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June 2019

IAL Biology WBI11 01

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Introduction

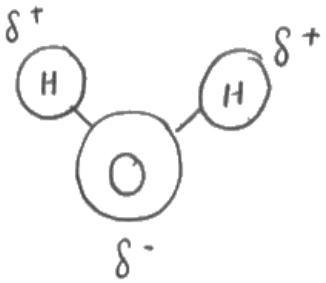
This is the second paper 1 of the new specification and candidates seemed more confident attempting the questions than they did in the first paper in January, as there were not so many responses left completely blank. Candidates were clearly more prepared for the maths questions as the mean mark for these was up on the mean mark in January. There were also some very good attempts at the levels-based question with a wider range of marks awarded. A range of responses was seen in the multiple choice questions with some of the ones included later in the paper being quite discriminating.

Question 1 (a)

Many candidates attempted this question and scored well. Carelessly-drawn diagrams lost marks, as did those that did not indicate that the charge distribution was very small by either stating this or using the delta sign. There was some confusion with the positive and negative charges on the Hs and the O.

1 Water is important as a solvent for transport in living organisms.

(a) Draw a diagram of a water molecule to show its dipole nature. **(2)**



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Examiner Comments

This is a good illustration of one of the types of diagram that we were looking for.

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Examiner Tip

Drawing diagrams may seem easy but care is needed to ensure that they are drawn accurately.

1 Water is important as a solvent for transport in living organisms.

(a) Draw a diagram of a water molecule to show its dipole nature.

(2)

ResultsPlus
Examiner Comments

We did not expect the circles to be drawn around the element symbols; the diagrams shown in the mark scheme are just a couple of examples of what we were looking for.

Question 1 (b) (i)

A range of responses were seen for this question. The better responses were those where one sentence was written about each salt. The weaker responses only mentioned one or two of the salts or else tried to describe what was happening at different temperature ranges.

(i) Describe the effect of temperature on the solubility of these three salts.

(3)

Salt F shows a positive correlation, as the temperature increases, so does the solubility. Similarly to salt F, salt H also becomes more soluble with an increase in temperature; the increase is non-linear. The solubility increases in salt H, from 0°C to 30°C, by 45 g per 100g water. However, the solubility of salt H, begins to decrease steadily from 30°C to 80°C. It decreased by 10g per 100g. On the other hand, salt H is not affected by temperature, remains constant at 30g per 100g water.

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Examiner Comments

This response is very clear and illustrates all of our mark points.

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Examiner Tip

If you are asked to describe data shown in a graph and there are three lines drawn and three marks allocated to the question, then each line needs a separate description.

Question 2 (a) (iii)

The majority of candidates attempted to answer this question. As expected, marks were lost by those candidates who could not remember if it was saturated or unsaturated fatty acids that were associated with risk of CVD or else muddled the two terms up.

(iii) The table gives some information about four fatty acids.

Fatty acid	Number of double bonds between carbon atoms	Number of carbon atoms
butyric	0	4
stearic	0	18
palmitoleic	1	16
linoleic	2	18

Explain which of these fatty acids would have the lowest risk of causing CVD, if included in a diet in equal masses.

(2)

~~linoleic~~ The fatty acid (linoleic) as it is ~~an~~ unsaturated and has (more double bonds)
Therefore less (LDL) is produced (blood cholesterol level is would not increase) ~~and~~ the balance between LDLs and HDLs would ~~be~~ balanced.

ResultsPlus
Examiner Comments

This candidate's response illustrates the second of the two options on the mark scheme. We ignored what was written in the second paragraph as it was superfluous to what was required.

Question 2 (b) (i)

Candidates clearly have good knowledge about the blood clotting process. However, marks were lost because the knowledge was not used to answer the question; too many candidates wrote about what happens in the blood clotting process instead of what would **not** happen in the presence of the drug.

(b) Anticoagulants, antiplatelets and thrombolytics are drugs used to treat blood clots.

(i) One anticoagulant binds to the active site of thrombin.

Explain how this drug reduces blood clotting.

