HUMAN AND SOCIAL BIOLOGY

Paper 5096/01
Multiple Choice

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

A total of 602 candidates sat this paper and the overall statistics are very similar to those obtained last year with a mean of 22.15 (55.4%), a standard deviation of 6.5 (16.24%) and an alpha of 0.81.

The alpha shows a good distribution, but the reduced candidate entry may be responsible for a few abnormal statistics in individual questions, such as those for **Questions 2**, **4**, **32** and **36**. **Questions 1**, **4**, **9** and **32** requiring straightforward factual recall, all proved easy, with facilities of .800 or above. However, each tested recall of a syllabus objective and this does indicate a pleasing standard. As may be expected, questions such as **2**, **22**, **34** and **36**, where knowledge had to be applied in slightly unfamiliar context gave most difficulty. The general standard of the answers was very similar to last year with most questions performing as expected.

Comments on specific questions.

Question 1

Normally the paper starts with an easy question and candidates found this one very easy, with a facility of .810. It illustrates that the similarity between combustion in a car and respiration in organisms is well appreciated.

Question 2

Candidates should have known from the features of bacteria and viruses that each distractor was seriously wrong, even if their knowledge of nucleic acid was limited. Many candidates thought all viruses and bacteria are parasites, which is a very serious misconception. The basic features shown by bacteria and viruses need to be emphasised when teaching them.

Question 4

Although this question, with a facility of .890, proved too easy, it shows the term vector is well understood, that a mosquito can be identified from a diagram and it is responsible for transmitting malaria.

Question 9

Once again, this was an easy question, with a facility of .800, but shows good knowledge of the syllabus objective 3 (f), that iron is needed for haemoglobin formation and related this fact to the needs in pregnancy, syllabus objective 10 (h).

Question 32

This question proved particularly easy with a proportion correct of .940. In previous papers, ringworm has proved more difficult because of the association with 'worm'. This did not present a problem to these candidates, who show they are well aware that ringworm is a fungal infection.

Question 36

This is the worst performing question on the paper, where option D was a serious positive distractor. It shows that most candidates wrongly believe several booster vaccinations were used to help eliminate smallpox. Candidates also did not appreciate that had smallpox infected animals, they would have acted as a reservoir for the pathogen, making eliminating the disease much more difficult. Perhaps using in the question 'ticks' and 'crosses', together with the negative statement number 3, gave some interpretation difficulty.

HUMAN AND SOCIAL BIOLOGY

Paper 5096/02
Theory

General Remarks

There was no evidence that any candidates were short of time and almost all obeyed the rubric and answered only one alternative to **Question 10**. Once again, many answers to **Question 10** indicated a distinct unfamiliarity with practical procedures. However, the graphical exercise showed that nearly all could plot points and construct a graph from figures given.

Detailed Comments.

Question 1 was concerned with cells and tissues. In **(a)** two cells were pictured, a cheek cell and a root cell. The membrane, nucleus and cytoplasm were labelled on the cheek cell and candidates were asked to label the corresponding parts of the plant cell. Most candidates were able to do this correctly, although some labelled the cell wall as the membrane and a few confused the vacuole with the cytoplasm.

In **(b)**, a bacterial cell differs from either of the cells in **(a)** by not having a nucleus, (and by being much smaller), but would resemble a plant cell by having a cell wall. Having cytoplasm and a membrane were also acceptable answers. This was generally answered correctly.

In **(c)** candidates were asked to identify four cells from brief descriptions given. It is a bone cell or osteocyte which secretes calcium salts and protein fibres; a cone cell that has pigment responding to bright light; a red blood cell which contains haemoglobin and a gamete that is haploid. Many were able to identify correctly only the red blood cell here. Rods and cones were predictably confused and few got the bone cell.

(d) showed an elbow joint with five types of tissue labelled **A** to **E**. Answers were muscle, bone, ligament, cartilage and tendon. The correctly named muscle (triceps) and bone (humerus) were accepted for **A** and **B**. Tendon and ligament were commonly confused as was synovial fluid for cartilage.

In **(e)** candidates were asked to identify by letter four of the above tissues from descriptions of their functions. The elastic tissue is **C** (ligament); the contractile is **A** (muscle); the non-elastic but soft tissue is **E** (tendon) and **D** (cartilage) is bathed by synovial fluid. This was often poorly answered with candidates failing to use the identifying letters, as requested.

In **(f)** the cell process carried out by mitochondria is respiration and tissue **A** has the highest number of mitochondria in its cells. This was often poorly answered.

Question 2(a) was an exercise in plotting a graph from figures given. As noted earlier, most were able to plot the points and join them up correctly.

(b) required candidates to use their graph to identify which part of their curve showed the fastest rise. Again, the great majority correctly identified the 36-40 week period.

In **(c)** they were asked to extend their graph to see what the birth weight would be at 42 weeks. Most scored one mark here by recognising the weight would be 4-5 kg, but fewer got the second mark, because either they failed to show the extension to their graph or they misinterpreted the scale on the axis of the graph.

