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Examiners' Report
June 2025

Int Advanced Level Biology WBI11 01

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June 2025

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Introduction

We saw a wide range of responses from candidates, covering all the points that we had on our mark scheme. There appeared to be fewer blank responses this series with some really excellent responses from the more able candidates. The MCQs generated a range of responses, with 3(b)(i) performing least well; candidates do struggle with ratios.

A vast number of centres are using our mark schemes and examiners' reports to prepare their candidates; this is evident in the answers where mark points have appeared on previous mark schemes.

Question 1(a)

Candidates performed very well in this question. Some marks were lost in the first response for specifying a particular type of blood vessel which we felt implied that prothrombin was not transported in all types of vessel. Other marks were lost for writing 'fibrogen' in the last response which we felt was not phonetic enough for a biological term that candidates should know as it is listed in the specification.

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 One risk factor for cardiovascular disease is a short blood clotting time.

One test for measuring blood clotting time is the prothrombin time (PT).

(a) Read through the following passage about prothrombin and the blood clotting process.

Complete the passage by writing the most appropriate word or words on the dotted lines.

(3)

Prothrombin is transported in the bloodstream of a human.

It is converted into thrombin by an enzyme called thromboplastin.

The substrate for thrombin is fibrinogen.

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Examiner Comments

A clear and accurate response.

ResultsPlus
Examiner Tip

In questions like this, read through the passage first before starting to fill in the gaps.

Question 1(c)

This percentage calculation did not cause many candidates a problem. Marks did get lost by candidates who gave their answer to too many decimal places.

(c) The range for a healthy PT is between 10 and 13 seconds.

A person with a PT of 8.5 seconds was treated with a drug to increase the PT time to 10 seconds.

Calculate the percentage increase in PT from 8.5 seconds to 10 seconds.

(1)

$8.5\left(1+\frac{x}{100}\right)=10 \Rightarrow$

$8.5+\frac{8.5x}{100}=10 \Rightarrow$

$8.5x=(1.5)\times 100 \Rightarrow$

$x=\frac{150}{8.5} \Rightarrow x=17.6\%$

Answer 17.6 %

(Total for Question 1 = 5 marks)

ResultsPlus
Examiner Comments

This candidate chose to give their answer to one decimal place which was fine.

ResultsPlus
Examiner Tip

Generally speaking, percentages should not be expressed to more than two decimal places.

Question 2(b)

We saw some very good descriptions of the structure of haemoglobin, which unfortunately was not what the question was asking for. The command word was "explain" not "describe"; we wanted candidates to link the structure with the function of the molecule.

We saw the first three mark points frequently from those candidates who did explain how the structure related to the function, but rarely in any one response. Several candidates realised that the molecule had hydrophilic R groups but then stated that this enabled the molecule to dissolve in the plasma. The fourth mark point was rarely seen; the majority of candidates think that the carbon dioxide binds to the haem group. Candidates are clearly confused with carbaminohaemoglobin and carboxyhaemoglobin.

(b) Explain how the structure of haemoglobin is related to its function in transporting oxygen and carbon dioxide.

(3)

- haemoglobin is a globular protein consisting of four polypeptide chains
- haemoglobin has hydrophilic R groups so that it can dissolve in cytoplasm of red blood cells
- haemoglobin has four iron haem groups, Fe^{2+}, which bind to an oxygen molecule so it can transported around the body
- it has a higher affinity for CO_2 than for O_2

(Total for Question 2 = 5 marks)

ResultsPlus
Examiner Comments

This response illustrates our first two mark points.

(b) Explain how the structure of haemoglobin is related to its function in transporting oxygen and carbon dioxide.

(3)

Haemoglobin is a globular protein with four polypeptide chain and four functional haem gramps. In the each haem group contains one Fe^{2+} ion. This binds to oxygen in the lungs as partial pressure of oxygen in lungs is high. It also carries carbon dioxide and off loads it at the lungs as the pressure partial of carbon dicxide is low in lungs. Vice versa in tissues. The first oxygen has difficulty binding to the first haem grap. However after binding the terhiary structure of the haemoglobin changes making it easier for the other oxygen to bind. Likewise with CO_2.

(Total for Question 2 = 5 marks)

ResultsPlus
Examiner Comments

This response illustrates our first and third mark points; we accepted a description of the staggered binding of oxygen for the third point.

Question 3(a)

We have asked candidates to draw and label an artery in previous series so we saw some very clear and accurate drawings.

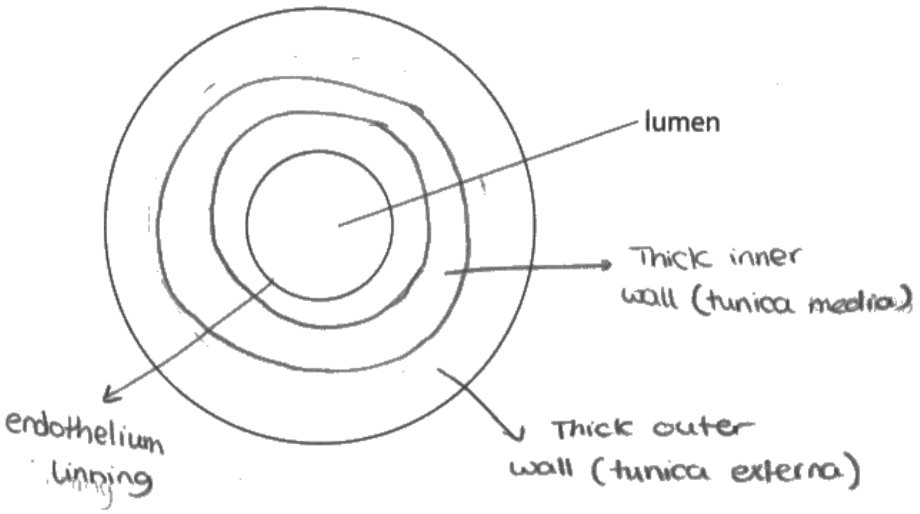
3 The structures of blood vessels relate to their functions.

