



**General Certificate of Secondary Education**

**Additional Science 4463 /  
Biology 4411**

**BLY2F      Unit Biology 2**

**Report on the Examination**

*2011 examination – January series*

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**Additional Science / Biology**  
**Foundation Tier BLY2F****General**

Examiners were pleased at the efforts made by the vast majority of candidates to complete the paper, applying their knowledge and understanding effectively.

Most candidates had been entered for this paper appropriately, although there was, inevitably, a small proportion who might have gained a higher grade had they been entered for the Higher tier paper.

Candidates' examination techniques are improving. On the whole, candidates' writing was more easily readable than in previous examinations, which meant examiners were better able to award marks for correct work. Most candidates followed the instruction to write within the printed box, so their work would be scanned for marking and those who extended their answers away from the printed lines/space, to other parts of the paper usually indicated with stars, arrows or a suitable comment. Candidates should be advised not to cross out a response unless they replace it with another answer. Crossed out responses that are not replaced are marked anyway, however crossing out often obliterates key components of what might have been a creditworthy answer. In addition a response that is only partly crossed out, even to the extent of leaving just one word not crossed out, will only have the 'uncrossed-out' portion marked. Furthermore altering an answer by overwriting an original (usually where a single letter is required) often leaves examiners unsure as to what was intended to be the final answer.

Although the use of past examination papers as part of a revision programme is a good practice, candidates should be reminded that the questions in the paper are unlikely to be exactly the same as those previous papers, thus responses need to reflect the question set rather than some preconceived or prepared answer. This was particularly noticeable in question 5(a)(i) (evaluation of industrial practice) and 8(b) (pyramid of biomass).

**Question 1 (Low Demand)**

- a) A considerable number of candidates made a good start to the paper, collecting all three marks. The most common error was to link 'cytoplasm' with 'strengthens the cell'. A small number of candidates drew two lines from at least one of the cell parts, thus cancelling any credit they might have gained for that part. It is important that candidates read the instructions carefully, hence 'a line from each part', indicates that just one line is needed from each of the boxes on the left. Candidates should also be advised that if they need to cross out a line, then any crossing out along with a replacement line should be absolutely clear. Some candidates overcome this problem by numbering the boxes they want linked, in pairs.
- b) Although the most common answer was 'energy', a large proportion of those not giving this selected 'oxygen'. There remains considerable confusion regarding the reactants and products of respiration and photosynthesis and the circumstances in which these two processes occur.

**Question 2 (Low Demand)**

- a) The vast majority of candidates collected all three marks in this part, showing a good understanding of the basic functions of the various organs involved in controlling conditions in the body.

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- b) (i) A large proportion of candidates collected the three marks on offer, the most common error being to transpose the answers for skin and bladder, as a result of, apparently, not interpreting the bar chart and key correctly.
- b) (ii) Many correct ideas concerning ‘cooling’, ‘reducing temperature’ and ‘to avoid overheating’ were seen, however those candidates who merely rephrased the question with responses such as ‘to maintain body temperature’ were not awarded the mark, as the direction of this maintenance was unclear. In this case, some idea of lowering the body temperature was required. References to ‘sweating’ were often included in responses, but without qualification as to how this helps to control body temperature, no credit was given. Weaker answers included misconceptions such as ‘sweating keeps you hydrated’ or ‘sweating gets rid of excess water’.

### Question 3 (*Low Demand*)

- a) (i) Many candidates secured both marks, and most of these followed the instructions to show their working. Of those who arrived at the wrong answer, one mark was available for showing the correct calculation (without additional numbers). It is perhaps surprising that a considerable number of candidates appeared not to have calculators with them, as the tortuous process of adding each number in turn was evident in a number of papers. Furthermore, when calculators are used it is always advisable that candidates should consider whether their answer is correct, as it is all too easy, in the pressured situation of the examination, to press the wrong key. At least double checking the answer, preferably via a different route, should be a minimum.
- a) (ii) A significant minority of candidates failed to make any effort here perhaps believing that they were required to conjure the figure required to be deducted from their answer to (a)(i), from memory. Again, for those who knew how to carry out the calculation but could not complete it correctly, one mark was awarded if the calculation was shown. Fewer candidates were awarded the single mark here, than in (a)(i). The most common error was to add 64 to the answer given in part (i), rather than to subtract it, thus a common incorrect response was ‘134’. Had these candidates stopped to consider this answer they might have wondered how the annual increase in carbon dioxide in the atmosphere could be greater than the total of all the inputs. Again, the number of candidates who were unable to subtract (or add, if they were doing the wrong sum) correctly surprised examiners.
- b) Most candidates knew that carbon dioxide is used in photosynthesis, although some will have inevitably continued their incorrect train of thought from question 1(b), as ‘respiration’ proved to be the most attractive distractor here.

