



**General Certificate of Education (A-level)
June 2012**

Biology

BIOL2

(Specification 2410)

Unit 2: The Variety of Living Organisms

Report on the Examination

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General Comments

Most students planned their answers so that they would fit within the space available. However some students did not make full use of the width of the lines, and continued with writing snaking down the side of the page, risking some of their answers going unseen. In some instances writing was so small as to be indecipherable. Many students failed to gain marks as a result of careless question interpretation, either mis-reading the instructions or giving descriptions where explanations were required. Sometimes students gave detailed descriptions of aspects of biology that were irrelevant to the question and so did not gain marks. In the main, students seem to be becoming mathematically more confident, with a significant proportion able to manipulate data in order to support their answers, for example in question 9 (d) and (e). The quality of written communication, while not directly assessed in this unit, is nevertheless crucial when it comes to students using the correct terms and writing unambiguously. It was too frequently the cause of students failing to gain marks because they did not write what they appeared to mean.

Question 1

- (a)(i) The term diffusion was known well, with the majority of students answering correctly.
- (a)(ii) This question was successfully answered by the vast majority of students. Where students failed to gain a mark it was because they referred to the flatworm having a large surface area rather than a large surface area to volume ratio.
- (b)(i) Many students could recall that an organ is a group of tissues.
- (b)(ii) Few students gained all three marks for this question but most achieved one or two marks in clearly appreciating that carbon dioxide enters a leaf through the stomata. Students clearly understood the process of diffusion but failed to gain credit where they stated that diffusion occurs across or along, rather than down, the gradient.

Question 2

- (a) This question was generally answered well, although some students had not appreciated the significance of the statement that the drawings were to the same scale. The lateral roots on the sugar beet were incorrectly referred to as root hairs and led students to structure answers around the uptake of water and minerals. The weakest answers came from students who had ignored the information in the stem of the question about the role of the root in the storage of the sugar.
- (b) Only a minority of students answered this question well. The commonest mistake was to write about profit in terms of more plants rather than the faster rate of growth. Others failed to gain marks by, apparently, intending to write about the 'sugar beet plant' but shortening this to 'sugar' and thereby making their answer nonsensical.
- (c) Most students understood that selective breeding would reduce genetic diversity but fewer were able to explain that this was because of the deliberate selection of a few alleles during the selective breeding process.

Question 3

- (a)(i) This was generally well known, although a significant number of students did not qualify the beta glucose. Amino acids and bases were given by a few students.
- (a)(ii) Also generally well known, with most students gaining the mark.
- (a)(iii) This was answered less well than the first two parts of this question. Incorrect answers included 'hydrogen', 'hydroxide' and 'alkali' showing students knew what should be there but not the correct term for the group.
- (b)(i) This question was answered well. The most frequent correct responses were for identifying the glucose isomer and molecular shape. Incorrect responses gave functional comparisons, rather than structural, or failed to compare like with like.
- (b)(ii) Quite a high proportion failed to attempt this question otherwise it was generally answered well, with a variety of explanations that showed good understanding. Incorrect references to 'strong hydrogen bonds' resulted in a number of students failing to gain credit.

Question 4

- (a) The role of mitosis in growth was generally well known and clearly expressed. Some responses did not give precise enough wording to distinguish between replacement or repair of individual cells, the former gaining credit but the latter not.
- (b)(i) Inappropriate answers often related to reliability or other aspects of general experimental design. Some very good answers demonstrated practical experience of finding cells undergoing the division process, but many disappointed with references, in particular, to the identification of anomalies.
- (b)(ii) This question was generally answered well; most incorrect responses identified **A** as prophase. Descriptions of evidence were generally good. Sometimes references were made to the spindle moving to opposite poles. Some answers referred to pairs of chromosomes, suggesting a confusion with meiosis.
- (c) While quite a high proportion of students made little or no attempt at this calculation, the majority of those that did gained at least one mark. Some students clearly spent a lot of time in very lengthy computation; they would benefit from understanding that, for a maximum of two marks, they would not be expected to have to carry out such a procedure. The main mistake was to regard stages **A+B** as being all of mitosis giving 3+1 as 4% of the total time, rather than taking 90% of the time in interphase, so 10% in mitosis.

Question 5

- (a)(i) Students were aware that polymers were made of many monomers, but in many cases went on to include descriptions in their answers that implied they did not understand what the monomers in this case were. A number of answers suggested that each strand was a monomer or that the monomers were amino acids.
- (a)(ii) Most students knew the names of the parts of the diagram; the most common mistake was giving 'sugar' or 'ribose' instead of deoxyribose.
- (a)(iii) In order to gain both marks, students had to show that they knew the names of the bases. This proved very revealing in that almost all knew the initial letters of the four bases but only a minority could write down the names correctly. About half were able

to complete the simple calculation to give the percentage of the other three bases.

- (b)(i) Those who failed to gain credit often did so because they were, apparently, of the opinion that one base coded for three amino acids.
- (b)(ii) Introns, non-coding DNA, start and stop codes were all known to be non-coding DNA and, thus, adding to the length of the gene without contributing to the polypeptide. Some students also mentioned addition mutations or the fact that there are two strands. A minority of students incorrectly linked the degeneracy of the genetic code to the difference in number of bases.

