

HUMAN AND SOCIAL BIOLOGY

Paper 5096/01

Multiple Choice

<i>Question Number</i>	<i>Key</i>	<i>Question Number</i>	<i>Key</i>
1	C	21	B
2	A	22	B
3	C	23	B
4	A	24	D
5	B	25	B
6	D	26	D
7	C	27	B
8	A	28	B
9	A	29	C
10	C	30	C
11	D	31	C
12	D	32	A
13	D	33	A
14	B	34	D
15	C	35	B
16	D	36	C
17	B	37	D
18	B	38	D
19	C	39	B
20	A	40	A

General comments

A total of 363 candidates sat this paper and a standard deviation of 8.26 (20.65%) was obtained, with a mean score of 25.24 (63.1%). This small entry of candidates again produced pleasing statistics, very similar to those of last year. **Questions 5, 19, 26, 31 and 40** proved to be easy, as each obtained a proportion correct above 800. However, along with proportions correct on the other questions, these figures indicate a very good standard of work from these candidates.

The discrimination index obtained by most questions was particularly good, with the exception of **Questions 9, 29 and 36**.

Comments on specific questions.**Question 9**

The very low discrimination index is most likely because the distractor **C** made the question more difficult than intended. Half the candidates obtained the obvious and correct answer that a lack of iron in the diet would make a pregnant woman anaemic. However, a number of candidates chose the perhaps plausible option **C**, that the fetus would be unable to absorb oxygen. This is wrong, because in such a situation the mother will suffer and not the fetus.

Question 19

A pleasingly high proportion of candidates knew all five facts about the skeleton and therefore got this correct.

Question 29

The low discrimination index here may indicate that even the better candidates find such genetics questions difficult. In this question, both parents are shown as not being albinos. Because they have one affected and one non-affected child, each parent must carry a recessive gene. Such carrier parents have a 1 in 4 chance of giving birth to an affected child. This is a basic fact that most teachers will have taught, but it could not be applied to the problem posed here.

Question 31

As expected, this question on HIV and AIDS was very well answered, because of all the attendant publicity from health education. In view of its social importance we feel this question was justified and are pleased with the very high proportion of candidates getting it correct.

Question 36

The low discrimination index is possibly because, as distractor **A** shows, some 20% of the candidates thought spores could move through the tube. This would not be possible, because there could be no air current to carry them. Reading and considering the other distractors, could have helped provide this clue to the answer.

HUMAN AND SOCIAL BIOLOGY

Paper 5096/02

Theory

General comments

Almost all candidates were able to complete both **Section A** and **Section B** questions as required, thus confirming that the time allowed for completion of the paper was adequate. A very small number of candidates (< 1% total entry) did not comply with the rubric for **Section B** and answered both **Question 10 (Either)** and **Question 10 (Or)**. Almost all such candidates also answered **Questions 8 and 9**.

In general, the overall performance of candidates was comparable with that seen in recent years, except that the proportion of stronger candidates was somewhat higher in this paper.

In **Section A**, whilst none of the questions proved to be too difficult some candidates appeared to find **Questions 5 and 6** more challenging than others in the section.

In **Section B** most candidates gave good answers to **Question 8**, but found parts of **Questions 9, 10(Either)** and **10(Or)** to be more demanding.

Detailed comments

Section A

Question 1 was concerned with various aspects of the structure and function of the human gut.