### Question 4 (*Low Demand*)

- a) (i) Most candidates correctly gave ‘A’ or ‘C’ as the male pig with the disorder. The most common error was to give pig ‘E’, which is female. The majority of candidates then went on to give either ‘B’ or ‘D’
- a) (ii) Although perhaps the negative aspect in this question confused those who suggested pigs ‘F’ or ‘E’. Some candidates, having suggested a correct answer then added a second, incorrect response in the same part, thus cancelling the

mark. Other candidates made it difficult for examiners to award marks by attempting to overwrite one answer with another, thus leaving a hybrid letter that was almost impossible to interpret. A clear cross through an original letter, coupled with a replacement inside or just outside the box would have made their intentions much clearer. A few candidates, despite the direction to choose a letter 'A, B, C...', only ticked the boxes so could not gain any credit.

The great majority of candidates correctly deduced that pig C inherited the disorder from pig A.

- b) However achievement in part (b)(ii) was less convincing, as both distractors, particularly 'embryo', proved to be attractive.
- c) Responses were very mixed. A good proportion of candidates showed a clear knowledge and understanding of the inheritance of gender, whilst others demonstrated a mixture of weak knowledge and illogical thinking. It might have been expected that candidates would recognise that 'male pig A' and 'male pig F' should have the same sex chromosomes, as they are both male, however many examiners reported that this was by no means the case. Other candidates suggested 'YY' for pig A, and then managed to get the correct pattern, 'XY', for pig F, for one, rather fortuitous, mark. There were others who, despite the clues in the female side, decided that sperm cells should each have two sex chromosomes, occasionally arriving with three or even four for pig F. A small but significant minority of candidates did not attempt this part, thus giving up the opportunity of any of the three marks. This is disappointing as there ought to have been sufficient information in the question stem ('..sex chromosomes X and Y') and in the diagram to have allowed some attempt.

#### **Question 5 (Low Demand)**

- a) The evaluation part of this question, was not set in the same way as previous evaluation questions. This appeared to confuse many candidates
- a) (i) Here in most cases, a distinct comparison of the two methods was required. Those candidates who only chose the bullet points were unable to gain the marks. The fact that, in the bio-stonewashing method, for example, 'washing takes half an hour' is not, in itself, an advantage; the advantage is that this is a shorter time than would be taken in the traditional stonewashing method. There were relatively few answers about damage to fibres and only rare suggestions regarding potential damage to the machines caused by the stones.
- a) (ii) Candidates were far more successful in this part, selection from the bulleted points was sufficient to gain the marks. Although in most cases examiners are willing to accept a clear indication of the selected point, without it needing to be written out in full, loose answers referring to economics, 'it is expensive', were not credited as the 'it' was not considered to be sufficiently clear, considering the stem of the question. In this example reference also needed to be made to 'the enzyme(s)', as it is likely, given the information, that both methods have their own, different, expenses.
- b) Most candidates correctly selected 'protease', with 'lipase' being the most common incorrect suggestion.

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**Question 6 (Low demand)**

- a) (i) Most candidates knew that oxygen would move by ‘diffusion’, although ‘photosynthesis’ was a powerful distracter for many of the others. Those candidates who realised that the concentration of oxygen in the three cells would mean that oxygen would move most quickly into cell ‘A’ were rewarded, however a significant proportion seemed to think that as cell B already had the greatest concentration, then it would continue to gain more.
- b) (i) The great majority of candidates are aware that water moves into or out of cells by ‘osmosis’. However, candidates were less secure in their knowledge of how osmosis works, towards the cell with the most concentrated solution, and often suggested cell ‘P’, rather than cell ‘R’.

