HUMAN AND SOCIAL BIOLOGY

Paper 5096/01
Multiple Choice

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

General comments

A total of 510 candidates sat this paper and a standard deviation of 7.51 (18.8%) was obtained, with a mean score of 24.16 (60.4%). The smaller number of candidates entered this year has produced fairly good statistics, but this small sample needs interpreting with some caution. Unusually, six questions obtained discriminations (point biserals), of .50 or above. There were a number of high scoring questions that fortunately also obtained a good discrimination as shown by **Questions 2**, **6**, **11**, **12**, **13**, **18**, **19**, **21** and **29**. These questions accounted largely for the higher mean score. Of these **Questions 11**, **12** and **21**, all with the facility (proportion correct) above .800 proved too easy. **Questions** such as **5**, **20**, **26** and **39**, which were difficult and intended to extend the brightest candidates, were well answered and obtained reasonable facilities.

Comments on specific questions.

Question 5

This was expected to prove a difficult question, because the arrow 'from' the atmosphere showing the process of photosynthesis, was the correct answer for the oxygen to 'enter' the atmosphere. Consequently the weaker candidates guessed wrongly and chose options where arrows went 'to' the atmosphere.

Question 8

Option B was a positive distractor; no doubt because many candidates knew that milk contains fat and protein. They did not know that the concentration is smaller than was shown by the bar charts and that sugar is also present.

Question 11

This proved far too easy with 91% of the candidates getting it right. It shows that candidates have a pleasing knowledge of the definitions of defecation, constipation and diarrhoea.

Question 16

More candidates chose the incorrect answers than the correct one. This guessing of answers appears to show a weakness in interpreting simple graphs and probably operating simple arithmetic. No doubt many candidates did not note that the answers were expressed per minute, while the graphs showed a 30 second period.

Question 39

This tests syllabus ***Section 14.(f)***, the part played by microorganisms in making sewage harmless. The answer option C, is that some other microorganisms ingest bacteria in a food chain. However, some very advanced, specialised sewage disposal works, do use bacteria that can absorb certain metallic ions. Also while most 'nitrogenous waste' is rarely harmful, young babies can be affected by drinking it in high concentrations. It is also unfortunate that 'nitrogenous waste', interpreted in sewage disposal as inorganic, could be interpreted more widely, since nitrogen is a constituent of organisms. Hence by applying highly specialised knowledge, options A and D could be deemed correct in some circumstances. Nevertheless, the obvious correct answer at this level is option C. With these faults this is a poor question and it would not be used again with these options.

HUMAN AND SOCIAL BIOLOGY

Paper 5096/02

Paper 2

General comments

Where a choice was offered, most candidates decided to avoid the experimental-design option (**Question 10 Either**) choosing instead the more descriptive **10 Or.**

It was pleasing to note that the graphical parts of the paper were often completed in good style, although many candidates failed to anchor their descriptions to the axes or quote actual figures, when describing the curve.

Candidates should be instructed that a question beginning with 'Explain' requires a different answer from one that says 'Describe'.

Detailed comments

Question 1 showed a diagram of the liver, a piece of intestine and three associated blood vessels. In part **(a)** the names of the vessels were the hepatic artery, the hepatic vein and the hepatic portal vein. Most candidates could identify all three, but there was some confusion with *renal* vessels. In **(b)** the vessels which would have the most glucose, carbon dioxide and oxygen were, respectively, the portal vein, hepatic vein and the hepatic artery. The majority of candidates identified these correctly.

Part **(c)** required candidates to transfer readings for concentrations of urea from a table onto a grid supplied on the paper and to label the line so formed *urea*. Once again this was usually accomplished correctly and neatly, although some forgot to label the line. In **(d)** the two lines on the graph - one for amino acids and the other for urea - were to be described, after the liver was removed. The answers expected were: the amino acid line rises to 5.5 units after+ 60 minutes and then levels out (at 5.5); the urea line falls to zero, steeply from 0 to + 60 minutes and then more slowly from + 60 to + 90 minutes. Weaker candidates said little more than the one increased while the other fell, without reference to amounts or time.

The process illustrated by these changes is *deamination*.