(2)

~~Prothrombin~~ Fibrinogen cannot form an enzyme-substrate complex with thrombin and hence cannot be converted to fibrin so a mesh cannot be formed at the site of wound.

ResultsPlus
Examiner Comments

This is an example of a good response that illustrates both of our mark points.

ResultsPlus
Examiner Tip

You will not score well if you simply write everything that you know about a topic; you have to use that information to actually answer the question.

(b) Anticoagulants, antiplatelets and thrombolytics are drugs used to treat blood clots.

(i) One anticoagulant binds to the active site of thrombin.

Explain how this drug reduces blood clotting.

(2)

Because the anticoagulant binds to the active site of thrombin, ~~fibrin no~~ fibrinogen cannot bind to the active site. Thus, enzyme-substrate complexes cannot form and fibrinogen cannot be converted into fibrin. As there aren't any free active sites. If fibrinogen cannot be converted into fibrin, the clot cannot be formed. So blood clotting reduces.

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Examiner Comments

This is also a very clear response but goes into too much detail.

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Examiner Tip

Use the mark allocation to help you judge how much detail to write. Although you will not lose marks for including more detail than is necessary, you could find that you run out of time and cannot complete the paper, which will cost you marks.

Question 2 (b) (ii)

A similar thing was seen with this question, as seen in the previous one; candidates just writing everything that they know without answering the question.

(ii) Molecules on the surface of platelets enable them to bind to other molecules.

One of the antiplatelet drugs affects molecules on the surface of platelets.

Explain how this drug reduces blood clotting.

(2)

By affecting the surface of platelets it prevents them from sticking together to form a clot so platelets cannot ~~fo~~ clot.

ResultsPlus
Examiner Comments

Possibly not the best-worded response at the end but nevertheless illustrates both our mark points.

Question 2 (b) (iii)

Again, marks were lost for the same reason as in parts (i) and (ii). Other marks were lost because candidates were not specific enough in their responses, not including AS level detail.

(iii) One thrombolytic drug converts plasminogen into the active enzyme, plasmin. Plasmin breaks down fibrin.

Explain how this drug reduces the formation of blood clots.

(2)

-fibrin forms the mesh like structure of blood clots.
-when plasmin breaks down fibrin, the mesh will not be formed, thereby blood clotting is prevented.

ResultsPlus
Examiner Comments

This response was awarded the second point (see additional guidance), but insufficient AS detail was given for the first point to be awarded.

ResultsPlus
Examiner Tip

Always check what you have written to see if your answer is using specific AS detail or terminology.

Question 3 (a) (i)

This question should have been straightforward but unfortunately a large proportion of candidates saw the diagram and assumed what was expected in the answer, without actually reading the question. So as a result, they wrote the mRNA complementary base sequence and not the amino acid sequence.

3 The sequence of bases in DNA determines the sequence of amino acids in a polypeptide.

The table shows four amino acids and their genetic codes.

Amino acid	Genetic code
alanine (Ala)	GCT or GCC or GCA or GCG
lysine (Lys)	AAA or AAG
serine (Ser)	AGT or AGC or TCT or TCC or TCA or TCG
tryptophan (Trp)	TGG

(a) The diagram shows a DNA base sequence.

