HUMAN AND SOCIAL BIOLOGY

Paper 5096/01
Multiple Choice

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

General comments

Some individual questions produced wide ranging statistics not encountered before. A high discrimination was produced by **Questions 2**, **14**, **18**, **19** and **33** (all above .50), and **Questions 5**, **12** and **13** (all above .60). But then a very low discrimination was shown by **Question 2** (of .09), and by **Question 31** (of .15). This is also the very first time a distractor was not chosen by a single candidate, as shown in **Question 31** option **D**. These more extreme statistics are likely to be caused by the small candidate entry, which reflects a further movement of candidates in the Caribbean to the new local CXC examination in this subject.

The general standard was very similar to last year with again only two very easy questions that had a proportion correct above .80, as shown by **Questions 4** and **11**. Apart from **Questions 2**, **21**, **31** and **36**, all with low facilities, the other questions performed as expected.

Comments on specific questions.

Question 1

Normally the paper starts with an easy question, but unfortunately this one proved difficult. Candidates had to distinguish the term locomotion from movement and apply it to cells, three that move and one that is static. The plant cell is static, the sperm and phagocyte are capable of locomotion, leaving only the red cell moving but not capable of locomotion. Candidates could not apply this knowledge of the terms to the moving cells.

Question 4

This question proved too easy with a proportion correct of .90, showing candidates had a much better knowledge than expected of the organs forming the female reproductive system.

Question 7

The positive distractor suggests that candidates did not know the colour change of the reagents used when positive results were obtained in food tests. Most candidate's answers did not make sense, because they chose the same reagent with and without its colour change. Had they performed the experiments themselves, they would have been more likely to remember that Benedict's reagent changes from blue to red, and iodine solution changes from brown to blue/black.

Question 11

It is pleasing to see from the high proportion correct here, that candidates are improving their skills in experimental deduction. Hence it is strange that **Question 7** reported on above gave such difficulty.

Question 25

The positive distractor highlights a common misconception by candidates that a nerve impulse is an electrical impulse. They perpetuated this error to the synapse, when it should be basic knowledge that chemicals cross the gap here.

Question 31

Option **D** was completely useless as a distractor. Strangely, research shows that a number of people think airborne transmission of AIDS is possible, but from the result here it shows these candidates have much better knowledge. That some candidates thought anti-viral drugs would prevent HIV is more alarming and must account for the low discrimination.

Question 40

The positive distractor shows candidates muddled lead pollution with the effect of carbon monoxide on the blood. The signs and symptoms of lead in the body need emphasising in the teaching of lead pollution.

HUMAN AND SOCIAL BIOLOGY

Paper 5096/02

Theory

General comments

The paper produced a wide range of marks. Once again the weaker candidates showed a lack of appreciation of experimental methods, for example, describing starch digestion in the gut rather than designing an experiment to be carried out in the classroom. Very few candidates failed to obey the rubric concerning the alternative **Question 10's**, and time did not appear to be a problem in this paper. In several cases mark allocation was not taken into account by the candidates, when answering a section of a question. A section worth 2 or 3 marks requires more than a single word or idea. Similarly, the word 'explain' at the start of a question requires a different approach from 'describe'.

Detailed Comments

Question 1 was concerned with aspects of breathing and its control.

(a) In inspiration, the sternum moves up and outwards, while the diaphragm flattens. Hence in **(b)** the volume of the thorax is increased and the pressure therein is lowered. Most candidates could see what was happening in **(a)**, but a significant number got the pressure-change wrong.

In **(c)** the function of the mucus in the various tubes of the system is to trap particles including bacteria. It has nothing to do with *lubrication*, as many stated. The cilia move the mucus upwards and away from the lungs; they do not act as *filters*.

(d) showed parts of the lining of such tubes in a smoker and a non-smoker. The smoker has more mucus and shorter cilia, as could be seen in the diagram. There was no difference in the *number* of cilia as some candidates stated. Some candidates confused cilia with hairs in the nose.

(e) showed an apparatus to collect the products of cigarette smoke. It is tar that stains the cotton wool brown; nicotine that is highly addictive and carbon monoxide that poisons haemoglobin. There was some confusion between tar and nicotine and carbon dioxide was a not uncommon wrong answer.

(f) Exercise requires energy which comes from respiration. Respiration generates carbon dioxide and this extra carbon dioxide triggers faster and deeper breathing. Although this action of carbon dioxide had been described in the stem of the question, few candidates could make the link between exercise and faster breathing, talking instead of *oxygen debts* and the need for *more oxygen*.

