



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

**Biology**

**BIOL2**

**(Specification 2410)**

**Unit 2: The Variety of Living Organisms**

***Report on the Examination***

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## General Comments

Overall students seemed to find the paper straightforward with no evidence of any general misinterpretation of questions. There were some very impressive answers with students displaying an excellent understanding of the unit content covered on the examination paper. However, it was also clearly evident that some students had not thoroughly prepared for this test as indicated by some of the responses on recall questions such as 9(a). Generally, questions involving interpretation of data presented graphically or in tables were well answered but calculations caused problems for many students. A number of the longer questions proved to be effective discriminators and often gave better students the opportunity to show their understanding of a topic or to demonstrate their analytical skills. One area of concern was the poor responses to parts of question 8, particularly relating to root pressure and analysis of results. There was considerable variation in the ability of students to express their ideas clearly and logically. Weaker students often failed to gain credit due to the use of imprecise or inappropriate scientific terminology.

### Question 1

- (a) The vast majority of students correctly named structure **X** as the granum or thylakoid. Structure **Y** was often incorrectly labelled as cytoplasm or matrix.
- (b) Over 80% of students gained both marks by referring to a chloroplast absorbing light in photosynthesis. A small minority of students incorrectly suggested that the function of a chloroplast is in 'energy production'.
- (c) Most students gained one mark for the principle of dividing the measured length by the magnification. However, only two in every five students were able to complete the calculation to provide the correct answer in micrometres.

### Question 2

- (a)(i) Over 80% of students correctly named this stage of mitosis as anaphase. A common incorrect response was telophase.
- (a)(ii) Most students gained one mark for describing the separation of the chromatids to opposite sides of the cell. However, less than 30% of students explained that the chromatids would be identical in terms of their genetic content. Most students simply stated that the cells being produced would be identical. This was in the stem of the question and, therefore, did not gain credit.
- (b)(i) This proved to be a very effective discriminator. The most common mark was for linking cells containing 8.4 units with DNA replication. It was only better students who correctly explained how cells with 4.2 units were produced. A third of students gained no credit, often referring to meiosis, gametes and haploid cells in their explanations.
- (b)(ii) Two thirds of students correctly showed that a gamete formed in this animal would contain 2.1 units of DNA.

### Question 3

- (a)(i) Very few students failed to identify *Synodontis batensoda* as the species of catfish most closely related to *Synodontis membranacea*.
- (a)(ii) Similarly, less than 4% of students failed to identify *Mochokus niloticus* as the species of catfish most distantly related to *Synodontis membranacea*.
- (b) This proved to be more demanding with over a third of students failing to determine that the number of different genera shown in the diagram was five.
- (c)(i) The vast majority of students obtained this mark. Students who failed to gain credit often stated that 'viable offspring' would be produced without indicating that the offspring would be fertile.
- (c)(ii) This question was very well answered with the majority of students gaining both marks. The importance of courtship in attracting the opposite sex, allowing species recognition and as an indicator of sexual maturity were common scoring points.

### Question 4

- (a)(i) Over 90% of students correctly determined that base sequence could code for a maximum number of four amino acids.
- (a)(ii) The vast majority of students gained at least one mark, often by mentioning a change in the sequence in amino acids. However, a significant number of students incorrectly referred to 'different amino acids being formed'. Most students gained a second mark for explaining that the active site/ tertiary structure would be altered. Over 50% of students gained maximum marks either by linking this to enzyme-substrate complexes not being formed or to changes in hydrogen bonds.
- (b) Most students had little difficulty in using the information to give two symptoms of phenylketonuria and gained both marks.
- (c) The majority of students obtained this mark, often by referring to migration or by describing interbreeding. However, over a third of students failed to gain credit and often accounted for the spread of phenylketonuria by horizontal or vertical gene transfer.

### Question 5

- (a)(i) Over 90% of students correctly explained that vancomycin does not affect human cells as these cells do not contain a cell wall.
- (a)(ii) Approximately two thirds of students gained this mark by outlining the role of ribosomes in protein synthesis.
- (b) This proved to be an effective discriminator. Most students obtained at least one mark often by referring to vertical gene transmission. Many students then referred to the reproduction of resistant bacteria to gain a second mark. Over a third of students gained maximum marks by explaining that a mutation leads to resistant strains or by stating that a resistant gene or allele is produced. Unfortunately, some weaker students incorrectly referred to bacteria becoming 'immune' or to bacteria reproduction by 'mitosis'.
- (c) This proved less demanding with almost 60% of students gaining maximum marks. Most students obtained two marks for referring to horizontal gene transfer and

conjugation. Maximum marks were often gained by mentioning the transfer of a plasmid between different species of bacteria. Relatively few students referred to the plasmid/gene/DNA being replicated. A small minority of students incorrectly described vertical gene transmission.

### Question 6

- (a) Over 40% of students failed to score on this question. Many of these students suggested that proteins consist of bases and the confusion between bases and amino acids pervaded their responses. Although a number of students did correctly refer to the sequence of amino acids, only better students linked the similarity of the amino acid sequence with a close evolutionary relationship between different species.
- (b) This question also proved challenging with less than 50% of students gaining any marks. However, a significant number of students did gain one mark for reference to the triplet code and students appreciating the degeneracy of this code were able to gain both marks. Some students gained credit by referring to introns or non-coding DNA.
- (c) This question caused few problems with three out of four students gaining both marks. Almost every student stated that the results showed that humans and chimpanzee have the closest evolutionary relationship. However, some students did not always clearly express the idea that the trout was least closely related to humans.