T	G	G	A	G	T	A	G	C	A	A	G	T	G	G
tryptophan			serine			serine			lysine			tryptophan		

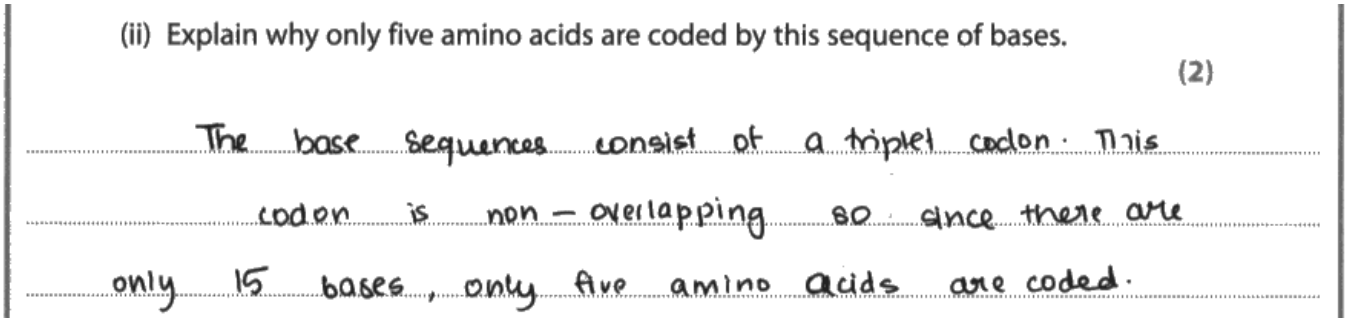
(i) Complete the diagram to show the sequence of amino acids coded by this DNA base sequence.

ResultsPlus
Examiner Comments

This illustrates the response that we were after. Candidates could have used the amino acid abbreviations as supplied in the table.

Question 3 (a) (ii)

We saw both of our mark points but rarely both of them in the same response. Candidates who referred to the code being degenerate could not be awarded the second mark point and unfortunately this was the case in many responses; we expect the candidates to differentiate between the two terms.



(ii) Explain why only five amino acids are coded by this sequence of bases.

(2)

The base sequences consist of a triplet codon. This codon is non – overlapping so since there are only 15 bases, only five amino acids are coded.

ResultsPlus
Examiner Comments

This response illustrates very clearly both of our mark points.

ResultsPlus
Examiner Tip

Always check the mark allocation to guide you in how much you need to write in your answer. If you write one fact and there are two marks available, you will not be awarded full marks.

Question 3 (b)

Again we saw all of our mark points but very few responses where three of them were included in one response. We also had to penalise those candidates who could not differentiate between the terms 'degenerate' and 'non-overlapping'.

(b) Explain why some amino acids, such as alanine, have more than one genetic code.

(3)

The degenerative code. There are 64 ~~combinations~~ of ~~cod~~ bases, meaning there are 64 codons. This exceeds the number of amino acids we have, which is 20. ~~The re~~ Therefore ~~some amino acids~~ alanine can have more than one genetic code. This is useful because it makes a mutation in a gene less harmful.

ResultsPlus
Examiner Comments

This candidate was one of the few who wrote a sufficiently detailed response to be awarded three marks.

(b) Explain why some amino acids, such as alanine, have more than one genetic code.

(3)

· Because the codons are degenerate - That is, they have more information than needed.

· In the case of alanine, only the first 2 bases are constant - the 3rd base varies - this is because of degenerate code - ~~This~~ This is ~~because~~ an advantage if a mutation takes place, and the 3rd base is changed, it will still code for alanine.

ResultsPlus
Examiner Comments

Our first and fourth mark points are illustrated in this response. The fourth mark point was probably the most frequently seen.

Question 3 (c) (i)

A reasonable number of candidates carried out the correct calculation but some of these included too many significant figures in their final answer.

(c) Of the 64 possible genetic codes, 61 code for amino acids.

(i) Calculate the percentage of genetic codes that code for amino acids.

Give your answer to four significant figures.

(1)

