



# CONTENTS

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<b>HUMAN AND SOCIAL BIOLOGY .....</b>	<b>1</b>
<b>GCE Ordinary Level .....</b>	<b>1</b>
Paper 5096/01 Multiple Choice .....	1
Paper 5096/02 Paper 2 .....	3

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## FOREWORD

This booklet contains reports written by Examiners on the work of candidates in certain papers. **Its contents are primarily for the information of the subject teachers concerned.**

# HUMAN AND SOCIAL BIOLOGY

## GCE Ordinary Level

Paper 5096/01  
Multiple Choice

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

### General comments

A standard deviation of 7.32 (18.3 %) was obtained, with a mean score of 22.28 (55.7%). The standard deviation is the best for many years, but the mean is slightly lower.

Two of the three questions with a low discrimination (Point Biser.) **16** and **33**, showed a general lack of knowledge and that guessing occurred. Candidates found **Questions 10, 19, 30** and **32** easy with facilities (Proportion Correct) beyond 0.800. They did however all test important syllabus objectives and it is good to see they are well known.

Most questions, as shown by **6, 18, 23** and **38** that had lower facilities (below 0.340), all had a reasonable discrimination, indicating they were performing well and extending the better candidates.

It is pleasing to note that questions involving deductions from data, diagrams and graphs are being well answered. This is particularly shown by **Questions 4, 7, 11, 26, 34** and **40**.

**Comments on specific questions****Question 10**

This proved a little easy, but it is good to see that so many know the importance of iron in the diet and that the other nutrients were not important for the function stated.

**Question 16**

The positive distractor option **A** that lymph bathes the tissues, shows the distinction between lymph and tissue fluid is not understood. Also, had candidates known that lymph drains away from tissues; they would not have caused the other positive distractor, by selecting option **B**, that lymph carries antibodies to tissues. The Examiners suggest candidates concentrate on the differences between plasma, tissue fluid and lymph because these differences are commonly misinterpreted.

**Question 30**

This question is typical of the other ones that were easy; they cover important syllabus topics that are thoroughly covered. Here 92% of the candidates correctly knew that infected towels could spread ringworm.

**Question 32**

As in **Question 30** above, this was also found to be easy because, with very good reason, AIDS is thoroughly taught nowadays. At first sight this does not appear a particularly easy question, needing to know that lymphocytes destroyed in AIDS are not available to help in other infections.

**Question 33**

It is easy to see how option **D** became a positive distractor because so many thought that urea in sweat causes the body to smell. Urea is associated with excretion and urine and so was thought to produce the smell. This tests syllabus objective 12 (a) 'discuss the importance of cleaning the body'. We thought this should include the fact, that bacteria, which are removed by washing, generate skin and body smells. The question does not expect candidates to know that urea is generally odourless, or may slightly smell of ammonia.

<p><b>Paper 5096/02</b></p>
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<p><b>Paper 2</b></p>
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### General comments

It is pleasing to report that there were no cases of candidates attempting both alternatives of **Question 10**. A few failed to answer three (**B**) questions, but this did not seem to be due to shortage of time, so candidates should be congratulated on obeying the rubric. However, in **Question 8**, a significant number failed to present part (**a**) in the form of a table, as requested. Very full answers were recorded to all the (**B**) questions, but **Question 8** was the weakest section of the paper, with candidates failing to tailor their answers to the questions posed here. The two **Question 10's** proved equally popular.

### Comments on specific questions

#### **Question 1**

- (a) This required the linkage of four stimuli to the appropriate receptors.

The answers accepted were: sound energy to inner ear, chemical to nose or tongue, temperature change to skin or tongue and light energy to retina. The last was unfailingly correct but a large number of candidates coupled temperature to the nose.

- (b) Two recordings were shown of impulses from a neurone connected to a touch receptor, one from a gentle touch and one from a harder touch. The differences were in the spacing or frequency of the impulses – 4 impulses in 5 seconds as against 4 in 2.5 seconds. The similarities were that the impulses showed the same electrical change – 100mV, or the same amplitude. Many candidates could not express the idea of frequency (impulses per second) and talked of 'speed of impulses'.
- (c) The recording apparatus would have been connected to a sensory neurone. Predictably, relay or motor neurone were common wrong answers here.
- (d) This showed drawings of a motor and a sensory neurone. Using these, the similarities were that each had a cell body, an axon and dendrites and their processes were myelinated. Two answers were needed. Two differences were that the motor neurone had short dendrites that surrounded the cell body and a long axon: the sensory neurone had a long dendron and a short axon. Other differences apparent in these figures were that the sensory neurone had a smaller cell body, its nodes were more distinct and its axis cylinder was thinner than that of the motor neurone. Answers relating to the functions of the neurones were also accepted here.
- (e) A nerve is a collection of neurones, not a single cell. Surprisingly few knew this.
- (f) This showed the circuit controlling the knee-jerk reaction. Candidates had to label the axons of the two neurones and the effector in this circuit. Axons and dendrons were often confused and leg bones were sometimes labelled as the effector.
- (g) This circuit is called a reflex arc because it is an 'automatic' circuit not involving conscious thought. It was shown to involve the spinal cord and not the brain.
- (h) This section asked for differences between the endocrine and nervous systems. This was often poorly answered. The answers expected were: the endocrine system uses chemicals (not impulses); the chemicals are all different, whereas the impulses are the same; hormones travel in the blood not in neurone-circuits; hence the endocrine system is slower; it has usually several targets and its effects are often longer lasting than the nervous system. While many candidates knew of specific hormones, as they showed later in the paper, they did not understand the general nature of the endocrine system.

