Pearson

Examiners' Report
Principal Examiner Feedback

January 2017

Pearson Edexcel
International Advanced Subsidiary Level
in Biology (WBI01)
Paper 01 Lifestyle, Transport, Genes and Health

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Introduction

This paper tested the knowledge and understanding of the two AS topics: 'Lifestyle, health and risk' and 'Genes and health', together with elements of How Science Works. The range of questions provided plenty of opportunity for candidates to demonstrate their grasp of these AS topics. Overall, candidates coped well with this paper, finding most of the questions straightforward to tackle; there were very few examples of questions not being attempted at all, with all questions achieving the full spread of marks.

It was good to see how well many candidates could recall several areas of the specification in a good level of detail, including the core practical for measuring vitamin C concentration. It was also very pleasing to see few candidates losing marks for poor quality of written communication (QWC) with answers often set out in a logical style with key biological terms spelt correctly.

Some candidates let themselves down by not reading the questions carefully enough, or by providing a response without the detail required at this level.

Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past.

1(a).

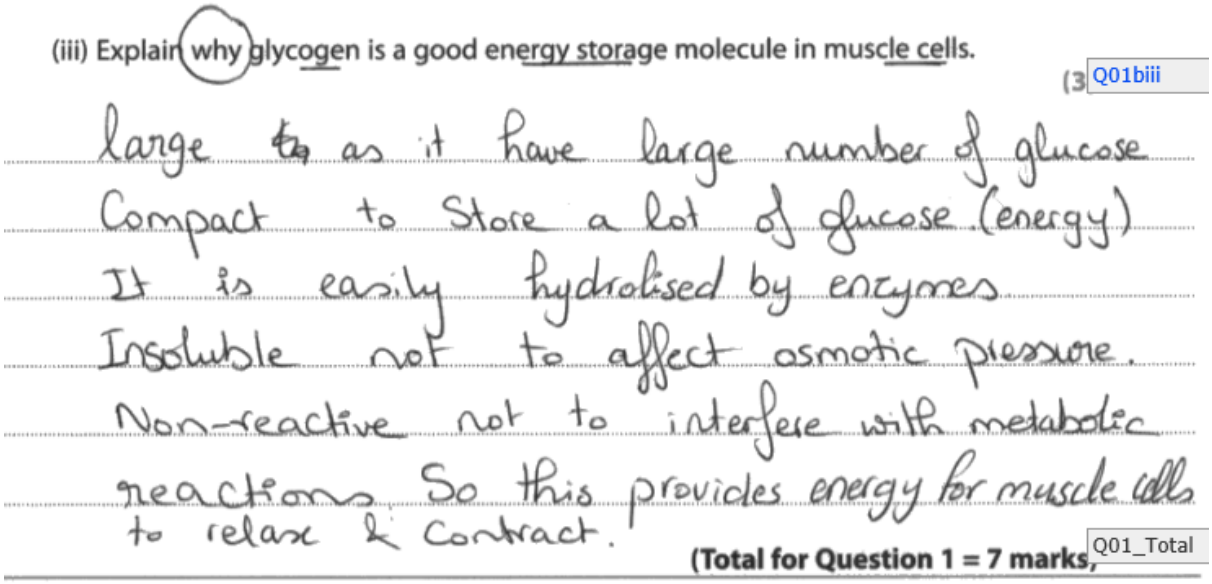
The majority of candidates were able to provide answers for this question that gained both available marks. All three marking points were frequently seen in candidate responses.

1(b)(iii)

Many good responses were seen for this question. Responses addressing all four marking points were frequently observed. Some candidates failed to express their ideas clearly. This often resulted in them not being awarded marking point 2 or 3.

Marking point 2 was not awarded for the suggestion that glycogen is easily hydrolysed. To gain the mark candidates need to make reference to the idea that glycogen can be rapidly hydrolysed, 'easily' was not accepted as being equivalent to 'rapidly'. To gain marking point 3 candidates need to make it clear that it was the storage of large quantities of energy or glucose in a small space. Simple statements that 'glycogen is compact' were not sufficient to gain the mark.