$\frac{61}{64} \times 100$

$= 95.31$

Answer 95.31 %

ResultsPlus
Examiner Comments

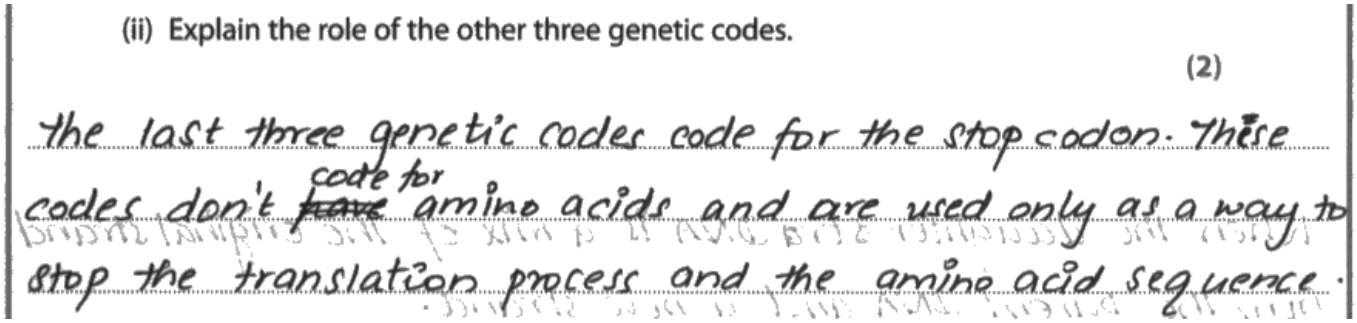
A clearly laid out calculation resulting in the correct answer.

ResultsPlus
Examiner Tip

Read the question carefully, even in the calculation questions as there may well be specific instructions about how you should express your answer e.g. number of decimal places, number of significant figures, standard form.

Question 3 (c) (ii)

The majority of candidates demonstrated that the other genetic codes were stopped codons but wrote little else, so only one mark was frequently awarded. One thing that became evident was that candidates think that there is a specific start codon, not appreciating that this codon also codes for methionine.



(ii) Explain the role of the other three genetic codes.

(2)

the last three genetic codes code for the stop codon. These codes don't ~~have~~ code for amino acids and are used only as a way to stop the translation process and the amino acid sequence.

ResultsPlus
Examiner Comments

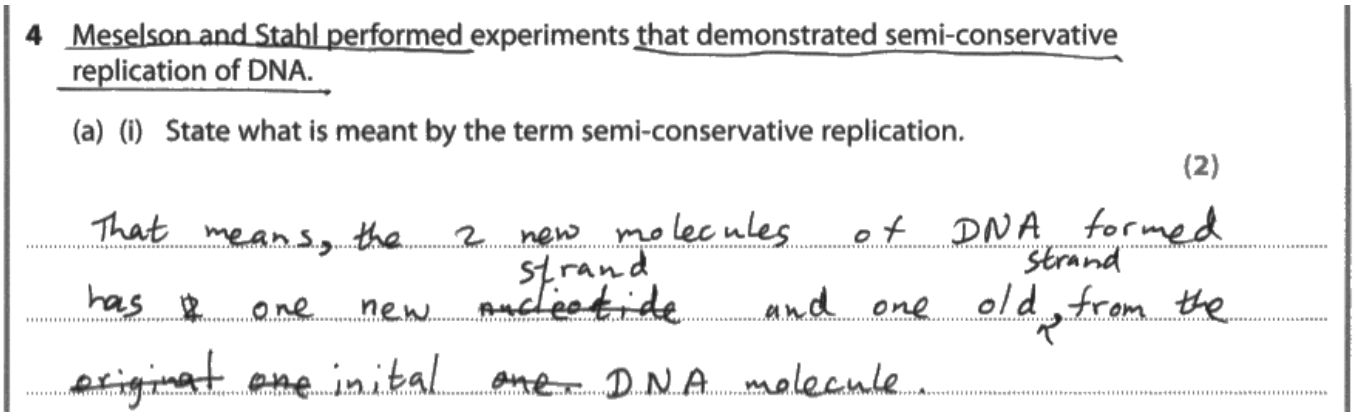
This illustrates the type of response that we were hoping to see.

ResultsPlus
Examiner Tip

If there are two marks available, you must make two AS level standard points.

Question 4 (a) (i)

This should have been fairly straightforward as it is a term that describes how DNA is replicated. However there were a number of responses that did not make it sufficiently clear if DNA strands or DNA molecules were being referred to.



4 Meselson and Stahl performed experiments that demonstrated semi-conservative replication of DNA.

(a) (i) State what is meant by the term semi-conservative replication.

(2)

That means, the 2 new molecules of DNA formed has 1 one new ~~nucleotide~~ strand and one old strand, from the ~~original~~ ~~one~~ inital ~~one~~ DNA molecule.

