



General Certificate of Secondary Education

Biology 4411

BLY3H Unit Biology 3

Report on the Examination

2009 examination – June series

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Biology
Higher Tier BLY3H**General**

Particular problems which occurred quite frequently included:

- the inability to express ideas clearly and unambiguously, such as patterns shown in data, or linking an observed effect to its specific cause
- excessive verbosity rather than making specific points succinctly and precisely as this merely wastes time as no marks are available for re-stating the question nor for making the same point more than once
- paying insufficient attention to information provided in the stem of a question in order to guide a reasoned response
- careless reading of the question resulting in an inappropriate answer
- not reading data accurately from a graph, or selecting the wrong part of the data
- mathematical weakness in calculations
- poor understanding of certain topics, such as digestion and absorption, diffusion, kidney function.

Question 1

This question was answered well by most candidates.

- (a) Most Higher Tier candidates correctly identified trace **A** on the graph as belonging to an artery and were able to give at least one reason for this, either the pulsations or the fact that the pressure in **A** was overall much higher than in the other vessel.
- (b) (i) Around three quarters of candidates were able to count correctly the number of heart beats that occurred in the 15 second period of the graph.
- (b) (ii) The large majority of the candidates were able to convert their answer correctly into the number of beats per minute.
- (c) Nearly all were able to name two useful substances supplied to the muscles at a faster rate during exercise, usually glucose and oxygen, and one waste substance that was removed at a faster rate, usually carbon dioxide, occasionally lactic acid.

Question 2

Overall, candidates were very successful in answering this question about the use of dialysis for treating people with kidney disease.

- (a) (i) Nearly all candidates were able to select two control variables from the six experimental details given in the stem of the question. Some spoiled their answers due to lack of precision, eg the milk rather than the volume of milk or type of milk.
- (ii) Only two thirds of candidates appreciated that repetitions leading to the calculation of a mean could make the investigation more reliable, or more representative, or would make anomalies more obvious. A common, incorrect answer was to state that it would make the investigation more accurate or that it would prevent anomalies, rather than just reducing their effect.

- (iii) In this part accuracy, precision or sensitivity were the correct attributes to assign to the pH meter, when compared to pH indicator papers, for making measurements, almost four fifths of candidates understood this.
- (b) The large majority of candidates were able to select the anomalous figure from the table of measurements.
- (c) Around half of the candidates knew that it was the production of lactic acid that caused the yoghurt to thicken. A further few knew it was something to do with acid, either unnamed or incorrectly named, a logical deduction from the falling pH values presented in the data. A common misconception was that it was merely the increasing number of bacteria that caused this.

Question 3

- (a) Nearly all of the candidates knew that methane was the fuel gas present in biogas, but ethanol was a common, incorrect answer.
- (b) Fermentation, or anaerobic respiration, were equally acceptable as the name of the process that produces biogas, the former being the more common answer. Just over two thirds of candidates knew this.
- (c) (i) Reading the optimum temperature for biogas production from the graph was straightforward for nearly all of the candidates. Some gave imprecise answers, a value of 32 to 33 °C was expected. A few read the figure on the rate scale rather than the temperature scale.
- (c) (ii) The vast majority of candidates appreciated that siting the biogas generator beneath ground level in India, with possible daytime temperatures in excess of 40 °C, would help to keep the generator cool. Many went on to explain that this would maintain a higher rate of biogas production. Some answers were a little vague, eg to insulate might have implied keeping warm rather than keeping cool.
- (d) Similarly, in this section, the thick concrete walls of the UK biogas generator, given the lower temperature in the UK, were recognised by most as being responsible for retaining heat, keeping the cold out was ignored by examiners, and possibly, again, for maintaining a high rate of biogas production.

Question 4

- (a) The majority of candidates recognised that cell **X** was a guard cell. Common incorrect answers included stoma, chloroplast and cytoplasm.
- (b) Most candidates appreciated from the data that plant species **A** opened its stomata in the dark and closed them during the light period of the day. Candidates also knew that this would help it to reduce water loss in the hot, dry desert, especially as light could be associated with a higher temperature during the daytime. Relatively few, about a fifth, stressed, unambiguously, the relationship between heat and increased evaporation of water. Some candidates, unable to think of more than one or two points, repeated them several times, in slightly different words, in order to fill the space available. A few

candidates misinterpreted the data and wrote about the number of stomata open rather than about how wide the opening was.

