sufficiently able to explain why the treatment of water using bleach alone was adequate treatment to make water potable. For Part (d), most candidates were not able to use current issues such as population increase, industrialization, and the increased production of non-biodegradable materials together with the cost of maintaining landfills, to show a contrast between what occurred many years ago and what occurs in these times.

Some common misconceptions were that atmosphere was used synonymously with environment; a person is a pollutant; confusion between examples of pollutants as opposed to sources of these pollutants; differentiating between antiseptic and disinfectants. A good answer would have been *Antiseptics kill bacteria while disinfectants kill pathogens*.

Recommendations to Teachers

- Teachers should remind students to focus their attention on key, guiding terms so as to be able to distinguish properly between disinfectants and antiseptics.
- Students should visit landfills and water treatment plants so that they can clearly understand that water treatment and sewage treatment are not the same.
- Visit the CXC website and read examination reports to see what is expected of students.
- View videos on YouTube to get a clearer understanding of what pertains at landfills.

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

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

MAY/JUNE 2013

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2013 examination was the ninth June sitting of Human and Social Biology offered at the General Proficiency level.

The format of the examination was different from that preceding 2011. There was no change to Paper 01, which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Part A) and two of which are essay questions (Part B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that candidates would have benefitted from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 would always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance on Paper 01 declined this year when compared with the June sittings of 2011 and 2012. Candidates had difficulties with questions that assessed knowledge of the following topics:

- The organ responsible for neutralizing hydrochloric acid
- Foods that prevent constipation
- Function of the ileum
- Interpreting a graph showing vital capacity
- Component of cigarette smoke that reduces the oxygen-carrying capacity of the blood
- Blood clotting sequence
- Cranial reflex action
- Changes in the eye to facilitate accommodation
- Genetics
- Signs of dengue fever
- Ideal soil type on which to construct a pit latrine

Paper 02 – Structured Essay Questions

Question 1

SPECIFIC OBJECTIVES: D8, 23, 10

This data analysis question tested candidates' knowledge of HIV/AIDS: the meaning of the acronym, the ways in which it is spread and symptoms related to it. Candidates were also required to construct a bar graph of the incidence of HIV/AIDS — related deaths within various age groups and do a comparative study knowledge of the socio-economic effects of deaths within the 25–44 age groups was also required.

General performance of candidates

This question was fairly well done.

Specific areas of good performance

Most candidates were able to state at least one way in which HIV can be spread within a population and were relatively knowledgeable regarding the symptoms of AIDS; however, there are still many misconceptions relating to the spread of HIV. Several candidates wrote that it could be spread by kissing, mosquito bites and via toilet seats. Popular responses such as weakness, weak immune system, lack of appetite, diarrhoea, sores, rashes were given. Major misconceptions were tiredness, lack of energy, hair loss and hair becoming pretty.

Part (b) (ii) required candidates to compare the number of deaths in the various age groups. They were expected to describe the initial increase in number of deaths, followed by consecutive decreases and most were able to respond correctly.

Specific areas of poor performance

Few candidates were able to state the meaning of the acronyms 'HIV' and 'AIDS'. For HIV, many candidates left out "deficiency" in human immunodeficiency virus. Regarding AIDS, many candidates were unable to state that it stood for acquired immunodeficiency syndrome.

Part (b) (i) — candidates were required to draw a bar graph of the data presented. The scale on the y-axis was a major problem and some candidates did not label the axis. A few candidates drew line graphs instead of bar graphs.

Part (b) (iii) – Candidates were asked to suggest three socio-economic effects that deaths within the 25–44 age group would have on a country. Most candidates identified at least one relevant socio-economic effect. Poor responses to this question included: stress, increased space for burials, juvenile delinquency, an increase in crime and criminals.

Recommendations to teachers

- The meanings of acronyms need to be taught and reinforced. Both words and meanings must be taught together. The correct spelling of the words could be reinforced through games and spelling competitions.
- Short video-clips involving the spread and symptoms of AIDS and the use of visual aids will serve to reinforce how HIV/AIDS is spread as well as its symptoms. Research via the Internet or other sources is a viable method for reinforcing and internalizing information. Students can also be challenged to engage in research and produce pamphlets on this subject as well as engage in role-play and produce skits in order to disseminate the information.
- The skill of drawing bar and line graphs needs to be taught; this includes determining scales, plotting of points and labelling of axes. An interdisciplinary approach can also be used (involving the teachers of Mathematics and Human and Social Biology respectively).
- Candidates need to be taught how to compare and contrast effectively. This can be done using concrete examples at first and then moving into abstract examples. Teachers need to ensure that candidates have a clear understanding of the meaning of the word 'socio-economic'. There are many topics in Human and Social Biology for which this term is used. In this particular question it related to AIDS - related deaths. The use of word games can greatly enhance reinforcement.

Question 2

SPECIFIC OBJECTIVES: A1; A2, 4; B7.2

This question tested candidates' knowledge of the following: structural differences between plant and animal cells; being able to identify a specialized cell and explain how its structure was suited to its function; characteristics of living organisms, other than respiration and feeding; being able to explain why the characteristics of respiration and feeding could not be applied to a car.

General performance of candidates

This question was moderately well done.

Specific areas of good performance

Part (a) – Most candidates were able to state at least one way in which the structure of a plant cell differs from that of an animal cell. Most were able to identify the sperm cell in Part (b) (i) and list three characteristics of living organisms in Part (c) (i).

Part (b) (ii) – Most candidates were able to state one adaptation of a sperm cell relating to its function and this was that it had a tail enabling it to swim towards the egg. Other responses which would have been acceptable included: mitochondria in the middle piece to provide energy; the head contains enzymes that dissolve membranes of the egg to facilitate fertilization, or the head contains genetic material to be passed on to offspring.

Specific areas of poor performance

Candidates found Part (c) (ii) challenging as it required them to explain why respiration and feeding are characteristics that cannot be applied to a car. Candidates were awarded marks if they defined the terms respiration and feeding. Responses of appropriate comparisons could have included: plants use glucose for respiration whereas cars use gasoline for energy; respiration occurs in cells in plants whereas cars do not have cells; respiration in plants requires enzymes. Regarding feeding, candidates could have stated that plants make their own food whereas cars need to be given fuel; plants use glucose to make other molecules; cars do not manufacture anything.

Recommendations to teachers

- Students should be taught how to draw and label diagrams.
- Differences between breathing and respiration should be emphasized.
- Emphasis should be placed on the differences between living and non-living things.

Question 3

SPECIFIC OBJECTIVES: B1.14, B1.20, B1.21, B1.24, D.6

This question tested candidates' knowledge of enzymes, types of teeth and diabetes.

General performance of candidates

This question was poorly done.

Specific areas of good performance

Parts (a) (iii) and (c) (ii) were well done. Most candidates knew which teeth are responsible for mechanical digestion. For the management of diabetes, other than by the use of medication, the candidates' responses, most of which related to diet and exercise, varied widely.

Specific areas of poor performance

Parts (a), (b) and (c) (i) were badly done.

Part (a) (i) asked to name two digestive enzymes and state one function of each enzyme named. Most candidates believed that the enzyme was saliva, hydrochloric acid or a hormone. Some were uncertain about the names of enzymes and their specific substrates as was commonly seen in responses like "the enzyme maltose breaks down maltase", "the enzyme fructose digests fructose" and "the enzyme salivary amylase digests starch into carbohydrates and glucose". Good responses would have been "The enzyme salivary begins the digestion of starch", and "Rennin breaks down milk proteins".

Part 3 (a) (ii) asked candidates to name the type of digestion for which the teeth are responsible. Many candidates explained the process of digestion instead of stating the type of digestion. This was evident in the responses given such as chewing, grinding and mastication, rather than mechanical digestion.

In Part (b) (i) required candidates to determine from the graph the temperature and pH at which amylase would best function. Candidates stated ranges outside those on the graph, indicating that many candidates attempted the questions without referring to the graphs.

Part 3 (b) (ii): candidates' misconceptions were that temperatures greater than 55 °C "killed, fried, dried, inactivated, degenerated or slowed down the enzyme".

Part (c) (i) required candidates to explain the role of the pancreas in the development of diabetes. Emphasis was placed on poor eating habits being the cause of diabetes rather than referring to the malfunction of the pancreas/insufficient insulin production.

Recommendations to teachers

- Visual aids with respect to the anatomy of the endocrine and the digestive systems should be utilized. Emphasis must be placed on the dual roles (exocrine and endocrine) of the pancreas.
- Emphasis should be placed on the differences between hormones and enzymes.
- Students should be encouraged to practise answering questions, especially those related to analyzing graphical data.

Question 4

SPECIFIC OBJECTIVES: C1, 2, 3, 4; B7.3

This question tested candidates' knowledge of mitosis, meiosis and the menstrual cycle.

General performance of candidates

This question was poorly done.

Specific areas of good performance

Parts (a) (i), (ii) and (c) (i) were well done. Parts (a) (i) and (ii) required candidates to state the type of cell division which results in identical offspring and the diploid number of chromosomes in human cells respectively. Most were able to respond correctly.

Specific areas of poor performance

Part (b) (i) required candidates to state that *crossing over* was the event where small parts of DNA are exchanged between homologous chromosomes. Candidates were unaware of this concept. Poor responses included the naming of various phases of cell division or descriptions of the event without naming it. For Part (b) (ii) it was expected that candidates would say that parents are the source of homologous chromosomes and that its importance is that variation is the result.

Part (c) required candidates to analyse a graph to describe changes in the menstrual cycle. For (c) (i) most candidates were able to describe changes occurring in the menstrual cycle from day 0 to 5, but were unable to describe the changes between days 6 and 14. It was expected that they would describe changes in the uterine lining or development of the egg. Candidates could also have described changes in the hormone levels.

Part (c) (ii) required candidates to describe the changes that take place with progesterone levels after ovulation if pregnancy occurs and if pregnancy does not occur. Too many candidates disregarded the instruction at the top of the Part relating to progesterone levels.

Part (d) required candidates to outline how follicle-stimulating hormone (FSH) controls the production of oestrogen. The expected response was that as FSH levels rise, oestrogen levels rise.

Recommendations to teachers

- The roles of hormones especially as they relate to the menstrual cycle, should be emphasized.
- The responses from candidates indicated that the topics of cell division and reproduction were covered however, there continues to be many misconceptions and misinformation related to these topics. It would be useful to have class discussions about misconceptions as they relates to reproduction.
- Audiovisual aids should be used for cell division and the menstrual cycle.
- The use of colloquialism should be avoided.
- Students should be encouraged to practise reading questions carefully before planning and writing their responses.

Question 5

SPECIFIC OBJECTIVES: D7, 14

This question tested candidates' knowledge of leptospirosis and gastroenteritis.

General performance of candidates

This question was poorly done.

Specific areas of good performance

Candidates were able to state the vector for leptospirosis as well as the signs and symptoms for both leptospirosis and gastroenteritis. Good responses such as "urine" and "faeces" were given for the source of pathogens for leptospirosis.

Specific areas of poor performance

Part (a) required candidates to name the vector for leptospirosis. Many were unable to state that the vector for gastroenteritis was the housefly.

Gastroenteritis was believed to be indigestion and as a result candidates gave remedies for indigestion.

Part 5 (b) required candidates to discuss ways to prevent pathogens from entering the body. Most gave better responses for leptospirosis than gastroenteritis. The use of rat traps or poison was expected for the control of rats and insecticides for the control of flies.

Recommendations to teachers

- Teachers need to emphasize the difference between vectors and pathogens.
- Personnel from the Vectors and Control Division of the Ministry of Health (or the corresponding local authority) could be invited to give lectures on various diseases and their methods of control.
- Emphasis should be placed on the correct use of biological terms and expressions.
- Teachers should insist on the correct spelling of technical terms related to the subject.

Question 6

SPECIFIC OBJECTIVES: E1, 2, 6, 7

This question tested candidates' knowledge of water pollution, small-scale water purification and testing for bacteria.

General performance of candidates

This question was relatively well done.

Specific areas of good performance

Parts 6 (a) (i) and (ii) were well done. Most candidates were able to define pollution; state an example of a pollutant which could not be seen or touched and describe methods used to purify water on a small scale.

Part (a) (iii) required candidates to list pollutants of water after a hurricane. While most were able to do so, some candidates were not able to state the source of the pollutants.

Specific areas of poor performance

Part (b) required candidates to describe how water can be tested for bacteria. Most candidates were not familiar with the use of Agar plate when testing for bacteria. Some candidates were able to describe the test; however, most made no mention of a control.

Recommendations to teachers

- All aspects of the syllabus should be covered thoroughly.
- Testing for the presence of bacteria can be done as a laboratory exercise.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

JANUARY 2014

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2014 examination was the ninth January sitting of Human and Social Biology offered at the General Proficiency level.