ResultsPlus
Examiner Comments

This response scored both mark points. Very few responses scored both points as they did not indicate that the number of DNA molecules were actually increasing (mark point 1).

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Examiner Tip

Your response must make it clear if you are talking about a DNA strand or a DNA molecule.
Remember: DNA is a double-stranded molecule i.e. one molecule is made of two strands.

Question 4 (a) (ii)

Very few problems were encountered here, except by those candidates who referred to 'RNA' polymerase or ligase.

(ii) Name **one** enzyme involved in semi-conservative replication.

(1)

~~DNA helicase~~ DNA polymerase

ResultsPlus
Examiner Comments

A typical response.

Question 4 (a) (iii)

This question caused more problems than expected with very few candidates scoring the second of our two mark points. Weaker candidates simply stated that the daughter cells would be identical and therefore did not score the first mark point as we were insisting on **genetically** identical.

(iii) Explain the importance of semi-conservative replication in the production of new cells.

(2)

The exact same DNA sequence is maintained for cells of same type and the new cells have the same function as the parent cells and code for the same type of protein.

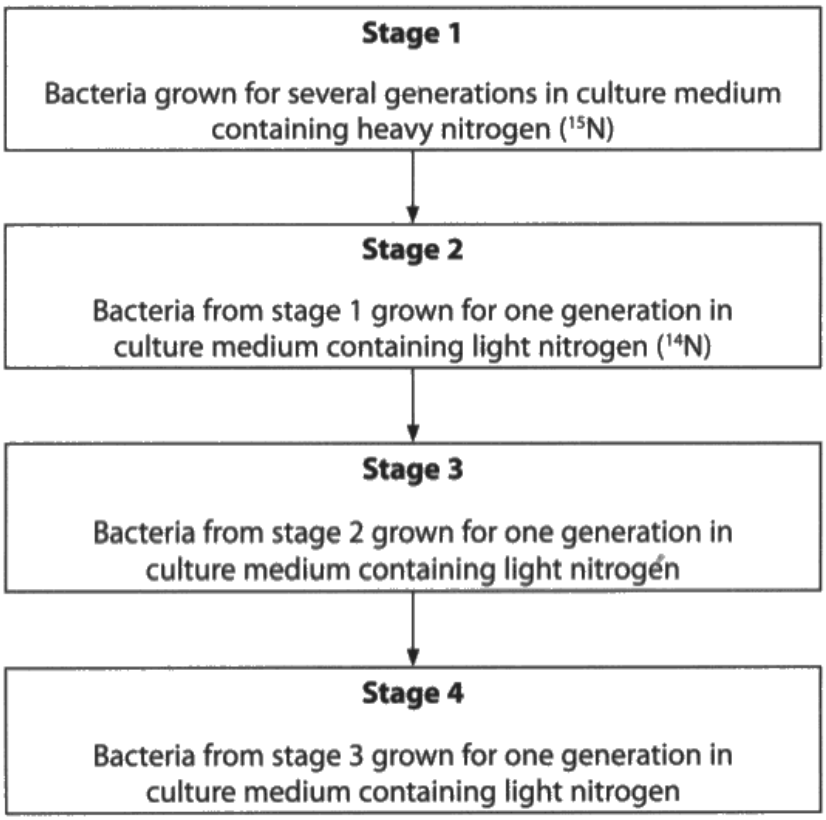
ResultsPlus
Examiner Comments

This was one of the few responses that scored both marks. See the additional guidance for why the first mark point could be awarded, even though **genetically identical** has not been stated.

Question 4 (b)

All combinations of answers were seen for this question, some of which were the correct combinations. A reasonably common error made was by candidates who only completed some of the boxes, leaving others blank. We could not mark these as we could not assume what was meant to be written in the empty boxes. There were also candidates who put ticks and crosses in the boxes so presumably had not read the question carefully.

(b) The flow chart summarises part of one experiment performed by Meselson and Stahl.



