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Examiners' Report
June 2017

IAL Biology WBI01 01

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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 the opportunity for candidates to demonstrate their understanding of these AS topics. Overall, candidates coped well with this paper, finding most of the questions straightforward to answer. There were very few examples of questions not being attempted at all, with all questions achieving the full spread of marks.

Many candidates could recall several areas of the specification in a good level of detail. Very few candidates lost marks for poor quality of written communication (QWC) with many candidates producing clear answers, set out in a logical style with key biological terms spelt correctly.

Some candidates would have benefitted from reading the questions more thoroughly, or by providing a response with 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.

Question 1 (b)

This was a relatively straightforward question and the majority of candidates gave the correct answer.

A small number of candidates gave pentose as the answer and this did not gain the mark.

Question 1 (c) (i)

There were two marks available for this question. Many candidates gained the second marking point, describing the production of DNA molecules that contained one original strand and on a newly synthesised strand. However, a number of candidates did not clearly express the idea that both original strands of DNA are used or copied in semi conservative replication.

Some candidates produced responses such as 'producing DNA in which half is the original DNA and half new DNA'. Responses like this were not accepted as it was not clear whether the candidates were referring to one original and one new strand of DNA.

Question 1 (c) (ii)

A number of candidates could not provide the names of the scientists who provided the evidence for semiconservative replication.

Question 2 (a)

Many candidates focussed on the word recessive and ignored allele. Two marks were available. The first was for a description of what an allele is and the second for a description of what recessive means.

2 Hereditary haemochromatosis is a disorder resulting from the inheritance of recessive alleles.

(a) Explain what is meant by the term **recessive allele**.

(2)

• when an allele ~~has a phe~~ only has a phenotype present when there are two copies of the same allele ,assualy shown by a lowercase letter ie (aa , Aa) .

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Examiner Comments

In this response, the candidate has provided a good explanation of the idea of 'recessive' but has made no attempt at an explanation for 'allele'. Only MP2 was awarded.

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Examiner Tip

When asked to explain a term make sure you explain the term completely.

It is a different version of a gene that is only expressed in the phenotype when there are two of the same allele in the genotype. ~~Alleles have di~~ Different alleles have different sequences of bases, although they are found at the same gene locus.

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Examiner Comments

In this response, the candidate has addressed both marking points, clearly describing what an allele is and then explaining what recessive means.

Question 2 (b)

This question proved challenging for a number of candidates. A significant number of candidates described how Punnet squares (or other genetic cross) diagrams could be used to work out the results of a monohybrid cross. Responses taking this approach gained no marks.

Candidates who recognised they were being asked about pedigree diagrams found the question more approachable and often gained two or three marks.

(b) Explain how a genetic pedigree diagram could show how haemochromatosis is inherited.

(3)

A pedigree diagram would show which members in the family tree are carriers of haemochromatosis, which ones are not affected, and which ones are affected. The pedigree diagram could show that if a child suffers from haemochromatosis, but their parents do not, then they must have recessive alleles that code for the disorder. Also, males and females are distinguished with different shaped symbols, and carrr sufferers of the genetic condition are usually sh represented by filling in such shape.

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Examiner Comments

In this response, the candidate links a pedigree diagram to the members of a family. This was just sufficient for MP1. They then link phenotype (affected or not affected) to the diagram, MP2. Finally, they explain how the pedigree diagram can be used to identify a recesssive inheritance pattern, MP3. Relatively few candidates were able to do this.

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Examiner Tip

At AS level candidates need to know how to use Punnet squares and how to interpret family pedigree diagrams. Make sure you know the difference between them and how to use each of them.

Question 2 (c)

This is a familiar question and the majority of candidates were able to produce reasonable answers. Marks were often lost where candidates gave incorrect descriptions of the material sampled (MP2 or 6). A number of candidates confused names and methods. Examiners then marked the method and ignored the name to give candidates the best possible score.

