



General Certificate of Secondary Education

**Additional Science 4463 /
Biology 4411**

BLY2H Unit Biology 2

Report on the Examination

2009 examination – June series

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Additional Science / Biology
Higher Tier BLY2H**General**

The examiners noted an improvement in the performance of candidates, when compared with recent examinations on this specification. There was a better quality of written response, in terms of biological knowledge and understanding, along with a better appreciation of what was required in an answer. The quality of written English was also improved with fewer examiners having difficulty in interpreting the meaning of candidates' answers. However there continues to be a small minority of candidates for whom, judging by their weak performance, the Foundation Tier examination would have been more appropriate.

Relatively few candidates wrote in inappropriate colours, blue or even pencil. In such cases the examiners do their utmost to read the scanned image, but there is a limit to contrast with online marking. Centres are requested, for the sake of their candidates, to ensure that black ink or ball-point pen is used throughout the examination.

Candidates are provided with what is considered to be more than adequate space to compile their responses. Inevitably some candidates wish to write all they know on particular subjects and spread their answers into areas of the page which are not accessible to the scanning process. In such cases candidates would be advised to use additional sheets, which are marked by hand, rather than risk extending their answers by more than a couple of lines, when they may not be read.

Once more, examiners are keen to point out the need for candidates to take careful note of the command words in questions. Describe and explain have very different meanings. A question requiring an explanation quite clearly identifies that an answer involving only a description will not score any marks. This was particularly noticeable in question 5 (a)(ii) but was less common than in the previous January examination.

Question 1

- (a) (i) The majority of candidates were able to complete the word equation for photosynthesis accurately. The use of chemical symbols, rather than words, was accepted, including those that did not entirely conform to standard conventions. The most common errors were to reverse the answers and to include chlorophyll or light as the reactant or energy as the product. Those candidates who had some understanding of examination technique and were perhaps unsure as to which way round the two compounds should be inserted, selected one of them to write in both spaces, thus ensuring them of one mark.
- (a) (ii) A little over half of the candidates correctly identified respiration in the plant as a source of carbon dioxide for photosynthesis, with the distracters being roughly equally attractive.
- (b) This part was poorly answered with a disappointing number of candidates not appreciating that the independent variables were light and chlorophyll. In answers that were incorrect a great proportion cited the black card for at least one of their answers and such variation in these included the position, colour, area and the size of the card. Sometimes control variables were incorrectly given in the answers including the same leaf, same amount of water, the card being left for the same amount of time. This was particularly disappointing, considering the effort which centres must put in teaching the meaning of terms such as independent variable.

Candidates must recognise that questions on How Science Works are not confined to ISA assessments and they cannot simply forget about them in their revision for written papers. Some candidates were perhaps fortunate in identifying light as one of their answers, when their other answer suggested that they were quoting two control variables. However as light was accepted here, a mark was awarded. References to the card were ignored if accompanied by a correct answer, however many responses got no further than this.

It was intended that this part would be a trigger for part (c), however, although a large proportion of candidates did not score on part (b), most did achieve the marks in part (c). Had candidates thought through their answers to part (c), they might have realised that the dependent variable (the presence or not of starch) is linked to the independent variable(s), in which case they might have gone back to part (b) and rethought their answers. However, this appeared not to be the case.

- (c) Candidates should be reminded that lists of answers, such as no carbon dioxide or light, will generally score no marks as incorrect answers negate correct ones.
- (c) (i) The most common incorrect answers included references to the card, without indicating that this absorbed light or prevented light reaching the leaf. A few candidates who suggested that the absence of light prevented the manufacture of chlorophyll had clearly not recognised that the 8 hours duration of the experiment would not have this sort of impact.
- (c) (ii) Although candidates were a little less successful here achievement was still good. However, there were a lot of vague answers and misunderstandings, and some even explained why starch was present. There was some confusion between photosynthesis and respiration, and between chlorophyll and starch, with some going as far as to suggest that the white part of the leaf was due to the presence of starch which is white.

