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General Certificate of Secondary Education

Additional Science 4463 / Biology 4411

BLY2H Unit Biology 2

Report on the Examination

2010 examination – January series

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Additional Science / Biology
Higher Tier BLY2H

General

Examiners noted a not insignificant number of candidates who would have fared better had they been entered for the Foundation Tier examination. Centres are encouraged to try to make sure their candidates are entered for the appropriate tier of the examination.

Most candidates now use black ink and few wrote in colours that were difficult to see as a scanned image. However, candidates do need to be aware that when drawing in pencil the problem of visibility may create difficulties.

Candidates need to keep their answers inside the box as instructed on the paper. The space provided should be adequate however if the candidates need more space they should extend their answers onto additional sheets, suitably identified with name, and correct candidate and centre numbers. Furthermore, should candidates write answers elsewhere than on the lines or in the space provided they would be advised to make it clear on the lines or in the space that their answer has been written elsewhere. If this is on the same page, an arrow to where it is written or a mark such as a star is enough to alert the examiner to look elsewhere on the page. Of course, these problems would be avoided if candidates considered their response, before committing pen to paper, as a good answer need fill no more than half the available space.

A number of examiners noted that candidates did not always recognise the command words, and other candidates failed to make answers clear and concise.

There was some evidence that a small number of candidates had been unable to complete the paper in the allotted time. In all of these suspected cases it was clear that candidates had written extensive and detailed answers to at least two of the questions, making every mark point on the mark scheme and possibly more beyond. Centres would be advised to give candidates more experience of the detail required to gain full marks, using the mark scheme, with their own or model answers, so that they learn to pace themselves to complete the examination.

Question 1 *(Standard demand)*

(a) The great majority of candidates drew and labelled a suitable pyramid of biomass. The examiners were willing to accept a variety of presentations, either as a three-layered triangle or in three blocks of diminishing width and with the apex uppermost or to the bottom. A second mark was gained if the layers or blocks were suitably labelled. Those candidates who failed to draw a correct pyramid shape were rewarded with a single mark for labelling their layers in food chain order. Only very few candidates failed to gain any marks here, these most commonly drawing pyramids with a wide block in the middle labelling it soya, some left the space blank. The mark scheme shows that a variety of appropriate labels was accepted at each tier of the pyramid.

(b) Candidates were expected to identify that energy released or lost by the trout would be eliminated by shortening the food chain. The majority of candidates achieved this, however nearly a quarter only chose one of these, with the third and fifth alternatives proving to be a little too attractive for many. Only a small number of candidates failed to read the vital ‘tick two…’ in the question, and these inevitably gave up the possibility of what may have been a vital mark.

(c) Some candidates failed to suggest suitable advantages of keeping the fish in a large net, suggesting no more than would be possible if they were swimming freely in the lake. Responses such as so they can't escape or so they can be fed would equally be true if there was no net. The examiners were looking for ideas such as easier feeding or being less likely to be preyed upon or the more common reduced movement or the reduced loss of energy.

Candidates are again reminded of the care they need to take with wording when referring to respiration and energy. Thus fish using less energy without further explanation is incorrect, as more of the energy gained from food will be used for growth. Some candidates referred to the net providing less space for the trout. Although obviously true this was insufficient to gain credit because it does not explain the advantage to the fish farmer. A few, presumably unaware of the idea of mesh size suggested that the net would prevent the fish getting bacterial infections.

(d) Most candidates showed a good understanding of the sequence of events in the carbon cycle. Most made reference to at least one of the organisms involved ie microorganisms, bacteria, decomposers, microbes, fungi or detritus feeders. This was usually followed by their role in decay, rotting, decomposing or digesting the dead organism. Less common was a reference to the term respiration being carried out by the microorganisms, but that carbon dioxide was released was regularly seen. Some candidates described what could eventually happen to dead trout in that they could become fossil fuels, and since the question did not indicate a time scale, this part of the carbon cycle was considered an acceptable part of the answer.

A few candidates failed to read the question sufficiently well and described all the details of the carbon cycle they could recall. In this case marks were awarded where correct statements about dead trout were made. Some candidates unaware of the details of the carbon cycle, or the nature of carbon suggested that carbon itself is released into the atmosphere by the decaying trout or that carbon falls to the lake bed and is absorbed by plant roots. However even these often picked up single marks for indicating the action of a microorganism.

Question 2 ***(Standard demand)***

(a) The majority of candidates gave the correct answer, 5, although it was not always clear how they got there. Despite being advised to show their working, not all did. Many subtracted the two distances, arriving at a figure of 800, whilst others took this figure one stage further, calculating that the imported carrots were transported 4 times further.