The response below gained 1 mark, marking point 4 on line four. Lines one and two do not clearly express the idea of high energy density and do not get marking point 2. In line three the candidate refers to easily hydrolysed rather than rapidly hydrolysed so does not get marking point 2.


(iii) Explain why glycogen is a good energy storage molecule in muscle cells.

(3) Q01biii

large as it have large number of glucose
Compact to Store a lot of glucose (energy)
It is easily hydrolised by enzymes
Insoluble not to affect osmotic pressure.
Non-reactive not to interfere with metabolic
reactions. So this provides energy for muscle cells
to relax & Contract.

(Total for Question 1 = 7 marks) Q01_Total

2(b)

This question proved to be a good discriminator across the ability range. Candidates that recognised the question was asking how atherosclerosis might lead to coronary heart disease often gave reasonably complete responses that gained three or four marks. Unfortunately, a disappointing number of candidates simply described the process of atherosclerosis and made no attempt to link this to heart disease.

Because the context of the question was heart disease candidates need to make reference to the blockage or narrowing of lumen of coronary arteries for marking point 2. Similarly, to gain marking point 4 candidates had to refer be heart tissue, muscle or cells being deprived of oxygen. A statement such as 'no oxygen will reach the heart' is not sufficiently clear.

The response below gains three marks. Marking point 2, lines 3 and 4, marking point 3 lines 4 to 5 and marking point 4 lines 5 and 6.

(b) Coronary heart disease is one example of CVD.

Explain why atherosclerosis is a risk factor for coronary heart disease.

(3) Q02b

As ~~atherosclerosis~~ High blood pressure damage the endothelial cells that accumulate the formation of atheroma which makes the wall of the coronary ~~artrey~~ less elastic and has narrower lumen that will decrease the blood flow to the heart so less oxygen reaches the ~~heart so the~~ muscle of the heart so the muscle start to respire anerobically so release lactic acid which will make the patient feel pain

2(c)(i)

The majority of candidates found this question accessible. Most gained at least one mark for marking point 1. Many also gained marking point 3. However, marking point 3 was not awarded unless candidates made it clear that the there was little difference in the percentage of strokes. Simply stating the percentages was not sufficient.

2(c)(ii)

Many candidates gained this mark. A frequently seen incorrect response was to suggest that heart attack and stroke are physical conditions and that since placebo has psychological effects its use is not appropriate.

2(c)(iii)

Candidates were expected to identify limitations from the information provided. A number of candidates made reference to information that was not provided e.g. gender of the participants. Any reference to information not being provided were ignored and did not gain credit.

3(a)(ii)

Many candidates were able to calculate the percentage decrease in pressure and gain both marks. Some candidates calculated a percentage increase and others misread the scale on the y-axis losing both marks.

3(a)(iii)

Candidates that read the question carefully generally made a reasonable attempt at this question. However, many candidates appeared to think the question was about the atria rather than the aorta and produced answers that did not address the question.

3(b)

This question is similar to questions asked previously and many candidates were well prepared gaining all three available marks.

3(c)

Many students gained both available marks for linking the idea of thin walls to rapid diffusion or pores in capillaries to increased permeability. However, a number of students simply stated that the 'capillary walls are one cell thick' this is not sufficient for marking point 1. If they do not state that the capillary walls are thin then students need to express the idea that the capillary wall is formed from a single layer of thin or flattened cells. To get marking point 2 candidates had to express the idea of rapid diffusion.

The response below scored zero.

(c) Explain **one** way in which the structure of a capillary is related to its function.

(2)

The capillary is one cell thick so increased diffusion as there is a shorter distance for diffusion.

This response gained both marks. Marking point 1 in line one and marking point 2 in line three.

(c) Explain **one** way in which the structure of a capillary is related to its function.