(a) The diagram shows part of a cross-section of an artery.

Complete the diagram to show details of the structure of an artery.

Label **two** features of an artery on your diagram.

(3)



ResultsPlus
Examiner Comments

This diagram clearly shows the endothelial lining and two other layers, all of which are correctly labelled.

ResultsPlus
Examiner Tip

We can ask for labelled diagrams of structures itemised in the specification. It might be an idea to identify what these structures could be and produce labelled diagrams as part of preparation for the exam. A starting point would be past papers to see what has been asked in the previous series.

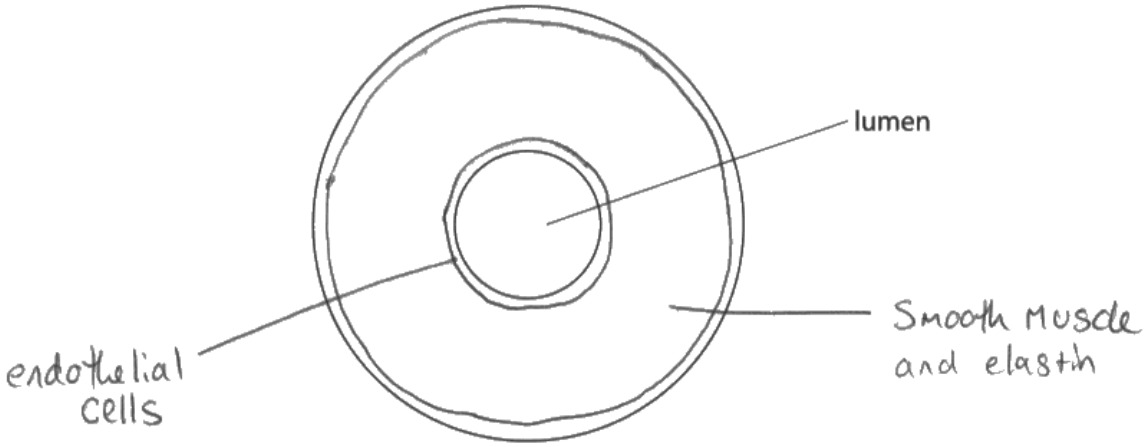
3 The structures of blood vessels relate to their functions.

(a) The diagram shows part of a cross-section of an artery.

Complete the diagram to show details of the structure of an artery.

Label **two** features of an artery on your diagram.

(3)



ResultsPlus
Examiner Comments

This candidate has drawn two layers and the endothelial layer. They have not named the layers but have described what the layer is composed of, which we credited once.

ResultsPlus
Examiner Tip

Learn the names of the layers in the wall of an artery.

Question 3(b)ii

Candidates who thought about this question before starting their calculation realised that they had to subtract 8 from 46 to get the diameter of the lumen and therefore could access full marks. Some candidates used a value of 46 and others substrated 4 from 46; we allowed a consequential error for correct calculations using these wrong diameters.

We also allowed for varying values of pi being used, from 3 to the calculator value.

(ii) Calculate the cross-sectional area of the **lumen** of this small vein.

Use the formula:

cross-sectional area = πr^2

Give your answer as a whole number.

(2)

diameter of lumen = 46 - 8 µm
= 38
radius = $\frac{38}{2}$ = 19 µm

CSA = 1134.1 ≈ 1130

Answer 1130 µm²

(Total for Question 3 = 6 marks)

ResultsPlus
Examiner Comments

This candidate appreciated that 8 had to be subtracted from 46 and then did the correct calculation. However, they then made a mistake by rounding their answer to the nearest ten, which we had to accept as this is the value written on the answer line.

ResultsPlus
Examiner Tip

Always check the wording of the question and your calculation to ensure that you are doing what has been asked and that you have inputted the correct values into your calculator.