Question 2

- (a) (i) Only rarely did candidates fail to note that the rate had increased. A few candidates confused temperature with oxygen concentration, describing the increased rate of decay as temperature increases, and so did not gain the first mark. Most candidates were able to put suitable numerical values on the increase, the most common error being to give values for 30% oxygen concentration instead of 20%. The concise answer the rate doubles was often seen and gained both marks, although when the incorrect figures were attached to this generalisation it cost one of the two marks.
- (a) (ii) This was intended to develop the theme from part (a)(i) and most candidates recognised that the holes are necessary to allow oxygen (air) to reach the contents of the bin and often this was linked to the decomposing microorganisms or their respiration. Some gained a mark for explaining that the holes would allow heat to escape, although most of these could not explain why this is important.

Common misconceptions were that microorganisms would need the holes to get in and more worryingly, that they need light to survive. Although moisture is required for decay, the access to rain provided by holes at the sides of the bin is unlikely to be significant when compared with an open top and so this was ignored. A few candidates, perhaps carrying continuity a little too far from question 1, believed that the plants in the bin would continue to photosynthesise so would need to acquire carbon dioxide and lose oxygen via the holes.

- (b) In this part it was clear that most candidates had effectively revised about the value of compost and the minerals or nutrients it supplies. Many were able to give excellent examples. Those who failed to gain this mark usually referred in too general terms of goodness or fertiliser. However others suggested incorrect substances including vitamins, glucose and proteins. Those who suggested carbon dioxide along with an appropriate substance were not penalised, however the examiners considered that the amount of carbon dioxide released by still-decomposing compost would be so small and so quickly dispersed as to make no noticeable impact on plant growth.

Question 3

- (a) A high proportion of candidates successfully negotiated the information to arrive at 4%. Of those who did not, the most common error was to invert the proportion, to get 25 (if they forgot to convert to a percentage) or 2500. Candidates should be aware that answers to numerical questions will always be realistic, so figures in excess of 100%, for questions such as this, should the need to rethink their answer. Only a few candidates showed the calculation but failed to work it out, often with the plaintive no calculator.
- (b) The three marks in this part were often gained by just three words: movement, respiration, excretion. Others were tempted, perhaps by the available space, to elaborate on their answers. This occasionally tripped them up as a significant minority of candidates insisted, incorrectly, that energy is used for respiration. Incorrect colloquial terminology was not accepted as equivalent to faeces, the spelling of which was many and varied, often containing few of the letters in the correct place, though recognisable phonetically. Reproduction was also a not uncommon incorrect answer, as candidates did not realise that the growth of an embryonic calf is still part of new growth. Weaker candidates showed evidence of poor reading of the question and included growth as one of their answers.
- (c) This part showed a number of misconceptions. Many candidates answered in terms of individual organisms having less biomass (further along the food chain) rather than trophic levels. Others appeared to believe that cattle could act as herbivores, by eating grass, or as carnivores, by eating other animals; that diseases are more likely to be caught by eating carnivores; that eating herbivores is less cruel. Still more candidates implied that herbivores do not lose or use energy. Those who gained marks commonly referred to the length of the food chain being shorter or that herbivores cost less to feed; although herbivores being cheaper to raise was considered too vague. Those who recognised the continuity of the question often went on to explain that in a herbivore food chain there would be fewer energy losses.