Question 3 dealt with aspects of osmosis in blood cells and described the results of placing drops of blood in each of three different solutions; distilled water, plasma and strong salt.

(a) No cells were visible in the blood placed in distilled water, since water is much more dilute than cytoplasm. Hence water enters the cells by osmosis, causing them to swell up and burst. Correct references to water potential were also rewarded.

(b) The cells in **(c)** appeared crenellated, because the strong salt caused water to move out of the cells by exosmosis, so that they shrank.

Only the best candidates scored their 5 marks here; the majority showed a poor understanding of this fundamental process. Few could link the results to osmosis.

Question 4 dealt with the Nitrogen Cycle presenting the processes involved in a diagram. Candidates were asked to use the information given in this diagram in their answers.

(a) The two processes lowering soil nitrate levels are uptake by plants and denitrification. A surprising number of candidates failed to extract these answers from the diagram or scored only one mark here. Guesses were common.

(b) Prolonged flooding will reduce nitrate levels because flooding lowers oxygen levels in the soil thus favouring denitrifying bacteria over the aerobic decay and nitrifying bacteria. Hence, less humus is converted to nitrates and more nitrates are broken down to nitrogen. In addition, flooding will leach out the nitrates from the soil. Many candidates made the last point but failed to see the preceding points, although the respiratory nature of the bacteria was highlighted in the stem of the question.

Question 5 showed a vertical section through the skin. In **(a)** candidates were asked to identify 5 structures or regions within the skin. These were: a layer of dead cells; a structure generating nerve impulses; a mitotic layer; a gland used in temperature control and a blood vessel with a muscular wall, i.e. an arteriole. Few could identify more than one or two here. The most commonly correct answers were the layer of dead cells and the gland. Common errors were to label the sensory neurone rather than the receptor, the capillary or venule rather than the arteriole and the sweat duct rather than the gland.

(b) required labelling a sensory and a motor neurone. Most candidates either got them confused with each other or with the erector muscle or receptor.

Question 6 was usually well-answered with most candidates able to extract the necessary answers from the table of figures.

In **(a)** fish is healthier since it contains less fat. Having *more calcium* was also accepted.

(b) The foods best preventing scurvy and rickets are potatoes and eggs, since they have the highest amounts of vitamins C and D respectively. This part was the least understood by the weaker candidates, who showed a tendency to guess here.

(c) Rice is better for growth than potatoes, since it has more protein and higher energy content.

Question 7 showed the response of lymphocytes to antigens in a diagrammatic fashion.

(a) The cell types produced are plasma cells and memory cells. Although this was clearly shown in the diagram, many candidates simply guessed at this point.

(b) The type of cell division shown here is mitosis, since the results of division are identical. Meiosis was a common wrong answer.

(c) Memory cells respond to future attacks by that antigen.

(d) Plasma cells have many ribosomes in order to make antibodies. It was not enough here to refer to proteins alone.

Even though most of the information needed was in the diagram, this question was usually poorly answered.

Section B

Question 8 (a) asked for a comparison of two water-borne diseases, cholera and schistosomiasis under the headings: causative organism; how each enters the body; where in the body the organism lives and the symptoms of each disease.

Cholera is caused by a bacterium or vibrio; it enters either in drinking water which has been contaminated by faeces or via food contaminated by flies or carriers with dirty hands. The bacterium lives in the intestines and the symptoms are profuse watery stools leading to dehydration, fever and cramps.

Schistosomiasis is caused by a fluke or flatworm which enters via drinking water contaminated by faeces or urine, or by paddling in such water, when the larva bores through the skin. The worm lives in the *blood vessels* of the gut or bladder depending on the species. The symptoms are ulceration of the gut or bladder wall, liver damage, blood in the stools or urine and anaemia.

Up to 10 marks were awarded here but it was apparent that cholera is better understood than schistosomiasis. Some confused the latter with hookworm.

Many weaker candidates failed to distinguish between the two diseases in their answers so making it difficult for them to be awarded marks. Many answers lacked precision stating gut rather than blood vessels of the gut for schistosomiasis.

(b) showed a diagram of stages in the large-scale treatment of water to make it safe to drink with three stages highlighted as **R**, **S** and **T**. Candidates were asked to explain how these three stages helped to purify the water. Inevitably there was some confusion between water purification and sewage treatment and even with the better candidates; there was a lack of detail apparent in the answers, especially in describing filtration.

R was the reservoir where particles sediment and U/V light helps to kill some of the bacteria.

S was the filter where bacteria are filtered out as the water passes through sand. Over time the sand becomes covered by a layer of mucilage full of protozoans and insect larvae which graze on the bacteria. Chemicals may be added at this stage to precipitate the bacteria for faster filtration.

T represented chlorination where, in a covered tank, chlorine is added to destroy all remaining bacteria and viruses.