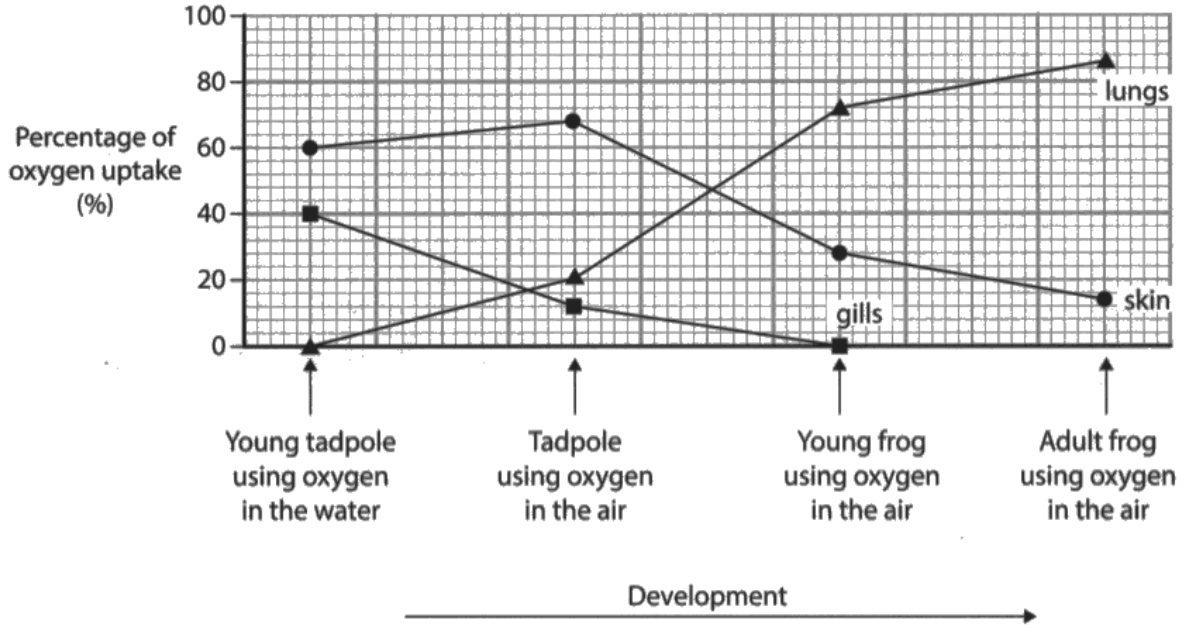
Question 4(a)

A very wide range of responses were seen to this question, which scored surprisingly low. Candidates did approach the question correctly, dealing with the gills, the lungs and the skin separately which could have accessed the three marks. However, very few put the biology into their explanation and omitted to explain the importance of these structures in obtaining oxygen from the water or air.

4 One function of the heart is to transport oxygen from the gas exchange surface to the cells.

(a) The gas exchange surfaces of a frog change as a tadpole develops into an adult frog.

The graph shows some of these changes.



The contribution to gas exchange of the lungs, gills and skin changes as a tadpole develops into a frog.

Explain the importance of these changes.

(3)

young
As a tadpole frogs live in water therefore oxygen can not be uptaken by skin and gills in the water, as a tadpole they take oxygen from the air and lungs start receiving oxygens and gills less. As a young frog lungs is where are the primary gas exchange occurs as they use oxygen from air and become bigger therefore less SA:V ratio so oxygen is diffused less by skins and they are no longer in water therefore gills are not needed

ResultsPlus
Examiner Comments

This is a good response as this candidae has clearly linked gills with getting oxygen from the water, lungs with getting oxygen from the air and, if we piece what they have written together, we can pick out that skin is used to get oxygen at all stages. They have also explained why skin is less used in an adult which scores them the converse of mark point four.

Question 4(b)

We saw lots of different ideas for the similarities and differences but some responses did not gain marks as they were not accurate enough.

Many responses did not score a similarity mark as they simply stated that both had atria or both had atria and ventricles. We felt that given there are clearly two atria and one ventricle, a candidate should state the similarity as being two atria.

For the difference, mistakes were made in giving the number of chambers in the frog's heart as two instead of three. Marks were also lost by candidates who wrote about the mammalian heart and not the frog's heart.

(b) The diagram shows the structure of the heart of a frog.

Give **one** similarity and **one** difference between the structure of this heart and a mammalian heart.

(2)

Similarity

Both hearts has 2atria

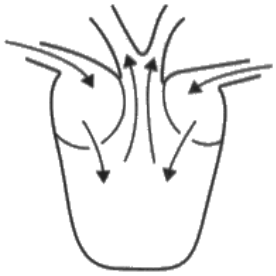
Difference

~~mammalian~~ mammalian heart has ~~two~~ two ventricles, & whether the frog heart has only one.

ResultsPlus
Examiner Comments

An example of a clear and accurate response.

(b) The diagram shows the structure of the heart of a frog.



Give **one** similarity and **one** difference between the structure of this heart and a mammalian heart.

(2)

Similarity

Both have two atria.

Difference

Frog heart has no septum separating the 2 ventricles, while mammalian heart has a septum separating the 2 ventricles allowing mixing of oxygenated and deoxygenated blood.

ResultsPlus
Examiner Comments

A high proportion of candidates chose to write about the lack of a septum in the frog's heart which was acceptable for a difference as well.

Question 4(c)

Candidates are unlikely to have seen a diagram such as the one we gave them in this levels-based question. We were pleased at how few blank responses there were, with many candidates at least describing what the diagram was showing using the numbers given. There were also some good descriptions of gas exchange surfaces. However, more than this was needed to access the level two and three marks; the command word was "explain", so we needed to read how the information in the diagram enabled the frog to provide their cells with enough oxygen.

The cells of the frog need oxygen to survive.

Explain how the circulatory system and the gas exchange surfaces of an adult frog are able to meet this need for oxygen.

Use the information in the diagram to support your answer.

