



General Certificate of Education (A-level)
June 2011

Human Biology

HBIO5

(Specification 2405)

**Unit 5: The Air We Breathe, The Water We
Drink, The Food We Eat**

Report on the Examination

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General Comments

This paper proved accessible to candidates. The vast majority of candidates completed the whole paper. Some candidates did not write a great deal for their essay, which might indicate some poor time management. Average or weaker candidates might be advised to attempt the essay first because there are a number of very easily accessible marks in this question. Candidates should be advised that their essay should consist of approximately five or six paragraphs, with each paragraph relating to a topic that can be used to illustrate the theme of the title. There are still some candidates who appear to think that they have to write something about every single thing they can think of that might relate to the title. This often produced very superficial content, with little AS or A2 factual content or terminology. There was evidence in the essays that some students had been taught considerable detail about examples that are not in the current specification.

There was an alarming frequency of mistakes relating to basic features of respiration and photosynthesis. This was most apparent in 9(b), where a very large number of candidates linked the rate of oxygen production by photosynthetic algae to 'the rate of respiration'.

It was also apparent in a number of questions that many candidates have little understanding of probability values and what does, or does not, constitute significant differences between results.

Question 1

- (a) In (i), most candidates scored one mark but about a quarter could not place glycolysis in the cytoplasm.

In (ii), only about half of candidates correctly referred to the inner membrane of the mitochondrion. Quite a large number made reference to chloroplasts, or parts of the chloroplast.

- (b) This question proved a good discriminator. Nearly forty percent obtained all three marks but a third scored nothing. Many tried to include unnecessary and often incorrect details about the whole of aerobic respiration. The best answers focused on oxygen as the final electron acceptor of the electron transport chain, associated with oxidative phosphorylation (or described) which produces a lot of ATP.

Question 2

- (a) About three quarters of candidates obtained this mark. Those who did not had usually drifted into descriptions of these sites as nature reserves or farms.
- (b) It was pleasing to see that some excellent answers to this question where candidates took note of all the variables in this study and used the data. Many candidates only scored two marks because they only discussed data relating to one variable, usually the area of the site, and failed to consider age or substratum. Weaker answers tended towards general discussions of brown-field sites with no use of the data.

Question 3

- (a) It was pleasing to see many clear statements about the polluter paying for both the direct and indirect environmental consequences of their actions. However, nearly half

only scored one mark because they failed to refer to direct and indirect, or referred to paying directly or indirectly.

- (b) Over forty percent obtained two marks, usually for references to the possibilities of increasing recycling and reducing landfill. About half obtained one mark, usually for mentioning one of the above. Those who referred to using waste in a power station often failed to include a statement about using it to replace a non-renewable energy source (or named example).
- (c) Just over half of candidates obtained one mark for stating that the BPEO was the one that produced the least damage to the environment. Fewer than twenty percent also made it clear that it was at an acceptable cost.

Question 4

- (a) It was pleasing to see that over forty percent could define someone's carbon footprint in terms of carbon dioxide production, in kg per year, and their primary/direct and secondary/indirect contributions. Weaker answers obtained some credit for references to contributions to greenhouse gases.
- (b) Over seventy percent were able to correctly complete the table.
- (c) This was very accessible and nearly sixty percent gained both marks.
- (d) This question produced the full range of marks but few obtained all four marks. In their evaluations, most candidates concentrated on one or two aspects of the study and alternative possibilities. It was interesting that very few considered possible flaws in the calculations, factors that may not have been included in the calculations, or possible bias on the part of the journalist.

Question 5

To obtain full credit in various parts of this question, it was important for candidates to appreciate significant and non-significant differences between means. They were helped in this by the inclusion of standard deviations.

- (a) This proved to be a very accessible question.
- (b) In (i), nearly a third failed to score and fewer than twenty percent obtained two marks. The examiners were looking for the identification of trends relating to predation in the data. Many candidates produced rather imprecise descriptions of the data.

Part (ii) was better done, with just over fifty percent obtaining both marks. Most noted the requirement for owners to spot and identify prey, or the idea that cats might not bring back all they catch.
- (c) Part (i) was well done. The examiners accepted statements of either an experimental hypothesis or a null hypothesis.
Part (ii) discriminated well, with around twenty percent failing to score and equal percentages obtaining one or two marks. A large number of candidates failed to note that the difference in the means for birds was not significant as indicated by the standard deviations.

Question 6

To obtain full credit in various parts of this question, it was important for candidates to appreciate significant and non-significant differences between results. Many expressed the idea that a probability of obtaining asthma of between 0.1 and 0.2 was a very small risk. It was clear that they did not think of this in terms of a ten to twenty percent chance.

