Version 2.0 22/08/2012

General Certificate of Secondary Education

Biology 4411

BLY3H Unit Biology 3

Report on the Examination

2012 examination – June series

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Set and published by the Assessment and Qualifications Alliance.

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Registered address: AQA, Devas Street, Manchester M15 6EX

Biology
Higher Tier BLY3H

General

Particular problems which occurred quite frequently included:

The inability to express ideas clearly and unambiguously.
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, or not giving a comparative answer to a comparative question.
A failure to distinguish between the instructions *describe* and *explain* and thus including much irrelevant material in the answer.
Evidence from diagrams or graphs not always being cited carefully and attempting to give descriptions of patterns in graphs without including numerical values – which are needed if full marks are to be gained.
Misuse of certain technical terms – for example *filtration* and *reabsorption* or *absorption* in relation to kidney function and confusion of terminology relating to data, such as *accuracy*, *reliability*, *precision* and validity.
Mathematical weakness in calculations and sometimes failing to include working as instructed
Limited ability to apply what has been learned to a novel situation. There was poor understanding of certain topics, such as aerobic and anaerobic respiration, and kidney function.

Question 1 *(Standard Demand)*

This was the first of two standard demand questions which were common to the Foundation and Higher Tier papers.

(a) (i) The six peaks in heart rate in the graph, which corresponded with the six running sessions, were obvious to the vast majority of Higher Tier students.

(a) (ii) The five squares on the graph which followed the final run indicated a 2½-minute rest period, not a 5-minute period as many thought. Two-thirds of students read the scale correctly.

(b) This question differentiated very well between students of different ability. About a fifth of Higher Tier students scored full marks. The most common point made was that extra blood flowed to the muscles during exercise in order to supply more oxygen. Better students then related this to the extra energy needed during exercise and also stated that the extra blood flow would supply more glucose and take away more waste, such as carbon dioxide or lactic acid, or even heat. The point most often missed was the increased supply of glucose. One misconception was that the blood supplied 'energy' *per se*, rather than in the form of glucose. Some students forfeited one mark by not making their answers comparative in order to relate to the *increased* blood flow given in the question.

Question 2 *(Standard Demand)*

This was the second of the two common, standard demand questions.

(a) A little less than half of the Higher Tier students made the point that using a sealed container in which the air was replaced with pure nitrogen was because biogas was made by *anaerobic respiration*. Some gained a mark for realising that oxygen would

have been removed, but some others had the misconception that the bacteria in the cattle manure would be able to make use of the nitrogen gas. Some also thought that the purpose of sealing the jars was to keep out microorganisms.

(b) (i) The vast majority of students knew that, in addition to methane, carbon dioxide was the other major component of biogas. 'Oxygen' was a common error.

(b) (ii) Nearly all of the Higher Tier students correctly calculated from the data in the table that the proportion of methane in the biogas, when 2.5% fish fat was added, was 0.62.

(b) (iii) Nearly all noticed that the addition of fish fat increased the amount of biogas, or of methane, produced. Some did not pay sufficient attention to the column headings in the table and confused the *yield* of methane and the *proportion* of methane in the biogas. Around one-fifth were able to make it clear that the proportion of methane barely changed, or increased only slightly, or did not increase above the value obtained with 5% fish fat. A number of students insisted on trying to *explain* the patterns they had described. However, since the question only required a *description*, no marks were available for *explanations*. Students should read the question carefully.

(b) (iv) Just over half of the students appreciated that the transport of fish fat over a distance of 110 kilometres was probably not economically viable, or that the environmental gain from the recycling of the organic matter would be counteracted by the environmental harm done by burning fossil fuels during transportation.

Question 3 *(Standard / High Demand)*

(a) (i) While two-thirds of students gained two marks for naming *aerobic respiration* as the process in which *Fusarium* uses oxygen, may others lost one mark by just giving 'respiration'.

(a) (ii) Only a third of students could suggest a sensible reason for moving the *Fusarium* around the fermenter – such as better mixing with, or increased absorption of, nutrients or oxygen.

(a) (iii) Most students made use of the information given about *Fusarium* in the stem of the question and correctly suggested that the use of paddles to stir the fermenter would have damaged the long fibres that made up its structure.

(b) (i) Either the higher protein or the higher energy content of chicken (compared to that of the mycoprotein) made it more suitable as a component of the diet of a body builder. Nearly all students got this right.