(2)

1) They have thin walls so ~~da~~ O_2 and glucose are transported at a short diffusion distance which increases the rate of diffusion.

4(b)(i)

A number of candidates did not gain this mark either because they simply re-stated the numbers in the table or did not give a full ratio. To score a mark candidates need to put either the mass or the surface area as 1 and give an appropriate value for the other.

The response below gains the mark.

(i) Use the data in the table to calculate the ratio of mass to surface area of the alveoli for the Thomson's gazelle.

(1)

$\frac{95.0}{19.5} = 5$

Answer 1 : 5

In the second response the candidate has completed the division but has not written out the answer as a ratio so does not gain the mark.

(i) Use the data in the table to calculate the ratio of mass to surface area of the alveoli for the Thomson's gazelle.

(1)

$\frac{19.5}{95} = 0.2$

Answer 0.2

4(b)(ii)

Candidates answering the question generally scored one or two marks. However, a number of candidates simply described the relationship and gained no marks.

4(c)

The role of the CFTR protein in cystic fibrosis is a common theme in exam questions. Most candidates had a good idea of what was expected and produced reasonably complete answers.

5(a)

The majority of candidates were able to describe the main effects of genetic modification and gained two or three marks. A number simply wrote out the vitamin C concentrations for the leaves and tubers of both types of plant, gaining no marks. To gain marks candidates needed to state the effect in words. E.g. 'the vitamin C concentration of genetically modified plants **is greater than** in the control plants' would gain marking point 1. In contrast 'the vitamin C concentration in control plants is 1.6 in the leaves and 2.7 in tubers whereas in genetically modified plants it is 2.7 in the leaves and 3.2 in the tubers', would not.

The response below gained two marks. Marking point 1, lines one and two. Marking point 3, lines three to five.

Describe the effect of genetic modification on the vitamin C concentration in these potato plants.

(3)

Genetic modification increased the vitamin C content in both leaves and tubers. In the leaves of DHAR. modified plants, vitamin C concentration increased by 1.1 $\mu mol\,g^{-1}$ (2.7-1.6) and the [redacted] vitamin C concentration in the tubers in the DHAR. modified plant increased by 0.5 (3.2-2.7)

5(b)

Most candidates appeared to be familiar with the measurement of vitamin C and were able to produce reasonably complete responses to this question.

6(a)(iii)

Candidates struggled to express themselves clearly with their responses to this question. Marking point 1 was the most frequently seen. However, some candidates did not make it clear that the double bonds were in the hydrocarbon chain or between carbon atoms so did not gain the mark.

Marking point 3 was not awarded for statements such as 'there are more hydrogens on each carbon'. The ratio of hydrogens to carbon is greater in saturated fats but only **some** of the carbon atoms in unsaturated fats have fewer hydrogens than the carbons in saturated fats.

Question parts 6(a)(iv), (b)(i) and (b)(ii) proved to be good discriminating questions, with stronger candidates producing good response to these questions.

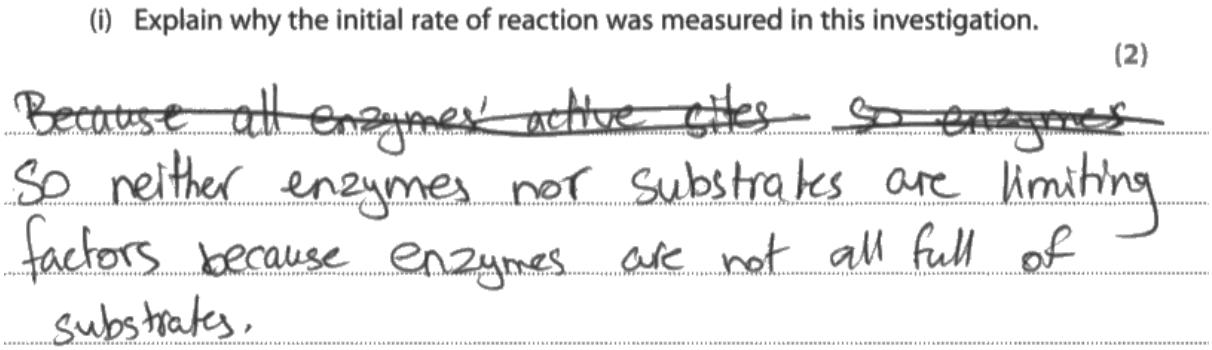
6(a)(iv)

