



General Certificate of Education (A-level)
June 2012

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

The vast majority of students completed the whole paper. Given the number of marks for factual recall in the essay, the other questions are mainly devoted to analysis and How Science Works. This makes the paper challenging for weaker students. Even when factual recall was required, there was often a disappointing lack of knowledge; this was particularly true in Question 1 and in Question 2(a) that related to photosynthesis and respiration.

Students 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 students 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.

It was also apparent in a number of questions that many students failed to use information given in questions, even when directed to do so.

Question 1

- (a)(i) Three quarters of students were able to identify where the light-dependent stage is found in chloroplasts.
- (a)(ii) A similar number were able to identify where the light-independent stage is found.
- (b) This question proved to be a good discriminator, although it was not intended to be. Nearly half scored nothing and only about ten percent obtained both marks. Many made vague statements about using products of the light dependent reaction to turn carbon dioxide into sugars. Those who obtained one mark usually did so by reference to ATP as a source of energy. Very few knew about the use of reduced NADP to convert glycerate phosphate (GP) to simple sugars.

Question 2

- (a) It was pleasing to see that this was well answered by a large majority of students.
- (b) About half of students obtained one mark for linking allopatric speciation to geographic isolation of populations. Only a third obtained both marks by linking sympatric speciation to the same area. Many stated that reproductive isolation is a characteristic of sympatric speciation but this is true of both allopatric and sympatric speciation. In sympatric speciation, reproductive isolation arises within the same location.

Question 3

- (a) The responses to this question were often poor and poorly worded; a third failed to score. Many failed to score one of the possible marks because they stated that biofuels do not give off any carbon dioxide when burnt. The most common mark awarded appeared to be for the idea that the plants grown for biofuel take up carbon dioxide.
- (b) This question illustrated how important it is to read the stems of questions and the keys of figures. About a quarter of students obtained both marks and sixty percent scored one. Many thought that the black grouse map showed a spread of the grouse rather than a reduction in range. Quite a few wrote about sizes of populations but the maps refer to ranges, not to numbers of individuals.

Question 4

The answers to this question about respiration were usually very poor and demonstrated very little knowledge or understanding of the process.

- (a) Just under a quarter of students obtained two marks, usually for identifying oxygen as the final electron or hydrogen acceptor at the end of the electron transport chain. Just over half of students failed to score. Many appeared to think that oxygen reacts to form the carbon dioxide produced by the process.
- (b) This was the most poorly answered question on the paper, with nearly sixty percent failing to score. Most students simply described the results from the graph. Few grasped the idea that the higher the concentration of chlorophenol, the greater the effect on ATP production and thus the faster the process goes to produce the same amount of ATP. There have been similar questions in the past about the effects of uncoupling agents, such as dinitrophenol.

Question 5

This question proved to be accessible to most students.

- (a) Nearly sixty percent of students obtained this mark. Some got confused and described a community of bacteria, rather than a population.
- (b) Nearly eighty percent obtained both marks, usually for suggesting that high use of antibiotics in hospitals reduces the 'normal' bacteria in patients' guts.
- (c) This discriminated reasonably well. Those who made good use of the information in the stem tended to give the whole story and obtained all four marks. For the others, there was usually a failure to realise that a patient's gut would be re-populated with 'good' bacteria and these would tend to prevent (re-)establishment of *C. difficile*.
- (d) It was pleasing to see many good answers to this question about evolution, with nearly sixty percent obtaining all three marks. Weaker answers made no reference to the genetic origin of resistance to antibiotics, or the role of chance mutation in the process.

Question 6

To obtain full credit in various parts of this question, it was important for students to appreciate what standard errors can tell one about differences between means. Many students ignored the standard errors (SEs).

- (a) Nearly forty percent of students obtained two marks and nearly half obtained one mark. Some answers were poorly expressed and some related to supposed inadequacies of the researchers; we always things were done correctly, by competent people.
- (b) Students would have been well advised to compare the results over lanes in farmland first, where the SEs suggested no difference between buzzards and kestrels seen per km of road. They should have then compared the differences for each bird between farmland and motorways and between birds. In both of these comparisons, the SEs do not overlap. Most ignored the SEs and some took mean number of birds per km to be total number of birds. As a result, few students obtained four or three marks. Nearly forty percent did get two marks for making general comparisons based on the graph.

- (c) This proved more accessible to students. Most deduced that there would be less prey in the fields in winter and that the kestrels would move to the motorways looking for food.

Question 7

This question proved challenging to most students, mainly because they didn't read information carefully or answer the questions as set.