**Question 7 (Standard Demand)**

- a) (i) There were many correct answers referring to ‘colour’ of ‘the light’, ‘the bulb’ or ‘the lamp’. Here ‘bulb’ alone, without qualification was accepted, as it was the bulb that had been changed in the investigation, however neither ‘lamp’ nor ‘light’ without qualification were considered sufficient as, in the context of the potential variables in this type of investigation, they were ambiguous. Few made reference to ‘wavelength’ of light. A few candidates failed to answer the question and instead gave the aim of the investigation ‘to find out the way in which the colour of light affects photosynthesis’, i.e. a copy of the first line in the question stem; these candidates were not awarded the mark as their understanding of ‘independent variable’ was unclear. Those who lacked the understanding of the required variable often suggested ‘time’, ‘number of bubbles’ or ‘pondweed’.
- a) (ii) A similar pattern of success was evident, the commonest responses referring to the ‘amount’ of ‘pondweed’ or of ‘water’. Although the examiners were willing to accept the loose term ‘amount’ here, candidates should be encouraged to use correct scientific terminology, such as ‘mass’, ‘length’ or ‘volume’ so that their intentions are clear. Other common correct answers referred to the ‘light intensity’ or the ‘distance between the lamp and the tube/pondweed’. ‘Temperature’ was acceptable without qualification but if qualified this had to be correct, ‘of the water’. References to ‘carbon dioxide (concentration)’ were rare. ‘Time’, offered by a minority of candidates, was not accepted.
- a) (iii) Many candidates suggested a whole list of possibilities often within the one answer, so suggestions such as ‘to improve the accuracy and reliability’ were common. The examiners elected to ignore suggestions such as ‘accuracy’, ‘precision’, ‘validity’ and ‘fairness’ for this mark; however this will not always be the case and candidates should ensure that they become familiar with the correct terminology. Other candidates took different approaches and suggested ideas regarding calculation of ‘average/mean’ or that counting for one minute intervals would ‘reduce the chance of losing count’, both of these ideas were credited, although those who suggested that ‘you are *more* likely to lose count’ had not read the question sufficiently well.
- b) (i) The majority of candidates correctly identified ‘green’ as the best colour, a significant minority however, thought that ‘blue’ would be best. Some candidates went on to explain their reasoning, referring to ‘fewest bubbles’ meaning ‘least photosynthesis’, in part (b)(ii), and were rewarded with both marks

- b) (ii) A significant proportion only made one or other of these points, showing the need to explain their logic in as much detail as possible. Those who had chosen 'blue' in part (b)(i) almost inevitably had the wrong line of thought, often believing that more bubbles would 'agitate the water' and would 'prevent the algae growing'. Those selecting 'yellow' usually did so for aesthetic reasons such as being 'nice and bright' or 'more like the sun' so the fish would 'be comfortable'. Candidates again showed their lack of security regarding the products of photosynthesis, with confusion and occasional contradiction, as to whether the bubbles were composed (largely) of oxygen or carbon dioxide. Although it was not necessary here to name the gas, those who chose the incorrect one lost the 'least bubbles' mark. A few candidates gained credit for pointing out that green light would be 'reflected by chlorophyll', a clear indication of good understanding.

### Question 8 (Standard Demand)

- a) (i) Most candidates correctly arrived at '6000', although a few added or missed out a zero in their final answer. In these cases examiners looked at any working and awarded one mark for the correct sum, '20 x 300', thus showing the advantage of following the instructions to 'show clearly how you work out your answer'. Those with answers such as '600' or, less often, '60000' without evidence of working, scored no marks.
- a) (ii) A significant minority of candidates made no attempt to this question. Those that did generally drew the bar below that of slugs to gain the second mark. The first mark was awarded for accuracy of drawing. Inevitably some attempted to extend the scale to 6000 on either side of the midline, clearly ignoring the clues in the pyramid, offered by the drawn bars for hedgehogs and slugs. Others made it difficult to award this mark by casual drawing at the 3000 mark, missing the correct location. For those candidates who arrived at the wrong answer in part (a)(i), both marks were still available here, provided the drawn bar was below that of slugs and its width matched their calculated figure or was 6000. A label on the bar was not required for this part although most added one.
- b) This question proved to be very demanding, for at least one of several reasons. Many candidates confused biomass with energy whilst others discussed losses from the slugs, rather than from the hedgehogs. Other candidates chose entirely the wrong tack and their answers consisted of little more than a mathematical exercise as to why 200 is smaller than 1200, dealing with the details of numbers of organisms at each trophic level and the mass of the individual animals. Others thought that this was entirely due to hedgehogs being 'killed by cars', 'unable to mate as there's only one of them' or 'hibernating so being difficult to find'. Candidates were generally of the opinion that losses by the slugs meant that there was less biomass available for the hedgehogs, however whilst this is true, it does not answer the question as to why the hedgehog population biomass is smaller than that of the slug. It is losses by the hedgehog, during and after it has fed on the slugs that cause the decrease in biomass. It is these losses *from the hedgehog* 'by excretion', 'through faeces' and 'by respiration' or by '(parts of) slugs not eaten' that result in the apparent loss of biomass.

Those candidates who wrote in general terms, describing losses through the food chain, but not ascribing these losses to any of the organisms in the food chain were awarded marks appropriately, but these were not common. Those candidates who referred to 'respiration' often had the misconception that 'energy is used' in the process and were also not awarded the mark. Many candidates described losses from 'heat' and

'movement'; these were not accepted here as they are references to a pyramid of energy, rather than of biomass. Disappointingly some candidates chose to use 'etc' in a list, e.g. 'losses from heat, movement etc', quite often these answers were about losses by the hedgehog. Had these candidates thought about their answers more carefully they might well have picked up one or two further marks.

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

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