#### **Question 2**

This involved extracting information from a bar chart. On the whole this was well done. The answers were: vitamins B, A and D plus calcium and iron. Weaker candidates answered cereal instead of vitamin B.

**Question 3**

This showed the life cycle of a parasite, a tapeworm. All the answers could be obtained or inferred from the figure.

- (a)(i) Thus, two ways of preventing the spread of the parasite were to dispose of human faeces in a sanitary manner, so the pig did not contact them; cook the pork thoroughly to kill the cysts in the meat. Simple references to cooking the pork were not considered to be sufficient for the mark.
- (ii) To detect infection in the human and the pig one would examine the faeces for embryos in the former, and the pork meat for cysts. Many candidates were not sufficiently specific here. Weight loss and large appetite in the human were also accepted here.
- (b) The worm has no gut and is several metres long but the diagram shows it to live in the ileum. It is, therefore, surrounded by already-digested food and can absorb these products through its surface area, since they are soluble. Relatively few candidates got both these marks, although the clues were in the question.

**Question 4**

This showed three cubes of decreasing size and below tabulated their side-lengths, surface areas and volumes.

- (a) Candidates were asked to calculate the ratio of surface area: volume for two of the cubes. The answers were 1.2 and 6. These were not always correctly calculated.
- (b) As the cubes get smaller this ratio increases in size.
- (c) The three cubes were then filled with boiling water and allowed to cool. Their temperatures were taken over 15 minutes and these were expressed as three lines on a graph. Candidates were expected to use the information they obtained in the first two parts to identify which line represented which cube. Cube A has the smallest surface/volume ratio and so cools slowest; cube C cools faster, since it has the larger ratio. This is an important ratio in biology and needs thinking about. Many candidates did their sums correctly but failed to appreciate the significance, guessing the answers.

**Question 5**

This showed vertical sections through the female and male urino-genital systems.

- (a)(b) Candidates were asked to label where meiosis occurred and where urine was stored. Some confused the uterus and the bladder, while others showed a lack of precision labelling the epididymis rather than the testis.
- (c) The urethra in females and males carries urine from the bladder, but also carries semen in the male. *Carries sperm* was also accepted here. Some candidates confused the ureter and the urethra, since they described the urethra as carrying urine to the bladder.
- (d) The testes are carried outside the body cavity, since the temperature is too high for sperm production or viability. The scrotum supplies the necessary cooler temperature. This question was usually a high scoring one.

**Question 6**

This showed the inheritance of albinism through three generations in two families linked by marriage.

- (a) The missing genotypes were  $rr$ ,  $Rr$ ,  $Rr$  and  $Rr$ .
- (b) Candidates were required to construct a genetic diagram to show the possible offspring of two heterozygotes. Most were able to do this, predicting the following offspring:  $RR$ ,  $Rr$ ,  $Rr$ , and  $rr$ , but many failed to show the gametes and so missed one of the marks. Some, however, did not use the letters  $R$  and  $r$  as instructed and so failed to score.

**Question 7**

This showed the four stages in the life cycle of the anopheline mosquito.

- (a)(i) The larval stage is killed by *Bacillus thuringiensis*. A pleasing majority knew this, although spelling was often only approximate.
- (ii) The bacterium does not kill the pupa, because it has to be ingested in order to kill and the pupa does not feed. Relatively few candidates had grasped this point. Instead, they talked of the pupa having a thick shell.
- (b) Two methods of control effective against both larvae and pupae included putting oil or insecticide in the water, introducing fish or draining the water source.

**Section B****Question 8**

This question was often the lowest scoring one in **Section B**. Candidates could not explain how the different vessels do what they do and a significant number threw easy marks away in (a) by not using a table, as requested.

- (a) Suitable answers included:

feature	artery	vein
lumen	smaller	larger
wall thickness	thicker	thinner
muscle tissue	more	less
elastic tissue	more	less
valves	no	yes

- (b) Arteries are elastic, so they can expand with the surges of blood, reducing the peaks of pressure coinciding with the beat of the ventricles.

Being elastic they recoil between beats helping to increase pressure. Hence the peaks and troughs in the graph are ironed out as the blood flows through the arteries.

Veins run over the body muscles. When these contract as we move, they squeeze the veins. Blood is pushed towards the heart, since the valves in the veins prevent backflow.