(c) Prenatal testing can be used to determine whether or not a fetus has hereditary haemochromatosis.

Name **one** method of prenatal testing and describe how it can be used to detect hereditary haemochromatosis.

(4)

Method Amniocentesis

Description of how the method is used A sample of the amniotic fluid is taken during 14 - 20 weeks of pregnancy. A needle is inserted through the wall of the abdomen and into the amniotic fluid. The amniotic fluid contains cells shed from the growing foetus. The cells are cultured for 2-3 weeks before they can be used to test for the presence of the recessive alleles.

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Examiner Comments

This is an example of a complete response in which the candidate has gained all four available marks.

Question 3 (a) (iv)

This calculation proved straightforward for many candidates. Those who did not get the correct answer usually misread the time for one heart beat and gained no marks.

Candidates that correctly read the time for one heart beat but then carried out an incorrect calculation gained one mark if the beat length (O.8) was seen in the working.

(iv) Use the graph to calculate the heart rate for this person.

(2)

~~0.2 - 0.4~~2

1.2-0.4 = 0.8 beats per second.

1s → 0.8b
60s → ?

$\frac{60}{0.8}$ = 75 beats per minute//

75 beats min^{-1}

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Examiner Comments

This is an example of the correct calculation that gained both marks.

(iv) Use the graph to calculate the heart rate for this person.

(2)

$\frac{110}{0.8}$ = 137.5 beats min^{-1}

137.5 beats min^{-1}

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Examiner Comments

Although the calculation was carried out incorrectly this candidate gained one mark. This was awarded because the candidate had correctly determined the heart beat length from the graph. This 'working' mark could be awarded because the candidate had written down the value 0.8 in their working.

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Examiner Tip

Always set out your working so that an examiner can follow what you have done.

Question 3 (b) (i)

In this question, candidates are expected to think about the data they are being asked to describe and judge how best to describe it.

This question required candidates to describe a reasonably complex graph. With no obvious points for which a mathematical comparison was useful, the candidates were expected to make three descriptive points. Many candidates made the observation that training reduces heart rate (MP1). A number went on to comment on the difference during exercise (MP2). However, few managed to state that training reduced the increase in heart rate that occurs during exercise (MP3).

(i) Use the information in the graph to describe the effect of training on the heart rate of this person.

(3)

Heart rate of the person after training is lower than heart rate before training. Before exercise, the resting heart be rate before training used to be 79, after training it's 65. The resting heart rate dropped by 14 beats per minute. The increase in heart rate of the person during exercise is less after he has done traing compared to before training. After exercising, the recovery time of the person after training is also faster compared to before training.

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Examiner Comments

In this response the candidate has gained MP1 and 2. MP1 line 1, MP2 lines 4 to 6.

Question 3 (b) (ii)

Many candidates found this question relatively straight forward and gained both marks. Marking points most frequently seen were MP1 and 2. Few candidates linked exercise to not being overweight or reducing the LDL:HDL ratio, MP 4 and 5.

(ii) Explain why the risk of developing coronary heart disease may be reduced for this person as a result of the training.

(2)

Training helped to reduce the overall heart rate of the person, which leads to reduced blood pressure and therefore reducing the risk of developing coronary heart disease by reducing damage to the arteries and the heart muscles.

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Examiner Comments

Recognising that high blood pressure is a risk factor for CVD, this candidate has identified reduced heart rate following exercise (MP2) leads to reduced blood pressure (MP1) reducing the risk of CVD.

Question 4 (a) (i)

Candidates who remembered that sucrose is formed from glucose and fructose generally gained all three marks. Those candidates who could not remember the structure of sucrose could still access two marking points.

4 The addition of sugars to food is one risk factor for cardiovascular disease (CVD).

(a) Two sources of sugar used in foods are sucrose and high-fructose corn syrup.

(i) Describe how sucrose is formed from monosaccharides.