- (a) This required the identification of four foods (**A, B, C, D**) based upon the results of various food tests as shown in **Table 1.1**. The majority of candidates were able to correctly identify **(i) (ii) (iii) (iv)** as foods **A** (fat/lipid), **C** (protein), **B** (starch), **D** (sugar) respectively, but most failed to realise that food **C** also contained sugar and was therefore also a correct answer for **(iv)** thereby failing to score one of the available five marks.
- (b)(i) required candidates to label a diagram of the human gut (**Fig. 1.1**) to identify where fats (**F**), proteins (**P**) and starch (**S**) are first acted upon by digestive enzymes. A majority of candidates correctly labelled the duodenum, stomach and mouth respectively although confusion was sometimes apparent. Some candidates provided labels to locations in the gut where each of the substrates is digested but not the first location as was required by the question.
- (b)(ii) This question required candidates to link pH values of 2, 7 and 9 with specific regions of the gut (stomach, mouth and duodenum/ileum respectively) by completing **Table 1.2**. Some confusion/lack of knowledge was apparent. Many candidates scored at least one of the three available marks but a relatively small proportion managed to score all three.
- (c) showed a section through part of the wall of the ileum (**Fig. 1.1**) and required candidates to state how a villus, muscle layers and mucus respectively adapt the wall for digestion and/or absorption. Most candidates demonstrated a sound understanding and scored at least two of the three available marks.
- (d) This was concerned with the role of mitochondria in absorption of nutrients. Most candidates correctly identified the release of energy and the link to active uptake of digested substances, thereby scoring both of the available marks.

- (e) Here, candidates were required to name the respective sites of manufacture and storage of bile. Many candidates correctly identified liver and gall bladder and scored both of the available marks. Common errors included confusion of liver/gall bladder as the site of manufacture/storage and involvement of the pancreas and confusion of the gall bladder with the (urinary) bladder.
- (f) This question required candidates to state the effect of bile upon (i) fats and (ii) peristalsis. A majority of candidates correctly identified the role of bile in the emulsification of fats, but some incorrectly referred to bile being responsible for the breakdown and/or digestion of fats. Fewer candidates correctly stated the effect of bile upon peristalsis, with guessing common. Some candidates simply described peristalsis and did not answer the question that was asked.

Question 2 was concerned with the structure and function of the heart, based upon a vertical section of the heart and its major vessels (**Fig. 2.1**).

- (a) required candidates to label **G** (right ventricle), **H** (left atrium/auricle), **J** (one of two venae cavae visible) and **K** (one of the four pulmonary veins visible). Many candidates correctly identified all four structures and scored the four available marks. Common errors included confusion of the right and left sides of the heart, confusion of the roles of atrium/auricle and ventricle, confusion of the major vessels.
- (b) This required candidates to deduce from the information contained in **Fig. 2.1** why the left ventricle generates four times the pressure of the right ventricle. A majority of candidates made correct reference to the thicker/more muscular nature of the wall of the left ventricle. Some candidates made loose reference to the left ventricle being larger/bigger than the right ventricle and so did not score the available mark.

Question 3 was concerned with aspects of the human menstrual cycle, based upon graphs showing the thickness of the uterus lining and the concentration of progesterone in blood during the cycle (**Fig. 3.1**).

- (a) required candidates to interpret **Fig. 3.1** to state at what time (i) the lining first shows signs of repair (ii) the concentration of progesterone begins to rise (iii) the lining reaches maximum thickness. A relatively small number of candidates correctly identified (i)(ii)(iii) as falling anywhere in the correct respective ranges of 3/4/5, 14/15/16, 10/11/12 days respectively to score all three of the available marks. Many candidates, however, scored at least one of the available marks. A significant number of candidates incorrectly stated ranges which were too wide to score marks.
- (b) This question was concerned with progesterone. (b)(i) required candidates to name the organ that produces progesterone. A large majority of candidates correctly named the ovary (corpus luteum was an acceptable alternative). (b)(ii) asked how progesterone reaches its target. Most candidates correctly identified blood, but others gave a variety of incorrect answers (e.g. oviduct).
- (c) Candidates were required to name the hormone predominant in the first two weeks of the cycle. A large majority correctly identified oestrogen/estrogen, but some confused this hormone with progesterone.
- (d) For this question, the interpretation of a bar chart (**Fig. 3.2**) was required. This showed mass increases of different regions of pregnant woman's body at the end of pregnancy and in (d)(i) candidates needed to calculate the total mass increase during pregnancy. A large majority of candidates correctly gave the answer of 10.00 kg by adding all the individual masses shown in the bar chart. A very small number of candidates made an error in the addition and failed to score the available mark. Part (d)(ii) required candidates to express the percentage of the total mass increase which was due to fetal tissues i.e. fetus plus fetal membranes ($3.50 + 1.25 = 4.75$ kg, then $4.75/10.00 \times 100 = 47.5\%$). Of the candidates who correctly identified 10.00 kg for the total mass in (d)(i), a significant number were unable to identify/totalise the mass comprising fetal tissues (usually missing out one of the two components) and convert this to a percentage of the total mass, thereby failing to score one or more of the available three marks. It was gratifying, however, to see that a majority of candidates were able to handle data and graphical representation of data in a competent manner.