- (c) Arterioles have muscular walls and each supplies a bed of capillaries. When the arteriolar muscle contracts less blood reaches those capillaries; when vasodilation occurs, more blood flows.

- (d) Capillary flow is slow to allow time for the exchange of tissue fluid and blood chemicals such as oxygen. The flow is low pressure so as not to burst the thin walls.

Many candidates got the point of the valves in the veins but few knew of the elastic properties of the arteries, even if they quoted them in part (a). Few could relate the familiar concepts of vasoconstriction and vasodilation to the arterioles in this context.

**Question 9**

- (a) This section asked for the differences between a bacterium and an animal cell. Many scores were low here, some even referring to plasmids in the former. The answers expected were: bacteria have cell walls but no nuclei; they lack mitochondria and are smaller. References to slime capsules and chlorophyll were not allowed as not being true of all. Animal cells do have ribosomes but they are of a different size.
- (b)(i) Bacteria decompose humus and excreta forming ammonium compounds. Nitrifying bacteria convert these to nitrates. In addition nitrogen fixing bacteria either free in the soil or in root nodules on legumes turn atmospheric nitrogen into nitrates. Some answers were very full here, but for many this part of the syllabus is a source of real confusion.
- (ii) Sewage is separated into sludge and liquor. The sludge is digested by anaerobic bacteria in a closed tank forming methane and eventually a harmless residue. The liquor is treated in a trickling filter or is aerated to boost the aerobic bacteria which attack the organic material, breaking it down to inorganic salts.
- (d) River water is first exposed to ultra-violet radiation from the sun's rays in a reservoir. This kills some bacteria. It is then passed through filters which strain off bacteria and sediments. In addition algae release oxygen which kills anaerobic bacteria and protozoa ingest others. Finally the water is chlorinated which destroys all that are left.

Although there was some confusion between sewage and water treatment, many candidates scored well here.

**Question 10 Either**

- (a) Apart from in urine, the body regularly loses water in breathing, sweating, faeces and in tears. Vomiting was not considered a correct response, nor was bleeding unless qualified with a reference to menstruation.
- (b)(i) Water reaches the kidney in the blood of the renal artery. Blood is filtered at the glomeruli and enters the nephrons at the Bowman's capsules along with other small molecules including salts glucose and urea. Most of the water (some 85%) is absorbed back into the capillaries surrounding the proximal convoluted tubule. The remainder passes round the rest of the tubule where varying amounts are also reabsorbed. In all some 98-99% is reabsorbed.
- (ii) When water is scarce in the blood, the hypothalamus detects this and instructs the pituitary gland to secrete more ADH. This makes the distal convoluted tubule and collecting ducts more permeable, so even more water is withdrawn from the filtrate, resulting in a concentrated urine. These two sections were worth 6 marks in total, and for such a well-known part of the syllabus high scoring was expected.

However, for many of the weaker candidates, kidney functioning remains at best sketchily understood.

- (c) Here candidates were asked to devise an experiment to find out the effect on themselves of heavy sweating on urine production. The outline is simple: day 1 drink some water, exercise hard for a time, collect the urine and measure its volume or its concentration by its colour. Day 2 repeat but with no exercise. Candidates who had done some practical exercises realised the devil is in the detail! The experiment must be closely controlled to make the two halves comparable. You must start with the same volume of water drunk; exercise or rest for the same time-period; collect the urine over the same period and, finally compare the two samples. The ambient temperature and diet should be as nearly the same as possible. Weaker candidates floundered here with no attempt to control the conditions on the two days of the experiment; little idea of what to measure or how to measure it. Once again practical applications are a real problem for many.

**Question 10 or**

- (a) Three non-enzyme proteins in the body could include fibrinogen, haemoglobin, antibodies, collagen, insulin, elastin or muscle protein. Weaker candidates put down named enzymes (in spite of instructions not to use them), others said hormones when only a few are proteins.
- (b) Protein digestion begins in the stomach where pepsin, in an acid environment hydrolyses proteins to polypeptides. This is continued in the duodenum by trypsin (another protease) and then in the ileum by various peptidases which convert the peptides to amino acids. References to pepsinogen, trypsinogen and enterokinase were also seen in the best answers.
- (c) This was another experimental design question. Given some protease and some cooked egg white, candidates were asked to find the effect of pH on the enzyme. Since the protease could be a pepsin or trypsin type, a range of different pHs must be used-three is the minimum-one acid, one neutral and one alkaline. Apart from using at least three tubes, candidates were rewarded for comparability – the same amount of egg white each time; the same amount of enzyme; how this would be achieved; how the different pHs could be obtained; the use of a water bath to make the temperature the same and, finally, running the tubes for the same time interval before testing. It was assumed that candidates would recall that cooked egg white is a solid, so digestion would be marked by its disappearance. In fact most chose to do a biuret reaction on the tubes. Although this would probably be positive each time due to the protein of the enzyme there, it was credited here as a feasible solution. It was again the lack of controlled conditions-comparability – that marked the weaker candidates.