(6)

① high percentage of blood ~~can~~ pump to ~~skin~~ lungs ~~and~~ and skin for gas exchange

② lungs contain alveoli with large surface area, capillaries contain only one cell thin layer around the alveoli, short diffusion ~~disease~~ distance, increase the rate of diffusion of ~~oxy~~ oxygen, increase the rate of gas exchange.

③ Large surface area of skin, increase the rate of oxygen diffusion, increase the rate of gas exchange.

④ ~~oxy~~ deoxygenated blood becomes oxygenated blood ~~the~~ after through skin and lungs, oxygenated blood then ~~send~~ flow back to heart

⑤ high percentage of oxygenated blood pump from heart to the cells for respiration, and obtain the waste of the cell, which is carbon dioxide. The blood becomes deoxygenated blood and ~~back~~ flow back to heart then pump again to the skin and lungs.

⑥ more percentage of blood pump to lungs, ~~to~~ than skin, because lung have ~~was~~ faster rate of diffusion and faster gas exchange.

(Total for Question 4 = 11 marks)

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Examiner Comments

This is a clear response and we can pick out three explanations which includes why more blood flows to the lungs than the skin. Five marks can therefore be awarded.

Generally, the key to scoring well in a levels-based question is to write a little about a lot and not a lot about a little. When the command word is "explain", the higher marks are usually for the number of explanations made which are relevant to the question. The explanations themselves are generally very straightforward. In this response, all the candidate has really told us is having both lungs and skin as gas exchange surfaces increases the uptake of oxygen, cells need to be supplied with oxygen for respiration and more blood is pumped to lungs than skin as the lungs can take up more oxygen.

Question 5(a)

This question did not score quite as highly as we expected. A high proportion of responses described semiconservative replication, which could have accessed the marks if the candidates had made it clear that both strands are used for synthesising new strands against.

5 When an organism grows or increases in number, cell division takes place.

(a) When a cell is preparing to divide, DNA synthesis takes place.

Explain how two identical molecules of DNA are produced.

(2)

1. semi - conservative replication of DNA molecule
2. DNA molecule unwinds by DNA helicase to form template of nucleotides
3. Complementary base pairing along each strand to form two identical DNA molecule
4. Each DNA molecule contains only original strand and a new strand

ResultsPlus
Examiner Comments

This candidate has written a description but does pick up the marks as it is clear that both strands are being used as templates.

ResultsPlus
Examiner Tip

A common error was to state that complementary bases line up against the parent strand - nucleotides, which consist of a base and a phosphate group and a deoxyribose, line up.

Question 5(b)

We have asked about the roles of mRNA and tRNA in previous series and it is clear that centres are using these mark schemes to prepare their candidates for the exam as we are seeing more accurate responses.

(b) Protein synthesis increases as a cell grows.

Describe the roles of messenger RNA (mRNA) and transfer RNA (tRNA) in protein synthesis.

(3)

mRNA → transcription. forms strand complementary to antisense strand (transcribed) but thymine is now uracil. This is copy of DNA sequence. mRNA transported out of nucleus into cytoplasm to ribosome, (loose or on ER).

tRNA → translation. tRNA has anticodon which has specific amino acid attached. anticodon binds to complementary codon on mRNA and holds amino acid in place until peptide bonds form. This repeats to form a long chain polypeptide

ResultsPlus
Examiner Comments

This is an excellent response, illustrating all our mark points.

ResultsPlus
Examiner Tip

It is probably safer to write words rather than replace them with symbols; in this case write 'involved in' instead of using the arrows.

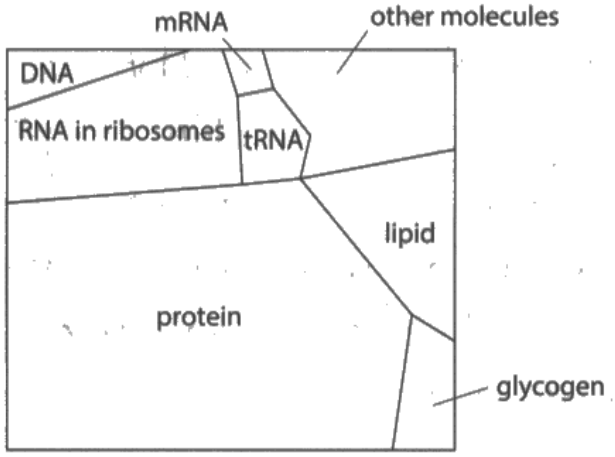
Question 5(c)i

There was a range of ideas about the possible advantages and disadvantages of the Voronoi diagram; more marks were awarded for the advantages than the disadvantages.

A number of candidates did not appreciate that they were supposed to be suggesting disadvantages about the format of the diagram; we saw a lot of responses where they wrote that the 'other molecules' should have been named or that the diagram did not show the sizes of the molecules.

(c) The Voronoi diagram shows the proportions of molecules in a bacterial cell.

The area of each labelled part of the square is proportional to the percentage of the dry mass of that molecule. The shape of each part has no meaning.



(Source: http://book.bionumbers.org/what-is-the-macromolecular-composition-of-the-cell/)

(i) Give **one** advantage and **one** disadvantage of using a Voronoi diagram to present this information.

(2)

Advantage

You can clearly see relative proportion of each substance in a bacterial cell

Disadvantage

You can't calculate the exact values since the shapes are irregular and the area can be calculated.