Other errors involved reading the bar chart incorrectly, reading the wrong data from the bar chart or showing the correct sum 1000/200 but arriving at the wrong answer, commonly 50. A small number showed the need to look carefully at answers and consider whether they are suitable, being reminded that they should expect calculated answers to give reasonable answers.

(b) This was marked as a single unit, the subsections being provided to encourage candidates to give a reason with an explanation. As both more light and more heat will be available for Kenyan beans and these are both provided by the sun, the examiners were generous regarding the use of the word sun, in Kenya, although they were looking for the comparative, more sun or sunnier. Having got this far most candidates added that this would increase growth rate, although fewer explained that more photosynthesis

would occur, and thus gain the second mark. Some candidates delved into their knowledge of geography, explaining that beans in Kenya receive more sunlight because Kenya is nearer the equator. Relatively few candidates referred to the increase of enzyme activity due to increased temperatures, although this was an acceptable idea.

(c) The vast majority of candidates showed a good understanding of the environmental issues surrounding the import of food. Many gave full and detailed explanations, although often with many more words than really necessary, reiterating points made several times. Most mentioned increased emissions, with carbon dioxide being most commonly given while some gave carbon dioxide along with carbon monoxide and sulfur dioxide, although occasionally, only carbon rather than carbon dioxide was suggested. In **one**-mark answers, increased transportation was given most frequently but without any explanation of the effect of this on the environment. There were also many references to an increased carbon footprint. Misconceptions included ideas that growing more crops locally would put more minerals into the soil, and that this would benefit local farmers (although had the candidate referred to nitrates, credit could have been gained); or that locally grown crops would increase oxygen levels in the air over the UK making air easier to breathe.

Question 3 ***(High demand)***

(a) (i) A large majority of candidates gave the correct response, pancreas, as the organ monitoring the glucose concentration in the blood. A wide variety of incorrect organs, glands and substances was suggested, the most common being liver, but kidney, brain and insulin featured frequently amongst incorrect responses. A few candidates hedged their bets, giving two organs, however the incorrect one of the two, whether written first or second, always cost the mark. This is a clear example of the need for candidates to understand the rules markers must abide by and thus develop examination technique.

(a) (ii) The examiners were looking for the idea, described in the specification, that insulin causes cells to absorb glucose from the blood. Clearly many candidates had been taught in more detail, perhaps in preparation for BLY3, and often referred to the conversion of glucose to glycogen or its storage in the liver or other organs; both of these concepts being acceptable. Although there were fewer misspellings of glycogen in this examination, than in previous versions, they were by no means uncommon, such that examiners were unsure whether candidates were referring to glucagon.

Credit was not given for hybrid words. A surprisingly high number of candidates referred to glucose being converted into starch or even that insulin digests the glucose, neither of which was accepted, whilst others did no more than repeat the information in the question, that insulin lowers blood sugar concentrations, without focusing on the command word ‘how’, in the question.

(b) Candidates were expected to draw one line from each type of diabetes. It was unfortunate that some misunderstood the intention of the second treatment and drew two lines from Type 1, thus disqualifying them from that mark. Many candidates successfully linked Type 2 diabetes to the correct treatment, although, judging by the amount of crossing out of lines the information clearly provoked some mental debate.

(c) (i) The majority of candidates gave the correct answer protein.

(c) (ii) The most common answer was gene, with allele being the much less frequent of the acceptable responses. The most common incorrect response was chromosome, although amino acid and base were also seen regularly. A surprisingly high number of candidates could offer no suggestion here and left the space blank.

(c) (iii) Many candidates showed considerable confusion regarding the excretion of excess amino acids. Many simply described the route (often in extended and more or less irrelevant detail), liver → kidney → bladder, taken by amino acids and scored no marks as the vital process of the conversion of the amino acids to urea was omitted. Those who knew of this conversion often described it happening in the kidney, perhaps confusing it with urine, but gaining the mark for the correct process, though limiting themselves to a maximum of two marks for indicating the wrong organ for this process. A lot of candidates thought the question was about digestion and described bile acting on or neutralising amino acids and being passed out in faeces. Some said that after bile neutralised amino acids that urea was formed but picked up the correct story from there. On the other hand there were also some truly excellent answers that would have scored well at a level beyond GCSE.

Question 4 *(High demand)*

The whole of this question discriminated well at the upper end of the grade range.

(a) (i) A considerable number of candidates suggested that leaf discs have a mind of their own. Responses such as they wanted to get more light implied a disappointing lack of understanding of living things. Many showed that they had not focussed on the details of the investigation sufficiently well, and referred to a wide variety of substances or reactions that could be causing the discs to float, whilst others recognised photosynthesis was involved but selected the wrong gases, suggesting that photosynthesis produces carbon dioxide; or the wrong end of the process, photosynthesis takes in carbon dioxide, making the discs float. Hence, it was only the better candidates who linked photosynthesis to the production of oxygen.