Question 5

- (a) Here, candidates were required to demonstrate their understanding of the process of diffusion in terms of movement of a substance down a concentration gradient, not across nor along the gradient, and to realise that, in the given situation, uptake of ions by the plants' roots would require movement of the ions up the concentration gradient and thus not be possible by diffusion. Less than half of candidates appeared to understand this fully.
- (b) (i) Just over a third of candidates scored both of the marks available for the calculation. The main problem appeared to be finding a correct value for the slope of the graph by reading the correct two figures on the vertical axis, subtracting them and dividing by the 100 minute time period. One mark was available for subtracting the given value of 0.4, for the second line on the graph, from the candidate's calculated slope, even if the latter were incorrect, thus, a further third of candidates scored one mark out of the two available.
- (b) (ii) A third of candidates were able to explain fully that the higher rate of ion uptake by the plant roots in the presence of oxygen was due to the greater amount of energy available in aerobic conditions to drive the process of active transport. A further third of the candidates scored two out of the three marks available, usually for mentioning active transport and its dependence upon energy, but failing to point out that more energy would be available in the presence of oxygen, or from aerobic rather than from anaerobic respiration.

Question 6

- (a) This question essentially tested the principles of digestion and absorption, ie that the enzyme secreted by the fungus would digest sucrose into smaller molecules which were, indeed, small enough to be absorbed. A mere handful of candidates fully grasped this. A vast number misread the question, which asked why it was helpful to the fungus to secrete the enzyme, not why it was useful to humans to have a fungus which secreted the enzyme. Others, about a sixth, although they realised that the sucrose would be broken down into smaller molecules by being digested, omitted to mention the vital stage of absorption, necessary before the products of digestion could be used by the fungus. Other candidates seemed to regard digestion and breakdown as completely separate processes, thus revealing that they did not understand this topic.
- (b) In this part of the question, candidates had to make selective use of appropriate data from those presented in the table in order to suggest sensible explanations.
- (b) (i) It was evident to about a third of the candidates, that using the lower concentration of the fungus would be more economical, particularly in light of the very slight reduction in yield of product that this caused.

- (b) (ii) Candidates encountered an unexpected phenomenon, a reduction in yield of product at a higher aeration rate. A wide variety of ingenious suggestions were put forward to explain this, from direct effects, eg making alternative products, possibly toxic ones, through mechanical effects, eg a high rate of air bubbling through the fermenter causing physical damage to the fungus, to alternative effects, eg cooling leading to slowing of chemical reactions, or contamination with other microorganisms leading to competition for resources. Such suggestions were the domain of only the most able candidates, very few scored full marks and only a fifth had any sensible ideas at all. The question differentiated, as intended, at the A* / A-grade level.

Question 7

In this question, candidates had to interpret data on the effects of the drug ecstasy on kidney function. This required knowledge and understanding of kidney functioning. It did not require anecdotal knowledge of the effects of ecstasy on the body. Those attempting to apply the latter, without a thorough grasp of the former, frequently came unstuck.

- (a) This part of the question simply required translation of the data displayed in the two graphs.
- (a) (i) Many candidates spoiled their answers by inclusion of the change in the pattern before the ecstasy was taken, the actual rate of filtration did, in fact, not drop after ecstasy was taken. Only two thirds gave an adequate description, ie no effect or very little effect or a slight rise after a half-hour delay. Some misinterpreted the initial horizontal part of the line, on 123 cm^3 per minute, as filtration having stopped.
- (a) (ii) This turned out to be more straightforward and the vast majority of candidates were impressed by the massive drop in urine flow which followed the taking of ecstasy.
- (b) (i) Only a sixth of candidates made any headway with this part. Far too few were able to associate a decrease in urine flow with an increase in the reabsorption of water by the kidney. Most candidates clearly do not appreciate that urine is mainly water. Many candidates invoked a supposed reduction in filtration rate, despite evidence to the contrary in **Graph 1**. Anecdotal answers relating to an increased rate of sweating, leaving less water to be filtered by the kidney simply conflicted with the data.
- (b) (ii) This part required understanding of the principles tested in part (b)(i), thus if more water were reabsorbed by the kidney, the concentration of ions in the blood would be expected to fall. Only a small number of candidates fully appreciated this. Many ingenious, but incorrect, suggestions were put forward, ranging from the supposed ion content of ecstasy to an imagined temporary suspension of kidney functioning due to the drug.

Mark Ranges and Award of Grades

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