Question 4

- (a) This question exemplified the need for candidates to read question details very carefully before embarking on their answers. Some of the mistakes made arose from a misunderstanding of the context. As a result, the experiments were often seen as being carried out on detergents, bacteria, antibiotics or disinfectants rather than on enzymes. The point about samples having been diluted to give the same concentration of lipase was often overlooked. The outcome of a clear mixture following digestion of the lipid was sometimes read cursorily as being a cloudy one.
- (a) (i) The vast majority of candidates correctly identified **B** as the most effective lipase. Those few who did not, most commonly suggested **C** and explained in part (a)(ii) that this was because none of the lipid had been digested.
- (a) (ii) In their answers to this part, the majority of candidates referred to the largest clear area around **B** and gained the mark. Some, however, did not use comparative words when they were needed. In this instance, candidates were asked to explain their choice of the *most* effective lipase and answers such as it changed from cloudy to clear failed to distinguish **B** from **A**, **D** or **E** and were, therefore, insufficient. Incorrect answers referred to the area around **B** being the clearest or the only one not to go cloudy. Some candidates thought that the results implied more bacteria had been killed and even that **B** might have eaten the most bacteria. Others believed that **B** had a higher concentration of lipase or that **B** digested most lipase.
- (b) Here the most common correct responses were temperature, cost and possible allergic reactions. pH as a factor was seen less frequently. Temperature was, on occasions, mistakenly given for both factors, firstly in relation to the optimum for the enzyme and secondly in relation to denaturation. Other answers such as how effective they are at digestion, the optimum conditions for the enzyme, if they are harmful to people and how fast they work were often too unspecific to be given credit. Some candidates referred to ideas that underpin science investigations in general but which were inappropriate here, such as repeat to increase reliability, check to see if there are any errors or ensure it's a fair test. The question context of lipase was sometimes overlooked when candidates suggested that other enzymes such as proteases should be tested.
- (c) Some excellent answers were seen in this part. Candidates often understood denaturation perfectly and gave clear explanations relating to changes in the shape of the active site due to the unravelling of amino acid chains which was detail far beyond the requirements of the question or the specification. Some failed to gain the mark because they made no mention of enzymes, usually referring to them, which implied the detergent as a whole. Candidates who gave unspecific responses, such as too hot for enzymes or enzymes become less effective also failed to pick up the mark. It was pleasing to note that relatively few references were made to enzymes being killed. Other incorrect answers included ones that suggested the detergent would burn or that bacteria would die.

Question 5

- (a) (i) There was no mark for identifying the correct type of bread, wholemeal. Those candidates who were confused as to what diabetes is, commonly suggested white bread and went on to explain that this raises blood glucose concentration the fastest and for the longest period of time, with answers such as gives you more sugar, which you need. Insufficient answers which got closer to the point suggested that wholemeal bread gives a steadier rise in blood glucose concentration, rather than a *slower* rise. It was interesting to note that descriptions of graphs were often better for answers that were not relevant, for example, descriptions of the fall in blood glucose concentration often described the *rate* of fall correctly, whilst descriptions of the rise often did not refer to rate.

Whilst many candidates gained one mark by referring to the lower maximum rise in blood glucose concentration, relatively few gained a more difficult second mark for describing the lower rate of rise, although some correctly referred to the reduced need for insulin injections. A not insignificant minority of candidates wrote about the time scale, either being quicker to reach the maximum, which is correct but irrelevant, or quicker to get back to zero which is clearly incorrect.

- (ii) A considerable number of candidates misunderstood the command word explain and filled all the space and often more beyond with detailed descriptions of every rise and fall in blood glucose concentration and gained no marks. Others attempted to compare brown bread with white and/or wholemeal bread, also often gaining no marks. Those who realised that the question was asking them to apply their knowledge of digestion, absorption and the action of the pancreas often gave extensive and detailed answers that could have gained six or seven marks had they been available, sometimes extending their answers with references to glucagon production once blood glucose levels fell too far. Misconceptions existed with ideas that glucose is broken down into starch or that sugar is turned into glucose or even that bread is turned into sugar. As usual on this topic, hybrid terms such as glucagen and glycogon were not uncommon.
- (b) The vast majority of candidates picked up one mark by referring to diabetics no longer needing to take or inject insulin. Better candidates went on to discuss the reduced need for dietary control or self monitoring. Fewer candidates clearly explained the permanency of the treatment. A few candidates perhaps became confused with work they had done on kidney transplants and suggested an improved lifestyle. As a disadvantage, reference to low success rate was the most common, however when using figures, candidates were expected to add at least something to the information 58%... in the question to indicate that they recognised this was a low success rate.

Many candidates also referred to the possibility of rejection and the need for immunosuppressant drugs. Fewer included ideas about operation hazards or the possibility of disease transmission. Amongst the disadvantages many candidates also referred to ethics or patients not liking the idea of having cells from dead people, neither of which was considered relevant here.