The format of the examination was different from that preceding 2011. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefited from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Question 1 in Paper 02 always involves the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidates experienced difficulty with the following topics:

- The process that creates a waste product which is required for respiration
- The structure that holds the tooth in place
- Cells that engulf bacteria
- Systole
- Tendons in a joint
- Feedback mechanism in urine production
- Continuous variation
- Genetic engineering
- Controlling the spread of dengue fever

Paper 02 – Structured Essay

Question 1

Specific Objectives: B2.2; D2, 4, 23

This data analysis question tested candidates' knowledge of the human respiratory system, asthma and its signs and symptoms, and the effects of different environments on persons suffering from asthma. This question was fairly well done. Most candidates were able to correctly describe asthma as a respiratory

disease as well as its signs and symptoms. However, few candidates were able to correctly label a diagram of the human respiratory system. Candidates were also unaware of the difference between a bar graph and a histogram and were unable to use the data to appropriately respond to questions asked. For example, candidates were asked in Part (d) to describe the trend using the graph which showed the average number of asthma attacks versus the level of Sahara dust particles. Candidates should have stated that *when the level of Sahara dust was high, the number of asthma attacks were also high except in December, when another factor triggered an increase in the number of attacks*. Instead, candidates described the number of attacks and the levels of Sahara dust as separate incidents.

Recommendations to Teachers

- Students need to be exposed to the proper techniques used for constructing graphs and the differences between bar graphs and histograms.
- Human models should be used to teach the various parts of human systems. Students should also be encouraged to draw and label diagrams of systems. This should lead to greater retention of the parts of systems.

Question 2

Specific Objectives: B3.7, 3.10, 2.11, 3.13; D6

This question tested candidates' knowledge of the following: red and white blood cells and their functions; whether fibrin and fibrinogen are soluble or insoluble; the effects of nicotine on arteries; and the association of tissue fluid/lymph with being sedentary for a prolonged period of time. This question was poorly done.

For Part (a), most candidates were able to correctly label a red and white blood cell and state their functions. Some candidates, though they incorrectly labelled the cells, knew the functions of red and white blood cells. Others, however, believed that red blood cells transport nutrients around the body and that white blood cells aid in the clotting of blood.

Candidates were unaware of the effects of nicotine on arteries. They continue to state that nicotine settles on the arterial walls. While some knew that nicotine encourages plaque formation, they were not able to show that using a drawing. Candidates stated that the artery was blocked by smoke.

Very few candidates were able to explain that being sedentary caused the accumulation of tissue fluid in the lower limb. They should have stated that

while Robert was sitting on the stool, the plasma from Robert's blood squeezed through the walls of his capillaries, collected in his tissues as tissue fluid, thus causing the heavy feeling in his lower limbs. As Robert walked around, the tissue fluid would be absorbed into the lymphatic system via lymphatic capillaries. The removal of the fluid would cause the heavy feeling in his lower limbs to disappear.

A common misconception was that the heaviness in Robert's limbs was as a result of poor circulation, a build-up of lactic acid, lack of exercise and oxygen debt.

Recommendations to Teachers

- Concept mapping can be used to teach systems such as the lymphatic system.
- Visual aids/You Tube videos could be used to show how tissue fluid accumulates in the body and how it is reabsorbed from the tissues into the lymphatic system.

Question 3

Specific Objectives: B5.3, 5.4, 5.8; A7

This question tested candidates' knowledge of the nephron of the kidney; excretory organs and the substances they excrete; why a partially permeable membrane is needed in renal dialysis; the need for dialysis fluid to have the same glucose concentration as blood; and the part that the hypothalamus plays in controlling the water content of blood when blood solute concentration is high. This question was poorly done except Part (b) where most candidates were able to identify an excretory organ other than the kidney, and the substance it excreted.

Parts (c) (i) to (iii) were badly done. Part (c) (i) required candidates to explain the role of a partially permeable membrane in a renal dialysis machine. Candidates should have stated that *the partially permeable membrane was needed to allow some substances that are not needed by the body to be removed while keeping those that are needed*. Common misconceptions were that osmosis occurred within the machine and not through the membrane and that substances moved from the dialysis fluid into the blood.

Part (c) (ii) required candidates to state why it was necessary for the dialysis fluid to have the same glucose concentration as the blood. Most candidates either did not respond to the question or linked the response to diabetes.

Part (c) (iii) required candidates to explain how the hypothalamus would control the water content of blood when the blood solute concentration is high. Most candidates were able to state that the hypothalamus would secrete ADH to cause less water to be excreted. A common misconception however, was that the hypothalamus itself controlled the water content of blood.

Recommendations to Teachers

- Teachers should utilize medical practitioners to explain concepts pertaining to the various systems of the body.
- Visual aids with respect to the anatomy of the urinary system should be used. Emphasis must be placed on the specific roles of hormones produced by glands.

Question 4

Specific Objectives: E12, 21, 13; D7, 12

This question tested candidates' knowledge of what sewage consists of; methods used to reduce the volume of household refuse; the threat to communities posed by improper disposal of household refuse; diseases that result from improper disposal of refuse; and similarities and differences between activated and biological filters.

Parts (a) (ii) and (iv) were well done. Most candidates were able to state two ways in which household refuse could be reduced and diseases that could result from improper disposal of household refuse. However, overall, this question was poorly done.

Poor performances were particularly noted in Part (b) (i) where candidates were required to state which component of the treatment plant comes immediately before the activated sludge tank. Most were unaware and stated the method rather than the component. When asked to compare the functioning of the two methods used in large-scale sewage treatment, most candidates gave features of the biological filter and activated sludge methods instead of comparing the processes. The key term, *functioning*, within the stem of the question was not considered.

Recommendations to Teachers

- Correct spelling of biological terms and in reference to this question, diseases needs to be encouraged.
- Students should be encouraged to carefully read the stem of the questions and refer to it often while responding to the questions.
- Emphasis should be placed on how to respond to *compare* and *contrast* questions.

Question 5

Specific Objectives: D6, 18, 21

This question tested candidates' knowledge of the differences between sterilization and disinfection and how each could be used when caring for a baby. It also tested candidates' knowledge of antibiotics and why they become ineffective when the course prescribed is interrupted.

This question was poorly done. Candidates were able to state how sterilization and disinfection could be used when caring for a baby and were knowledgeable about how antibiotics should be used to ensure that they are effective. However, for Part (a) (i) which required candidates to state two differences between sterilization and disinfection, candidates could not provide strong differences between them. A common misconception was that sterilization is synonymous with tubal ligation. A good response would have been that *sterilization involves the complete destruction of all microorganisms while disinfection provides partial destruction*. Part (b) (i) required candidates to explain what is meant by the term *antibiotic*.

Candidates were unable to state that *antibiotics are made by a living organism in order to destroy bacteria*.

Recommendations to Teachers

- Teachers need to emphasize the difference between sterilization and disinfectants.
- Students should be encouraged to do research on microorganisms and perhaps do skits/presentations in class in order to ensure that information is understood
- Emphasis should be placed on the correct use of biological terms/expressions.
- Correct spelling of terms should be encouraged.

Question 6

Specific Objectives: C5, 6, 7; E1, 3, 4

This question tested candidates' knowledge of the differences between continuous and discontinuous variation; the difference in chromosome number of a Down's syndrome individual and that of a normal person; the use of a Punnett square to determine the genotype of offspring of a cross between a female carrier of red-green colour blindness and a normal male; and the type of pollution, its effect and possible action needed to reduce the effect of pollution from cellphone towers.

Overall, this question was poorly done. Some areas of good performance were Parts (b) and (d). These were well done; most candidates were able to state how the chromosome number of a person with Down's syndrome differs from that of a normal person. Candidates were also relatively knowledgeable about the type of pollution that emanates from cellphone towers, its effect on humans and actions that humans could take to reduce the effect of the pollution.

However, poor performances were noted in Part (a) which required candidates to distinguish between continuous and discontinuous variation. Most candidates believed that continuous meant ongoing and not that the variation was influenced by genes and that discontinuous meant that the variation was initiated and abandoned rather than it not being genetically influenced. Part (c) required candidates to use a Punnett square to determine the genotype of offspring of a cross between a female carrier of red-green colour blindness and a normal male. Most candidates, while able to draw the Punnett square, had difficulty differentiating between phenotype and genotype. They were also unable to identify the gametes. A common misconception was the genotype being viewed as gametes. Candidates were also unaware of the fact that a sex-linked disease was due to a recessive allele in the X chromosome.

Recommendations to Teachers

- All aspects of the syllabus should be covered thoroughly with extra attention being paid to genetics. Students continue to perform poorly on this topic.
- Both a diagrammatical cross and the use of Punnett squares should be taught when explaining/determining genotype.
- Resource personnel should be utilized.

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

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE EXAMINATION**

MAY/JUNE 2014

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2014 examination was the tenth June sitting of Human and Social Biology offered at the General Proficiency level. E-marking was done in this subject area for the first time. While there were many challenges, marking was completed in a timely manner.

There was no change to the format of the examination. Paper 01 consisted of 60 multiple-choice items and Paper 02 six compulsory questions, four of which are structured (Section A) and two of which are structured essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefitted from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 would always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance on Paper 01 was consistent with performance in previous years. The following areas proved challenging for some candidates:

- Formula for Body Mass Index
- Full complement of deciduous teeth in infants
- Substances transported by the blood
- The position of the main lymph glands facilitating draining of lymph from major parts of the body
- Identifying the phenotype, not genotype, from a genetic cross
- Gases that do not contribute to acid rain, for example, carbon monoxide
- Water entering the atmosphere by respiration, transpiration and precipitation

Paper 02 – Structured Essay

Question 1

SPECIFIC OBJECTIVES: D.8, 10

This data analysis question tested candidates' knowledge of HIV/AIDS: the ways in which it is transmitted; the associated signs and symptoms; the cell that is specifically targeted and destroyed by the virus; and why though transmitted via unprotected sex, it is not referred to as a venereal disease. Candidates were also required to construct a bar graph of the incidence of HIV/AIDS versus related deaths within various countries and do a comparative study. Suitable responses on the effects of a high incidence of AIDS on the countries were also required.

General Performance of Candidates

This question was fairly well done.

Specific Areas of Good Performance

- Most candidates were able to state at least one way in which HIV can be transmitted within a population and were relatively knowledgeable regarding the symptoms of AIDS. However, there are still many misconceptions relating to the spread of HIV. Several candidates said that it can be spread by kissing, mosquito bites and via toilet seats. Popular responses such as, weakness, weak immune system, lack of appetite, diarrhoea, sores and rashes were given. Major misconceptions were

tiredness, lack of energy, vomiting, hair loss and hair becoming pretty. Most candidates correctly stated that it is the T-lymphocyte that is specifically targeted and destroyed by the HIV.

- Part (d) required candidates to state which countries had the highest and lowest number of deaths due to AIDS and to suggest one reason why Cuba had less deaths than the Bahamas. This was well done. Candidates were successful in getting at least one mark by relating the lower deaths in Cuba to their advanced health services, health care, available medication, national awareness of the disease and their healthy life style. They were also able to state reasonable effects that a high incidence of AIDS would have on the mentioned countries.

Specific Areas of Poor Performance

- Candidates continue to give vague responses for signs/symptoms of AIDS. For example, instead of stating “*extreme fatigue*”, they stated “fatigue”.
- Very few candidates stated that both AIDS and venereal diseases are spread via sexual contact. They did not bear in mind that though AIDS is spread by sexual contact, it is also spread by other means.
- Candidates are still unable to correctly plot a graph and often omit the legends.

Recommendations to Teachers

- Commendations to teachers. Most candidates have a good working knowledge on this topic.
- More emphasis should be placed, however, on the review of terms such as venereal diseases, which are commonly used but students who are not absolutely clear as to its meaning.
- When reviewing signs and symptoms of diseases, special attention should be given to specific information relating to individual diseases, especially since many signs and symptoms are common to different diseases.
- Short video-clips involving the spread/symptoms of AIDS and the use of visual aids will serve to reinforce how HIV/AIDS is spread as well as its symptoms. Research via the Internet or other sources is a viable method for reinforcing and internalizing information. Students can also be challenged to engage in research and produce brochures on this subject, as well as write skits in order to disseminate the information.
- The skill of drawing bar/line graphs needs to be taught; this includes determining scales, plotting of points and labelling of axes. An interdisciplinary approach can also be used (Mathematics/Human and Social Biology).

Question 2

SPECIFIC OBJECTIVES: A. 2, 4, 1

This question tested candidates’ knowledge of plant organelles and their functions; similarities and differences between viruses and plant cells; recognition and classification of different cell types; and characteristics of living organisms.

General Performance of Candidates

This question was moderately well done.

Specific Areas of Good Performance

- Part (c) (ii) – Most candidates were able to correctly state that the cells were differentiated.
- Part (d) – Most candidates were able to name at least two characteristics of living things that were illustrated by the children who were playing in the park.

Specific Areas of Poor Performance

- Part (a) (i) – Most candidates stated that the nucleus was the cytoplasm and the endoplasmic reticulum was starch granules. They were also confused about the function of the mitochondria and chloroplast, stating the function of the mitochondria was the function of the chloroplast and vice versa.
- Part (b) – Most candidates were unaware of the features of a virus and repeatedly stated that the nucleus is a common feature of both a virus and a typical plant cell.
- Part (e) required candidates to explain why whether a flame is a living organism because it moves, grows and reproduces by spark. Most candidates were able to state that flames are not living but were unable to substantiate their response. A good answer would have been that flames do not exhibit all of the characteristics of living things, neither do they possess cells.

RECOMMENDATIONS TO TEACHERS

- Emphasis should be placed on the identification of the organelles within the cell.
- Emphasis should also be placed on identifying organelles based on shape and appearance.
- Teachers should use a number of teaching strategies like drawing, making models and viewing cells under the microscope.
- Teachers MUST spend more time on the first part of the syllabus – Section A, that is, the structures and functions of parts of the cell, PARTICULARLY the plant cell.
- Students should be taught how to draw and label diagrams.
- Differences between breathing and respiration should be emphasized.
- Emphasis should be placed on the differences between living and non-living things.