Question 4 was concerned with the transmission of diseases.

Candidates were required to name an example of each of five disease types described in **Table 4.1**. The majority of candidates were able to correctly complete **Table 4.1** to score the five available marks. Common errors included non-protozoan diseases e.g. schistosomiasis linked to protozoan, malnutrition linked to nutritional deficiency, bacterial diseases e.g. gonorrhoea linked to virus via semen, HIV (cause, not disease) linked to virus via semen. Notwithstanding these errors, the overall standard of answer to this question was encouragingly high.

Question 5 was a genetics question dealing with albinism as an inherited condition. The phenotypes of individual from two linked families were shown in **Fig.5.1**, which candidates were asked to interpret.

- (a) required candidates to identify the genotypes of individuals numbered 2, 3, 4, 8 using alleles **N** and **n**. Many candidates correctly identified all four and scored the four available marks, whilst others correctly identified one or more, scoring accordingly. In some cases, knowledge/understanding was poor and much guesswork was apparent. A small number of candidates failed to use **N** and **n** as instructed, and so did not score.
- (b) This required candidates to state the chance of individual 12 being (i) an albino (ii) an albino boy. Whilst a significant number of candidates gave the correct answers of (i) 50% or $\frac{1}{2}$ or 1:1 etc. (ii) 25% or $\frac{1}{4}$ or 1:3 etc. Many candidates appeared to struggle with this part of the question even where they had correctly answered (b)(i). The overall standard of answer to this question was generally encouraging.

Question 6 was concerned with structure and function of the human eye, a horizontal section through the eye being provided in **Fig. 6.1**.

- (a) Candidates were required to add four labels identifying (i) **P** (fovea), (ii) **Q** (anterior portions of either side of the retina - 2.5 cm from the front edge of the retina as shown in **Fig. 6.1**), (iii) **R** (blind spot). A majority of candidates correctly identified **P** (cones only) and **R** (no photoreceptors), but relatively few were able to correctly identify **Q** (many rods, few cones) as being the part of the retina sensitive to dim light. It was apparent that many candidates were guessing the location of **Q**.
- (b) Candidates were required to add a label identifying **M** (the iris). A majority of candidates correctly labelled **M**, but a significant number incorrectly labelled the ciliary body/muscle. The overall standard of answer to this question was slightly disappointing.

Question 7 was concerned with aspects of the carbon cycle which, shown in diagrammatic form in **Fig. 7.1**.

- (a) required candidates to identify **R** (photosynthesis), **S** (animal respiration) and **T** (burning of fuels) by selecting the correct term for **R**, **S** and **T** from a list which only contained one additional term (leaching). A very large majority of candidates correctly identified **R**, **S** and **T** thereby scoring the relatively easy three available marks.
- (b) This required candidates to state two reasons why 'slash and burn' clearance of tropical forest is thought to be partly to blame for a rising concentration of carbon dioxide in the atmosphere. Most candidates gave the two correct reasons, namely that fewer trees remain to utilise carbon dioxide in photosynthesis and the burning of trees releases carbon dioxide. A minority of candidates gave incorrect answers including some that were not linked to trees e.g. animal respiration. Overall, the standard of answer to this straightforward, less demanding question was high.

Section B

Question 8 was concerned with aspects of human reproduction.