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Examiner Comments

This is an example of a response that scored both marks.

Question 5(c)ii

This was the second levels-based question in the paper and it turned out to be the more challenging of the two. Many candidates worked out that all they really had to do was to give us a function of each molecule linked in with how the levels would change; however vague responses cost marks. For example, we really felt that an AS level candidate ought to be able to tell us that mRNA would increase as it was needed in transcription and tRNA could increase as it was needed in translation and not simply that they were needed for protein synthesis. We knew that only more able candidates would correctly write about a change in the proportions of each molecule, which is why it was one of the two possible discriminating points for full marks.

*(ii) The proportions of these molecules change as a bacterial cell prepares to divide, as it divides into two new bacterial cells and as each new bacterial cell grows.

Discuss how the appearance of this Voronoi diagram might change:

- as a bacterial cell prepares to divide
- in one of the new bacterial cells produced
- as one new bacterial cell increases in size.

Give reasons for these changes to support your answer.

(6)

As a baderial cell prepares to divide, the DNA is replicated, so DNA dbo will take up double twice as space. and other molecules will take up less space. The proportion of glycogen will decrease as it is broken down into glucose for respiration for energy to synthesize DNA. As cell prepares to divide, the membrane will increase in size 2 times so lipids and protein as well as protein and lipids are used for organelle synthesis. That means DNA, protein and lipids will take up more space on the diagram, while glycogen way less space and the rest a little less space. In the new bacterial cells the DNA will be the same as on the diagram as this new cell is genetically identical. The cell might still have less glycog as energy was used for division. As cell increases in size mRNA, tRNA and RNA in ribosomes will increase on the diagram (more area) as they are used in protein synthesis (transcription and translation). Protein will also increase in size as new molecules are made and lipids as more cell membrane is made as well as phospholipids. DNA will stay became a smaller proportion of mass cell but won't change in amount

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Examiner Comments

This response is one of the best we saw, scoring the full six marks.

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Examiner Tip

To avoid any ambiguity, this candidate should have written two separate statements about mRNA and tRNA, stating clearly that mRNA is used in transcription and tRNA is used in translation. We gave them the benefit of the doubt as they had written mRNA before tRNA and transcription before translation, and the rest of the response was very clear.

*(ii) The proportions of these molecules change as a bacterial cell prepares to divide, as it divides into two new bacterial cells and as each new bacterial cell grows.

Discuss how the appearance of this Voronoi diagram might change:

- as a bacterial cell prepares to divide
- in one of the new bacterial cells produced
- as one new bacterial cell increases in size.

Give reasons for these changes to support your answer.

(6)

When the bacterial cell prepares to divide, the DNA need to replication so that the ~~be~~ seperate one can get DNA. so the number of DNA will increase.

When new bacterial cells produced, in the new cells the mRNA and tRNA will increase to do transcription and trasiation.

As one new bacterial cell increases in ~~s~~size. the protein ~~th~~ in the cells will beincrese, also lipid and glycogen

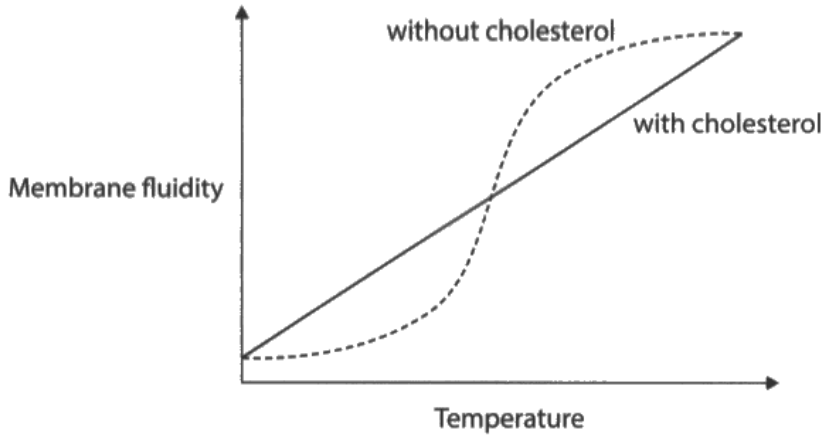
ResultsPlus
Examiner Comments

This response illustrates how a straightforward response can pick up marks. This candidate has explained the changes in three molecules: DNA, mRNA and tRNA, which is the criterion for four marks.

Question 6(c)

The data presented in this graph was fairly straightforward and at least two of the marks were relatively easy to pick up.

(c) The graph shows the effect of temperature and cholesterol on membrane fluidity.



Describe the effect of temperature and cholesterol on membrane fluidity.

(3)

As temperature increases, membrane fluidity ~~[illegible]~~ increase, with and without cholesterol.
with cholesterol it increase linearly.
without cholesterol it has a sigmoidal shape, as the increase is low at low temperatures but greater that withcholestrol at higher temperatures.

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Examiner Comments

This response scored three of our mark points.

Question 6(d)i

See below.

(d) The table shows the composition of protein, lipid and carbohydrate in three membranes, A, B and C.

Membrane	Percentage of protein (%)	Percentage of lipid (%)	Percentage of carbohydrate (%)
A	49	43	8
B	54	42	4
C	75	25	0

(i) Calculate the ratio of protein : lipid in membrane A.