The examiners were willing to accept answers that did not clearly state which were advantages and which disadvantages, as the context of responses was inevitably implicit. A few answers showed poor understanding of what was going on, with references to the need for healthy donors or for donors to be asked after they are dead.

Question 6

- (a) The genetics problem should have been relatively straightforward, and for many candidates this proved to be the case. Those candidates who gained just one mark often did so for quoting the correct chance, sometimes with no working and others with completely erroneous working. However, even for those with the correct working, quoting the chance proved a hurdle too far, for some; answers such as 1:2, 50/50 (ie 100%) or 50 were not uncommon, often appeared in a list, disqualifying a correct answer.

Some believed that as child **V** had already used up one of the chances, then the chance of **W** developing Huntington's disease was reduced to 1 in 3! Those who chose to identify which parental genotypes were which, either by gender or letter generally got this correct, however the examiners did not require this and a few candidates lost two marks by reversing them. Candidates are clearly taught genetic crosses in one of two ways: punnett squares or by joining gametes to offspring using lines. The former is a far more successful way of gaining marks as the mark for offspring genotypes was only awarded if correctly derived. Some candidates did not use all the information in the family tree and were unsure as to the genotype of parent **U**, suggesting **HH** or **Hh**, then showed possible crosses with both, which only gave them direct access to the mark for the genotype of parent **T**. Despite the instruction to use **H** and **h** for the alleles, a small number of candidates inevitably chose their own symbols which were accepted without a key, only if they showed the conventional approach.

- (b) (i) Those candidates who continued the theme of the question, by referring to Huntington's disease almost inevitably gained the mark. Others assumed the question was more general and referred to inherited diseases, which was also credited. The most common error by far was to ignore inheritance completely and suggest that screening simply detected diseases, which was not credited. A few, weaker candidates incorrectly suggested that screening removed the faulty alleles or cured the disease.
- (b) (ii) Most of those candidates who gained the mark referred to either possible harm to the embryo or mother or the increased possibility of termination or abortion. Weaker candidates often referred to moral or ethical points or unnatural without further explanation and were not rewarded.
- (c) (i) Here there were many responses that showed clear, detailed understanding of the genetic and mathematical principles involved, although the latter was not required. Most candidates were able to explain that cystic fibrosis is caused by a recessive allele although some believed that it could be recessive *or* dominant depending on the circumstances, perhaps using these terms incorrectly to refer to the number of people in the population with or without the disorder. Around half the candidates gained the second mark for explaining that two of these alleles are required for someone to have cystic fibrosis. The use of the term carrier, when applied to parents of someone with cystic fibrosis was, as in previous examinations, commonly misused as referring to someone either homozygous or heterozygous for the allele.

- (c) (ii) Thus part discriminated well between those candidates who understood osmosis and those who did not, although some candidates took the wrong tack entirely and explained possible advantages to breathing or avoiding the lungs becoming clogged up. A fairly common fault with weaker candidates was that the water was carried in by the ions as they moved or diffused from the cells to the mucus or that the chloride ions move by osmosis. Many responses did not discriminate whether they were discussing the concentration of solutes or solvent. In such cases the examiners took the conventional route that any references to concentration referred to solutes, unless there was clear statement referring to concentration of water. Other candidates failed to appreciate the importance of the difference between the *concentrations* of chloride ions/water /molecules in the lung cells and the mucus, thus statements that there were *more* ions in the mucus or *more* water molecules in the cells were not accepted. Surprisingly few mentioned the partially permeable membrane some of whom described it as a cell wall, (although full marks could still be and often were obtained with no mention of this).
- (c) (iii) Around half of the candidates correctly identified ribosomes. Of those who did not, mitochondria was by far the most common suggestion. Again weaker candidates failed to read the question carefully and ignored the requirement for a part of the cell, with frequent suggestions of alveoli, along with tissues (muscle), organs (lung) or even (Villa).

Mark Ranges and Award of Grades

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