### Question 7

- (a)(i) Slightly more than half the students obtained this mark, often for mentioning the idea of identifying anomalies or that the sample would be representative of the population. Answers failing to gain credit often lacked sufficient detail with responses such as 'to make the results reliable' or 'to calculate an average' being commonplace.
- (a)(ii) Almost 95% of students gained this mark by mentioning the removal of bias.
- (b) Two thirds of students correctly carried out the calculation and obtained both marks. Approximately 5% of students obtained a principle method mark having calculated an incorrect answer.
- (c) This question proved to be a fairly effective discriminator. Surprisingly, a significant minority of students suggested that there would be a decrease in the variety of insects on the golf course despite the stem of the question indicating that diversity would be higher. However, most students did mention an increase in habitats for one mark. Many also appreciated there would be an increase in the variety of food sources although references to 'more food' were not credited. Only the very best students mentioned an increase in the variety of plants.

### Question 8

- (a) It was clearly evident that many students had little understanding of root pressure with almost half the students failing to obtain any marks. Less than 10% of students gained maximum marks. A glaring omission from many responses was the role of the endodermis in developing root pressure and in some instances a lack of understanding of water potential. A third of students obtained a single mark, often for referring to osmosis in the context of the root.
- (b)(i) It was pleasing to note that the vast majority of students were able to describe the rate of water movement in the upper branches and gain both marks. Only 5% obtained zero on this question.

- (b)(ii) Many students gained one mark for the idea that the peak is higher in the upper branches. However, relatively few students described a second difference between the results in the trunk and upper branches. A significant number of students simply described one of the results and gained no marks.
- (b)(iii) Approximately half the students gained one mark by describing how tension is produced or by referring to water being pulled up the tree. Very few students referred to water movement starting in the upper branches for a second mark.

### Question 9

- (a) This question produced a good spread of marks. Most students referred to haemoglobin combining with oxygen in red blood cells and appreciated that loading took place in the lungs. Some students then described the unloading of oxygen at respiring tissues and these students often linked this to the increase in carbon dioxide. Generally, only better students referred to high and low partial pressures of oxygen and gained maximum marks. A significant minority of responses ignored loading and unloading of oxygen and described the passage of oxygenated blood through the circulatory system.
- (b) Almost half the students failed to gain a mark as they often simply referred to it being a 'fair test' without an explanation. Most answers gaining credit mentioned enzymes and better students linked this to respiration to gain two marks. Answers relating to the temperature affecting the amount of dissolved oxygen were fairly infrequent as were references to enabling 'comparisons' between the larvae of both species.
- (c) Most students appreciated that the mean rate of oxygen uptake increased and then levelled out with an increase in oxygen concentration in the water. However, only better students specifically referred to where oxygen uptake levelled out. Students gaining zero marks often stated that there was a positive correlation between the variables.
- (d) Many students noted, for one mark, that *Chironomus longistylus* has a higher oxygen uptake at lower concentrations of oxygen. However, less than 25% of students used the data to support their observation and gain a second mark.
- (e)(i) Almost 80% of students gained this mark, often by stating that more oxygen is lost via the gills in Australian lungfish than in African lungfish.
- (e)(ii) Most students were aware that more exchange is via the lungs in African lungfish. However, far fewer students gained a second mark by mentioning that gills would not function in air.

### Question 10

- (a)(i) Over 80% of students had little difficulty obtaining both marks in this question. Students who obtained one mark often provided two examples of lifestyles or referred to age which was excluded in the stem of the question.
- (a)(ii) This was also well answered with over 70% of students gaining both marks. Most students referred to the large sample size and that the study took place over a long period of time. Some weaker students incorrectly answered the question in terms of additional features which may have been desirable in this investigation.

- (b) Approximately half the students obtained both marks for this calculation. 20% of students obtained a single mark for their method of calculation or provided an answer of 210 rather than 209/209.1.
- (c) Most students made the link between age and the risk of getting cancer. Answers which linked age to caffeine consumption were not credited.
- (d) The majority of students obtained at least two marking points often for stating that a correlation does not mean a causal relationship and for mentioning that tea /coffee contains other substances. All the other marking points were seen by examiners but surprisingly few responses included a reference to the lack of a control group in this investigation.
- (e)(i) The vast majority of students gained at least one mark by stating that the control group would be treated in exactly the same way as the experimental group. Over 50% of these students gained a second mark by mentioning that the control group should not have caffeine. Answers which were limited to using a placebo without mentioning lack of caffeine were not credited.
- (e)(ii) Almost two thirds of students gained this mark often by referring to different rates of absorption, different sources of caffeine or to people having different blood volumes.
- (e)(iii) Slightly less than half the students obtained this mark usually by referring to a lack of oxygen supplied to the cancer cells or to the spread of cancer cells being reduced.

### **Mark Ranges and Award of Grades**

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