(3)

The monosaccharides has a single saccharides. The sucrose is disaccharides. it's made up from two monosaccharides and the sucrose is glucose and fructose. the bonds that form between monosaccharides are glycosidic bonds In the reaction that forms a glycosidic bond there is a loss of one molecule of water. it is called condensation reaction

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Examiner Comments

In this answer the candidate gained all three marking points.

Question 4 (a) (ii)

Similar questions have been asked previously and many candidates were well prepared for this question. Marks were lost when candidates confused amylose with amylopectin or did not give complete descriptions.

(ii) High-fructose corn syrup is manufactured from starch.

Describe the structure of starch.

(3)

Starch can be in the form of amylose or amylopectin. Amylose and amylopectin are both made for form bonded by alpha glucose units by glycosidic bonds to form polysaccharides. Amylose has a alpha helix structure with only 1-4 carbon glycosidic bonds but amylopectin has both 1-4 & 1-6 glycosidic bonds giving it its branched ~~structure~~ structure.

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Examiner Comments

This response gained all three available marks.

(ii) High-fructose corn syrup is manufactured from starch.

Describe the structure of starch.

(3)

- Starch is a polysaccharide sugar.
- It's a branched sugar making it easy to be decomposed
- It contains both hydrogen and glycosidic bonds

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Examiner Comments

In this response, the candidate has not quite provided sufficient detail to gain marks. For MP 1 candidates must describe many glucose molecules joined by glycosidic bonds. Glycosidic bonds alone (line 3) is not sufficient. They needed to link this to many glucose molecules to gain the MP.Unfortunately, they did not link the branched structure (line 2) to amylopectin so did not gain MP3.

ResultsPlus
Examiner Tip

When describing or comparing structures make sure you give as complete a description as possible.

Question 4 (b) (i)

Many candidates recognised that the LDL:HLD ratio increased with the increase in energy from added sugar (MP1). Relatively few then went on to suggest that this would increase blood LDL concentrations and that high levels of LDL were a risk factor for CVD.

(i) The scientist who carried out this study concluded that:

'The addition of large quantities of sugar in the diet increases the risk of CVD.'

Use the information in the graph and your own knowledge to explain why the scientist came to this conclusion.

(3)

As the percentage of energy obtained from added sugar (large quantities of sugar) the higher the ratio of LDL to HDL cholesterol. Therefore there's a positive correlation. At 25 + < 30 y. the ratio was the highest however after that at ≥ 30 it slightly decreased by 0.04. Therefore this shows more of the LDL cholesterol is produced which is a factor that contributes to CVD as the LDL's take ~~glucose~~ sugar from the liver to the tissues. which increases blood pressure and thus may lead to atherosclerosis and CVD.

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Examiner Comments

In this response, the candidate has addressed all three marking points.

Question 4 (b) (ii)

A number of candidates were able to suggest one of the accepted answers.
Relatively few however managed to make two suitable suggestions.

Question 4 (b) (iii)

Many candidates recalled that statins lowered the LDL cholesterol so gained MP1.
Few then linked this to a change in LDL:HLDL ratio or commented that the effect of added sugar would be hidden or counteracted by the statins. A number of candidates made the comment that the study would not be valid (MP4). Some candidates suggested the result would be less reliable or less accurate. However it is the validity that is affected and not the reliability or accuracy of results.

(iii) Suggest why young people taking statins were not included in this study.

(2)

To make experiment valid. Additionally statins reduces total blood cholesterol level by reducing the absorption of cholesterol into blood. If they were included then ratio of LDL to HDL cholesterol would be lower thus reduces the reliability of study.

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Examiner Comments

In this response, the candidate was awarded a maximum of 2 marks. These could be awarded for MP 1, 2 and 4.

Question 5 (a) (i)

This was a fairly straightforward calculation that many candidates were able to complete and therefore gain full marks. Those candidates that did not record any working and made an error in the calculation did not gain any marks.