Give your answer to **2** decimal places.

(1)

$\frac{49}{43} : \frac{43}{43}$

1.14 : 1

Answer 1.14 : 1

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Examiner Comments

A clearly laid out calculation.

ResultsPlus
Examiner Tip

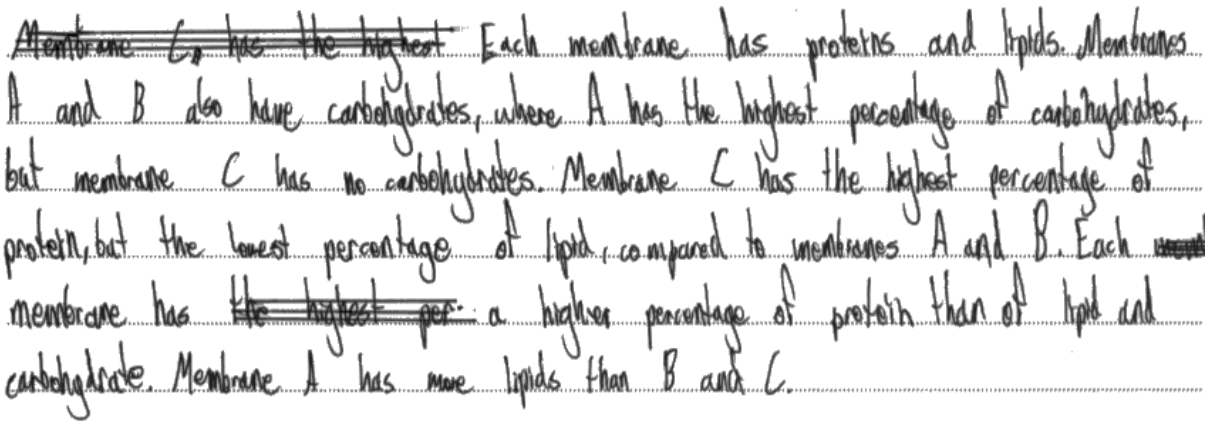
Although you do not have to show your working on a one-mark calculation, you are probably less likely to make a mistake if you follow the calculation through logically and written in front of you.

Question 6(d)ii

It is clear that centres are showing candidates how to effectively answer "compare and contrast" questions. We are seeing far fewer separate descriptions of the items being compared and we are seeing more responses that include both similarities and differences.

(ii) Compare and contrast the composition of these three membranes.

(3)



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Examiner Comments

This response illustrates all four of our possible mark points.

(ii) Compare and contrast the composition of these three membranes.

(3)

Similarities : All three membranes contain proteins and lipids.
All three membranes have a nigher protein percentage than lipid percentage

Differences: only membrane A and B have percentages of carbohydrate, membrane C does not.
Membrane C has the highest percentage of protein

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Examiner Comments

Another illustration of all four points, clearly laid out to cover both aspects of the question.

Question 7(a)

A high proportion of the candidates answered the question in the way it was designed for, by writing about the R groups. When we saw candidates' responses we felt that the question could be correctly answered with comments about pH and temperature so this idea was added into the mark scheme.

7 Plastic waste can cause damage to the environment.

Some microorganisms produce enzymes that break down plastic.

Scientists are using protein engineering techniques to modify these enzymes to improve the way in which they break down plastics.

These modifications include:

- changing the properties of the active site
- making enzymes more stable at higher temperatures
- increasing the size of the active site of the enzyme.

(a) The interaction between enzyme and substrate can be improved by changing the properties of the active site.

Explain what determines the properties of an active site.

(2)

The primary structure determines the location of R groups which can be hydrophillic or hydro phobic determining the 3D structure of the enzyme, the way it folds to form bonds such as hydrogen bonds or disulfide bridges determine the properties of active site

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Examiner Comments

This candidate has taken the R group approach, scoring two marks.

Question 7(b)i

The effect of temperature on enzyme activity is a frequently tested specification point so we were surprised when a high proportion of candidates wrote about the content in mark points one and three only.

(b) (i) Some types of plastic break down at higher temperatures.
These temperatures are too high for some enzymes to be active.

Explain why some enzymes cannot function at high temperatures.

(3)

At high temperatures R groups vibrate to much breaking hydrogen bonds between them, this results in denaturing of enzyme and active site changing shape. The substrate can no longer fit and bind to active site to be broken down

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Examiner Comments

This candidate did score mark points two and four, as well as mark point three, but unusually omitted the first mark point which is the link between high temperature and what happens.

(b) (i) Some types of plastic break down at higher temperatures.
These temperatures are too high for some enzymes to be active.

Explain why some enzymes cannot function at high temperatures.

(3)

At high temperature, increased kinetic engy within the enzyme would result in increased vibrations between its R group. This could result in the hydrogen bonds between R groups to be broken. As a result the tertiary structure of the enzyme is changed, which changes the shape of the active site and its substrate no longer fits and bind to the active site. Therefore at high temperatures the enzyme is denatured and ~~not~~ no longer functions.

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Examiner Comments

A clear response illustrating all our mark points.

Question 7(b)ii

In response to this question, candidates could describe what changes could be made to the bonding, scoring mark point 1. Mark point two was rarely seen and mark point three was awarded for the alternative idea given in the additional guidance. However, this mark was not awarded to those candidates who referred to no change in the enzyme; we really wanted active site.