Question 3

SPECIFIC OBJECTIVES: B1.20 – 24; B1.14; D.2

This question tested candidates' knowledge of the organs of the digestive system and their functions; the food groups which are digested by the enzymes in pancreatic juice; deficiency-related diseases; conditions under which enzymes are functional; and the importance of chewing one's food properly.

General Performance of Candidates

This question was relatively well done.

Specific Areas of Good Performance

- Parts (a), (b) (i) and (ii), and (c) (i) and (ii) were well done. The most popular response for the function of the liver was that it produces bile.
- Good responses for deficiency-related diseases were:
 - Carbohydrates – *Marasmus*
 - Fats – *Fat soluble deficiency*
 - Proteins – *Kwashiorkor*
 - Vegetables and Fruits – *Vitamin deficiency*

Specific Areas of Poor Performance

- Part (c) (ii) required candidates to determine in which of three tests digestion would not occur. Many candidates correctly stated that digestion would not have occurred within the test tube which had starch plus boiled amylase but they were unable to adequately explain why digestion did not occur.
- Part (d) (i) required candidates to explain why chewing food briefly is bad for the digestion of food. A good response was:

The teeth mechanically break down food into smaller pieces which exposes more food to the digestive juices. This facilitates the start of digestion of starches in the mouth. Insufficient chewing results in increased effort by the small intestines in order to digest the food.

Recommendations to Teachers

- Visual aids with respect to the anatomy of the digestive systems should be utilized. Emphasis should be placed on linking structure with function since very few candidates stated a function of the liver other than bile production.
- Students should engage in practical activities in order to demonstrate the effects of pH and temperature on enzymes
- Students should be encouraged to practise answering questions especially those related to analyzing graphical data.
- Emphasis should be placed on both mechanical and chemical digestion.

Question 4

SPECIFIC OBJECTIVES: C.1 – 4; C.6; B.7.3

This question tested candidates' knowledge on mitosis, genetic diseases, meiosis and the menstrual cycle.

General Performance of candidates

This question was poorly done.

Specific Areas of Good Performance

- Parts (a), (b) and (c) were fairly well done.
- Part (a) required candidates to state the chromosome number that cells possess at the end of meiosis. Most candidates gave a correct response.
- Part (b) required candidates to name the type of cells in which meiosis occurs and two differences between mitosis and meiosis. Candidates were able to state the differences but were confused as to which difference applied to which type of cell division.
- Part (c) was well done. Most candidates were able to state that Down syndrome occurs if the zygote receives an extra chromosome.

Specific Areas of Poor Performance

- Part (d) (ii) required candidates to use a diagram to respond to questions such as “during which period does menstruation occur and what occurs within the ovary as the wall of the uterus starts to thicken”. In spite of the fact that the diagram was an excellent stimulus and guide to correct responses, candidates did not maximize the opportunities given.
- Part (d) (iv) required candidates to state the pituitary hormone that controls ovulation and on which day does ovulation occur. Most candidates should have stated that luteinizing hormone controls ovulation but instead stated that follicle-stimulation hormone was responsible for ovulation. Most knew that ovulation occurs on Day 14 of the menstrual cycle.

Recommendations to Teachers

- The role of hormones especially as they relate to the menstrual cycle should be emphasized.
- The responses from candidates indicated that the topics of cell division and the menstrual cycle were covered. However, there continues to be many misconceptions/misinformation related to these topics. It would be useful to have class discussions about misconceptions as they relate to these topics.
- Audiovisual aids should be used to teach cell division and the menstrual cycle.
- The use of jargon should be avoided.
- Students should be encouraged to read the stem of the questions.

Question 5

SPECIFIC OBJECTIVES: D.11, 12, 14

This question tested candidates' knowledge of dengue, leptospirosis and gastroenteritis.

General Performance of Candidates

This question was fairly well done.

Specific Areas of Good Performance

- Parts (a) (i), (b) (i) and (ii) were fairly well done.
- Candidates were able to state the vector for dengue as well as its symptoms.
- Part (b) required candidates to explain why vomiting and diarrhoea would occur in a neighborhood when garbage collectors go on strike. Most candidates gave appropriate responses such as, *the buildup of garbage being responsible for an increase in the populations of rats and flies which transmit pathogens when they come into contact with household food, resulting in vomiting and diarrhoea.*
- Part (b) (ii) required candidates to suggest three measures that could be taken by the community to prevent the spread of gastroenteritis and leptospirosis. Most candidates were able to give a partially good response to this question, stating that *food should be covered, vectors should be exterminated and garbage could be recycled, buried or burnt.*

Specific Areas of Poor Performance

Part (a) (ii) required candidates to explain how a mosquito spreads dengue. They were confused as to how dengue is spread. A good response as to how dengue is spread is as follows:

A mosquito bites an infected person and picks up the pathogen. When the mosquito bites another person it transmits the pathogen to him/her.

Recommendations to Teachers

- Teachers need to emphasize the difference between vectors and pathogens in relation to dengue and how it spreads from person to person.
- Personnel from the Vectors and Control Division of the Ministry of Health could be invited to give lectures on various diseases and their methods of control.
- Emphasis should be placed on the correct use of biological terms/expressions.
- Correct spelling of terms should be encouraged.

Question 6

SPECIFIC OBJECTIVES: E. 1, 2, 3, 10, 7, 6

This question tested candidates' knowledge on water pollution, eutrophication and testing for bacteria.

General Performance of Candidates

This question was fairly well done.

Specific Areas of Good Performance

Part (a) (i) was well done. Most candidates were able to define pollution and state an example of a water pollutant. Most, however, were unable to link the pollution to human activity.

Specific Areas of Poor Performance

- Part (a) (ii) required candidates to describe the process of eutrophication. Most candidates confused it with methods of water purification/pollution. A good response was:

Excessive amounts of minerals, particularly nitrates and phosphates enter waterways causing rapid and abundant growth and algae. Algae deplete the water of oxygen resulting in the death of organisms.

- Part (b) (i) required candidates to explain why members within a community became ill after eating vegetables from flooded areas and to suggest two measures that could have been taken to prevent illness. Candidates stated that the water infected the vegetables thus infecting the members of the community. A good answer was:

Flood waters contain industrial and agricultural chemicals, sewage and other pollutants which contaminate crops. Eating these contaminated foods when uncooked causes illness, as a result of pathogens. Preventative measures that could be taken to avoid illness should include washing vegetables thoroughly under running water, using frozen or canned vegetables and/or avoiding the use of vegetables from the flooded area.

- Part (b) (ii) required candidates to describe how water can be tested for bacteria. Most candidates were not familiar with the use of agar plate when testing for bacteria and most were unable to clearly state the steps involved in testing for bacteria. While candidates mentioned that boiling and using chlorine could be used to sterilize water, they failed to add that the water should first be filtered.

Recommendations to Teachers

- Candidates should be encouraged to study the causes of pollution through the use of brochures and posters. They should also thoroughly understand the role that humans play in the pollution process.
- Testing for bacteria continues to pose a problem. Testing for the presence of bacteria should be done as a laboratory exercise.
- All aspects of the syllabus should be covered thoroughly.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

JANUARY 2015

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2015 examination was the tenth January sitting of Human and Social Biology offered at the General Proficiency level. E-marking was done in this subject area for the first time for the January examination. While there were many challenges, marking was completed in a timely manner.

The format of the examination was different from that preceding 2011. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefitted from the learning opportunities provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 always involves the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Performance on this paper was consistent. While candidates had knowledge of most of the topics tested, the following areas proved difficult:

- A positive test for a reducing sugar
- The organ responsible for converting excess amino acids to urea
- Substances transported by the blood in a human body
- Definition of systole
- Function of antidiuretic hormone (ADH)
- Meaning of the term ‘dominant’
- The reason for dehydration and thirst in a person suffering from Type II
- Effect of acid rain

Paper 02 – Structured Essay

Question 1

Specific Objectives: B 3.7–10, 13, 14

This data analysis question tested candidates' knowledge of asthma, its signs/symptoms, measures to manage it, and its effects on the respiratory tract. Candidates were required to determine from two graphs, the factors which reduce the risk for asthma, and describe the trend of the incidence of asthma in a Caribbean population as well as the health implications of high levels of Sahara dust in the atmosphere.

This question was well done.

Specific Areas of Good Performance

- Parts (a) (i) and (ii) required candidates to give one sign/symptom that would be experienced by someone with asthma and two measures that could be adopted to manage it. Most candidates were able to state one sign/symptom of asthma and two measures other than medication that could be used to manage asthma.
- Part (a) (iv) asked whether asthma was classified as an infectious or chronic disease and most candidates correctly stated that it was a chronic disease.
- Part (c) required candidates to suggest two health implications of high levels of Sahara dust in the atmosphere. Most of them correctly stated that there would be an increased incidence of new asthma cases as well as increased asthma attacks.

Specific Areas of Poor Performance

- Part (a) (iii) asked candidates to describe the effects of asthma on the respiratory tract; most candidates gave vague responses such as the tubes were blocked and therefore, breathing was difficult. A good response would have been *the lining of the airways swells causing narrowing of the bronchial tubes thus making it difficult for air to move into and out of the lungs*.
- In Part (b) (i), very few candidates correctly stated from the graph, factors which reduce the risk for asthma. A good answer would have been *being lean* and *not smoking*.
- Part (b) (ii) required candidates to describe the trend that was seen in one of the graphs concerning the incidence of asthma in a Caribbean population. Most candidates stated that obese smokers had the highest incidence but were unable to accurately describe what pertained to the other groups.

Recommendations to Teachers

- Most students have a good working knowledge of this topic. However, more emphasis should be placed on the review of terms such as *infection* and *chronic diseases*. Terms like these are commonly used but students are not absolutely clear as to their meanings.
- When reviewing signs and symptoms of diseases, special attention should be given to specific information relating to individual diseases especially since many signs and symptoms are common to different diseases.
- Short video clips involving the spread/symptoms of asthma and the use of visual aids will serve to reinforce how asthma develops as well as its symptoms. Research via the internet or other sources is a viable method for reinforcing and internalizing information. Students can also be challenged to engage in research and produce pamphlets on this subject as well as write skits in order to disseminate the information.
- Students need to be taught how to interpret information from a graph.

Question 2

Specific Objectives: B 3.7–10, 13, 14

This question tested candidates' knowledge of aspects of the circulatory and lymphatic systems. It focused attention on the anatomical differences between the main blood vessels, the mechanism of clotting, the difference between plasma and tissue fluid and the roles of the lymphatic system. Candidates were also required to indicate which blood cells were most numerous in the blood, based on data provided in a diagram in which blood was centrifuged. Finally, they were required to explain why there was no backflow of lymph fluid in the lymph vessels.

This question was not well done.

Specific Areas of Good Performance

- Part (a) (i) required candidates to distinguish between cross-sections of the artery and vein from the illustrations provided and most were able to do so correctly. They were also able to identify the region of the white blood cells in the centrifuge tube presented in Part (b) (i). For Part (b) (ii), many candidates also correctly stated that red blood cells were more numerous than white blood cells in the blood in the figure shown.

Specific Areas of Poor Performance

- Part (a) (ii) required candidates to make clear comparisons to highlight two differences between arteries and veins. Most were unable to do so.
- Part (c) (i) required candidates to explain the blood clotting process while Part (c) (ii) dealt with explaining the difference between tissue fluid and plasma. Insufficient details were provided to explain the mechanism of blood clotting. Many candidates merely used the stimulus material provided to formulate a response. Few candidates actually knew the difference between plasma and tissue fluid. A good response would have been *tissue fluid bathes/surrounds the cells in tissues while plasma is the liquid part of blood*.
- Part (c) (ii) dealt with roles of the lymphatic system apart from removing excess fluid. In Part (d) (i), many candidates could not provide two roles of the lymphatic system, other than removal of excess fluid and foreign material from the tissues.
- Lastly, in Part (d) (ii), the definitive response of *valves* present in lymph vessels to allow lymph fluid to flow in one direction, eluded many candidates.

Recommendations to Teachers

- Teachers should encourage students to pay attention to the details of the process of clotting. The use of video clips can aid students in their understanding of the process.
- Teachers must also use a holistic approach when giving instructions on transport and circulation.
- Details about the roles of the lymphatic system must be emphasized.

Question 3

Specific Objectives: B 5.2, 3; D.6

This question tested candidates' knowledge on the role of the organs in excretion in human beings; the structure of the kidneys as it relates to their functions; the causes and symptoms, treatment modality and prevention of chronic lifestyle-related disease, specifically diabetes.

This question was relatively well done.

Specific Areas of Good Performance

- Parts (a), (b) (i) and (ii); (c) (i); (d) (i) and (ii) were well done.
- Some candidates were confused about the definitions of excretion and egestion and gave the definition for one as the other.
- Some candidates understood Part (d) (ii) to be asking for a description of urine instead of asking for the constituents of normal urine.

Specific Areas of Poor Performance

- Part (c) (ii) was badly done. Most candidates used the diagram from Part (c) (i) to trace a path for urine formation but had no understanding of what was taking place at each section of the nephron. This was evidenced by the missing explanations.