This mechanism is a reflex. Thus it is automatic, so that we can continue to breathe when asleep or thinking of other things. Most candidates managed one mark out of the two here - an example of not looking at the mark allocation.

In **(g)**, if one breathes in and out deeply several times before inhaling fully, one can hold a breath longer, since more carbon dioxide has been exhaled, thus lowering its level in the blood. Hence it takes longer to reach the threshold point that makes us breathe again. Few candidates could see this connection with the carbon dioxide threshold described in **(f)**, even though this can be easily demonstrated in the classroom.

Question 2 was concerned with the mechanisms controlling the water content of the blood. In **(a)** a rise in blood concentration is detected in the hypothalamus or brain; the gland then stimulated is the pituitary and the hormone secreted is ADH. *Osmoreceptors* were an acceptable alternative to brain.

In **(b)** the effects on the volume of urine produced are to decrease it, if the person sweats heavily or has excessive diarrhoea but to increase it, if he drinks a litre of water. References to the concentration of the urine were not acceptable in this answer. Most candidates showed a good understanding of this mechanism.

In **Question 3** the characteristics of a premature baby were described as were the need to keep it in an incubator in a cold climate.

In **(a)** candidates were asked to relate the individual characteristics described to the necessity for an incubator: that is, why each contributed to the inability of the baby to keep warm.

Smaller size leads to more heat loss (and less heat generated), since the surface area is relatively greater than the volume. (As size decreases, the surface area increases relative to the volume).

The thin skin means the blood vessels are closer to the surface, so heat is lost more easily.

Having little fat under the skin means less insulation.

Having a poorly developed shivering response means that the baby cannot generate much heat. Very few candidates scored more than the insulation mark, although questions on temperature control are usually high scoring. It is important for candidates to register the word **explain** in the stem of the question and answer accordingly.

Question 4 was concerned with 4 bottles of broth that had been treated in different ways. A, C and D were kept at 30ºC, B at 5ºC; A, B and D were open to the air while C was corked. All four samples of broth had been boiled first. Candidates were asked to explain the different results.

In **(i)** A was cloudy, since bacteria had entered from the air after the sample cooled. C stayed clear because it was corked.

In **(ii)** disinfectant had been added to D, so it stayed clear.

Most candidates scored well here, although some confused the bottles.

Question 5 showed the life cycle of the mosquito. In **(a)** A was the pupa, B the larva.

(b) Two chemical methods to control these stages were putting insecticides into the water or spraying the water surface with oil or paraffin.

(c)(i) A biological method to control both A and B was the introduction of suitable fish, such as *Gambusia*.

(ii) A different biological method to control the larva only was the use of *Bacillus thuringiensis*.

(d) Two advantages of biological rather than chemical control are that no resistance is possible and it is non-polluting or will not affect other forms of aquatic life.The no resistance point was seldom scored.

Question 6 was illustrated by the familiar section through the eye and candidates were asked to identify and label different regions of the eye from descriptions given.

J, containing only cones is the fovea;
K, responding to low light is the edge of the retina;
L is the blind spot;
M, the region to contract for close vision is the ciliary muscle and
N, the region to contract in bright light is the iris.
J and L were sometimes confused, as were M and N.

Question 7 was a key to identify four types of organism, P to S:
P - virus; Q - Fungi; R - Bacteria and S - Protozoa. The majority of candidates got this right but there was some confusion between R and S.

Section B

8 (a) The signs of a disease are what can be seen in the patient by an observer; symptoms are what the patient feels. In cholera signs include watery stools, diarrhoea, sweating and vomiting; symptoms include fever, stomach ache, thirst and headache. This was generally well-answered.

(b) Cholera is caused by a bacterium.

(c) Cholera may follow an earthquake or flood, since the former may fracture pipes leading to a contamination of treated water; the latter may wash sewage from latrines into water supplies. Credit was also given for references to the breakdown of normal services after these occurrences forcing people to use casual sources of water.

(d) A vaccine is active immunisation, using an injection of dead or attenuated (weakened) pathogen which causes the lymphocytes to make antibodies to this pathogen. Memory cells are also formed which stay in the blood for long periods. The mechanism thus takes time to develop but is long-lasting. If the pathogen invades again, the memory cells recognise it and flood the blood with antibodies which clump or lyse the antigens, before they can produce the symptoms of the disease. Although 6 marks were given for this section, accounts were often very brief and were often confused with passive immunity.