(ii) Changing the bonding in the enzyme can make it more stable at higher temperatures.

Suggest why changing the bonding could enable enzymes to work at higher temperatures.

(2)

Changing the bonding in the enzyme, such as increasing the number of stronger disulfide bonds between the R-groups of amino acid active sites, which will require more heat energy to break, making enzymes more resistant and less likely to denature at higher temperatures.

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Examiner Comments

This candidate did write about the extra heat energy that would be needed to break the stronger bonds but were not specific enough for the third mark point.

ResultsPlus
Examiner Tip

When writing about enzymes, check that you are supposed to be referring to the active site in your answer. A reference to "simply the enzyme" is going to be too vague.

Question 7(b)iii

Candidates tended to find this question relatively straightforward and scored the marks, provided they wrote about the active site.

(iii) Suggest why changing the bonding could affect the binding of the plastics to the active site of the enzyme.

(2)

The bonding determines shape of active site so changing it would change active site and therefore no more binding of plastics as they do not fit.

ResultsPlus
Examiner Comments

An example of a clear response scoring both marks.

Question 7(c)i

We saw quite a few responses that referred to an increase in surface area speeding up the reaction which we did not feel would quite work, so we chose to ignore suggestions of this nature. Very few candidates specified the entering of the substrate into the active site so mark point one was generally awarded for the additional guidance idea of more collisions, providing a reference was made to active site. A reasonable number of candidates scored the second mark but the third one was rarely seen.

(c) A larger active site could affect the activity of the enzyme.

(i) Suggest how a larger active site could **increase the rate** of breakdown of plastic.

(2)

larger active site means more substrates will be able to enter active site, molecular activity of enzyme increases as more substrates are broken down per unit time. ∴ rate of breakdown increases

ResultsPlus
Examiner Comments

This response is one of the better ones that we saw.

Question 7(c)ii

There were a number of ways in which candidates could answer this question, however only the more able ones scored the mark.

(ii) Suggest why an enzyme with a larger active site may be **less active**.

(1)

It might cause the active site shape to not be complementary to the substrate / the binding might not be strong

ResultsPlus
Examiner Comments

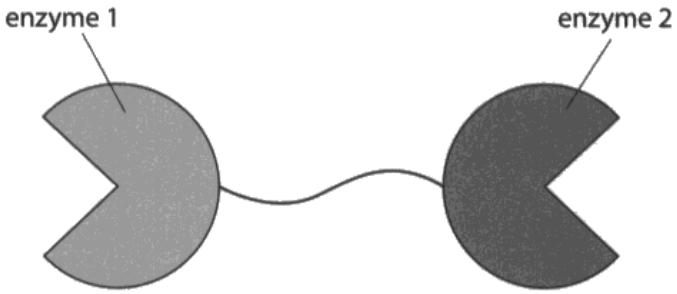
A response such as this was more frequently seen, picking up the additional guidance mark.

Question 7(d)

Candidates found this question challenging but it had deliberately been targeted at the more able candidates. The second mark point was most frequently awarded with very few candidates picking up a second mark.

(d) One way of improving the activity of an enzyme is to link it to a different enzyme.

The diagram shows two different enzymes linked together.



Enzyme 1 is the enzyme that is engineered by linking it to a different enzyme, enzyme 2.

Enzyme 1 breaks down plastic into short chains of monomers.

Enzyme 2 can break down these short chains into individual monomers.

Explain why linking these two enzymes together will speed up the breakdown of plastics.

(2)

The chance of plastic that has been broken down into short chains of monomers by enzyme 1 ~~binding~~ binding to enzyme 2 would increase as they are closer together. This would increase the rate as it decreases the time spent going from enzyme 1 to enzyme 2.

ResultsPlus
Examiner Comments

The second mark point is illustrated in this response.

Question 8(a)

This calculation scored quite well, with the majority of the candidates arriving at their answer by the first method given in the mark scheme. As expected, a number of candidates only scored one of the two available marks as they either did not express their answer in standard form or else expressed it incorrectly.

8 Gum disease affects up to 90% of the world's adult population.

Gum disease has been shown to be associated with the development of cardiovascular disease (CVD).

(a) Towards the end of 2023, the world's population was 8 078 799 080.

Approximately 70% of this population were adults.

Estimate the number of adults in the world.

Give your answer in standard form.

(2)

40% x 8078799080

= 5655859356

= 5.66×10^9

Answer 5.66×10^9

ResultsPlus
Examiner Comments

We decided to allow 5.66 x 10 9 , which is how a number of candidates expressed their answer.

ResultsPlus
Examiner Tip

Expressing an answer in standard form is a requirement for a calculation in many of our papers so make sure you are able to do this correctly.

Question 8(b)

Cardiovascular disease is covered quite extensively by our specification so candidates are very familiar with the topic and the risk factors associated with the disease. There are quite a few risk factors to choose from so it was a shame that quite a few answers were too vague, simply referring to healthy diet, balanced diet or low fat.

(b) The development of gum disease can be reduced by good oral hygiene. This is one example of a healthy lifestyle.

Give **two** other examples of a healthy lifestyle that can help reduce the risk of CVD.