- (a) Seventy percent failed to score here. Many simply re-stated the question and said that Japanese knotweed competes with native species. Some students added non-specific references to competition for 'resources' but didn't name a resource or explain how competition for this would reduce populations. The best answers tended to refer to knotweed out-competing native species for light for photosynthesis and thus energy for growth.
- (b) Most failed to appreciate that one would not want *A. itadori* to feed on native plants and the most likely to be affected might be plants related through evolution to Japanese knotweed. About a third obtained a mark for a relatively simple statement about seeing if these plants would be food for the insect.
- (c) Very few students obtained four marks. Many ignored the information in the stem and life cycle and drifted into general statements about biological controls. Many stated that it was important that *A. itadori* should *never* breed. However, three quarters did obtain two or three marks for parts of the whole picture. Very few noted that the larvae attach to the leaves and stay on the plant where they hatch from the egg, so will not move and attack other plants.
- (d) Just over half the students obtained both marks. These students usually noted that larvae of *A. itadori* take nutrients from the leaves and then deduced that this would reduce growth (of the leaves or plant). They then went on to suggest that native plants would then out-compete knotweed for light or water. Other suitable reasons were seen and accepted.

Question 8

- (a) This question proved very accessible to students and two thirds obtained three marks. Some students got rather confused about what became bound to mast cells and when.
- (b) Quite a few students did not note that each circle represented the result for one volunteer and that there were two groups. Instead, they saw these as two normal distribution graphs and described a higher 'peak' for group G. It appears that some were not able to see that there didn't appear to be any real difference between the sets of results. Of course, in a study such as this a finding of no significant difference is very important. Quality of communication was also important here, since group G show the highest results but not (generally) higher results.
- (c) Only a small number of students noted the reference to an enzyme coded for by the gene and then thought of the enzyme as a protein that would be a foreign antigen. A large number wrote about the GM soybean plant being a foreign antigen.
- (d) Around forty percent obtained one mark for noting that IgE would be produced (by B cells) in response to the soybean antigen/allergen. A second mark was usually awarded to those who linked the amount of IgE produced to the amount of antigen.

- (e) About half obtained the mark for correctly identifying the difference in means as not significant. This is broadly in line with the outcome for similar questions in this and other units.

Question 9

- (a) Two thirds of students scored one or two marks here. Many had problems expressing themselves clearly. Fifteen percent of students obtained all three marks. These were students who looked for, and found, the broad trends in the data. Some weaker answers involved quoting numbers for each bar, for each treatment. Others failed to consider the point of the trial and wrote about blue light giving a very good result with 0-19 percent reduction in spots. There were a number of students who saw the percentage reductions in spots as age groups. Although the examiners took account of this in (b), it did have some knock-on effects.
- (b) A similar spread of results to those seen in (a) and with the same problems for weaker responses. It was surprising how many students had the idea that the cream was good because it had the greatest percentage reporting reasonable improvement in acne.
- (c) Similar numbers obtained two, one and no marks. Those who obtained two usually did so by references to quantitative and qualitative/subjective; or words with similar meanings. A few resorted to the idea that doctors know best.
- (d) In this question, many drifted into generic answers about validity, reliability, etc without any indication of why or how. The better answers revolved around the need for a larger sample, to improve reliability, or noted the short duration of the trial and the need to see if improvements lasted, or there were long-term side effects.

Question 10

Students 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 students 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.

10(a) appeared to be somewhat more popular with students but produced most of the poorer essays.

- (a) The best essays focused on how humans affect populations of other organisms, rather than just how humans affect the environment. There were many poor essays with little or no AS or A2 Biology content. These tended to be rambling accounts about harming the environment and how this was bad for other animals and plants, usually polar bears and rain forests. The best essays used correct terminology and explored real ecological issues, in a variety of contexts. For example, they wrote about deforestation and its impact on biodiversity through niche destruction, food chains and food webs and reduction in carrying capacity of the environment. Such students often went on to write about fragmentation of forests, isolation of populations and the potential impact of this. Other popular topics in good essays were humans as hosts for microorganisms, effects of domestication of species and the impacts of farming, introduction of species, creation of habitats such as brownfield sites and GM organisms. In essence, good essays contained content from the specification and poor essays could have been written by anyone, without two years of study.
- (b) The best essays focused on the importance of shapes fitting together as the title required, rather than just the shapes of things. Popular topics included membrane

transport, cystic fibrosis, nerve impulses, synapses and drugs, muscle contraction, DNA replication and protein synthesis, antibodies and allergens.

Many students chose appropriate examples to write about but did not make it clear, or emphasise the importance of the role of shapes fitting together. For example, they might write about a neurotransmitter binding to a specific receptor but not continue about the functional consequence of this, i.e. the opening of sodium channels leading to the production of an action potential. This resulted in somewhat lower content marks than might otherwise have been the case.

Mark Ranges and Award of Grades

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