Most candidates are able to express the idea that enzymes are specific (Marking point 1). However, relatively few were able to take this further and explain why enzymes act on one substrate (are specific).

6(b)(i)

Many candidates knew that the initial rate was important and they often suggested that this was so that the enzyme is the limiting factor (marking point 1). However, relatively few candidates exemplified this with marking points 2 and 3. A number of candidates contradicted themselves stating that at the start neither enzyme or substrate is limiting and did not gain marking point 1.

The response below gains no marks. The candidate has contradicted themselves and does not gain marking point one.


(i) Explain why the initial rate of reaction was measured in this investigation.

(2)

~~Because all enzymes' active sites so enzymes~~
So neither enzymes nor substrates are limiting factors because enzymes are not all full of substrates.

6(b)(ii)

Investigating the effect of substrate concentration on the initial rate of activity of an enzyme is a core practical. Candidates would be expected to know that factors such as pH and temperature would be controlled in such an investigation.

Many candidates recognised that a buffer is required to control pH. However, relatively few made the connection with fatty acids (marking point 2) or were able to explain how changes in pH would affect enzyme activity.

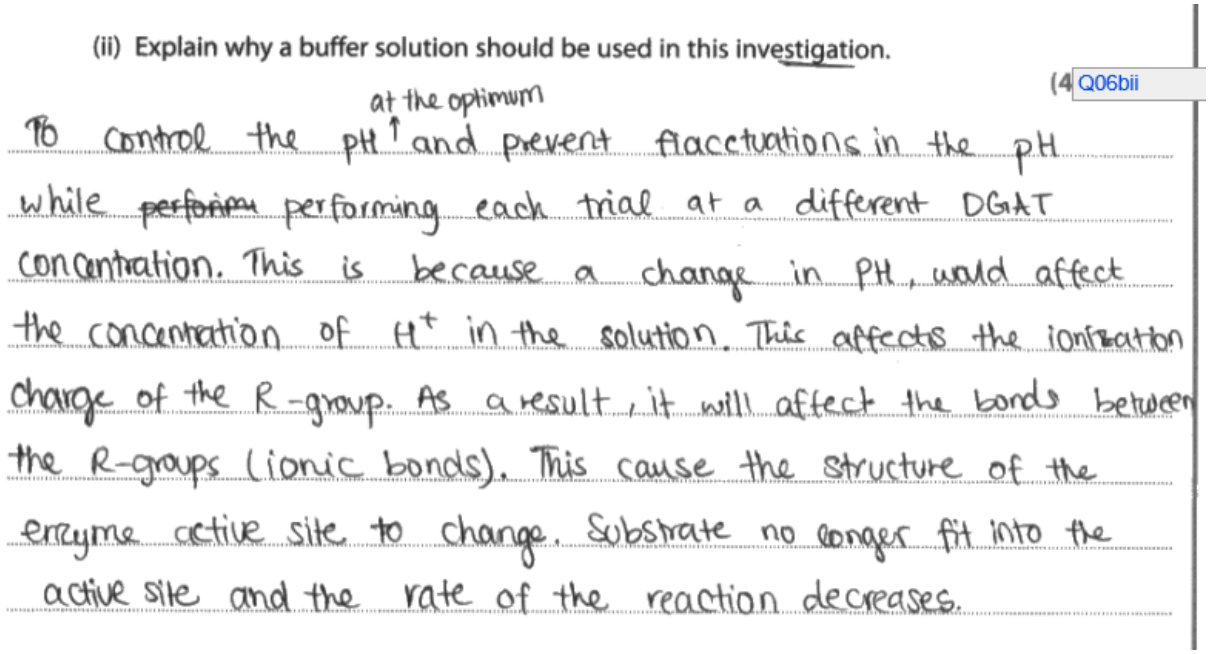
The response below was awarded four marks.

