

CARIBBEAN EXAMINATIONS COUNCIL

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

JUNE 2006

HUMAN AND SOCIAL BIOLOGY

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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 villi 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.