Recommendations to Teachers

- Greater emphasis needs to be placed on the nephron's structure and function.
- The use of annotated diagrams can help students make the link between structure and function.
- Students should be encouraged to carefully read questions to ensure that they are providing appropriate answers.

Question 4

Specific Objectives: E. 12, 15; D. 11

This question tested candidates' knowledge of water pollution, sewage and its disposal, proper guidelines for the construction of a pit latrine, why disinfectants should not be used in a pit latrine and the cause and spread of malaria as well as what causes a fever to develop in malaria-infected individuals.

The question was poorly done.

Specific Areas of Good Performance

- Some candidates were able to define *sewage* as required for Part (a) (i). Part (a) (ii) which asked about the effects of improper sewage disposal and Part (b) (ii) which asked about the use of disinfectants, were fairly done.

Specific Areas of Poor Performance

- Part (a) (iii) required candidates to state challenges experienced by the Caribbean in the disposal of sewage. Most candidates confused it with illegal methods of dumping of sewage which would result in water pollution. A good response would have been *growing populations cause governments to experience huge financial cost/constraints resulting in insufficient sewage treatment plants being built as well as improper maintenance of existing sewage plants.*
- Part (c) (i) required candidates to advise Suzie of the organism that caused malaria and explain how it is spread from one person to the next. The majority of candidates stated that mosquitoes caused malaria instead of it being caused by the protozoan *Plasmodium*; a few were able to state how malaria is spread. A good answer would have been *Malaria is caused by the protozoan Plasmodium and is spread by the Anopheles mosquito when it*

bites an infected person and takes in the protozoan. When the infected mosquito bites a non-infected person, it passes the protozoan via the saliva to that person.

- Part (c) (ii) required candidates to explain the cause of the fever Suzie was suffering due to the malaria. None of the candidates was able to give an accurate explanation.

Recommendations to Teachers

- Students should be encouraged to study the causes of pollution by sewage through the use of brochures, posters and books. They should also be exposed to the role that governments play in the building of sewage treatment plants and their maintenance.
- Students could be taught about the guidelines used in the building of pit latrines by visiting lectures given by public health officers (nurses or inspectors).
- Understanding the relationship between the cause and control of vectors that spread malaria continues to pose a problem. The use of YouTube videos can assist students in understanding the steps taken when explaining this problem.
- All aspects of the syllabus should be covered thoroughly.

Question 5

Specific Objectives: C. 5–8

This question tested candidates' knowledge on monohybrid inheritance and variation. It was poorly done.

Specific Areas of Good Performance

- For Part (a), most candidates were able to state the cause of genetic variation as something that was inherited or passed on by genes.
- In Part (b), candidates were able to classify characteristics caused by genetics alone (eye colour, blood group) and those caused by a combination of environment and genes (natural hair colour, femaleness, obesity, agility).

Specific Areas of Poor Performance

- In Part (a), most candidates had difficulty distinguishing between genetic variation and environmental variation. They were expected to state that *environmental variation is controlled by influences within the environment and partially by genes*. A common misconception was that environmental variation was due to social interactions which changed behaviour. Candidates also did not gain marks if their answers were poorly expressed.
- Part (c) (i) required candidates to analyse a family tree where the parents were heterozygous for cystic fibrosis. Only a few candidates were able to explain that in order

for the grandparents to have offspring who were both normal and had the disease cystic fibrosis, they both had to be carrying the gene. Where the child did not have the disease, the genotype would have been CC or Cc and the child with the disease would be cc. Candidates misused the term *carrier* which is used in sex-linked questions. Many candidates did not attempt this part of the question or Part (c) (ii).

- Part (c) (ii) required candidates to suggest the genotypes of a woman, Sumintra, and her husband. Two of their offspring were normal and one had cystic fibrosis. Since Sumintra had cystic fibrosis, her genotype had to be cc. In order for her husband to be normal and for the couple to parent a child with cystic fibrosis, the husband had to have one gene for the disease making him Cc or heterozygous.

Recommendations to Teachers

- Teachers should ensure that students get practice in the skill of comparison using clearly stated statements and examples where necessary, for clarification. Expression was generally poor, causing students to lose marks.
- Students should be encouraged to become familiar with family trees and interpreting information from them.
- Students should be encouraged to use Punnett squares to help them explain genetic crosses.

Question 6

Specific Objectives: D. 17, 18, 20

This question tested candidates' knowledge of the methods used to control the growth of microorganisms and their ability to distinguish between disinfectants and antiseptics. The question also tested candidates' use of knowledge of antibiotics by requiring them to give reasons for the use of antibiotics in treating infections and the use of vaccines for immunity to certain diseases.

This question was fairly well done.

Specific Areas of Good Performance

- For Part (a) (i), most candidates were aware that the use of UHT to sterilize milk was more effective in controlling growth in bacteria than pasteurization. However, a significant number of candidates were unable to clearly state the definition for pasteurization and that pasteurization kills some bacteria, while UHT kills all bacteria. Candidates tended to state that the heat affected the enzymes in the milk and that UHT affected them to a greater extent than pasteurization.

- In Part (a) (ii), candidates showed that they were aware that antiseptics are used to kill germs/fight infections and that they are used on wounds in preference to disinfectants. A good response would have been *antiseptics destroy organisms without causing damage to the tissues while disinfectants cause tissue damage*.

Specific Areas of Poor Performance

- Part (b) (i) required candidates to state why antibiotics are the best choice for treating the infection. Candidates failed to indicate that antibiotics specifically kill bacteria instead they indicated that they fight infection, disease or kill germs. Candidates confused bacteria becoming resistant to the particular antibiotic with the body becoming resistant to the antibiotic.
- Part (b) (ii) required candidates to explain why babies should be immunized although they would have received passive immunity from their mothers. Common misconceptions stated were that vaccines fight infections/kill infections/fight diseases/protect against diseases instead of the fact that vaccines cause the body to produce antibodies which then fight infection or provide immunity to other diseases.

Recommendations to Teachers

- Teachers should encourage students to pay attention to the definitions of terms so that they can state them correctly.
- Teachers should give guidance in answering questions so that students learn to respond to the questions asked.
- Teachers should focus on having students compare the differences between active and passive immunity.

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

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

MAY/JUNE 2015

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2015 examination was the eleventh June sitting of Human and Social Biology offered at the General Proficiency level. This subject is now being e-marked. While there were many challenges, marking was completed in a timely manner.

The format of the examination remained the same as that of 2014. Paper 01 consisted of 60 multiple-choice items. Paper 02 consisted of six compulsory questions, four of which were structured (Section A) and two of which were essay questions (Section B). Each question was worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions on this paper assume that students would have benefitted from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 would always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

There was a decline in candidate performance on Paper 01. Some topics that proved challenging were:

- The cellular structure of fungi, plants and bacteria
- Reason for the decrease in energy at each trophic level in food chains
- The organ that secretes a substance to neutralize hydrochloric acid in the stomach
- The function of the corpus luteum
- Factors affecting oxygen concentration in a river

Paper 02 – Structured Essay

Question 1

Specific Objectives: B. 1.5, 1.6, 1.9, 1.12

This data analysis question tested candidates' knowledge of the importance of water, the use of food tests to distinguish between macronutrients, what constitutes a balanced diet, and the impact of an unbalanced diet. Candidates were required to analyse a table that reflected the results of a survey of four groups of students' intake of proteins, carbohydrates and fats, to determine which group had the most balanced diet and which group was prone to developing obesity.

This question was moderately well done.

Specific Areas of Good Performance

Part (a) required candidates to give two uses of water, other than a medium in which reactions occur. Most candidates were able to state two other uses of water. However, quite often candidates would

provide answers reflecting water as a medium for metabolism or were too vague in their response, for example, 'keep cell/tissues moist', 'prevent dehydration', etc.

Part (b) (i) required candidates to define a balanced diet. Most candidates were able to partially or completely do so.

Part (b) (ii) required candidates to identify two nutrients in a balanced diet that provide energy for activity. A majority of candidates were able to identify carbohydrates as an energy providing nutrient. However quite often 'protein' was identified as the second nutrient instead of *fats*.

Part (c) (ii) required candidates to determine if there would have been a colour change in a test tube in which a substance and Benedict's solution were placed but the test tube was not heated. They were to provide a reason for their responses. The majority of candidates was able to determine that the reaction would not occur because the test tube was not heated. However, rarely did candidates indicate that heat was required for precipitate formation.

Parts (d) (i) and (ii) required candidates, after studying a table, to determine which group was consuming a balanced diet and which group was at risk for becoming obese. They were to use data from the table to provide reasons for their answers. Most candidates were able to identify the appropriate groups, however, candidates were unable to use the data to provide an accurate explanation.

Specific Areas of Poor Performance

Part (c) (i) required candidates to identify the nutrient in a test tube in which the colour changed from blue to brick red. Most candidates were unable to do so or gave unspecific responses such as 'carbohydrates' instead of *reducing sugar*.

Part (d) (iii) required candidates to identify a factor, other than diet or exercise, that contributed to obesity. Most candidates provided answers that reflected the impact of diet or exercise instead of the factor that contributed to obesity. A good response would have been *health problems/physiological diseases* as well as *being genetically predisposed to obesity*.

Recommendations to Teachers

- Students should be encouraged and taught how to write complete and clear answers. Too often marks are lost because answers are incomplete or too vague.
- More practical activities should be used when teaching food tests to facilitate better understanding.
- More opportunities should be provided to students to analyse data. This can be accomplished through the use of case studies or student-led mini survey-research projects.
- Students need to be taught how to read and understand what questions are asking. Often the answers provided reflected what was specifically indicated as not being required for the questions.

Question 2

Specific Objectives: A8, 9, 10; B. 4.3

This question tested candidates' knowledge of aspects of the skeletal system, photosynthesis and a food web. It focused attention on bone structure, the raw materials of photosynthesis and the products of photosynthesis, the experiment and results of starch production by a variegated leaf. Candidates were also required to analyse a food web along with the importance of producers to the biomass

energy transfer at the different levels. Finally, they were required to explain what would be the effects on various organisms of the food web following the removal of a single species from the web.

This question was moderately well done.

Specific Areas of Good Performance

Part (b) required candidates to name two raw materials of photosynthesis and one product of photosynthesis. Most were able to do so correctly. They were also able to suggest one consequence of the parrots being removed from the food web presented in Part (d) (iii). Many of them also correctly identified the group of organisms with the greatest amount of biomass but were unable to suggest their role in the food web as shown in the figure provided.

Specific Areas of Poor Performance

Parts (a) (i) and (ii) required candidates to label a long bone and state one benefit of bones being hollow rather than being solid; most were unable to do so. The definitive responses were *compact bone* and *spongy bone* for the labelling and *hollow bones are lighter for movement* as the correct response for the benefit of being hollow.

Part (c) required candidates to explain the results expected in an experiment in which a variegated leaf was tested for starch using iodine after being shielded from the sun for a while and then being uncovered. Many candidates were unable to state the results expected. They were unable to distinguish between the areas with chlorophyll and those without chlorophyll, hence their inability to give the expected colour change as the correct response. Few candidates knew what the actual colour change was. A good response would have been that *areas that contain chlorophyll would show a blue-black coloration indicating the presence of starch whereas areas without chlorophyll would not change colour indicating the absence of starch.*

Part (d) (ii) required candidates to state why each trophic level would possess less energy than the previous one. Many candidates could not provide the appropriate response. The appropriate response would have been that *at each energy level, energy is used for respiration and growth/daily activities and the remaining energy is passed on to the next level.*

Recommendations to Teachers

- Teachers should encourage students to pay attention to the details of diagrams and the labelling of diagrams. The use of relevant technological devices (videos, etc.) can aid students in their understanding of the diagrams.
- Teachers must also use a real experimental approach when giving instructions on photosynthesis.
- Teachers should emphasize the difference between conditions (sunlight and chlorophyll) and raw materials (carbon dioxide and water) in teaching the concept of photosynthesis. Additionally, they should highlight to students that the products of photosynthesis are oxygen and glucose and that students should not say ‘foods’.
- Details about the roles of the organisms in the food web and how the energy is utilized must be emphasized.

Question 3

Specific Objectives: B. 2.1, 2.4, 2.5: E. 1, 2, 3

This question tested candidates’ knowledge of pollution, the respiratory system and the impact of pollutants on the respiratory system. It was poorly done.

Specific Areas of Good Performance

Parts (a) (ii) and (b) were well done. Most candidates were able to name two gases that contribute to global warming and state the function of breathing. Popular answers for Part (a) (ii) included *carbon dioxide*, *carbon monoxide* and *methane*. Many candidates gave incorrect responses such as ‘nitrogen’, ‘nitrogen oxide’ and ‘oxides of nitrogen’.

Part (b), although well done, was not as well done as Part (a) (ii). Candidates were able to articulate that *oxygen is inhaled and carbon dioxide is exhaled*. A popular misconception was ‘inhaling/exhaling of fresh air and exhaling/removal of stale air’.

Specific Areas of Poor Performance

Part (a) (i) required candidates to identify the largest source of air pollution in the world today. Very few candidates correctly identified *fossil fuels*. Inaccurate responses such as ‘carbon dioxide, factories, garbage, smoke, and fuels from cars’ were given.