9 (a) An enzyme is a catalyst made in living cells- a biological catalyst. It speeds up a reaction without altering the products or being altered itself. Being made of protein, each is specific; is pH and temperature sensitive, being destroyed or denatured if the pH varies too much from its favoured value or the temperature rises above 80ºC, certainly at boiling point. At low temperatures the enzyme is inactivated. In addition, enzymes are easily poisoned by substances, such as metals or cyanide. A total of 7 marks was given for this section. Many candidates scored well here.

In **(b)** candidates were asked to show that it is an **enzyme** in saliva that converts starch to sugar. Two reaction vessels or test-tubes are needed. One contains a sample of starch solution to which a sample of saliva is added. One drop can be tested by iodine solution at the start to show starch is present - it goes blue-black. Place this tube in a water bath at 30ºC and leave it for 5 to 10 minutes. Testing by boiling a sample with an equal volume of Benedict's reagent will show that sugar has been formed. That procedure is worth about 5 marks. It does not prove an enzyme is responsible for the change. To score the rest we must show that an identical set-up but with denatured saliva (boiled or acidified) will **not** change the starch solution to sugar - the solution of starch and boiled/acidified saliva continues to give a positive starch test, but shows no sign of sugar when tested with Benedict's solution. Thus saliva must contain an enzyme.

It was pleasing to note that the better candidates scored full marks here. Weaker candidates used only one tube or did not suggest an experimental procedure at all.

Many simply described starch digestion in the gut, which does not answer the question.

10 **Either** showed the structures involved in the knee-jerk reflex and asked in **(a)** for the steps by which a blow on the tendon is converted to a movement of the lower leg.

The answer worth 8 marks should have included some of the following steps:

The blow on the tendon stretches the thigh muscle; the stretch-receptor converts this into nerve impulses (not messages) and these travel up the sensory neurone, entering the spinal cord by the dorsal root. This neurone synapses with a motor neurone which exits the cord via the ventral root and innervates the thigh muscle. On stimulation, this contracts, pulling on the tendon and raising the lower leg. Transmission across the synapse is chemical. The diagram showed only two neurones to be involved, so no credit was given for references to a relay neurone. Although a diagram was given and this is a familiar area of the syllabus, it was disappointing to see so many answers lacking descriptive detail.

In **(b)** candidates were asked to state how the **structure** of bone and muscle tissues differs. Answers expected were that bone has cells and a matrix of calcium salts and protein fibres, secreted by those cells. Muscle is composed of cells with no extracellular matrix. These cells are long fibres. This section was often poorly answered with candidates failing to confine their answers to structure, as requested.

In **(c)** candidates were asked to write an equation for the energy-supplying reaction in muscle. The required answer was:
Glucose (sugar) + oxygen = carbon dioxide + water (+ energy).
Chemical equations were accepted even if they did not balance.

10 **Or** proved to be the more popular of the alternatives. In **(a)** candidates were asked for 4 pollutants likely to enter the river pictured on the question paper as it flowed past agricultural land, a power station, a town and its sewage works and the possible **effects** of these on the river.

Answers included:

Fertilisers such as nitrates or phosphates leading to eutrophication or, in the case of the former, making the water unfit to drink.

Herbicides killing the water plants, thus affecting the aquatic food chains.
Pesticides, insecticides killing invertebrates in the water, then becoming concentrated via the food-chains to affect vertebrate life.
Hot water from the power station which would lower oxygen levels in the water.
Possible sewage leaks or spills leading to various intestinal diseases, or to lowered oxygen levels as the sewage is broken down. Pathogens could include eggs of gut flukes or worms.
Detergents could lead to foams or frothing on the surface, slowing oxygen-uptake.
Petroleum products leading to oiling up of birds or, again, lowering of oxygen levels as the petroleum products are decayed.
Heavy metals and other chemicals from industry in the town, which may be toxic to aquatic life.
Most candidates collected a fair number of the 8 available marks here. They could usually suggest four pollutants but often confused their effects.

In **(b)** candidates were asked how filtration and chlorination make river water containing bacteria safe to drink.

Filtration uses a sand or gravel-based filter to trap the bacteria. It is soon covered by a gelatinous layer of micro-organisms which assist in the process. Protozoa ingest the bacteria and algae release oxygen which kills some bacteria. The water is then pumped on to be chlorinated which kills all microbes. The water is stored in closed tanks to retain the chlorine and give it time to act. There was some confusion between screening and filtration, but many candidates were unable to provide good descriptions of the processes. Better candidates had some knowledge of the details of filtration and included accounts of the chemical action of chlorine.

(c) The process that increases oxygen levels in the water is photosynthesis. An equation for this process is:

Carbon dioxide + water = glucose (sugar) + oxygen.
Again, a chemical statement was accepted, even if it did not balance. A large proportion of candidates left this section blank.