Complete the table to show the percentage of the total number of DNA molecules containing heavy nitrogen only, light nitrogen only or both heavy and light nitrogen, at the end of each stage.

(3)

End of stage	Percentage of DNA molecules containing		
	heavy nitrogen only	light nitrogen only	both heavy and light nitrogen
1	100 %	0 %	0 %
2	0 %	0 %	100 %
3	0 %	50 %	50 %

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Examiner Comments

Three correct combinations.

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Examiner Tip

Read your instructions carefully to ensure that you complete tables correctly.

Question 5 (b) (i)

(b) The table shows the concentration of these sugars in three pineapples.

Sugar	Concentration of sugar / g cm^{-3}		
	Pineapple 1	Pineapple 2	Pineapple 3
fructose	1.71	1.44	1.41
glucose	1.22	1.02	1.00
sucrose	9.08	7.77	8.81

(i) Calculate the mean concentration of glucose in these three pineapples.

Give your answer in **g dm^{-3}**.

(2)

$\frac{1.22 + 1.02 + 1}{3} = 1.08$ g cm^{-3}

$= 1.08 \times 10^{-3}$ g dm^{-3}

Answer 1.08 x 10^{-3} g dm^{-3}

ResultsPlus
Examiner Comments

A clearly worked out response.

(b) The table shows the concentration of these sugars in three pineapples.

Sugar	Concentration of sugar / g cm^{-3}		
	Pineapple 1	Pineapple 2	Pineapple 3
fructose	1.71	1.44	1.41
glucose	1.22	1.02	1.00
sucrose	9.08	7.77	8.81

(i) Calculate the mean concentration of glucose in these three pineapples.

Give your answer in **g dm^{-3}**.

(2)

$1.22 + 1.02 + 1.00$

$\rightarrow \frac{3.24}{3} = 1.08$

Answer 1.08 g dm^{-3}

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Examiner Comments

This candidate showed their working clearly and therefore was awarded the first mark point.

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Examiner Tip

Show your working as you may pick up method marks even if you do not end up with the correct answer at the end.

Question 5 (b) (ii)

A wide range of responses was seen for the only levels-based question on the paper (there may be one or two levels-based questions on each of WBI11 or WBI12). Very few blank responses were seen, which was encouraging. Many candidates wrote either about what the solution should contain for dehydration or what it should contain for maintaining sweetness, fewer wrote about both limiting themselves to a level 1 response. There were some excellent descriptions of osmosis using terminology such as water potential and solute potential. The weakest candidates are still refering to water concentrations, which is not acceptable at this level. We were really pleased to see some candidates explaining that the solution should contain the same concentration of each of the three sugars, thus getting a level 3 response for 5 marks. Very few responses were awarded 6 marks as there were not many candidates who appreciated that another solute would have to be included in the solution as well as in order to lower the water potential.

Osmotic dehydration helps to preserve the pineapple by reducing the water content.

Osmotic dehydration also ensures that the concentration of each sugar in the pineapple does not change. This preserves the sweet taste of the pineapple.

Explain what the solution of sugars should contain to preserve pineapples.
Use the information in the table to support your answer.

(6)

mean conc. of fructose :- 1.52 g cm^{-3}

mean conc. of sucrose :- 8.55 g cm^{-3}

mean conc. of glucose :- 1.08 g cm^{-3}

The solution of sugars should contain the same ~~amount~~ concentration of sugars in the pineapple. That is it should have 1.52 g cm^{-3} of fructose, 8.55 g cm^{-3} of sucrose and 1.08 g cm^{-3} of glucose. Thus the concentration of sugars in the fruit and in the solution would be the same. Thereby the net movement of sugars in and out would be 0. In order to remove water, the water potential in the solution should be less than in the fruit. So the water would move out of the fruit from a high water potential to a low water potential, down the concentration gradient, by osmosis.

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Examiner Comments

This was a nice clear example of a level 3 response, gaining 5 marks.

ResultsPlus
Examiner Tip

You do not have to write excessively to access the level 3 marks - you just have to address all parts of the question.