Part (c) (i) required the definition of *vital capacity*. Many candidates were unable to give the definition. They indicated that vital capacity referred to ‘exercising’ or ‘increasing vitals.’ Another major misconception was that vital capacity involved the amount or volume of breaths, amount of air breathed in or amount of air breathed out.

Part (c) (ii) required explanations of the effects of exercise and smoking on vital capacity. Candidates were able to accurately predict an increase in vital capacity for exercise and a decrease in vital capacity for smoking. However, they were unable to fully explain the link between exercise and the expansion of lungs. Similarly, linking smoking to deposition of chemicals in the lungs was not clearly articulated.

Regarding Part (c) (iii), many candidates recognized that training at a higher altitude improves performance. A fair number of candidates were able to correctly state that higher altitude meant less oxygen/thinner air linking this to increased vital capacity. Fewer candidates were able to make the link that less oxygen meant that more red blood cells would be manufactured by the body in order to transport a greater amount of oxygen.

Part (c) (iv) was fairly well done. Most candidates were credited for recognizing that training in polluted air adversely affects performance. However, many were unable to articulate that *polluted air leads to shortness of breath, breathlessness or the presence of pollutants in the lungs lead to decreased vital capacity*.

Recommendations

- Fossil fuels as the largest source of air pollution in the world was virtually unknown to many candidates. In most cases, candidates gave examples of air pollutants rather than the source. Teachers, therefore, need to assist students in distinguishing between source and example, applying these terms to real life situations which should include air pollutants. Even though in some cases there was an understanding of the question, the source was still not identified accurately. This requires that this area has to be actively taught through the use of video clips/pictures to stimulate discussion.
- Although Part (a) (ii) was well done, gases such as sulphur dioxide, sulphur trioxide, nitrous oxide and nitric oxide were not well known. Teachers need to emphasize these other gases in teaching through reinforcement.

- Teachers need to clarify definition vs function and then use several examples. Emphasis should however, be placed on the function of breathing.
- Teachers need to engage in discussions using vignettes to highlight/explore how vital capacity is affected in different scenarios.

Question 4

Specific Objectives: B. 3.5, 3.11; D.6; C.10

This question was not well done. It tested candidates' knowledge of the heartbeat, hypertension, arteriosclerosis and diabetes.

Specific Areas of Good Performance

Part (a) required candidates to complete sentences using the terms *systole* for contraction of the heart and *diastole* for relaxation of the heart. While several candidates were able to give an accurate response, too many of them were confused and gave responses for one term as the response for the other.

Part (b) (i) required candidates to name the condition that describes the hardening of the arteries and one associated symptom. Very few candidates were able to name arteriosclerosis as the disease that describes hardening of the arteries, however, most candidates were able to give a symptom of the disease which included symptoms of a heart attack or stroke.

Part (b) (ii) required candidates to name two factors that that may contribute to hypertension. Most candidates were able to correctly name at least one factor that contributed to hypertension. Some candidates, while recognizing that diet could contribute to hypertension, failed to state what aspect of diet would. Too much salt or fat in the diet would have been acceptable answers in addition to smoking, stress and obesity.

Specific Areas of Poor Performance

Part (c) required candidates to describe the effects that clogged arteries would have on Brian's brain, and hence, on Brian. Most candidates were unable to describe these effects. An example of a good response would have been *the amount of oxygenated blood flowing to the brain would be reduced. This would lead to the death of brain cells, a stroke and possibly death.* Many candidates misinterpreted this question and wrote on the general functions of the brain rather than the effects a stroke has on the body while others wrote about electrical impulses being unable to travel to the brain so messages would not be sent.

Part (d) (i) required candidates to analyse a graph showing the relationship between blood glucose levels and meals, of two persons, Axel and Golda. Most candidates were able to identify the correct person — Golda. However, few were able to fully explain their responses. Some recognized that Golda's blood sugar level was never lowered during the course of the day. Candidates should have gone on to explain why the blood sugar levels were not lowered. Glucose levels should have been lowered as it would have used during metabolic activities. Those individuals suffering from diabetes mellitus either do not produce insulin or their insulin cannot be utilized.

Part (d) (ii) required candidates to explain one way in which genetic engineering has assisted in the treatment of diabetes mellitus. Very few candidates were aware of the role genetic engineering had in treating diabetes. The insertion of the gene for insulin into a bacterium to produce insulin that could be used by diabetics should have been the response given.

Recommendations to Teachers

- Teachers should be mindful that they follow the syllabus in detail and take special note of the explanations given in the syllabus for each objective. For example, for any disease mentioned in the syllabus, students should be taught the cause, effect, sign/symptoms, prevention and treatment of the disease. Definitions of words must be emphasized during discussions of topics.
- A wide variety of resources should be used when teaching the subject, including the recommended text, multimedia and the internet. Emphasis should be placed on reading questions carefully and answering questions paying attention to details. Repeating the words of the question does not constitute a good response. Students also need to be given more practice with the analysis and interpretation of graphs.

Question 5

Specific Objectives: C4, C5, B7.10.

This question was moderately well done. It tested candidates' knowledge of meiosis, genetic variation and its advantages, family planning, its advantages and how it benefits the country at large.

Specific Areas of Good Performance

Part (a) (ii) which required candidates' to name two processes by which genetic variation occurs in humans and one advantage of genetic variation was accurately stated. Candidates showed that they had knowledge of the impact of genetic variation even if they were not able to articulate the advantage of genetic variation to living organisms.

Part (b) (i) required candidates to list the advantages of Hose and Maria practising family planning. Most candidates took into consideration Hose and Maria's current situation more than the general aims of family planning but the responses were accurate.

Specific Areas of Poor Performance

Part (a) (i) required candidates to name the process by which sperms and eggs are made and the importance of the process. Few candidates correctly named the process stating processes such as 'puberty', 'ovulation', 'sexual reproduction', 'copulation' and 'mitosis'. Candidates were unable to show that the halving of the chromosome number during meiosis is an integral part of successful fertilization. Candidates instead gave the definition of fertilization.

Part (b) (ii) required candidates to discuss three ways in which family planning benefits the country. Most candidates were able to state that family planning helps to reduce/control population size, however, some candidates gave the benefits to the nuclear family or listed their own personal needs instead of discussing the benefits to the country at large. Too often when a benefit was stated, no supporting explanations were given for that benefit.

Recommendations to Teachers

- Emphasis should be placed on the differences and purposes of mitosis and meiosis.
- Objectives should not be only covered but reinforced.
- Students should be reminded to be careful not to repeat the same things in different words when answering questions.

Question 6

Specific Objectives: D.7, 13

This question tested candidates' knowledge of the life cycle of the housefly as well as the duration of each stage. The question further tested candidates' knowledge of the signs/symptoms and the causative agents of gastroenteritis. Lastly, the question required candidates to state a disease, other than typhoid that causes gastroenteritis and then to explain two measures that can be used to prevent the occurrence of gastroenteritis.

This question was poorly done.

Specific Areas of Good Performance

Part (a) required candidates to label the housefly at different stages during its life cycle. Most candidates were able to correctly label the eggs and pupa stages. The section of Part (b) that dealt with the signs/symptoms of gastroenteritis was extremely well done. A large percentage of candidates were able to state the signs/symptoms.

Specific Areas of Poor Performance

For Part (a), candidates were required to give the duration of each stage of the housefly's life cycle. This proved to be a challenge for most candidates. Most were unable to correctly label the hours at which each stage occurs.

In Part (b), candidates were required to give the causative agent of gastroenteritis. Most were not able to give any of the possible correct answers. Some stated 'bacteria' or 'virus' without being specific. A good response would have been *rotaviruses*, *E. coli* or *Giardia*.

Part (c) required candidates to state a disease other than typhoid that causes gastroenteritis. Many candidates were not able to give the correct answer which was *cholera*. They were also required to give two measures that prevented the occurrence of gastroenteritis. A common misconception among candidates was that the housefly or the mosquito can cause cholera. Most were not able to explain two measures that cause cholera. Most of those who offered an answer did not explain that the measure was to get rid of the microorganism/bacteria.

Recommendations to Teachers

- Teachers should emphasize the duration of each phase of the housefly's life cycle. They should also emphasize the specific name of the organisms that cause gastroenteritis as well as other diseases.
- Teachers are also advised to have a thorough discussion on the causes, signs and symptoms and the preventative measures of gastroenteritis comparing them with typhoid and cholera in the process.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

JANUARY 2016

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

GENERAL COMMENTS

The 2016 examination was the eleventh January sitting of Human and Social Biology offered at the General Proficiency level. Marking for this subject was done online.

The format of the examination was different from that preceding 2011. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefited from learning opportunities provided by field trips.
- There has been little change to the essay components.
- Teachers should be mindful that Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance on this paper improved slightly compared with 2015. The following areas proved challenging for some candidates:

- Structure of the lymphatic system
- Structure and function of parts of a typical long bone
- Structure and function of the parts of the human heart
- Movement of the chambers of the human heart in systole
- Internal structure of the kidney
- Feedback mechanisms
- Identification of crops which reproduce asexually
- Definition of a gene
- Identification of examples of discontinuous variation
- How to test water for the presence of bacteria

Paper 02 – Structured Essay

Question 1

Specific Objectives: D.10, 15; B.1.16, 17

This data analysis question tested candidates' knowledge of the structure and function of parts of the tooth, factors which contribute to tooth decay and measures other than changing one's diet that would reduce the formation of cavities. Candidates were required to determine from a graph the group most severely affected by AIDs, which age group had more persons with AIDs and to predict the socioeconomic future of the population represented in the graph. Additionally, they were to explain factors that may have contributed to the reduction in the incidence and death rates from infectious diseases since 1990.

This question was done relatively well.

Specific Areas of Good Performance

- Part (a) (i) required candidates to identify the labelled part of the tooth and its function. Most candidates correctly stated that it was the enamel and loosely stated that it was for the protection of the tooth.
- Part (a) (ii) asked for factors that are necessary for tooth decay. Most candidates stated that having a high sugar diet together with not brushing/flossing one's teeth often would contribute to tooth decay.
- Part (a) (iii) required candidates to state measures, other than a change in diet, which would reduce the formation of cavities. Most candidates correctly stated that having regular dental checkups, brushing/flossing after each meal would reduce the formation of cavities.
- Parts (b) (i) and (ii) were correctly answered by candidates revealing that candidates showed improvement in understanding information given in the form of a graph.
- Part (c) required candidates to explain factors that may have contributed to the reduction in the incidence of and death from infectious diseases since 1900. Most candidates gave appropriate responses such as *increased medical research/technology resulting in the disease being prevented/treated/cured*.

Specific Areas of Weak Performance

- When asked to predict the socioeconomic future of those with AIDs most candidates simply stated information that they gleaned directly from the graph. Good responses would have been *a decline in the workforce; less available resources for development due to increased spending on health care; disintegration of family unit*.

Recommendations to Teachers

- Students need to be taught how to interpret information from a graph, as outlined in the syllabus. While this clearly should be done in a Mathematics class, since students are

unaware of how this should be done and it is required by the syllabus, it becomes incumbent upon Human and Social Biology teachers to ensure that this skill is taught and clearly understood.

Question 2

Specific Objectives: B. 1.1, 1.4, 1.26; A.6

This question tested candidates' knowledge of vitamins and their solubility, elements other than oxygen and hydrogen which make up protein molecules, and the function of proteins in the human body. Additionally, candidates were required to state why avocado would be a better source of fatty acids than a slice of pizza and which sugar would most likely be present in the blood stream following the digestion of a meal consisting of a slice of pizza and a glass of guava juice. The final part of the question required candidates to state two structures on the walls of the small intestine which facilitate maximum absorption and to name and explain the process by which one's meal would be absorbed from the intestinal wall.

This question was not well done.

Specific Areas of Good Performance

- For Parts (b) (i) and (ii), most candidates were able to name the elements which make up protein molecules as well as the function of proteins in the human body. The correct responses were *carbon/nitrogen/sulfur/phosphorus* being the elements which make up protein molecules. The function of proteins required were the *production of hair/nails/bone/enzymes and for growth and repair*.
- For Part (c) (i), most candidates were cognizant of the fact that the breakdown product from carbohydrate digestion is glucose.
- In Part (c) (iii), most candidates were able to correctly state that *villi/microvilli are structures on the wall of the small intestine and that they facilitate maximum absorption*.

Specific Areas of Weak Performance

- For Part (a), most candidates were unable to correctly differentiate between water soluble and fat soluble vitamins.
- For Part (c) (ii), few candidates were able to correctly state that *fatty acids derived from plant sources contain unsaturated fats thus reducing the risk of heart disease while the converse is true for fatty acids derived from animal sources*.
- For Part (c) (iv), very few candidates correctly stated that nutrients are absorbed through the intestinal wall via either diffusion or active transport. Good responses for the explanation of the process of diffusion should have been as follows: *Nutrients move from a place of high concentration in the intestines to a place of low concentration on the other side of the intestinal wall while Nutrients move from a place of low concentration in the intestines with the use of energy to a place of high concentration on the other side of the intestinal wall* explains the process of active transport.

Recommendations to Teachers

- Teachers should encourage students to pay attention to details. While students are aware of the different types of vitamins, most are completely unaware of those which are fat soluble versus those which are water soluble.
- Teachers must also use a holistic approach when differentiating between diffusion and active transport.
- Details about the processes used in the absorption of nutrients can be easily explained using YouTube videos.