In **(f)** the explanations for the changes in the two curves are that urea falls to zero, since it is being removed from the blood in urine by the kidney; the amino acid curve levels, since without the liver no more amino acids are broken down. The role of the kidney was not often appreciated here.

Question 2 dealt with length-changes in chips cut from a yam and placed in three different sugar solutions. In **(a)** explanations of the results were requested, not descriptions. In D the chips become longer, since water has entered the chips from the solution, because the solution must be more dilute/have a higher water potential than the solution in the chips. In F the chips become shorter by losing water to the external solution, since the chips are more dilute/have a higher potential than the external solution.

The solution showing the least change in chip-size is E, so this must approximate most closely to the solution in the chips.

One other way in which changes could have been measured was by changes in mass. Answers suggesting volume were allowed but not width, since such changes would have been too small to measure. In such an experiment the chips should be taken from the same yam, since different yams will have different water potentials. Better candidates recognised osmosis in action and could explain the results; weaker ones merely described them or confused concentrations and potentials.

In **Question 3(a)** the tube entering each balloon represents a bronchus, not a *bronchiole*; the tube entering the bell jar is the trachea and the rubber sheet is the diaphragm.

In **(b)** the balloons inflate when the sheet is pulled down, because the volume in the jar increases; the pressure there decreases; so external pressure is now greater than inside the jar and air is sucked in. Again, an explanation was required.

This model does not explain inflation fully, since the jar is rigid and does not equate to the chest wall with its intercostal muscles and flexible rib-cage. Most candidates scored well here.

Question 4 showed two thermometers. **(a)** The clinical thermometer has a kink in the mercury column close to the bulb and its scale is different.

(b) to take your temperature you should shake the clinical thermometer to lower the mercury, place it under the tongue for 30 secs. to 1 minute, remove and read.

(c) To read a baby's temperature one would place the thermometer in the armpit or the rectum, not the mouth. Again, this question was well done in general, although the importance of shaking down the mercury was not always appreciated.

Question 5 was concerned with the results of a common experiment on photosynthesis. In **(a)** the chemical making the leaf green is chlorophyll; that used in testing for starch is iodine, or more correctly a solution of iodine in potassium iodide.

(b) wanted an explanation of the results shown, not merely a description. The green areas of the variegated leaves have chlorophyll, the white do not. Leaf G is exposed to light, so photosynthesis occurs in these green areas as shown by the blue/black colour, when tested with iodine solution, showing the presence of starch. Leaf H had no light, so made no starch and so was brown when tested with the iodine solution.

Question 6 was concerned with the formation and return of tissue fluid. Hydrostatic pressure falls as blood passes along a capillary, since tissue fluid is escaping. However, the osmotic pressure remains the same, since the proteins which cause it are too large to escape with the tissue fluid.

In **(b)** some tissue fluid passes into the lymph vessels where it is squeezed on by tissue movements assisted by valves. It passes through lymph nodes and empties into the veins close to the heart. This was a 'describe' question but the details were seldom given.

Question 7 showed a diagram of how athlete's foot may be spread. In **(a)**, three ways to reduce the spread include: dry feet thoroughly, especially between the toes; do not share towels; wear shoes in the changing room and dust feet with talc or an anti-fungal preparation.

The type of organism that causes the infection is a fungus. Most candidates could extract this information from the diagram and so scored reasonably well.

In ***Section B***, **Question 8** was concerned with insect vectors of disease as illustrated by the housefly and the mosquito.
A vector is an organism that spreads a disease but is not itself affected by it. Few achieved the second point here.

(a) In the spread of typhoid, the fly is attracted to faeces which may be infected. The bacteria are collected on its feet, hairy legs and body and are sucked up into its mouthparts. Both sexes are involved and when visiting our food or kitchens, the bacteria may be deposited, so spreading the infection when we eat the food.

(b) In malaria, the female mosquito sucks blood to help develop her eggs. If the person she feeds on is infected, gametes of the protozoan parasite are ingested and reproduce inside her passing special infective stages, sporozoites, to her salivary glands. These are injected into the bloodstream of her next food-source, so infecting that person.

