Version 1.0 02/03/10

General Certificate of Secondary Education

Biology 4411

BLY3H Unit Biology 3

Report on the Examination

2010 examination – January series

Further copies of this Report are available to download from the AQA Website: www.aqa.org.uk

Set and published by the Assessment and Qualifications Alliance.

The Assessment and Qualifications Alliance (AQA) is a company limited by guarantee registered in England and Wales (company number 3644723) and a registered charity (registered charity number 1073334).
Registered address: AQA, Devas Street, Manchester M15 6EX
Dr Michael Cresswell Director General

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 eg the distinction between the instructions 'Describe...' and 'Explain...'
- 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 *(Standard demand)*

(a) The majority of Higher Tier candidates were able to select the correct blood vessels from the diagram, with slightly more success for recognising which carried oxygenated blood than which was an artery.

(b) Over half of the candidates scored full marks in this section, displaying a full and detailed knowledge of the relationship between heart rate and exercise. Some candidates confused heart rate with breathing rate and some thought that the heart rate increases to supply the lungs with oxygen.

As ever, one of the most common correct points was the increased rate of transport of oxygen, with fewer realising that an increased food supply (eg glucose) would also be needed during exercise and that carbon dioxide, lactic acid and heat would need to be removed.

Question 2 *(Standard demand)*

Many candidates found this question difficult

(a) Just over half scored at least some marks. Good candidates were able to link the decrease in the rate of carbon dioxide production to a decrease in the yeast's rate of respiration, sometimes realising that the initial supply of sugar might have been running out. However, many thought that respiration had stopped by 70 minutes, only to start up again later.

(b) Candidates were generally a little less successful in this section. Many could not make the link between enzymes similar to those in germinating barley grains and the digestion of starch in the flour. Some even thought that barley grains were germinating in the bread dough mixture (more careful reading of the question would have eliminated this possibility).

It was a rarity to read of enzymes being used to digest the starch to sugar so that the rate of respiration could increase again, thus producing carbon dioxide at a higher rate. A common misconception was that the enzymes were actually respiring rather than the yeast.

Question 3 *(Standard demand)*

(a) Nearly three quarters of the candidates were able to work out from the data that Leaf C had lost the most water.

(b) (i) Just over half knew that cell X was a guard cell.

(b) (ii) Just under half scored both marks for knowing that water was lost from a leaf mainly via the stomata and that, in this species, the stomata were found only on the lower surface. A common misconception was that water entered the leaf via the stomata, although how this could result in a decrease in mass, as shown by the data, was not clear.

Question 4 *(High demand)*

(a) Over 80 % knew that the main fuel gas in biogas was methane.

(b) (i) Very few candidates were able to suggest two sensible advantages of siting the biogas generator underground. The most common acceptable answers related to temperature stability and to reduced visual impact. However, many thought, erroneously, that burying the tank would reduce the smell or that it would take up less space.

(b) (ii) Less than a quarter of the candidates realised that high levels of liquid in the inlet and overflow would help to keep out the air, or help prevent the biogas escaping, or even maintain a pressure to force the biogas out along the collection pipe when the tap was opened.

(c) Less than a fifth could explain that the pipes of hot water might warm up the biogas generator to the optimum temperature for biogas production in the given, cool environmental conditions. Some appreciated the economically sustainable aspect of recycling some of the biogas for heating the water in order to increase its own rate of production.

Question 5 *(High demand)*

(a) The production of lactic acid was generally well understood with over three quarters of candidates scoring at least one mark, but only two thirds of these were awarded both of the available marks. Typically, candidates knew that lactic acid was formed if oxygen supplies were low, but only the more careful candidates explained that anaerobic respiration was involved (or that insufficient oxygen limited aerobic respiration).

(b) The data provided, about the effects of different exercise and rest periods on the distance an athlete could run, on his oxygen uptake and on lactic acid production,

displayed some perhaps unexpected patterns. Candidates had to 'think on their feet' in order to understand what was happening

(b) (i) The instruction was to describe the effect of exercise and rest on the distance the athlete was able to run. Many candidates did not restrict themselves to this remit and insisted on describing the effect on oxygen consumption and on lactic acid production which no marks were available for. Others sought to explain the phenomena and again no marks were available for this.