Question 3

Specific Objectives: B. 5.9, 5.10, 5.7, 6.13, 6.15

This question tested candidates' knowledge of the functions of endocrine organs and their hormones and the function of the nervous system.

This question was poorly done.

Specific Areas of Good Performance

- Part (b) required candidates to complete a table that linked hormones (insulin and glucagon) with their actions and times of secretion. Most candidates were able to provide nearly complete or complete answers.

Specific Areas of Poor Performance

- Part (a) required candidates to state two activities that are controlled by the hypothalamus. The majority of candidates were unable to identify activities controlled by the hypothalamus. Good responses were *blood pressure/heart rate/peristaltic movements/body temperature/osmoregulation*.
- Part (c) (i) required candidates to identify a hormone secreted by the pituitary gland that would affect urine concentration and explain the effects on the body if that hormone is no longer being secreted. Most candidates were able to identify the hormone but were unable to describe its effects on urine concentration.
- Part (c) (ii) required candidates to identify two other hormones which would not be produced if Vonrick's pituitary gland was no longer functional and to describe the function of these hormones. Most candidates provided no responses. A good response would have been *FSH – required for the production of gametes; LH – required for the production of testosterone; GH – required for growth of the body*.
- Part (c) (iii) asked candidates to outline two ways in which Vonrick's endocrine system differed from his nervous system. Responses to this question were weak and often reflected confusion or a lack of clarity on the topic.

Recommendations to Teachers

- Videos should be used to develop an interest in the topic.
- Assignments/worksheets should be utilized to encourage candidates to familiarize themselves with the material. Candidates could also create skits, songs, comic strips, allegorical stories et cetera on the topic so as to make learning more enjoyable.
- Special emphasis should be placed on how to respond to *compare and contrast* questions. Similarities and differences must be highlighted. For example:
Correct: The endocrine system effects are slower and long lasting while the nervous system effects are quick and short lasting.

Incorrect: The endocrine system effects are slower and long lasting.

The second response does not state a comparison between both systems and, therefore, does not receive the allotted mark.

Question 4

Specific Objectives: B. 6.5, 6.6, 6.9; C. 7

This question tested candidates' knowledge of the nervous system, with particular reference to the functions of parts of the eye, the mechanism of the knee jerk spinal reflex and the differences between voluntary and involuntary actions.

This question presented many challenges for the majority of candidates and overall the question was not well done.

Specific Areas of Good Performance

- Part (c) was well done. Many candidates were able to distinguish between voluntary and involuntary actions, giving examples of each to highlight the differences.

Specific Areas of Weak Performance

- Part (a) (i) required candidates to state the functions of labelled parts of the eye, the pupil, sclera and optic nerve. Most candidates were unable to correctly state the functions of each.
- Part (a) (ii) required candidates to explain how glaucoma develops in the eye. Few candidates were able to correctly state that glaucoma develops as a result of ducts becoming blocked/narrowing resulting in the build-up of pressure within the eye, which cause glaucoma.
- Part (b) (i) required candidates to label the cell body and neurons involved in the knee jerk spinal reflex. Most candidates were unable to correctly do so.
- Part (b) (ii) required a detailed explanation of the mechanism of the knee jerk reflex. Many candidate responses were only awarded one mark for stating that there was 'hitting' or

‘tapping’ of the knee cap. The details of the mechanism resulting in the lower leg swinging outward were rarely stated.

Recommendations to Teachers

- Teachers should encourage students to pay attention to the details of the processes involved in the responses of the nervous system. The use of video presentations can aid students in their understanding of the processes.
- Teachers must seek to develop the critical thinking skills of students, in order to assist them in answering the questions asked.

Question 5

Specific Objectives: D21, 22, 23; B. 2.11

This question tested candidates’ knowledge of drugs and the effects of smoking.

Overall, performance on this question was fair. Parts (a) (i) and (ii) however, were well done by candidates.

Specific Areas of Good Performance

- In Part (a) (i), candidates were asked to state two examples of medicinal drugs and one example of a drug used for pleasure. Most candidates were able to state at least one drug used for medicinal purposes and one drug used for pleasure.
- In Part (a) (ii), candidates were required to state three social effects of drug abuse. Most candidates were able to state at least two. Good answers included the following: *the individual would become withdrawn/violent; it would disrupt family life; increase criminal activity; develop depression/mental illness; an inability to function in the workplace.*
- Part (b) (ii) was done fairly well with most candidates being able to give at least two reasons why more teenagers were beginning to smoke.

Specific Areas of Weak Performance

- For Part (b) (i), most candidates were unable to state how smoking contributes to lung cancer and stroke. It was expected that candidates would be able to link the accumulation of chemicals in lung tissue to the damage of lung tissue and therefore, the development of cancer. Many candidates spoke about constriction of blood vessels affecting the heart even though the question clearly asked about a stroke occurring in the brain. A good answer would have linked the nicotine in cigarette smoke causing constriction of the blood vessels that supply the brain, decreasing the supply of oxygen to the brain and causing a stroke.

Recommendations to Teachers

- This topic lends itself to research projects and oral presentations. Health care workers or persons who work with drug addicts could be used as resource persons to do presentations on smoking, cardiovascular diseases and the development of cancers.

Question 6

Specific Objectives: E. 1, 2, 3, 4, 5

This question tested candidates' knowledge of the water cycle, pollution of the water cycle and bodies of water, as well as the reduction of air pollution. It was satisfactorily done.

Specific Areas of Good Performance

- In Part (a) (ii), many candidates were able to adequately define the term *pollution*. Additionally, quite a number of candidates were also able to identify two ways in which humans pollute the water cycle.
- Part (b) (ii) was also well done and many candidates were able to articulate three ways in which humans could reduce air pollution. Good responses were as follows: *walking instead of using vehicles; using unleaded petrol; using solar cars*.

Specific Areas of Weak Performance

- Part (a) (i) required candidates to name the processes of *transpiration, evaporation* and *percolation* from an illustration of the water cycle. Many candidates attempted to describe the processes instead of naming them. No marks were awarded for descriptions.
- Part b (i) required candidates to discuss two effects of contaminated water on human health and the environment. Candidates had difficulty providing clear responses to explain the effects of contaminated water on human health and the environment. Good responses were: Effects of consuming contaminated water – *development of diseases such as cholera, typhoid and gastroenteritis due to ingestion of pathogens from faecal matter in the water*.
- Effects of contaminated water on the environment – *destruction of aquatic environments due to oxygen depletion from eutrophication and algal bloom*.

Recommendations to Teachers

- Teachers should encourage students to pay attention to the details of natural cycles to improve students' knowledge of the processes. The use of video presentations can aid students in their understanding in this area.
- Students' understanding could also be extended through the construction of models and charts.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

MAY/JUNE 2016

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2016 examination was the twelfth May/June sitting of CSEC Human and Social Biology offered at the General Proficiency level. The marking of this subject continues to be done online and marking was completed in a timely manner.

Overall, candidates' performance in this sitting of the examination improved, with 52 per cent of candidates achieving Grades I–III, compared with 45 per cent in June 2015.

The examination consisted of two papers: Paper 01, a multiple-choice paper consisting of 60 items and Paper 02, a constructed response paper consisting of six compulsory questions, four of which were structured (Section A) and two of which were essay questions (Section B). Each question was worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that candidates would have benefitted from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

There was an increase in candidate performance on Paper 01. This year, the mean score was 29.1 compared with a mean score of 27.7 in 2015. Out of a total of 60 marks, the maximum score achieved was 55 and the minimum score obtained was 0.

Some topics that proved challenging were:

- The process of blood clotting
- Interpretation of data on the circulatory system
- Identification of skeletal bones in the lower leg
- The process of homeostasis
- The process of regulation of blood sugar
- Identification of parts of a sensory neurone
- Relating the internal structure of the eye to its functions

Paper 02 – Structured Essay

Question 1

Specific Objectives: B 1. 5; 1.10; 1.12

This data analysis question tested candidates' knowledge of the various food tests, foods that are rich in starch, the food group needed for growth and repair, diseases that occur as a result of a deficiency of a particular nutrient in one's diet as well as those that result from overeating and lack of exercise. It was relatively well done.

Specific Areas of Good Performance

In Part (a), candidates were given a scenario of a young man who was interested in increasing his body mass and his trainer recommended that he eat more complex carbohydrates and thus foods rich in starch.

Part (a) (i) required candidates to name a test he could use to determine the presence of starch. Most candidates were able to state that the iodine test is used to determine the presence of starch.

Part (a) (ii) required candidates to suggest foods which are rich in starch. Most candidates answered this section correctly.

Part (a) (iii) required candidates to state from four foods given, namely fish, plantain, carrots and lentil peas, which foods should be ingested for growth and repair of his muscle tissues. Most candidates chose the correct foods which were fish and lentil peas.

Part (iv) required candidates to name two reagents that he could use to test for the presence of protein in his meals. Most candidates were not able to provide accurate responses.

In Part (b) candidates were given a table which showed data relating to four diet-related diseases of children in two countries, X and Y.

Parts (b) (i)–(iv) required candidates to draw a bar graph to represent the data and make inferences from the data given in the table. While this task, as in previous years, posed a problem, there was marked improvement in this area. Candidates were also able to give accurate responses to the graph-related questions but were unable to accurately state what was lacking in one's diet that would have caused the development of night blindness. They were also unable to state the source of the nutrient that was lacking. A correct response was that vitamin A was lacking and a source of vitamin A is bright orange vegetables such as carrots as well as dark green, leafy vegetables.

Part (c) required candidates to state two diseases that could develop as a result of overeating and lack of exercise. Most candidates accurately stated obesity and cardiovascular disease as those diseases.

Specific Areas of Poor Performance

Part (b) (iv) required candidates to suggest the reagents used to test for the presence of protein. Very few candidates were able to accurately state that sodium/potassium hydroxide and copper sulphate were needed to test for the presence of protein.

Recommendations to Teachers

While there was an improvement in the analysis question, students still need to be taught how to interpret information from a graph. While this may be expected to be covered in a Mathematics class, since students are unaware of how this should be done, it becomes incumbent upon Human and Social Biology teachers to ensure that this is taught and clearly understood.

Question 2

Specific Objectives: A6, 7; B 1.24, 1.26

This question tested candidates' ability to define the terms, diffusion and osmosis. Two diagrams depicting two experimental scenarios were given, one depicting diffusion and the other depicting osmosis. Candidates were asked to identify which represented diffusion and which represented osmosis and to make predictions about the experimental outcomes. In addition, they were asked to identify two organs in the body in which diffusion occurred and to describe and explain the structure and function of the villus. This question was done moderately well.

Specific Areas of Good Performance

Part (a) asked candidates to define the terms diffusion and osmosis. Most candidates were able to define osmosis. However, many candidates did not remember to include the term "selectively permeable membrane" in their definition of osmosis.

Specific Areas of Poor Performance

Part (b) showed two figures, Figure 1 showing diffusion occurring in a beaker and Figure 2 showing osmosis occurring in a beaker which contained a Visking tubing.

Part (b) (i) was generally misinterpreted. It required candidates to compare the movement of particles/molecules during the processes of diffusion and osmosis. Expected answers included

that *during diffusion there is movement of solute particles whereas during osmosis, there is movement of water molecules*. Another good response would have been that *during diffusion, there is no movement across a membrane whereas during osmosis there is movement across a selectively permeable membrane*. Candidates instead looked at the drawings and compared them rather than stating the differences between the movement of particles/molecules in each figure.

In Part (b) (ii) some candidates were able to identify that osmosis was taking place in Figure 2.

In Part (b) (iii), many candidates understood that the level of the water in the beaker would drop but were unable to properly explain why. They were expected to state that the water molecules would have moved from the higher water molecule concentration in the beaker, through the selectively permeable membrane into the sugar solution which had a lower water molecule concentration. Candidates instead said that the sugar solution absorbed the water which did not merit any marks.

Recommendations to Teachers

Students must not only be able to define diffusion or osmosis but they must also be familiar with how these processes are used in the body. A practical approach to this topic is required so that students are familiar with different examples of diffusion and osmosis. The use of videos, worksheets, labs, or class activities should assist in understanding the differences between the two processes.

Question 3

Specific Objectives: B 2.8; 2.11; D4

This question tested candidates' knowledge of the end-products of aerobic and anaerobic cellular respiration; the positioning of the thoracic cage and activities that occur during the process of inspiration; a disease that is most likely to occur when bush fires occur during the dry season; factors that may trigger the development of that disease and the treatment that one would receive at the hospital should that disease develop. This question was poorly done.

Specific Areas of Good Performance

Part (b) (i) required candidates to determine which of two figures showed the correct positioning of the rib cage during breathing. Most candidates accurately chose the correct Figure B.

Parts (c) (i), (ii) and (iii) were very well done. Most candidates accurately stated that asthma can develop as a result of bush fires. There were also able to state that pollen, dust and mould to name a few, may trigger the development of asthma. Most candidates accurately stated

that at the hospital one would be given oxygen or placed on a nebulizer in order to relieve the symptoms of asthma.