Question 6

- (a)(i) Almost all students gained this mark.
- (a)(ii) Again, almost all gained this mark, with many writing a mnemonic of one form or another in the margin.
- (b)(i) Most students gained the first mark for a simple definition of standard deviation in terms of the spread of the data. A few failed to gain the mark by using the word 'range' as an alternative to 'spread'. The interpretation of standard deviation in terms of overlap was less well understood, and very few students suggested that a low standard deviation was related to closely grouped and therefore reliable data.
- (b)(ii) This question was mostly answered successfully. However some students used up all the space describing the differences in colours, and did not link the different colours of the two types of hummingbird to successful mating or to species recognition. They referred only to courtship which, as the term appeared in the stem, did not gain credit.
- (c) The majority of low marks gained in this question resulted from students failing to respond to the question '....these sequences (i.e. the amino acid sequences) could provide evidence....' and going on to describe how different DNA base sequences would give different proteins. Although students seemed to appreciate that different species have different amino acid sequences in the same protein, few could link this to differences in the DNA base sequence. Students seemed unclear about the relationships between the DNA base sequences and the amino acid sequence, and the use of incorrect terminology made their answers even more opaque.

Question 7

- (a) This question was generally answered well, with the better students able to explain the importance of random collection in the context of the investigation rather than simply turning out the phrase 'avoiding bias'.
- (b)(i) Most students understood the summation process even though they made mistakes in another part of the calculation. A significant number of answers went up to 5 or 6 decimal places which, although not penalised, should be avoided. The mathematical requirements of the specification do state the 'use of an appropriate number of significant figures'. A significant number of students use the space available as rough working rather than for setting out the logic by which they arrived at the answer. A tangled mass of numbers did not always allow the examiners to credit incorrect responses for an understanding of underlying principles.
- (b)(ii) Most students made reasonable attempts at this section. Most correct references were to the reduction in species number and to the predominance of the bird-cherry aphid. Incorrect references were made to totals of all organisms and totals of all

species. Weaker students assumed that the fewer organisms in total, the lower the biodiversity. Some wrote, incorrectly, about genetic diversity.

- (c) Instead of evaluating the conclusion given, a significant number of students wrote their own conclusions about the effects of farming on the environment and the mechanisms by which these were brought about. Answers were often vague and did not refer to the data provided.
- (d) Generally answered well; almost all students offered responses, often with good explanations relating to increasing variety of habitats and food sources.

Question 8

- (a)(i) There were many approaches used in trying to explain this. Better students were precise in answering, relating data given to stomatal action and transpiration. Some did not read the stem carefully and wrote about changes in pressure. Many others failed to make the link between flow in the xylem and transpiration. The idea of increased tension occurred only rarely but most students showed an understanding of cohesion.
- (a)(ii) Most students made an attempt at this question but often made incorrect reference to root pressure and osmosis. There were some imprecise general discussions of water flow and transpiration, but there were also good answers showing clear understanding of principles. Again the best answers addressed the context of the question rather than producing generalisations. Many incorrect answers linked the negative values of water potential to negative pressure in the xylem.
- (b)(i) Generally answered well, but answers often only described rather than explained the difference in wall thickness. A significant number of students wrongly referred to the artery wall as 'needing thick layer of muscle to pump the blood'.
- (b)(ii) There were frequent incorrect references to the aorta wall contracting or relaxing and to thickness increasing due to contraction. There were also many very general references to vasodilation or constriction. A frequently expressed incorrect idea was that the wall would become thicker with increasing pressure.
- (b)(iii) This question was answered well by the majority of students. Frequent inappropriate responses involved relating the function of the vessel to wall thickness rather than to the variations in wall thickness.
- (c) The majority of students were able to score high marks on this question. Many gave well reasoned answers, although some failed to include precise detail. There were often good discussions relating to hydrostatic, water and osmotic pressures. Many students made good references to the role of the lymphatic system, although a common error was to state that the lymph nodes returned the surplus fluid to the circulatory system.

Question 9

- (a)(i) The majority of students gained this mark. A few gave answers such as 'optimum for antibiotic', 'optimum' or 'optimum for bacteria' and did not gain credit. Some correctly referred to denaturing of enzymes but a small proportion referred to denaturing of bacteria. Most who referred to the temperature understood that it was around body temperature, but a few lacked that basic understanding and thought it was room temperature.
- (a)(ii) There were many very general answers about fair tests, comparison or reliability that

gained no credit as they were not linked to the context of the question. Other students restated the stem of the question – ‘same volume’ – and gave no new information.

- (b)(i) There were quite a few responses that failed to describe the pattern and simply put the table into words. The steep initial fall was sometimes just written as a decrease. Most students attempted to use figures in their answer, a minority choosing intermediate amounts such as $4 \mu\text{g cm}^{-3}$ or $20 \mu\text{g cm}^{-3}$ as their reference points. A few students were not accurate in their reading of the graph and gave the levelling off point as $40 \mu\text{g cm}^{-3}$.
- (b)(ii) Many wrote very wordy explanations of only one or two points. Most did not consider that fewer bacteria would be killed with lower concentrations. Quite a few responses listed rote-learned statements, such as ‘correlation does not prove causation’, ‘no repeats’ or ‘other factors’. They did not gain credit.
- (c) Many scored well on this question. Many who scored only one mark gave horizontal and vertical transmission as the two different points. Some made loose statements about the increased probability of antibiotic resistance when not completing a course, or through overuse of antibiotics, but failed to answer the question and gained no credit.
- (d) Many non-specific responses that did not gain credit were given, such as ‘other factors’, ‘to eliminate age as a factor’ or ‘to compare the results for reliability’. The effect of age on an aspect of physiology relevant to the investigation was needed to gain the mark.
- (e) Students who worked through the available data logically and commented on each part usually gained high marks. A significant number did not appreciate that the bacteria that were not killed would probably already have an allele for resistance. Their answers implied that the presence of the antibiotic itself would bring about the mutation. The table was sometimes misunderstood, for example in writing answers such as ‘people with infected heart valves were more likely to have their teeth extracted’. Often weaker responses about the table referred to an overall trend – ‘not much difference...’ and did not include enough detail, such as separate comments for data at 2 months and 3 months.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the [Results statistics](#) page of the AQA Website.