Most candidates scored something for the chlorination points.

Question 9 (a) showed a diagram of the three blood vessels associated with the liver. They were the hepatic vein, hepatic artery and the portal vein. Better candidates identified these correctly but weaker ones confused them with renal and even pulmonary vessels.

In **(b)**, candidates were asked how the liver assists digestion. Answers expected included that it makes bile which is alkaline, so helping to neutralise the acidity of the chyme in the duodenum to prepare the pH for the action of duodenal enzymes such as trypsin, amylase or lipase. Also bile emulsifies fats helping to speed the action of lipase. Finally bile stimulates peristalsis. Most candidates scored one mark here for the emulsification point but knew very little of the remainder. Perhaps they thought one fact was all that was needed, even though the mark allocation showed 3 marks?

(c) was concerned with the liver's responses to various hormones in regulating blood glucose concentration. Most candidates knew something of the insulin/glucagon mechanism but very few mentioned adrenaline. There were the usual confusions between glucose, glycogen and glucagon.

Marks were awarded for: when glucose levels are high in the blood, insulin is secreted which makes the liver cells take up glucose from the blood. Some glucose is respired, some converted to fat, while some is converted to glycogen, which is then stored in the liver cells, so blood glucose levels fall. When blood glucose levels are low, glucagon stimulates conversion of stored glycogen to glucose. This is released to the blood. In an emergency, adrenaline is secreted which also converts glycogen to glucose, so raising blood glucose levels. Few scored all the available 9 marks here, although this is a familiar part of the syllabus.

Question 10 Either (a) asked candidates to distinguish between *antiseptic* and *antibiotic* in the control of an infection. Answers expected included that antiseptics are man-made chemicals which cannot be taken into the body but are applied to the body surface or to utensils or working surfaces. They kill microbes. Antibiotics are chemicals made by microbes and can be swallowed or injected into the body. They kill or prevent the growth of bacteria and fungi. Most candidates scored between 2 and the maximum 4 marks here. Weaker answers confused antibiotics and antibodies or described antibiotics as attacking viruses.

(b) Patients must finish the course of antibiotics even if they feel better after a few days, in order to build a sufficiently high level of chemical in the body for long enough to kill **all** the microbes. A lower concentration may allow some to survive which may then multiply to re-infect the patient or some may mutate to become resistant. This section was reasonably well answered, although some candidates referred to the *body* becoming resistant to the antibiotic and few mentioned mutation as the process responsible for the origin of resistance.

In **(c)** some of the earliest antibiotics are no longer effective because resistance has occurred in the target bacteria due to mutation. This is in part due to the indiscriminate use of these early antibiotics including their use in animal foods to prevent infections. This section was worth 2 marks but was poorly answered with many candidates referring vaguely to modern antibiotics being *stronger*.

In **(d)** an experimental procedure was required to find out if a substance had antibiotic properties. The mark scheme rewarded suggestions to prepare plates of nutrient agar; to then add a bacterial solution; and a paper disc soaked in the test substance. The plate should be incubated at a suitable temperature for a day or two and then examined for signs of suppression of bacterial growth around the disc. Alternatively, two flasks of nutrient broth could be seeded with bacteria, to one of which the test substance was added. Both are then incubated and compared with one another for cloudiness, for example. As remarked earlier, such practical procedures are not well understood and few were able to score well here.

10 Or (a) asked candidates to distinguish between *egestion* and *excretion*. Egestion is the removal of faeces from the gut or anus. It is undigested material that has never entered the cells or blood stream. Excretion is the removal of metabolic wastes from the blood and includes chemicals such as urea made in the cells.

Most candidates scored some of the 4 marks possible here, although weaker answers failed to link metabolic wastes with the blood or with processes inside the body cells.

(b) Such products must be disposed of safely, since faeces or urine may contain pathogens such as bacteria or the eggs of parasites. These may spread disease either by the direct contamination of food or water or via vectors such as flies or rats.

Most candidates knew something of these matters, although detail was lacking in the weaker answers.

(c) A suitable equation for respiration is:

Glucose + oxygen = carbon dioxide + water + energy. 2 marks were available, 1 for each side of the equation. Some candidates failed to score 2 by omitting energy from the right hand side. Some gave the equation for photosynthesis instead. Chemical symbols were also accepted here.

In **(d)** candidates were told that carbon dioxide turns lime water milky and to use this in an experimental procedure to show that we produce more carbon dioxide when we exercise.

A suitable procedure would be to take 2 beakers and add the same quantity of lime water to each. Then exhale, for the same time or for the same number of breaths, through a straw into one beaker. Carry out some vigorous exercise and repeat the procedure using the second sample of lime water .Compare the degree of cloudiness in the two samples or record the time it takes to reach the same cloudiness, when at rest and after exercise. Many candidates managed to collect the 5 marks awarded from some 12 scoring practical points. Weaker answers lacked sufficient details, or in the worst cases, failed to devise an experimental procedure at all.