(a) (ii) An appreciation of the fifth disc providing a rough average or allowing the elimination of anomalous times, was expected. Some candidates gave weak responses which involved the whole range of terms from precision and reliability through to accuracy, none of which were credited. Others suggested that by recording the time for the fifth disc to float, this only needed to be doubled in order to acquire the time for the tenth disc, which would have been irrelevant, as the results would only be in the same proportion. Further common misconceptions included that this method would allow a second set of results to be collected for the remaining five discs or that this method would save time waiting for the tenth disc to float. Once more it was only the better candidates, thinking clearly about the investigative process, who arrived at the right answer.

(b) (i) The majority of weaker candidates failed to focus on the question, choosing to write about the comparative times taken for the discs to float, rather than what this showed about their relative rates of photosynthesis; although no marks were awarded for this, the examiners ignored it in an otherwise acceptable answer. Good candidates recognised that those discs that took longer to float were

photosynthesising more slowly; having made this link, they were usually able to go on to gain both marks by comparing rates of photosynthesis of the two species at both higher and lower light intensities. Slightly weaker candidates attempted to describe rates of photosynthesis but did not make the inverse link, either believing that a longer time represented faster photosynthesis or that the ordinate on the axes showed rate of photosynthesis. Relatively few, of even the good candidates, identified that the rates are the same at 12.5 units of light intensity.

Many candidates did not refer to light intensity at all and gave just a bland statement such as flat wrack photosynthesises faster, which could not gain marks as the examiners did not know which 'end' of the graph candidates were attempting to describe. It was again disappointing to find a significant number of candidates writing answers such as increasing light intensity reduces the rate of photosynthesis, which, had they stopped to think for just a few seconds, they would have known to be incorrect. In questions such as this, candidates are advised to carefully read the question, to ensure they are referring to the right relationship and that they are answering the whole question.

(b) (ii) This proved to be a little less demanding for most candidates. However, the main stumbling block in this part was when candidates referred to the position of the two species on the shore, but failed to link this to the point of the question and explain how this affected the light that the seaweeds received. This often resulted in candidates only getting the mark for correctly explaining that the bladder wrack got more light, or the saw wrack got less. Better candidates then linked this to photosynthesis.

A significant number of candidates tried to relate the relevant diagram at the beginning of the question to the later graph, and gave an answer in terms of the photosynthesis at different light intensities. This usually resulted in a very confused account which didn't answer the question as they didn't know which light intensity was actually being received by the two seaweeds. The second major misconception was by candidates who thought that the water absorbed the light, and then gave it off to the seaweed, so saw wrack got more light as it was deeper underwater. Other common misunderstandings included the idea that the saw wrack is closer to the surface of the sea, or the reverse, that bladder wrack is closer to the surface without reference as to which state of the tide they were referring.

Question 5 ***(High demand)***

(a) This should have been a relatively straightforward genetic cross and proved to be so for the majority of candidates. Despite this, a significant minority achieved at best only one of the three marks available. Most were able to identify both parental genotypes as Aa, either by a clear statement or by showing relevant gametes. Once this had been achieved, the vast majority went on to give a correct cross, showing homozygous recessive offspring. Those candidates who had learned to show crosses by means of lines joining gametes and offspring genotypes were more likely to lose this second mark as it was often unclear to which part of the parental genotype the relevant offspring were linked.

Candidates are advised to use punnett squares for their crosses, as not only are these sorts of errors less likely, should they go on to study more complex genetic crosses, they will certainly need to use them. The biggest disappointment was for the many candidates who showed the cross perfectly, but then failed to identify the individual who would have cystic fibrosis.

Of these, some simply ignored the need to do so, whilst others only quoted figures such as 25% have cystic fibrosis, without stating which these were. Perhaps surprisingly, had they considered the information that neither of the parents had cystic fibrosis, a significant minority of candidates suggested that those with either one or two copies of the dominant allele were sufferers.

(b) In both parts candidates were expected to add to the information provided in the question, rather than merely restate it. Hence references to suitable embryo or egg were expected to be qualified to some extent; without cystic fibrosis (allele), or even healthy were considered sufficient.

(b) (i) Many candidates arrived at the correct answer referring to the greater chances of finding a healthy egg or the converse if only one egg were taken, whilst others often referred to the improved chances of fertilisation. Weaker candidates got little further than suggesting there is a greater chance of the procedure working or it allows back-ups, which the examiners did not feel were sufficiently clear to gain credit.

(b) (ii) Candidates were expected to use the information provided to develop arguments both for and against the described procedure and then to arrive at a justified decision as to whether it is appropriate or not. A significant proportion of candidates failed to read the question carefully and missed out on potential marks. One of the main errors was to refer to screening in general, and discuss ideas of abortion, when this was excluded by the information that clearly stated that the procedure described takes place before implantation, hence *before* pregnancy.