Question 5 (a) (ii)

Many candidates found this question straightforward and gained both available marks. Marking points one and three were the most frequently seen. Some candidates confused the roles of elastic fibres and collagen in the walls of blood vessels and did not provide acceptable answers for MP1 or 2.

(ii) Explain why the structure of a vein differs from the structure of an artery.

(2)

Veins do not have a thick, elastic wall because the blood pressure is low, (doesn't need stretch & recoil) and hence also contain valves to prevent backflow due to the low blood pressure unlike the high blood pressure in the artery - which (it) has to withstand.

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Examiner Comments

In this response the candidate has gained both available marks. These could be from for MP1, lines 1 and 2 and MP2, lines 1 to 3 and MP3, lines 2 and 3.

Question 5 (b) (i)

This question asks about blood clot formation in a novel context. Full marks are available for a good description of the clotting process, MP2 to MP6. An additional mark was available to candidates who thought about the site in which these clots are forming (veins) and suggested a role for slow blood flow in initiating blood clotting.

Question 5 (b) (ii)

Although some good responses were seen, many candidates struggled with this question. Most of the answers given did not take into account the path that blood clots would take after formation in veins.

Question 5 (b) (iii)

A number of good responses were seen to this question. However, candidates often struggled to express marking points clearly. Marking point 3 was the most frequently seen.

Question 6 (a) (i)

This was very straight forward for most candidates. Some candidates gave phospholipid bilayer or phospholipid monolayer neither of which were accepted. Candidates were asked to name the molecule identified.

Question 6 (a) (ii)

To answer this question, candidates needed to explain how phospholipids contribute to the fluid mosaic properties of a cell membrane. Many candidates made reference to the formation of a phospholipid bilayer and the insertion of proteins into the membrane, gaining the first and second marking points. Some candidates also went on to explain that membranes are fluid because the phospholipids move freely (MP4). Very few candidates linked the insertion of proteins into membranes with the presence of hydrophobic R groups or the interactions between R groups and the hydrophobic fatty acid tails (MP3).

(ii) Explain how the properties of molecule **A** contribute to the fluid mosaic model of cell membranes.

(3)

The phospholipid have hydrophilic heads and hydrophobic tails. In water the heads point into the water while tails ~~point~~ are hidden inside to form a bilayer

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Examiner Comments

In this response the candidate has explained why phospholipids form a bilayer (MP1). However, candidates were asked to explain how properties of phopholipids contribute to the fluid mosaic model of cell membranes.

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Examiner Tip

Make sure you read questions carefully and answer the question that is asked.

Question 6 (b) (i)

This question was answered well by many candidates. However, a number produced descriptions of the changes in absorbance. No credit was gained for such responses since the question asks candidates to describe the effect of pH on membrane permeability. Candidates who recognised that increased absorbance of the solution corresponded with an increased membrane permeability generally scored well.

Question 6 (b) (ii)

Many candidates recognised that at extremes of pH, membrane proteins would be denatured (MP1) and that this would result in gaps or holes in the membrane (MP2). However, a number of candidates provided responses in terms of enzymes being denatured. This was allowed if the context was clear i.e. they were describing membrane enzymes. However, frequently it was not clear that the candidates were describing membrane proteins so marking point 1 could not be awarded.

(ii) Suggest an explanation for the effect of pH on membrane permeability.

(2)

The ~~cell~~ membrane proteins become denatured as a result of very low or high pH. ~~Therefore~~ That's why at the ~~a~~ pH of 12 the cell membrane proteins were denatured and allowed the Vacuole membrane to become denatured and form gaps that allow the pigment to leave the cells.

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Examiner Comments

In this response the candidate gained both available marks. Extremes of pH were linked to proteins being denatured lines 1 and 2 (MP1). MP2 was awarded for the description of gaps forming in the membrane – lines 3 and 4.