- (a) Descriptions of the terms *fertilisation* and *implantation* were required. A large majority of candidates scored highly for a description of *fertilisation* (fusion, nuclei, gametes (ovum/sperm), forming zygote, in oviduct/fallopian tube) although there was occasional confusion between ovum and ovary. In general the descriptions given for *implantation* (after fertilisation, sinking/embedding of embryo, into endometrium or lining of wall of uterus) were of a slightly lower standard. The most common error was a lack of precision concerning location, with many candidates simply making reference to the 'uterus' which was too vague to score the relevant mark. Overall, most candidates performed well scoring at least four of the available six marks.

- (b) A full description of the pathway taken by oxygen from the mother's lungs to the fetal blood was needed here. The majority of candidates gave full and correct answers (describing the mechanism) and scored highly, with many obtaining all of the six available marks. Common weaknesses included failure to mention the role of red blood cells/ haemoglobin and sketchy descriptions of both the involvement of the maternal heart and transfer from maternal blood to fetal blood.
- (c) required an explanation of how smoking by mothers may reduce the supply of oxygen to the fetus. Once again a majority of candidates gave full answers describing the roles played by carbon monoxide and (less often) nicotine, scoring at least two of the available three marks.

Overall, the standard of answer to this question was pleasingly high, with a majority of candidates scoring a significantly high number of marks.

Question 9 was concerned with aspects of structure and function of the skin.

- (a) Here, candidates were required to describe and explain the changes which take place in the skin to prevent our body from overheating. Many candidates were able to provide a full and accurate answer and scored at least four of the available six marks. Some candidates erroneously referred to (vaso)dilation of capillaries rather than arterioles. Arterioles dilate in order to provide increased blood flow to capillaries at the surface of the skin, thereby losing heat. Some candidates did not mention the different ways by which heat may be lost i.e. conduction, convection and radiation. Most candidates referred to the role of sweat/sweating in the loss of heat but, in some instances, marks were lost by answers lacking sufficient detail. In particular, the importance of the evaporation of sweat was often inadequately covered. The majority of candidates scored more highly on this part as compared with the rest of the question.
- (b)(i) This required an explanation of why we continue to lose heat even when the air temperature exceeds 40 degrees C. Very few candidates were able to provide a sufficiently adequate explanation. The reasons sought were that heat loss by conduction/convection/radiation ceases, the rate of evaporation of sweat increases due to the high air temperature and so heat continues to be lost. Most candidates scored poorly (often zero) on this part of the question.
- (ii) required an explanation of why hot and humid conditions are less comfortable than hot and dry ones. The reasons sought were that in humid conditions evaporation of sweat is slow/nil resulting in accumulation of sweat on the skin, together with reduced cooling. Whilst more candidates gave adequate answers than in (b)(i), lack of detail/imprecision was again a common failing. Most candidates scored only one mark for this part of the question.
- (iii) required candidates to explain why babies may need a blanket when adults do not. The important reason why this is the case is that babies have a much larger surface area (or higher surface area to volume ratio) and therefore lose heat more easily/quickly than an adult. Relatively few candidates identified both of these reasons, although a significant number did mention relative heat loss and scored accordingly. A large proportion of candidates gave accounts which included less significant factors related to insulation and hair. Most candidates scored poorly on this part of the question.
- (iv) required an explanation of why sportsmen playing in the sun for several hours now cover exposed areas with protective sun creams. The reasons sought were that sunlight includes damaging ultra violet (UV) radiation which may cause mutation and/or result in skin cancer. Whilst relatively few candidates provided full answers, a majority did manage to score one or two marks. The most common issue was lack of detail e.g. vague references to sunlight linked to sunburn or tanning.

Overall, the general standard of response was disappointing with most candidates scoring significantly lower marks than they had obtained for **Question 8**.

Question 10(Either) was concerned with aspect of malaria. It was by far the more popular of the two options for **Question 10** and was answered by approximately 90% of candidates.