(c) To reduce the number of flies kitchen waste should be bagged, burned or buried to avoid giving the flies a breeding ground. Alternatively, rubbish can be sprayed with insecticide or turned regularly to bury and 'cook' the larvae and pupae. Insecticides can be used in the house together with fly papers and screens to keep them out. Faeces should be disposed of properly, not left exposed.
Good candidates displayed their knowledge here and often scored well. Some answers to **(c)** were vague and tended to confuse the two insects. Some thought that mosquitoes became infected simply from living in swamps.

Question 9 asked for detailed differences between three pairs of biological substances.

Aqueous humour is found in the anterior chamber of the eye, in front of the lens. It is thus in contact with the iris and the cornea and is a watery fluid allowing movements of those structures. It assists in refracting light between the cornea and the lens. Vitreous humour is a more jelly-like fluid found behind the lens in the posterior chamber of the eye. It bathes the retina and helps maintain the shape of the eyeball.

Glycogen is an insoluble polysaccharide, assembled from lots of glucose molecules for storage in the liver and the muscles. Glucagon is a protein, a hormone made in the pancreas and carried in the blood to the liver and muscles, where it directs the conversion of glycogen to glucose.

An antibiotic is a chemical made by fungi or bacteria (or assembled in the laboratory) which inhibits or kills bacteria. Although some are narrower in their target species than others each is not specific, but can be taken into the body to help destroy infections. Its effects are short lived, many being removed in the urine.

Antibodies are proteins assembled by lymphocytes in the body in response to foreign antigens. They help destroy the antigens, viruses included, and are specific in their action. They are often long-lasting in the body and are the basis of our immune response. They may be supplied to the body in anti-sera or in mother's milk during suckling.

This question provided a huge range of quality in the answers with many scoring very well. Weaker candidates confused the terms or gave little detail.

Question 10 Either began by asking how heat and carbon dioxide from respiration were released from the blood. This was a 'describe' question and so details were expected. Carbon dioxide is carried to the lungs where gaseous exchange occurs by diffusion down concentration gradients across the huge surface area of the alveoli. It is then breathed out, taking some heat with it. Heat is also lost in the urine but mainly via the skin by radiation, conduction and convection and by the evaporation of sweat. These processes are accelerated by vasodilation, when more blood is sent into the surface capillaries by dilation of the skin arterioles. Some eighteen separate marking points here gave the candidates plenty of scope to score their ten points.

In **(b)** candidates were asked to show that a person produces more carbon dioxide during exercise than at rest, given that when carbon dioxide is blown through lime water it produces a chalky suspension. This is a fairly simple experimental technique to design but the question was avoided by over 90% of the candidates, and those that did try it progressed little further than suggesting one should blow through the lime water at rest and then after exercise. Few suggested <u>how</u> to blow through the test solution or how to estimate the <u>degree</u> of cloudiness. Fewer still noted that the same <u>volume</u> of limewater should be taken for each test or that the <u>length</u> of blow should be the same, as should the test-apparatus. Experimental design remains a difficult area for most candidates, but will continue to be tested.

Question 10 Or (a) asked how the body uses water. Answers expected here were that the body is composed of about 80% water; water is both a solvent for the cell's chemicals; a medium for enzyme action and a transport medium as illustrated by blood, lymph, tissue fluid and urine. It is a reagent in hydrolysis and so is central to digestion. It removes latent heat from the blood when it evaporates and is incompressible, so helping to protect the foetus. Other general points were allowed but vague references to *preventing dehydration* were not.

(b) asked for a description of how water is removed from the blood in the kidneys and excreted. Up to 5 marks were allowed for the following: blood arrives in the renal artery and is filtered at the glomeruli. In each nephron, the water passes as the filtrate into the tubule, thence to the collecting ducts and into the ureters. From here peristalsis takes it to the bladder. On relaxing of the sphincter at the neck of the bladder, urine is passed out via the urethra. Most candidates scored well here, although there were the usual confusions between *ureter* and *urethra*.

In part **(c)** an explanation of how the urine could be made more concentrated was requested. The mechanism, well known by many candidates is: water-lack in the blood is detected in the hypothalamus. The pituitary gland is stimulated to release <u>more</u> ADH. This hormone makes the collecting ducts in the kidney more permeable, so that more water is extracted from the filtrate by osmosis, hence the urine is more concentrated (and the water saved helps to dilute the blood). Weaker candidates continue to get confused by the details of this example of homeostasis.