Question 7 (b) (i)

The majority of candidates recognised that they were being asked to describe the process of transcription and many good responses were seen. Some candidates confused transcription and translation and gave a detailed description of translation. All of the marking points were seen. Marking point 3 was often not awarded because candidates incorrectly described the binding of DNA nucleotides. To gain marking points 6 and 7, candidates had to make clear that the phosphodiester bonds were between adjacent nucleotides in a strand and not between the nucleotides undergoing complementary pairing.

In this question marks are available for mentioning complementary base pairing and phosphodiester bonds. However, to gain the marks it must be clear candidates are using the terms correctly. This means there must be some relevant context; for example, where the complementary base pairing is found or which nucleotides are being joined by the phosphodiester bonds.

(b) Mutations in the gene for prolidase result in an enzyme that cannot hydrolyse collagen.

*(i) Describe the process of transcription in the synthesis of prolidase.

(5)

Transcription happen in nucleus. DNA strands unwinds by DNA helicase and antisense strands of DNA would acts as template strand for formation of mRNA. RNA nucleotide lines up along ~~both strand~~ template strands of DNA. Hydrogen bond is formed between complementary ✗ base pairing. DNA ligase ~~catalyse~~ involved in formation of phosphodiester bond between adjacent mononucleotide. DNA polymerase is also involved in ✗transcription. Now mRNA is formed and mRNA moves out of nucleus through nuclear pore. mRNA contains genetic code for ✗the formation of new protein.

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Examiner Comments

This is a comprehensive response that gained all five available marks. MP 1 – line 1, MP2 – lines 2 and 3, MP3 and 4 – lines 2 to 5, MP7 line 7 and MP1 lines 9 and 10. Reference to hydrogen bonding between complementary bases – lines 5 and 6 was not enough for MP5. Complementary base pairing needs to be clearly in context of bases nucleotides lining up along the template strand for MP5.
MP 6 was not available (line 6 and 7) as DNA ligase is incorrect. The enzyme forming phosphodiester bonds is RNA polymerase.

Question 7 (b) (ii)

This is another question that many candidates found relatively straightforward. However a number of candidates still struggled to separate the idea of a nucleotide sequence (base sequence) from the primary structure of a protein. Responses such as 'a mutation is a change in the amino acid sequence of a protein' gained no marks.

This was a reasonably complete response that gained all four available marks.

MP2 – lines 4 and 5, MP3 – lines 8 to 10, MP4 – line 11 and MP5 – lines 12 – 17.

MP1 would not have been awarded in line 1. It needs to be clear that the mutation changes the **sequence** of bases. 'Changing the bases' could means something else.

(ii) Prolidase hydrolyses the bonds that join hydroxyproline to adjacent amino acids in collagen.

Explain how a mutation could result in prolidase that is unable to hydrolyse collagen.

(4)

A mutation results in a change in the bases of DNA. Prolidase is an enzyme which is a globular protein and has a 3D structure. If the bases change, then the position and the sequence of amino acids in a polypeptide chain ~~increases~~ changes. The hydrogen bonds, ionic bonds and disulphide bridges are all dependent on the sequence of amino acids in the primary structure. If the sequence changes, then these bonds happen between different amino acids and the bonds ~~so~~ between R groups also changes hence the folding of the enzyme and its 3D structure changes. Enzymes are very specific molecules with an active site shape. Due to the mutation, the active sites shape changes hence the enzymes lose their specificity and are no longer complimentry to the DNA substrate so they cannot form the Enzyme substrate complex and ~~so~~ so hydrolysis does not happen.

(Total for Question 7 = 10 marks)

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Examiner Comments

Try to give responses that are not ambiguous. An example of an ambiguous statement is the first line of this response, 'A mutation results in a change in the bases of DNA'. This could mean a change in the sequence of bases or it could mean all the bases are changed for some different bases. The examiner cannot guess what you are thinking.

Question 8 (a) (i)

This was a relatively straight forward calculation that many candidates were able to complete successfully.