Specific Areas of Poor Performance

Parts (a) (i) and (ii) required candidates to name the end-products of anaerobic and aerobic respiration. Most candidates stated that oxygen was an end-product of both aerobic and anaerobic respiration. A good response would be that *carbon dioxide, water and energy are end-products of aerobic respiration while lactic acid, carbon dioxide, alcohol/ethanol and energy are end-products of anaerobic respiration.*

Part (b) (ii) required candidates to outline the activities that occur during the process of inspiration. While most candidates were able to state that the rib cage moves upward and outward thus increasing the volume of the thoracic cavity, many did not make the link between increased volume resulting in decreased pressure and so air rushes into the lungs during the process of inspiration.

Recommendations to Teachers

Videos should be used to develop an interest in the topic.

Assignments/worksheets should be utilized to encourage candidates to familiarize themselves with the material. Models and videos could be used to explain the process of inspiration/expiration.

Question 4

Specific Objectives: C4, 8; B 7.2

This question tested candidates' knowledge of meiosis, the inheritance of sex in human beings and the role of sex chromosomes. In addition, candidates were assessed on their understanding of the human reproductive systems as it related to the disorder of cervical cancer. This question was moderately well done.

Specific Areas of Good Performance

Parts (a) (i), (ii), and (iii) were fairly well done. Many candidates were able to identify the type of cell division illustrated as meiosis.

In Part (b) (i), a few candidates were able to provide a partial or complete response as to why the testes should be carried outside of the body.

In Part (c) (i), a few candidates were able to provide one or two measures that would protect against cervical cancer such as routine pap smear testing, vaccination, the use of condoms/having protected sex, having one sexual partner and abstaining from sex.

In Part (c) (ii), most candidates were able to state one example of a sexually transmitted disease, for example, gonorrhoea, herpes, chlamydia and trichomoniasis.

Specific Areas of Poor Performance

Part (a) (iii) required candidates to state the chromosome numbers of parent (diploid) and daughter (haploid) cells. Most candidates confused one with the other.

Part b (ii) required candidates to outline the roles that the epididymis, the seminal vesicles and the prostate gland played in forming semen. Most candidates were unable to do so.

Recommendations to Teachers

Teachers should encourage students to pay attention to the details of the processes involved in spermatogenesis. The use of video presentations and worksheets can aid students in their understanding of the processes.

Question 5

Specific Objectives: D 11, 14

This essay question tested candidates' knowledge of causes of malaria and gastroenteritis, the associated symptoms and preventive measures that could be taken to avoid contracting the diseases. The overall performance on this question was poor.

Specific Areas of Good Performance

Part (a) (ii) asked candidates to list three symptoms exhibited by those suffering from malaria. Most candidates were able to describe at least two symptoms of malaria. Some good responses to this question included high fever, moderate to severe chills, profuse sweating, nausea and exhaustion/fatigue.

Specific Areas of Poor Performance

Part (a) (i) required candidates to identify the single-cell organism that causes malaria and to state two tissues/organs that it destroys in the human body. Very few candidates were able to state that the organism that causes malaria is the plasmodium parasite and that it affects the liver and red blood cells.

Part (b) described a scenario where a man ate oysters and drank water while vacationing and experienced severe abdominal cramps and diarrhoea the following morning. Candidates were required to discuss the disease that was contracted, the causative agent, two ways in which he may have contracted the disease and steps he could take to avoid becoming ill in the future.

Most candidates were unable to name the causative agent of the possible diseases that could have been contracted, namely, gastroenteritis – *E. coli*; salmonella bacteria or cholera – *Vibrio cholera* bacteria. While candidates were aware that the man became sick as a result of eating the oysters/drinking the water, generally answers were not well discussed. It was expected that they should have discussed exactly what it was about the oysters or water that made the man ill; for example, that the oysters were raw or they may have been raised in water which was contaminated by raw sewage. The water that the man drank may also have been contaminated with raw sewage.

Recommendations to Teachers

Students must be able to state causative agents of diseases by naming the specific disease-causing organisms. This topic lends itself to research projects and oral presentations. Health care workers or persons who work with diseases could be used as resource persons to do presentations on types of diseases, their causative agents, methods of transmission and methods of prevention.

Question 6

Specific Objectives: E 5, 8, 9

This essay question tested candidates' knowledge about the ways in which water is cycled between the earth and the atmosphere. They were also asked to explain why fish and plants in a pond situated near to a garden were dying and to explain the effects of chemicals from an industry on a food chain. This question was poorly done.

Specific Areas of Good Performance

There were no areas of good performance for this question.

Specific Areas of Poor Performance

Part (a) required candidates to describe three ways in which water is cycled between the Earth and the atmosphere. While most candidates were able to list evaporation and precipitation as ways in which water is cycled, few were able to describe the processes whereby water moves from one state to another. For example, evaporation is the process whereby water is changed from a liquid state in bodies of water to gas in the atmosphere. Candidates were required to link their answers to the atmosphere and therefore the term "runoff" was not accepted.

Part (b) required candidates to demonstrate a knowledge of eutrophication. In the question, fishes were dying in a pond covered by water plants which was located near to a garden. Only a few candidates were able to identify the process that was taking place and hence explain why the fish in the pond were dying. Some candidates recognised that some chemicals could have been entering the pond but did not specify that it would have been the fertilizers causing the phenomenon. Candidates also recognized that the fish would not get enough oxygen but the reasons given for this were often wrong. They also recognized that the plants in the pond would not get light.

An ideal answer should have included the following: *Fertilizers entered the pond causing an increase in the growth of algae on the surface of the pond; the lack of light for plants growing in the pond would prevent them from photosynthesizing thus causing their death; bacteria causing the decay of these plants would utilize the oxygen in the pond causing the fish to die; also large quantities of carbon dioxide in the water would have caused the water to become acidic further leading the death of the fish.*

Common misconceptions included that plants used up all the oxygen; the fish needed sunlight to live or keep warm and that the fish died because of a lack of a food source.

Part (c) required candidates to explain the effect that chemical waste would have on the food chain of a river. There was a general understanding that if the fish in the river were eaten by humans that this could cause illness or death. Most candidates did understand the concept of a food chain but did not utilize their knowledge to answer the question. As the chemicals were consumed by different organisms in the river, the concentration of the chemicals would increase until it eventually caused the death of organisms higher in the food chain.

Recommendations to Teachers

Syllabus coverage of the environment and man's effect on it can be taught as a project with oral presentations. Students could be asked to create PowerPoint presentations on specific topics, for example, eutrophication. These topics can also generate interesting class discussions.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION**

JANUARY 2017

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION**

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GENERAL COMMENTS

The 2017 examination was the twelfth January sitting of Human and Social Biology offered at the General Proficiency level. Marking for this subject was done online.

The format of the examination was different from that preceding 2011. There was no change to Paper 01 which consisted of 60 multiple-choice items. However, Paper 02 now consists of six compulsory questions, four of which are structured (Section A) and two of which are essay questions (Section B). Each question is worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that students would have benefited from learning opportunities provided by field trips.
- There has been little change to the essay components.
- Question 1 in Paper 02 will always involve the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

Candidate performance on this paper improved when compared with January 2016.

The following areas proved challenging for some candidates:

- Structure and function of digestive organs
- Identification of major bones of the skeletal system
- Relating the structure of the skeletal system to its functions
- Function of skeletal muscles in the movement of limbs
- Functions of parts of the brain
- Process of mitosis
- Monohybrid inheritance
- Causative agents of infectious diseases
- Methods to control the spread of infectious diseases (autoclaving)

Paper 02 – Structured Essay

Question 1

Specific Objectives: D.22; B.1.10, B1.9

This data analysis question tested candidates' knowledge on problems which persons who abuse drugs may experience and health problems that could develop as a result of excess weight. It also tested candidates' knowledge of the relationship between being overweight and suffering from malnutrition, and the benefits of having fruits and vegetables in one's diet.

The question was well done by candidates.

Specific Areas of Good Performance

Parts (a) and (b) were well done. Candidates were able to analyse the data presented in the table relating to problems associated with persons who abuse drugs and thus were able to correctly answer the questions.

Parts (c) (i) and (iii) were also well done. Most candidates were able to suggest three health problems that could develop as a result of excess weight. Correct responses included *obesity, arthritis, heart disease*, to name a few. The majority of candidates correctly stated the benefits of having fruits and vegetables in one's diet.

Specific Areas of Weak Performance

Part (c) (ii) required candidates to explain how it is possible to be overweight and still suffer from malnutrition. While most candidates correctly stated that the individual could suffer from malnutrition because of being overweight, they were unable to make the link between having a balanced diet which includes eating the right amount of nutrients as well as having the correct proportions of each nutrient.

Recommendations to Teachers

There was an improvement in the manner in which students interpreted the information from the tables and teachers are to be commended for this. It is recommended that emphasis on data analysis be continued.

Question 2

Specific Objectives: A.8, A.14; E. 3

This question tested candidates' knowledge and understanding of the process of photosynthesis, the carbon cycle and the nitrogen cycle. Additionally, candidates were required to discuss the impact of agriculture on aquatic ecosystems and the impact of man on the carbon and nitrogen cycle.

The question was moderately done.

Specific Areas of Good Performance

Parts (a) and (b) were well done. Most candidates were familiar with the process of photosynthesis and the stages of the carbon cycle.

Specific Areas of Weak Performance

Most candidates were unable to provide complete responses to Parts (c) and (d). Part (c) required candidates to state two reasons why it is important for plants to have adequate amounts of nitrogen and to name two types of bacteria, which provide nitrogen when present in soils. A good response would have been that *nitrogen is needed for the synthesis of DNA, protein and amino acids and that nitrifying and nitrogen-fixing bacterium are present in soil*.

Part (d) required candidates to suggest three pollutants that may run off from a garden where farming activities take place, into a river. Most candidates were unsure of suitable responses. A good response would have been *pesticides, weedicides and manure slurry*, to name a few. They

were also required to outline two effects of pollutants on living organisms in the river. Suitable responses included *creates algal blooms*, *organisms die due to lack of oxygen* and *accumulation of toxins in tissues*.

Recommendations to Teachers

Teachers should encourage students to pay attention to detail. While students have a general understanding of the environmental impacts of agriculture, they could not provide details. For example, when asked to suggest three possible runoff pollutants from the garden, most candidates stated 'chemicals' but could not specifically identify pollutants such as pesticides, insecticides, fertilizer or manure runoff. The use of worksheets or case studies can encourage students to focus on the details.

Question 3

Specific Objectives: B4.4, B4.7; B1.3

This question tested candidates' knowledge of the functions of bone and the human vertebral column, the location, structure and function of bone and cartilage. It also tested the type of joint found in the knee and its associated movement, why vitamin D is necessary for proper bone formation, the disease that develops as a result of its deficiency, and the mineral most likely lost from bone due to ingesting large amounts of carbonated beverages.

The question was moderately done.

Specific Areas of Good Performance

Part (a) required candidates to state one function of bone, other than the protection of internal organs, and two functions of the human vertebral column. Most candidates were knowledgeable on this topic.

Specific Areas of Poor Performance

Part (c) required candidates to identify the type of joint in the knee region and to describe its movement. Most candidates were unaware that it was a hinge joint and that it allowed movement in one plane only. They were also asked to describe the difference in terms of movement between the joint in the hip region and the joints between the bones of the skull. A good response would have been that *the ball and socket joint allows movement in all planes, whereas the joints between the bones of the skull allow no movement*.

Part (d) required candidates to explain why vitamin D is necessary for proper bone formation and to name the disease that occurs as a result of its deficiency. While most candidates knew that rickets occurs as a result of vitamin D deficiency, most of them could not make the link between vitamin D and calcium absorption.

Recommendations to Teachers

Videos could be used to develop an interest in this topic. Assignments/worksheets could be utilized to encourage students to familiarize themselves with the material. Students could also create skits, songs, comic strips, allegorical stories et cetera on the topic to make learning more enjoyable.

Question 4

Specific Objectives: B.6.4, B6.5, B6.14, B6.15; B7.3

This question tested candidates' knowledge of the nervous system, the mechanism of the knee jerk spinal reflex action and the differences between voluntary and involuntary actions. It was poorly done.

Specific Areas of Good Performance

Parts (a) (i) and (ii) were well done. Many candidates were able to distinguish between nerves and neurons and differentiate between sensory and motor neurons.

Specific Areas of Weak Performance

Performance of Part (b) (i) was mixed, as many candidates were not able to provide all four steps of the reflex action. Part (b) (ii) required candidates to provide examples of hormones produced by the pituitary gland. Many candidates were unable to provide correct responses, as they did not take note that the scenario dealt with a female whose period had ended – a female therefore could not produce testosterone.

Recommendations to Teachers

Teachers should encourage students to read questions carefully in order to avoid giving incorrect responses as was pointed out above.

The use of concept maps may assist students in learning sequential processes such as the reflex action.

Question 5

Specific Objectives: D. 6 (a); B. 3.11

This question tested candidates' knowledge and understanding of cardiac disease, diabetes and the effects of smoking. Overall, the performance on this question was poor.

Specific Areas of Good Performance

In Part (a) (i), candidates were asked to state two types of cardiovascular diseases that develop as a result of one's lifestyle and explain how the diseases develop. Many candidates were able to provide satisfactory answers such as *hypertension* and *coronary heart disease* and were able to explain how they develop.

Specific Areas of Weak Performance

In Part (b), candidates had difficulty identifying symptoms of diabetes and providing ways in which to manage the disease. Regarding symptoms, expected responses included *increased urination* and *thirst, pain in the limbs, tiredness, renal failure, eye defects* and *mental confusion* to name a few.

