Version 1.0 27/07/10

General Certificate of Secondary Education

Biology 4411

BLY3H Unit Biology 3

Report on the Examination

2010 Examination – June 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

Biology
Higher Tier BLY3H

General

Particular problems which occurred quite frequently included:

- the inability to express ideas clearly and unambiguously or giving extra alternative answers
- 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
- limited ability to apply what has been learned to a novel situation
- poor understanding of certain topics, such as digestion, diffusion, kidney function, the production of biofuels.

Question 1 *(Standard Demand)*

(a) (i) Both of the structures, A, cell wall, and B, cytoplasm, were named correctly by the large majority of the candidates. There was the inevitable confusion between cell wall and cell membrane.

(a) (ii) A similar number were able to correctly describe from the diagram one way in which the bacterial cell differed from the yeast cell, usually the absence of the vacuole or of the nucleus. A substantial minority, however, stated that the bacterium contained DNA, with the incorrect implication that this was absent from the yeast cell.

(b) Often it was difficult to tell whether the candidate was writing about the yeast or about the bacterium and sometimes they were writing, inappropriately, about both.

(b) (i) Under a half gained two marks for this part with very few pointing out that respiration, or carbon dioxide production, was responsible for the bread rising

(b) (ii) Slightly more got two marks here. It was often thought that the bacteria were acidic rather than being responsible for the release of the acid, or that dead yeast or alcohol from the yeast gave the sour taste.

(b) (iii) One fifth of candidates scored the mark, most failing to realise that if the yeast could still function in these acidic conditions then the bread would still rise. Some were heading in this direction when they stated that the yeast would not be killed but they failed to point out the relevance of this to bread production which was the subject of the question. Many pointed out that, since the yeast was able to grow over a broad range of pH values, there would be no need to expend resources on control of the pH: this idea was credited.

Question 2 *(Standard Demand)*

(a) (i) Nearly all of the candidates appreciated that the purpose of boiling the flask of nutrient broth was to kill microorganisms.

(a) (ii) Three quarters understood that the shape of the swan neck prevented more microorganisms from entering; but some thought the absence of microorganisms was due to a lack of air or oxygen.

(b) The principle of repeating an experiment in order to improve reliability, rather than to make the investigation more accurate, precise or fair, was known to most of the candidates. Some spoiled their answers by stating that repetition made the investigation reliable and accurate.

(c) While just over two thirds of candidates realised that microorganisms must have entered the broth when the flasks were tilted, it was not always evident where they had come from, eg either from the outside air or from where they had previously settled in the bend of the swan neck of the flask. A few noted that the presence of nutrients in the flask would enable the growth of microorganisms.

(d) More than half of candidates knew that this investigation provided evidence for the theory of *biogenesis*.

Question 3 *(Standard Demand)*

((a) (i) A large majority of candidates knew that *anaerobic* meant without oxygen. A few failed to gain the mark as they gave the inadequate answer, without air.

(a) (ii) However, less than half the candidates appreciated that, with the given design of biogas generator, a high concentration of solids would make the contents difficult to stir.

(a) (iii) Most candidates understood that this generator might be expensive to run as a supply of power would be needed for the heating coil and/or the stirrer.

(b) (i) Descriptions of the graph were usually very thorough, with over three quarters of candidates scoring full marks. Good use was made of actual numbers quoted from the given scales and the overall pattern was well described. Some misread either the question or the graph and gave details for methane rather than carbon dioxide and those who insisted on comparing the methane and carbon dioxide production rates merely wasted time and often ran out of space before giving sufficient relevant details. Those who used the word change, rather than increase or decrease in concentration, inevitably lost marks.

(b) (ii) Three quarters of candidates realised that the best quality biogas was produced on day 16, with its minimum carbon dioxide content and maximum methane content. Day 13, the intersection of the lines for the two gases, was a favourite, incorrect answer.