- (a) This question required candidates to describe the signs and symptoms of the disease, which were headache, high and periodic fever, sweating and shivering. A majority of candidates correctly identified at least two or three of these and scored two or three of the available four marks. The periodic nature of the fever was often omitted. Some candidates described non-specific symptoms such as aches and pains, often in an account which also mentioned one or more of the correct signs and symptoms.
- (b) Here, candidates were required to use the information shown in **Fig. 10.1** (showing the life cycle of the malaria parasite) and their knowledge of vaccines to explain why it has proved so difficult to make a vaccine that is 100% effective against malaria. The reasons sought were (i) there are several kinds of malaria (ii) requiring different antibodies (iii) parasites live/reproduce inside red blood cells (iv) parasites live/reproduce inside liver cells (v) parasites spend little time in blood (vi) so there is little time for the immune system to attack parasites (vii) the surface antigens of parasites may change. Overall, the standard of answer to this part of the question was extremely disappointing, with very few candidates scoring more than two of the available five marks and many scoring zero. It appeared that even when candidates made use of the information contained in **Fig. 10.1**, their background knowledge/understanding of immunity/immunology was not sufficient to produce an adequate answer to the question.
- (c) required candidates to give three reasons why not all mosquitoes are capable of infecting humans. The reasons sought were not all mosquito species carry malaria, not all mosquitoes bite humans, only adult mosquitoes bite humans, only female mosquitoes bite and not all female mosquitoes are infected with the parasite. In general, candidates provided good answers which scored at least two of the available three marks, and often all three.
- (d) required three ways of reducing the numbers of the mosquito. The measures sought were removal/avoidance of stagnant water, use of oil on water, use of insectivorous fish, use of *Bacillus thuringiensis*, use of insecticides and sterilisation of male mosquitoes. Most candidates scored highly in this part of the question, often achieving all three of the available marks. The answers provided were usually full and indicated a good understanding of the subject matter. One particularly common error was non-specific reference to the use of pesticides rather than insecticide.

Overall, the standard of answer to this question was mixed. Answers to **(a)**, **(c)** and **(d)** were generally good, whilst the standard of answer to **(b)** was almost universally weaker.

Question 10(Or) was concerned with aspects of schistosomiasis. It was much the less popular of the **Question 10** options and was selected by only approximately 10% of candidates. The life cycle of *Schistosoma* was shown in **Fig. 10.2**.

- (a) Candidates were asked to describe the signs and symptoms of the disease, which are lethargy/tiredness, anaemia, blood in urine/faeces, pain when passing urine/stools, liver damage. The general standard of answer to this part of the question was rather disappointing with most candidates only managing to score one or two of the four available marks. Liver damage almost never appeared in answers. Common errors included mention of high temperature/fever, vomiting, pain.
- (b) required an explanation as to why one contact with an infected mosquito can lead to malaria while repeated larval contacts are needed to produce symptoms of schistosomiasis. The reasons sought were that the malaria parasite reproduces asexually in red blood cells and also in the liver thereby increasing numbers, whereas with schistosomiasis there is no asexual reproduction in man with one larva giving rise to one adult which then produces symptoms. Very few candidates provided answers which contained sufficient correct detail to score a significant number of the five available marks. In the majority of cases answers were of a disappointing standard, scoring only one or two (sometimes zero) marks. In general candidates did not appear to have sufficient knowledge of the respective life cycles of the causative organisms of malaria and schistosomiasis in order to make the comparison required by the question.

- (c) This required candidates to explain why schistosomiasis is more common in children. The explanation sought were that children are more likely to play/paddle barefoot in water by larvae and therefore it is more likely that larvae will penetrate the skin of children. candidates correctly identified one or two of these factors and scored marks accordingly, relatively few scored all three of the available marks
- (d) required candidates to explain fully why several species of rat are referred to as a *reservoir of infection* for schistosomiasis. The explanation sought was that rats are a source of eggs/worms even if the parasite is absent from humans and are able to re-infect both snails and humans. The majority of candidates gave very imprecise answers which lacked relevant detail. For this reason, scores were very low with few candidates scoring more than one of the three available marks. It was evident that a majority of candidates have little or sketchy knowledge/understanding of the concept of a reservoir of infection.

Overall the general standard of answer to this question was moderate. Most candidates provided better answers to (a) and (c) as compared with (b) and (d).