

**CARIBBEAN EXAMINATIONS COUNCIL**

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

**JUNE 2005**

**HUMAN AND SOCIAL BIOLOGY**

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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 O<sub>2</sub> 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 O<sub>2</sub> is accomplished by the formation of oxy-haemoglobin' and 'O<sub>2</sub> 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: 11<sup>th</sup> – 17<sup>th</sup> 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.

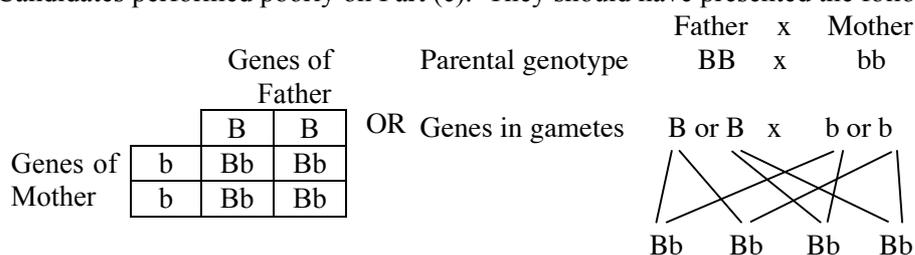
In Part (a), candidates were expected to state that DNA is deoxyribonucleic acid that it is found in the nucleus of cells and that it stores genetic information to be passed on to offspring.

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, cokecane – cocaine; erowine – heroin; mariwanna - marijuana.

#### 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 CO<sub>2</sub> 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 CO<sub>2</sub>. 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.