(c) This section proved more problematical for many candidates. Relatively few appreciated that, during the first few days after the biogas generator had been set up, there would still be a high percentage of oxygen from the air inside it and that, consequently, more aerobic respiration would take place and hence more carbon

dioxide would have been produced and little methane. Many thought that extra carbon dioxide had been trapped in the manure when it was added to the generator, while others merely mentioned air rather than *oxygen* from the air being present or failed to point out that the extra carbon dioxide would have come from *aerobic* respiration. Over half the candidates scored zero for this section and only a quarter scored both marks.

Question 4 *(High Demand)*

(a) (i) Although most candidates managed to read the correct figure, 120 beats per minute, from the first graph, there were many errors. These included reading from the wrong line or at the wrong time, eg 5 minutes elapsed time, rather than 5 minutes after the exercise began, and even 2½ minutes after the exercise began. Examiners made allowance for this in the calculation in part (a)(ii), except that a stated heart rate of 56 was impossible to work with on the second graph, a point that might have alerted more astute candidates that they had misread the first graph.

(a) (ii) Three quarters of candidates arrived at the correct answer.

(b) Although approximately half the candidates could see from graph 2 that the trained athlete's heart had a higher stroke volume, less than half of these could then go on to explain the consequence of this which was that the *same* volume of blood could be sent round the body with fewer beats, or than more blood would be sent at the *same* heart rate.

(c) Although this question had a similar format to questions on this topic in previous examinations, the emphasis here required a *comparative* answer in order to explain the benefits of *more* oxygen and *more* glucose being sent to the athlete's working muscles. Marks were only awarded in this context. Thus a *higher rate* of aerobic respiration (or *less* dependence on anaerobic respiration), with *less* lactic acid being formed, enabling *more* work to be done with *less* fatigue were the points required Less than a tenth of candidates achieved this completely, although nearly all were able to make at least one of these points.

Question 5 *(High Demand)*

This was an unstructured question on the production of ethanol-based fuels from plant materials, the only proviso stipulated being that at least one enzyme should be named.

There were many rather confused answers where enzymes such as amylase or carbohydrase were responsible for the whole of anaerobic respiration. Some recounted the story of beer production while others confused the process with biogas production. Given that the named enzymes were hydrolases, there was a disappointing lack of mention of the process of *digestion*, although better candidates often included details of the conversion of starch to sugar. Some knew that the ethanol produced would need to be distilled if it were to be separated from the mixture of substances involved in the reaction, and a fair proportion mentioned blending with petrol to produce the final fuel. Weaker candidates clearly did not know how the structures of starch and glucose were related, ie that the former could be broken down into the latter. However, a good proportion did mention *fermentation* or *anaerobic respiration* as being involved in ethanol production. A tenth of candidates scored full marks for this question, but a fifth scored zero.

Question 6 *(High Demand)*

(a) (i) Few emphasised that diffusion only occurred *down* the gradient, rather than along, with or across it. Also, to get full marks for the definition of diffusion, it was necessary to mention molecules, atoms, ions, particles or dissolved substances and many candidates did not go beyond substances.

(a) (ii) Rather more candidates were successful in their definitions of active transport than in their definitions of diffusion. Most knew that active transport could operate *against* a concentration gradient, and most knew that *energy* was required to drive active transport.

(b) This was another unstructured question, although a hint that diffusion and active transport might be mentioned was provided in the introductory stem before part (a). A quarter of the candidates were very successful and scored all five marks.

To gain full marks, candidates had to discuss both *filtration* and *reabsorption*. Some used these terms interchangeably and produced rather confusing answers. A description of filtration was satisfactory in terms of only small molecules being allowed into the kidney tubule and, similarly, a description of reabsorption was allowed if substances were taken back from the tubule into the blood. While many knew that substances such as glucose, water and ions were reabsorbed, they did not necessarily stress that *all* the glucose was reabsorbed while only *some*, or *most*, of the water and ions were. It was here that mention of *active transport* and either *diffusion* or *osmosis* would have been relevant, but some candidates made global statements about a list of substances for some of which the nominated process was inappropriate. Most candidates knew that urea was filtered out of the blood that it remained in the filtrate and was thus present in the urine.

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