Marking point 1 (line one), marking point 3 (lines two to four), marking point 4 (lines three and four) and marking point 5 (line seven and eight).

(ii) Explain why a buffer solution should be used in this investigation.

(4)

Buffer solutions control the pH of a solution in an experiment. Enzymes work at ~~optimum~~ a range of pH values and any extreme pH values can denature the enzyme by disrupting the ionization of the R-groups and damaging the shape of the active site. In this experiment, we are measuring only the affect on enzyme concentration on the initial rate so keeping the pH constant is essential as the pH can alter the rate of the reaction and the results will be less valid.



7(a)

Many candidates produced good descriptions of the structure of the cell membrane. All marking points were seen although marking points 2 was often not clearly expressed.

Some did not address the question asked. Instead they explained the term 'fluid mosaic'.

7(b)(ii)

Many complete answers were seen for this question. A few candidates mistakenly thought the cell had burst.

8(a)

Candidates were asked to use the specific example of alpha-1-antitrypsin to explain the terms genotype and phenotype. Candidates that simply provided an explanation of the terms without correct reference to alpha-1-antitrypsin did not gain the marks.

The response below gained both marks.

(a) Using alpha-1-antitrypsin as an example, explain the terms **genotype** and **phenotype**.
(2)

Genotype It is the ~~combinate~~ combination of the different alleles that code for a particular protein. For example, MM and SZ are two genotypes that code for the production of alpha-1-antitrypin.

Phenotype It is the physical outcome or appearance ~~of the~~ due to the genes. For example, the ~~percentage of~~ concentration of alpha-1-antitrypsin in the blood is the phenotype caused due to the different genes coding for this protein.

8(b)

Many candidates struggled with this question. However, there were a number of good attempts that gained all three available marks. Usually, marking points 1, 2 and 3. Marking points 2 and 3 were frequently observed.

8(c)(iii)

This question is reasonably familiar and many candidates produced a good response that scored well.

8(d)

The majority of candidates had a reasonable attempt at this question gaining two or three marks. Marking point 2 was only awarded if candidates clearly identified the ZZ genotype as being responsible for the AAT concertation below those of the parents.

(d) Two parents with the **MZ** allele combination had a child.

Use a genetic diagram to determine the probability that this child will have a blood concentration of alpha-1-antitrypsin that is lower than its parents'.

(3)

phenotypes | 60% ⊗ 60%

genotypes | MZ ⊗ MZ

gametes | (M), (Z) ⊗ (M), (Z)

↑ of parents

	M	Z
M	MM	MZ
Z	MZ	ZZ

child's phenotypes

100%, 60%, 60%, (10-15%)

child's respective genotypes

MM, MZ, MZ, (ZZ)

concentration lower than parents' ↙

Probability 25%

Paper Summary

Based on their performance on this paper, candidates are offered the following advice:

- Read the whole question carefully, including the introduction, to help relate your answer to the context asked. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question.

- Read your answers back carefully – do they answer the question, have you made at least as many clear points as marks are available.

- When asked to distinguish between two things make sure your answer is comparative and mentions both things being compared.

- When asked to describe data, either graphs or tables, look first for the main trends i.e. the overall changes and describe these. You need then to make a judgment about the usefulness of any mathematical manipulation of the data and this should only be carried out if it adds value to your written description.

- Do not be afraid to include a sketch diagram or graph if it will help add clarity to your answer.

- When describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount.

- Pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions.

- Explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of questions, and exemplify the level of knowledge and understanding expected at AS level.

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