Most candidates provided relatively little evidence of workings. This was not a problem if they produced the correct answer. However, if the correct answer was not provided then it often proved difficult to award the first marking point (working mark).

A number of candidates either did not write an answer on the answer line or miscopied the answer from the working space to the answer line. Examiners mark the answer provided on the answer line. This applies even if the correct answer is somewhere else in the response.

In this response the final answer calculated was incorrect. However, because the candidate has shown their working it was possible to give the first marking point.

Calculate the percentage difference in the concentration of dissolved oxygen in these two samples.

Show your working.

(2)

225.0 − 90 = 135 difference

225 + 90 = 315

$\frac{135}{315} \times 100 = 42.857\%$

$= 48.9\%$

48.9 %

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Examiner Comments

Always show your workings for calculation questions.

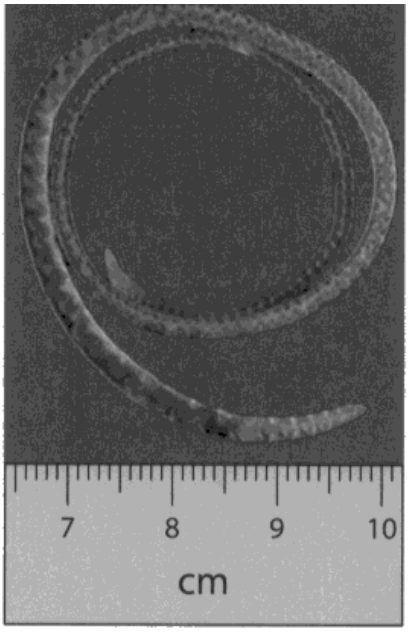
Question 8 (a) (ii)

A number of candidates did not read the question carefully or gave too little consideration to the stimulus material. A lot of responses were general answers about small animals and many candidates answered a different question altogether about why T tubifex does not require a circulation system.

The question is about the gas exchange surface of the T. tubifex. Marking points 1 and 2 come from the photograph. Marking points 3 and 4 come from candidates applying their understanding of gas exchange surfaces to the organism shown.

(ii) *T. tubifex* obtains oxygen from the water through the surface of its body.

The photograph below shows *T. tubifex* with a scale.



Use the photograph and your own knowledge of gas exchange surfaces to suggest how the structure of *T. tubifex* is adapted to obtain oxygen from the water.

(3)

T. tubifex has a narrow and long body, ~~with~~ giving it a high surface area to volume ratio. Having the ability to absorb oxygen from the surface of its body, the large surface area exposed to the oxygen source helps it obtain as much oxygen as possible. The diffusion pathway is also short.

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Examiner Comments

This response gained two marks MP1 and 2 (lines 1 and 2). Reference to 'absorbing oxygen form its surface' and to 'a short diffusion pathway' were too vague and did not focus on gas exchange so gained no marks.

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Examiner Comments

Read questions carefully and answer the question that is asked.

Question 8 (b)

This question was answered well by many candidates. Some candidates struggled to express ideas clearly and in particular did not convey a sufficiently clear idea of the surrounding alveoli by capillaries (MP4) or the role of blood flow and ventilation in maintaining the diffusion gradient (MP6 and 7).

Many candidates make reference to the capillaries and alveoli being 'one cell thick', which is incorrect. Many also describe the walls as being one cell thick. However candidates need to say that 'the walls are thin' or that 'the walls are made form a single layer of flattened cells'.

Paper Summary

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

- Read the whole question carefully, including the introduction. This will help relate your answer to the context used. 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.
- Make sure you understand the biochemistry that underpins the concepts covered in this unit.
- Read questions carefully. Do not assume that the question asked is the same as that which has appeared on a previous paper.
- Read your answers back carefully. Ensure you have answered the question and 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 a trend, look for the overall change. Do not give a detailed description of individual points on a graph or in a table.
- Include a relevant calculation whenever you are asked to describe or compare numerical data in tables or graphs.
- Don’t 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 the 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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