- (a) This topic was very well known by most candidates, with over sixty percent obtaining all four marks.
- (b) In (i), most candidates described the increase risk for group A children who lived very close to a road and scored one mark. Fewer spotted the similar risk for groups A and B after (about) 130 metres, or that the risk for group B was similar at all distances. Poorer answers focused on describing every slight rise, fall and difference in probabilities.
In (ii), candidates tended to focus either on analysis of the data, or on an analysis of the methods employed. To score all four marks they had to discuss some element of both. As a result, many scored two marks but few obtained all four.

Question 7

- (a) Over half of candidates obtained one mark, usually for the idea of new species being formed or reproductive isolation taking place. Under a quarter expressed the idea that this was occurring in the same place. Poorer answers showed confusion with allopatric speciation and poor use of terminology.
- (b) This question discriminated quite well across the range. Candidates had little problem relating differences in morphology to function. Where they sometimes fell down was in stating the environmental factor that caused differential survival. So, they might say that M's thicker shell would protect it from crabs but not make it clear that this was an advantage in the middle shore where there were many crabs.
- (c) This proved difficult for many candidates and fewer than twenty percent obtained both marks. More obtained one mark for noting the evidence for development of reproductive isolation. Most failed to see that it was selection by form T males that was driving the process. Some obtained credit for noting that this might well be due to behavioural changes associated with mating.

Question 8

- (a) This question proved very accessible to candidates.
- (b) In (i), there was a fifty-fifty split between those who thought that the probability value was significant or not. As noted in other parts of other questions, a large number of candidates appear to have little understanding of probability values. Any failure to understand that the probability value in (i) was significant may have affected the performance of some candidates in (ii). Around fifty percent of candidates scored one mark for noting the lower range of viral concentrations for the mice given the bacterium. Only better answers then went on to look at the data in detail or the method employed. It was noticeable that many wrote about 'not knowing the sample size', when the graph axis states that the results are for individual mice.

Question 9

- (a) This question was a good discriminator. Many candidates correctly identified an advantage of algae growing in seawater and the idea that the algae could be used to obtain both types of fuel. Quite a large number of candidates incorrectly implied that algae would be better because each algal cell contains more energy. This showed that they misinterpreted, or misunderstood that energy content was given per hectare of land used.
- (b) Fifty percent of candidates scored no mark here. Probably about that percentage stated that oxygen was produced by respiration. The other candidates did link rate of oxygen production to the rate of photosynthesis and obtained one mark. Relatively few obtained a second mark for linking this in some way to possible biofuel production. A mark was awarded if they suggested that oxygen production was chosen because it was easy to measure.
- (c) Given the levels of misunderstanding shown in (b), it was probably not surprising that most candidates scored poorly here. Nearly half obtained one mark, usually for noting the higher oxygen production by the mutant strain. In this part, they were not penalised for linking oxygen production to respiration. As in some other questions, candidates tended to focus either on the data, or on the method used. As in 8(b)(ii), it was noticeable that many wrote about 'not knowing the sample size', when the stem of the question states that the results relate to individual algal cultures.

Question 10

Candidates should be advised that their essay should consist of approximately five or six paragraphs, with each paragraph relating to a topic that can be used to illustrate the theme of the title. Some candidates appeared to think that they had to write something about every single thing they could think of relating to the title. This often produced very superficial content, with little AS or A2 factual content or terminology.

Both titles appeared to be equally popular and very good essays were seen with both. However, most of the poorer essays were produced for (a)

- (a) The best essays focused on examples from the specification relating to how environmental factors can affect human life. Many wrote good accounts of things such as allergens, parasites transmitted by water or faeces, pathogens, selection pressures, evolution and adaptations, mutagens and cancer and the impacts of climate change. Relatively few wrote about environmental factors such as diet and smoking and other life style factors.
There were many poor essays with little, or no, AS or A2 Biology content. These tended to be rambling accounts about the importance of things such as family, people around us, home life, the work environment and politics, with no factual content.

Some candidates wrote about the effects of humans on the environment, rather than the title given. They could get credit if they wrote about how we change the environment and then about how that impacts on us.
- (b) The best essays focused on 'movement' as the title required. Popular topics included movement across membranes, osmosis, cystic fibrosis, nerve impulses, synapses, muscle contraction, protein synthesis, gas exchange and various aspects of circulation.

Many candidates chose appropriate examples to write about but did not make it clear, or emphasise, the 'movement' aspect. For example, they might write about respiration or photosynthesis and mention electron transfer chains but not concentrate on the movement of electrons or protons. This resulted in somewhat lower content marks than might otherwise have been the case.

Few candidates wrote about topics relating to ecosystems or succession. Surprisingly few wrote about the heart and problems with movement associated with cardiovascular disease.

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