Many candidates discussed choice of whether to have a child with cystic fibrosis or not, giving time to prepare for such a child as though the child was already conceived and developing in the womb. They went on to describe how the parents could decide whether to have a child with cystic fibrosis or have a termination. Many also stating that it would give the parents time to get used to the idea or prepare for the problems that they would face.

Others described the test as identifying *whether* an embryo has the cystic fibrosis allele, but then did not explain that the implanted embryo would (probably) not have cystic fibrosis. Most candidates picked up on the ethical argument regarding the killing of other embryos, although some merely restated the final bullet point. The strongest candidates realised that they were expected to give a considered and justified decision as to whether the procedure was appropriate, of these some only restated both the advantages and disadvantages they had already described and were not awarded this mark.

Question 6 *(High demand)*

(a) Most candidates gained at least one mark with examiners being willing to accept a wide variety of spellings of pancreas. Some hedged their bets as far as intestine was concerned and gave unqualified answers or used terms such as upper intestine; none of these responses being credited. Common incorrect answers included liver, stomach, and others such as kidneys and lungs which are not part of the digestive system. Once more candidates are encouraged to read the entire question carefully, as there was a significant minority of answers such as mouth and salivary glands.

(b) Those candidates who gained a mark most commonly referred to the significance of 40°C, being at or close to body temperature or the temperature at which enzymes work best. Relatively few recognised the importance of both enzyme and substrate being at the same temperature to begin with, although the examiners suspected that some of these gained the mark fortuitously with loose use of language such as they are at the same temperature, possibly referring to all the tubes throughout the investigation.

Some students were, unfortunately, very confused and gave totally incorrect answers such as time for the amylase and starch to diffuse through the water, the starch would become soft and easier to breakdown, so that light could pass through, to ensure they were sterile or to get rid of any glucose in the enzyme. Some misinterpreted the time reference as being time <u>after</u> mixing and responded by saying that the enzyme would (therefore) have enough time to digest the starch. Others focused on either the starch or amylase alone.

Clearly incorrect references to the starch working best at this temperature gained no credit. Neither did answers that incorporated ideas of the amylase being activated or starting to work before mixing had taken place. Vague responses such as so the enzymes got to the <u>right</u> temperature for working or to make sure they got used to the temperature of the water bath also gained no marks. Candidates should always be encouraged to give answers which are as precise as possible, particularly in the Higher Tier paper, to ensure that points made are clearly creditworthy.

(c) (i) Many candidates managed to gain the mark. Incorrect responses usually involved incorrect appreciation of the graphs. Some students simply read the value 32 from graph 2 and, despite the emboldened references in the question to use <u>both</u> graphs, failed to refer to graph 1 at all. Others took the *y*-axis in graph 1 as giving time and read from the 20 value here to give an answer of 0.5 mol per dm^3

(c) (ii) Many candidates left the question unattempted. The most common error was to take the answer from part (c)(i) and multiply, rather than divide, by 20 but other, often very complicated, attempts at calculations were seen. Candidates were not penalised twice in this question so that an incorrect answer in part (c)(i) that was subsequently used correctly in part (c)(ii) gained both marks. The value of showing working out in questions such as this should always be emphasised. A mark was often given for a correct method even though the final calculated answer was wrong.

(c) (iii) Most able candidates gained the mark; many, however, appeared to be confused. The word light, in the question, opened the door for comments on photosynthesis particularly as it was associated with a plateau on graph 2. Answers referred to optimal light intensity, light no longer being a limiting factor

and other factors such as CO_2 concentration or temperature becoming limiting (for photosynthesis). Other responses described enzymes using up all of the light. Some answers, for example, the reaction was complete and amylase could not digest any more, were considered too vague to gain credit whilst others showed misconceptions that the enzyme had been used up or all the sugar had been broken down.

(c) (iv) Most candidates were able to gain at least one mark, invariably for having stated or described that the amylase would have been denatured. Very occasionally students disqualified their answer by going on to explain this in terms of the enzyme being killed. More often, however, answers were well developed and displayed excellent understanding of the active site and of substrate fit.

Candidates, however, sometimes failed to appreciate the need to make two clear points in order to gain the maximum marks. Answers that referred to denaturation and then simply added that the experiment would therefore not work lacked the necessary detail for the second mark. Similarly, vague responses such as enzymes work best at 40°C, the amylase would not work properly or temperatures above that of the body are too hot were not credited as they do not refer specifically to events at 80°C.

Mark Ranges and Award of Grades

Grade boundaries and cumulative percentage grades are available on the **Results statistics** page of the AQA Website.