(b) (ii) A substantial proportion of students did not include sufficient information in their answers to actually *explain* how the information and data given supported the claim that eating mycoprotein was healthier than eating chicken. For example, although it was true that there was a lower fat, or zero cholesterol content in mycoprotein, this would then mean that there was less chance of developing heart disease or other circulatory problems; and the higher fibre content would reduce the chance of developing cancer of the colon.

Question 4 *(Standard / High Demand)*

(a) (i) While the vast majority of students noticed that the concentration of mineral ions in the plant's root was higher than that in the soil and so net absorption by diffusion would not be possible, only a half went on to explain adequately that diffusion only operated *down* a concentration gradient. Some used the term 'gradient' where they really meant *concentration*. Others thought the ions would need to be absorbed by 'osmosis' since they were in solution and diffusion 'only occurs in gases'.

(a) (ii) About four-fifths of students knew that the roots would therefore have to use *active transport* to absorb the ions.

(b) Almost all students appreciated that the thousands of root hairs would provide the plant's roots with a large surface area for the absorption of ions. Although nearly all students knew that mitochondria were the site of respiration, or of energy release, less than one-third gave both of these points. Some students spoiled their answer by describing energy as being 'made' in respiration rather than being *released*: in high demand questions, students are expected to understand this. Around two-thirds of students appreciated that starch stored in the root cells would be a reserve of energy to drive active uptake of the mineral ions.

Question 5 *(Standard / High Demand)*

(a) Around two-thirds of students were able to name two substances, in addition to the water given in the question, which were present in the urine of a healthy person. The most common correct answers were *urea* and *mineral ions*. The most common incorrect ones were 'amino acids' and 'protein'. Despite its exclusion by the question, some students included 'water' in their answers.

(b) (i) The points required in were that glucose would be filtered out of the blood in the kidney and that it would then *all* be reabsorbed. The question differentiated very well across the ability range. There was the usual confusion by some students of the meanings of the two terms, *filtration* and *reabsorption*, which were often interposed and some stating that glucose was too big to pass through the filter and yet, somehow, it was still reabsorbed. One-fifth of students scored the full 3 marks, while over a half scored 2, often due to omission of the detail that *all* the glucose was reabsorbed.

(b) (ii) Students performed very poorly here, with only a third scoring any marks. Students were expected to apply their understanding of kidney functioning to the given situation by realising that because so much glucose would be filtered from the blood of a diabetic, there would not be enough time, or enough length of tubule, or enough glucose carriers to reabsorb all of it and hence some would remain in the urine. Many thought that excess glucose had to be excreted by the diabetic because there was too much in the blood. Others did not present their argument clearly and it was not clear whether the concentration to which they were referring was that in the kidney tubule or in the blood.

Question 6 *(Standard / High Demand)*

(a) Students had to make use of information from both the table and the graph to answer this question. The table showed that the higher the concentration of the fungal toxin, DAS, the lower was the production of alcohol by the yeast. The graph showed that DAS had no effect on the use of the sugars glucose and fructose by the yeast, but that progressively higher concentrations of DAS caused less and less maltose to be

used. Any appropriate manipulation of numerical values from the data would result in the award of the final mark – e.g. 5 units of DAS approximately halved the alcohol production, or 15 units of DAS reduced the use of maltose by 98 percent; relatively few students did this. Some students made their answers difficult to understand as they simply referred to 'sugar' rather than to the specific, named sugars, *glucose*, *fructose* and *maltose*. The question differentiated well across the ability range, although very few gained full marks.

(b) (i) Two-thirds of students understood that maltose was too large a molecule for the yeast to absorb (information in the stem of the question explained that maltose consisted of two glucose molecules joined together).

(b) (ii) Was another question that differentiated well, but with a much higher proportion of students gaining zero than was the case in part (a). Students were told that DAS inhibited the release of an enzyme from the yeast cells; the data in the graph had shown them that glucose could be absorbed by the yeast whatever the concentration of DAS but that the use of maltose was severely inhibited by it. More able students thus deduced that the enzyme needed to digest maltose to glucose outside the yeast cell could only be released to do so if little or no DAS was present. While many (over half) suggested that the maltose needed to be broken down before being absorbed, fewer stated that the product was glucose and fewer still that molecules of glucose were small enough to be absorbed.

(c) Nearly half of the students were only able to make one valid point here, while a further third made two. There was a range of suitable points that students could have deduced from the earlier parts of the question. These included the increased yield of alcohol due to unimpaired use of maltose in the malt extract, the absence of a potential toxin in the beer that was produced, the flavour of the beer being unaltered (i.e. not being too sweet due to maltose still being present).

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

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