CARIBBEAN EXAMINATIONS COUNCIL

REPORT ON CANDIDATES’ WORK IN THE
CARIBBEAN SECONDARY EDUCATION CERTIFICATE® EXAMINATION

JANUARY 2014

HUMAN AND SOCIAL BIOLOGY
GENERAL PROFICIENCY EXAMINATION

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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/YouTube 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.