Part (c) was poorly done. Candidates were unable to outline how smoking increases the risk for heart attacks.

Diabetes and cardiovascular diseases are common throughout the Caribbean. Many of the responses were not based on sound concepts but rather on candidates' informal knowledge of the diseases. As a result, responses often reflected misconceptions.

Recommendations to Teachers

The use of concept maps may assist students in learning and understanding how diseases develop. It appears that students need to spend more time focusing on understanding diseases. For example, while eating more fruits and vegetables is generally a good thing for a diabetic, this may not always assist in managing blood glucose levels.

Question 6

Specific Objectives: E. 18, E.19, E.20, E.21

This question tested candidates' knowledge of the advantages and disadvantages associated with the use of landfills, differences between a dump and a landfill, and measures used to control the volume of solid waste within their respective communities. It was poorly done.

Specific Areas of Good Performance

Part (c) required candidates to name and explain measures which could be used to control the volume of solid waste within the community. Most candidates were very knowledgeable about the reduce/reuse/recycle concept.

Specific Areas of Weak Performance

In Part (a), many candidates were unable to state disadvantages and advantages associated with the use of landfills. Most mistook landfills for dumps. A good response for the advantages would have been as follows: *At landfills, garbage can be compacted thus reducing its volume; garbage is not as unsightly when its disposal is properly managed.* Some disadvantages were *the landfill could become a breeding ground for disease-carrying animals and it may contaminate the groundwater.*

Part (b) required candidates to explain three differences between a dump and a landfill. Most candidates were able to differentiate between the two. Some good responses were as follows: *A dump is an open hole in the ground where trash is placed and sometimes buried whereas a landfill is a carefully designed structure built into or on top of the ground into which garbage is placed.*

Recommendations to Teachers

Special emphasis should be placed on how to differentiate between concepts/processes. Teachers should encourage students to pay attention to detail because very often they do not obtain marks because they do not fully answer the questions.

Students' understanding could also be deepened through the use of models and charts.

CARIBBEAN EXAMINATIONS COUNCIL

**REPORT ON CANDIDATES' WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE®
EXAMINATION**

MAY/JUNE 2017

**HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY**

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GENERAL COMMENTS

The 2017 examination was the thirteenth May/June sitting of CSEC Human and Social Biology offered at the General Proficiency level.

Candidates' performance in this sitting of the examination was consistent with that of June 2016, with 53 per cent of candidates achieving acceptable grades, Grades I–III, compared with 52 per cent in 2016.

The examination consisted of two papers: Paper 01, a multiple-choice paper comprising 60 items and Paper 02, a constructed response paper consisting of six compulsory questions, four of which were structured (Section A) and two of which were essay questions (Section B). Each question was worth 15 marks. Teachers should note the following:

- The four structured questions are longer and a single question attempts to integrate several areas of the syllabus.
- The questions in this paper assume that candidates would have benefitted from the opportunities of learning provided by field trips.
- There has been little change to the essay components.
- Question 1 in Paper 02 will always require the analysis of data.

DETAILED COMMENTS

Paper 01 – Multiple Choice

There was a marked improvement in candidates' performance on Paper 01. This year, the mean score was 34.1 compared with a mean score of 27.9 in 2016. Out of 60 marks, the maximum score achieved was 59.

Some topics that proved challenging were:

- Definition of respiration
- Function of amino acids
- Identification of bones in the lower leg
- Role of luteinizing hormones in the body
- How contraceptives work to prevent pregnancy
- Genetic engineering

Paper 02 — Structured Essay

Question 1

Specific Objectives: B 1.1 – 1.5, B 1.9

This data analysis question tested candidates' knowledge of the presence of various macronutrients based on the results of food tests; how balanced diets differ between two

groups of individuals – pregnant vs. non-pregnant and young vs. older persons; what happens to excess vitamin A in the body; diseases which develop as a result of deficiencies in iron and vitamins A and C, and the importance of fibre in one's diet. This question was relatively well done.

Specific Areas of Good Performance

In Part (a) (i) of the question, candidates were presented with the results of three food tests carried out on a sample of food in the laboratory. Most candidates correctly identified the presence of starch and fats and the absence of proteins based on the results of the food tests. They were also able to correctly state the food most likely present in the test sample.

In Part (c), most candidates were familiar with the diseases that develop because of deficiencies in iron and vitamins A and C.

In Part (d), the majority of candidates were able to state one reason why fiber is an important part of the diet.

Specific Areas of Poor Performance

Part (b) required candidates to define the term 'balanced diet'. Most candidates were able to state that a balanced diet must contain the correct nutrients, but failed to obtain full marks because they omitted to state that they must be in the correct proportions.

Part (b) (ii) required candidates to discuss how a balanced diet would differ between a pregnant versus a non-pregnant woman of the same age, and between a young person versus an older person. Most candidates correctly stated that a pregnant woman was eating for "two" and therefore, needed more nutrients. Concerning the young person versus the older person, most candidates failed to make the link that younger persons are growing and are more active and therefore, need more nutrients than an older individual.

A good response would have been "A younger person has a higher metabolic rate than an older person and therefore needs more calories and nutrients".

Recommendations to Teachers

There was an improvement in the data analysis question, and teachers are encouraged to continue insisting that students apply what they were taught and not to just regurgitate information. It is suggested that exercises in reasoning be done which will assist students in retrieving information and applying that information to correctly answer questions.

Question 2

Specific Objectives: B 3.1, 3.2, 3.3, 3.7; C 7

This question tested candidates' ability to recall the functions of certain structures of the heart and the components of blood. They were also required to demonstrate an

understanding of how sickle cell anaemia affects an individual's health; to distinguish between plasma and serum, and to describe the relationship between plasma and tissue fluid. This question was not well done.

Specific Areas of Good Performance

Part (a) required students to identify two labelled structures within the heart. This part was well done. However, some candidates needed to pay more attention to distinguishing right from left on the diagram of the heart.

Part (b) was moderately well done, as most candidates were able to correctly state the type, shape or function of the blood cells as required.

Part (c) was also moderately well done. However, many candidates were unable to make the link between the deficiency in oxygen and the production of energy.

Specific Areas of Poor Performance

Part (d) was poorly done, as candidates were unable to distinguish between plasma and serum. A correct response would have been, "Plasma is the liquid part of blood that contains clotting proteins while serum is plasma from which clotting proteins have been removed".

Candidates were unable to explain the relationship between plasma and tissue fluid. A correct response would have been, "When plasma is squeezed out of blood vessels it is secreted into tissues and fills the spaces between the cells of the body and within the tissues, it is then called tissue fluid".

Recommendations to Teachers

Concept maps could be used to assist students with differentiating as well as comparing and contrasting various concepts.

Question 3

Specific Objectives: B 2.8; 2.11; D 4

This question required candidates to identify the triceps muscle, its origin and insertion; the type of joint situated between the bones of the arm and forearm, and the type of movement that joint allows. They were also required to explain how the triceps and the biceps muscles work to allow for flexion and extension of the forearm. In addition, candidates were asked to define the term 'muscle tone' and explain its benefits. They were also required to describe the correct way to lift heavy objects and to explain what could occur as a result of not maintaining proper posture when lifting. This question was relatively well done.

Specific Areas of Good Performance

In Part (a), most candidates were able to correctly identify the triceps muscle and its origin and insertion. They were also able to identify the joint as a hinge joint and to state that the type of movement at that joint was a backward/forward movement or movement in one plane.

Part (b) (i) was also well done. Most candidates accurately explained how the biceps and triceps muscles work to allow for flexion and extension of the forearm.

Part (c) (ii) was also well done as most candidates correctly stated what could happen if proper posture was not maintained.

Specific Areas of Poor Performance

Part (b) (ii) required candidates to explain the term ‘muscle tone’. Most were unable to correctly state that it is “the tension muscles have when they are in a healthy condition”.

In Part (c) (i), most candidates were unable to explain the correct way in which heavy objects should be lifted. A good response would have been, “One should get as close to the object as possible, bend one’s knees and then maintain a straight back when lifting”.

Recommendations to Teachers

Assignments and worksheets could be utilized to encourage candidates to familiarize themselves with the material. Models and videos could be used to explain how the skeletal system operates.

Question 4

Specific Objectives: B 5.5, 5.7, 5.10; D 6

This question tested candidates’ knowledge of homeostasis as well as their ability to identify organs involved in excretion and their excretory products. Candidates were also required to describe the roles of hormones that affect glucose levels in the blood and describe what happens to excess glucose in the blood. They were also required to explain how diet and exercise could reduce the risk of developing a named lifestyle-related disease. This question was poorly done.

Specific Areas of Good Performance

In Part (a), most candidates were able to correctly define homeostasis as the maintenance of constant internal conditions in the body.

Specific Areas of Poor Performance

It was apparent that most candidates had an understanding of the question and the topics discussed. However, they were unable to express their answers completely and therefore, lost marks for incomplete answers.

In Part (b), although most candidates were able to identify the organs involved in homeostasis, many were not able to state the corresponding products of excretion. For example, in Part (b), sweat was stated as the excretory product produced by the skin. The correct response was “urea, salts and water”.

In Part (c), candidates were presented with a scenario, which dealt with the consumption of a given meal at specific times of the day. They were asked to explain the role of hormones in causing glucose to enter the cells. They were also required to explain the processes that would take place in the body to raise a low blood glucose level and suggest what would happen to the excess glucose formed after digestion of the carbohydrates. Many candidates failed to correctly explain that the pancreas secretes insulin that causes the glucose to leave the blood, to enter the cells and that the pancreas would secrete glucagon which would convert stored glycogen to glucose. Further, any excess glucose would be converted to fat.

Recommendations to Teachers

Teachers should encourage students to provide complete, detailed responses when answering questions posed, as failure to do so results in fewer marks being awarded.

Question 5

Specific Objectives: D 2, 3, 4, 5

This question tested candidates’ knowledge of asthma, non-infectious and infectious diseases, and the link between poor personal hygiene in males and cervical cancer in females. This question was fairly well done.

Specific Areas of Good Performance

Part (a) required candidates to state two signs or symptoms of asthma, two factors that trigger it, and to explain how asthma affects the respiratory system. Most candidates knew the signs or symptoms of asthma as well as the factors that trigger the disease.

Part (b) (i) required candidates to explain the difference between an infectious/communicable and non-infectious/non-communicable diseases and to give examples from each category. Most candidates were able to explain the difference and give suitable examples.

Specific Areas of Poor Performance

In Part (a), most candidates were unable to adequately explain how asthma affects the respiratory system. While they knew that there was difficulty breathing, they could not articulate what occurs to cause the difficulty in breathing. A good response was, “The muscle in the walls of the bronchi and bronchioles are stimulated to contract. Mucus-secreting cells in the lining of the respiratory tract become more active resulting in increased mucus secretion. This causes breathing to be more difficult because of increased resistance to airflow”.

Part (b) (ii) required candidates to explain the link between poor personal hygiene in males and the incidence of cervical cancer in females. Most candidates stated that females develop cervical cancer because they “do not bathe”. A complete response should have indicated poor personal hygiene, with particular reference to the genitals. The question also required candidates to include the benefits of circumcision in their responses. Very few candidates were able to adequately respond to the question. A good response was as follows:

“Poor personal hygiene in males could increase the risk of cervical cancer in females. Failure to wash under the foreskin results in the accumulation of microorganisms, which could induce the development of cervical cancer in females. Circumcision involves the removal of the foreskin, making the area easier to clean. This reduces the risk of providing the environment for the accumulation of pathogens”.

Recommendations to Teachers

Students must be encouraged to link the signs and symptoms of diseases to their triggers. Having students draw concept maps should assist them in linking and retaining the information.

In addition, this topic lends itself to research projects and oral presentations. Health care workers or persons who work with diseases could be invited as resource persons to make presentations on types of diseases, their triggers or causative agents, and how they affect the various systems.

Question 6

Specific Objectives: E 9, 10, 11, 12; D 7

This question tested candidates’ knowledge of the causes and symptoms of cholera; the operations of a drop latrine and its effects on persons living in the environment, and the steps that communities could take to reduce water pollution. This question was poorly done.

Specific Areas of Good Performance

In Part (a), most candidates were able to identify the disease as cholera and state the symptoms of the disease. In Part (c), most candidates were able to suggest one or two ways of reducing water pollution.

Specific Areas of Poor Performance

Part (b) required an understanding of how drop latrines work. It appears that many candidates misunderstood the diagram. Though it was indicated that the latrine was over the stream, many candidates did not read the label and mistook the stream to be soil. They, therefore, identified the drop latrine as a pit latrine. This incorrect assumption influenced subsequent answers. The responses to the questions posed were also very superficial and therefore, marks could not have been awarded.

In Part (c), candidates were required to explain three steps that a community can take to reduce water pollution. Again, this part of the question was not well done. Although some candidates could list the steps, they could not proffer an explanation and thus, were not awarded full marks.

Examples of correct responses included:

“Situate latrines or sewage treatment away from waterways. This prevents water from becoming contaminated with bacteria.”

“Minimize use of fertilizers as fertilizers can give rise to algal blooms”.

“Properly dispose of domestic and industrial chemical waste. Chemical waste is poisonous to aquatic organisms.

Recommendations to Teachers

Students need to spend more time practising how to answer questions in a manner that completely expresses a thought or argument.