Many candidates recognised that continuous running resulted in the shortest distance and that 10-second bursts of exercise with 5-second rest periods achieved the greatest distance; fewer candidates saw that there was an unexpected relationship between the length of the rest period and the distance covered. The use of loose terminology was the downfall of many, with the athlete running faster or better.

(b) (ii) In this part an explanation was required but many candidates just provided a description of the trend in the data. Better candidates appreciated that longer rest periods would enable more oxygen uptake to help in the breakdown of lactic acid.

(b) (iii) A third of candidates could suggest one feature of lung structure, such as the width of the bronchioles or the surface area of the alveoli, that might limit the rate at which the athlete took in oxygen. Unqualified references to size were often given which were considered to be too imprecise.

Question 6 *(High demand)*

(a) Most candidates recognised that protein was the substance present in the urine of the person with diseased kidneys which would not have been present in the urine of a healthy person. Although many understood that protein molecules are too large to be filtered out of the blood by a normal, healthy kidney, many candidates concentrated on a supposed purpose for this rather than the cause, eg stating that proteins are needed by the body. Others thought that protein did pass through the filter but was later reabsorbed.

(b) A very large number of candidates have a poor understanding of how dialysis treatment actually works, with over half scoring no marks in this section. The most common correct point was the use of a partially permeable membrane. Very few mentioned concentration gradients and diffusion or the idea that the blood plasma would come into equilibrium with the ideal concentrations of solutes in the dialysis fluid.

Question 7 *(High demand)*

Success in this question required thorough reading and assimilation of the information given in the introduction as this set the scene and thus provided the essential context for understanding the topics being tested. Many candidates clearly did not do this and they therefore found the question very difficult.

(a) (i) Many ignored the instruction to suggest one further reason why the flasks were shaken and merely repeated the information about mixing the *Fusarium* and the

liquid. Very few realised that shaking would aerate the mixture. Some even thought the shaking simulated a washing machine (presumably since the enzyme being produced was destined for use in a biological washing powder).

(a) (ii) Similarly, one other reason was required, additional to increasing the rate of lipase production. Again, many candidates gave the answer they had been expressly forbidden from using. Very few candidates realised that the *Fusarium* should not be a limiting factor in investigations designed to measure the effects of protein or olive oil concentration.

(b) (i) This part required the selection of appropriate data from graph 2. The maximum rate should have been related to the steepest section of one of the three lines on the graph. While most candidates chose the right line (that for lipase production with 0.5% olive oil present), few restricted themselves to the section between 24 and 48 hours.

Many used the entire 72-hour period of the whole investigation. A number of others misread the value from the graph, particularly the point (24, 800). Thus, only a sixth of candidates made any headway with this calculation, still fewer arriving at the correct answer of 300 units per dm^3 per hour.

(b) (ii) Less than a half were able to score any marks for application of their understanding of How Science Works to explain why raw data are of more value than just the mean calculated from them. The most frequent correct suggestion related to the ability to detect anomalies or being able to assess the range of values.

Some thought that repetition would make the values more accurate or precise rather than providing information on how accurate or precise the readings actually were. Hardly any candidates appreciated that, with three sets of data per graph, the potential for overlap between the three different conditions might invalidate any conclusions about the effects of these conditions.

(c) Here candidates had to restrict themselves to a description in part (c)(i) and only offer their explanation in part (c)(ii)

(c) (i) In this part just under half the candidates were able to give at least one point of description usually relating to the time lag between *Fusarium* growth and lipase production. Very few went on to point out that, after 48 hours, the growth of the fungus slowed down while production of lipase quickened.

(c) (ii) In this part explanations were very weak, with very few candidates scoring both marks. While some (around a sixth) understood that there had to be sufficient *Fusarium* present before it could produce a detectable amount of lipase, hardly any realised that the growth of the *Fusarium* could therefore not have been dependent on the digestion of the olive oil in the mixture, nor could they suggest that the other major ingredient of the mixture, protein, might have been utilised instead. Too many candidates seemed to think that the *Fusarium* was producing lipase merely to benefit humans rather than for its own use.

Mark Ranges and Award of Grades

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