(1)

1 Exercise

2 No smoking

ResultsPlus
Examiner Comments

Exercise and no smoking were probably the pair of risk factors most commonly seen.

Question 8(c)i

We have not asked candidates to define 'correlation' for a while now. We saw a whole range of answers, some were textbook definitions whilst some were poorly worded to suggest a causation.

(i) Give the meaning of the term **correlation**.

(1)

the tendency of 2 variables to change together

(change in one variable is reflected by change in another variable)

ResultsPlus
Examiner Comments

This candidate has given two separate definitions and can be awarded the mark as they are both correct.

ResultsPlus
Examiner Tip

We can ask for a definition of any of the terms used in the specification. It is a good idea to compile a list of these terms with acceptable definitions; use past marks schemes as a

starting point.

Question 8(c)ii

Candidates know the CVD story very well so many easily picked up our first and second mark point. However, candidates are not so good at selecting the term 'valid' and applying it appropriately. Mark points three and four were less frequently seen.

A number of candidates did not realise that the number of neutrophils was being used to assess the extent of CVD so some responses talked about the neutrophils causing the disease; we tried to ignore this wherever possible, particularly in awarding our third mark point's alternative.

(ii) **It was important that all the people in the study had similar blood pressure that was within a healthy range.**

Explain why this was important.

(3)

This ~~is~~was important as a control. as high blood pressure is a risk factor for CVD and it causes damage to the endothelial lining of blood vessels. and this could have caused an increase of white blood cells - ~~and so the study~~ so and so this was to ensure the study was valid.

ResultsPlus
Examiner Comments

A good clear and accurate response.

Question 8(c)iii

A very high scoring calculation with the majority of candidates able to insert values into the equation. Very few candidates expressed their answer with a recurring value so presumably centres have been using our reports to effect.

(iii) Calculate the blood pressure of a person who has a systolic blood pressure (SBP) of 11.0 kPa and a diastolic blood pressure (DBP) of 6.7 kPa, using the formula:

$$\text{blood pressure} = \frac{\text{SBP} + (2 \times \text{DBP})}{3}$$

$\frac{11 \times 10^3 + (2 \times 6.7 \times 10^3)}{3} = 8133.33$ (1)

Answer 8.133 kPa

ResultsPlus
Examiner Comments

Unfortunately this candidate did not think about an appropriate number of decimal places to express their answer to; we felt that we could not justify this number.

ResultsPlus
Examiner Tip

Deciding on how many decimal places or significant figures to express your answer to is a maths skill that we can test you on.

Question 8(c)iv

The answer to this question required the rest of the CVD story so was a high scoring question.

However, we did identify one misconception: a number of candidates think that a blood clot is the actual cause of CVD.

(iv) The scientists assessed the damage to endothelial cells.

Explain why damage to endothelial cells might be an indication that a person is at risk of CVD.

(3)

Because damage to endothelial lining, causes an inflammatory response which causes cholesterol to accumulate along with white blood cells and calcium forming plaques which narrows the coronary artery. Thrombosis can occur and due to blood clots forming the coronary artery can get blocked hence less blood transported to heart muscle cells and higher change of a heart attack.

ResultsPlus
Examiner Comments

This illustrates a good response. Blood clots may well form, as stated by this candidate, but there is no indication in this response that they actually cause CVD.

Question 8(c)v

Candidates always find 'comment on' questions difficult to answer, either because they cannot express themselves clearly or simply because they do not make enough points in their responses.

Candidates often make a comment about error bars, or a lack of them, but frequently they do not go on to show that they understand what the significance is. This was seen in this question so mark point five was not awarded that frequently.

Comment on the relationships between the number of neutrophils and the proportion of healthy endothelial cells of the males and females in this study.

(4)

when number of neutrophils increases the ~~the~~ proportion of healthy ~~endo~~ ~~thelial~~ endothelial cells decreases (overall)
females have more number of neutrophils in saliva than males
no SD no error bars so we have no idea about the significance of the differences
males have higher proportion of healthy cells than males

ResultsPlus
Examiner Comments

This candidate did appreciate the significance of the error bars and was awarded mark point five, together with two other marks.

Comment on the relationships between the number of neutrophils and the proportion of healthy endothelial cells of the males and females in this study.

(4)

For both male and female, the proportion of healthy endothelial cells decrease as the number of neutrophils in saliva increase. Females have more number of neutrophils in saliva than males. Males have a lower proportion of healthy endothelial cells than females. The data of male are more spread than female. There is no s.d. and error bars so the result is not valid. There is more male than female in this study.

ResultsPlus
Examiner Comments

This candidate did not demonstrate an understanding of the lack or error bars. Nevertheless it was a good response, scoring three marks.

Paper Summary

Summary

A few suggestions for improving candidate performance are given below:

- Candidates should avoid repeating information in the stem of the question in their answers as this will not gain marks.
- Candidates need to take notice of the mark allocation for each item to help them decide if they have written enough points to be awarded that many marks.
- Candidates should consider the questions asked in the early question parts as they are quite often trying to give a clue as to what is expected in the latter question parts.
- Candidates should check the command word for each question before attempting their response. The meaning of each of our command words can be found in appendix 7 of the specification.
- Diagrams should be drawn carefully so as to be an accurate representation, and labelled carefully.
- Candidates should be familiar with the maths skills outlined in appendix 6 of the specification.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link: https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

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