The question directs you to dehydration and preserving sweetness so you have to address both these aspects. The command word is 'explain' so you have to use some AS level knowledge to say why.

You have not written an explanation if you do not use expressions such as 'because, therefore, as a result, in order to', in your answer.

Question 6 (a)

Antioxidants are a new topic in this specification and the quality of the responses was very centre-based; some candidates clearly knew how antioxidants reduced free radicals and therefore damage to endothelial cells. Whereas many candidates gave very muddled responses about LDL levels.

6 Dietary antioxidants may reduce the risk of cardiovascular disease (CVD).

(a) Explain how dietary antioxidants reduce the risk of CVD.

(3)

Dietary antioxidants reduce free radicals and hence prevent the damage done by them to the arterial endothelium. This reduces the inflammatory response, the accumulation of LDL and hence the formation of plaque so the arterial lumen is not narrowed and the amount of ~~oxygenated blood concentration~~ blood supplied to the heart is not ~~less~~ reduced.

ResultsPlus
Examiner Comments

A nice clear response, illustrating our three mark points.

ResultsPlus
Examiner Tip

When describing CVD avoid expressions such as fatty deposits and hardening of the arteries. Ensure that you make it clear that the endothelium in the arteries is damaged.

Question 6 (b) (i)

A range of responses were seen for this question. The weaker candidates either made two descriptions or only discussed one of the two sets of data.

(b) Chocolate contains high concentrations of a group of antioxidants called flavonoids. It has been suggested that eating chocolate could reduce the risk of CVD.

The table shows some information about two types of chocolate.

Type of chocolate	Mass of flavonoids / mg per 100 g of chocolate	Energy content / kJ per 100 g of chocolate
milk chocolate	70	2345
dark chocolate	170	1800

(i) Explain whether eating dark chocolate is likely to reduce the risk of CVD more than eating milk chocolate. Use the information in the table to support your answer.

(4)

Dark chocolate has ~~more~~ 100 mg more flavonoids than milk chocolate.
These antioxidants help reduce risk of CVD.
Furthermore, the energy intake of dark chocolate is 545 kJ/100g less than that of milk chocolate.
If the consumption of milk chocolate is substituted with dark chocolate, the energy intake is reduced which may reduce obesity, ultimately reducing CVD.

ResultsPlus
Examiner Comments

This was awarded all four points.

ResultsPlus
Examiner Tip

If you are asked to describe data in a table make sure that you refer to all of it. If you did not need to do this then the data would not be there. If you are asked to explain data then you must use some AS level knowledge to say why.

Question 6 (b) (iii)

Very few blank responses were seen which was encouraging and most responses attempted to describe how a study on chocolate should be designed. However, very few candidates scored full marks, although all our mark points were seen. Common errors included a study to compare eating milk and dark chocolate (so not mark point 1) and a group of people of mixed males and females (so not mark point 3).

(iii) Describe how a study could be designed to collect valid and reliable data on the effects of eating chocolate on the risk of CVD.

(3)

~~Two groups of people are taken. One group is given chocolate~~ volunteers

Different groups of volunteers of same age, gender, diet and lifestyle are tested. Each group is given a specific type of chocolate to include in their diet with the exception of one group. This group is the control group and not given chocolates to include in their diet. Every volunteer is tested for CVD once a week and a table is drawn.

ResultsPlus
Examiner Comments

This was awarded mark points 1 (see additional guidance), 3 and 4.

(iii) Describe how a study could be designed to collect valid and reliable data on the effects of eating chocolate on the risk of CVD.

(3)

- Select people of the same health, mass, age and gender.
- Divide them into three groups, one given milk chocolate, one given dark chocolate and one not given chocolate.
- Give each group the same daily ~~fat~~ intake of chocolate (same mass) of the same brand for 1 year.
- After 1 years, calculate the percentage of people who got CVD.
- To increase validity, keep all other factors constant such as level of exercise of each individual and same diet.

(Total for Question 6 = 11 marks)

- To ensure reliability, repeat for each group of people twice and calculate the mean percentage of individuals who got CVD.

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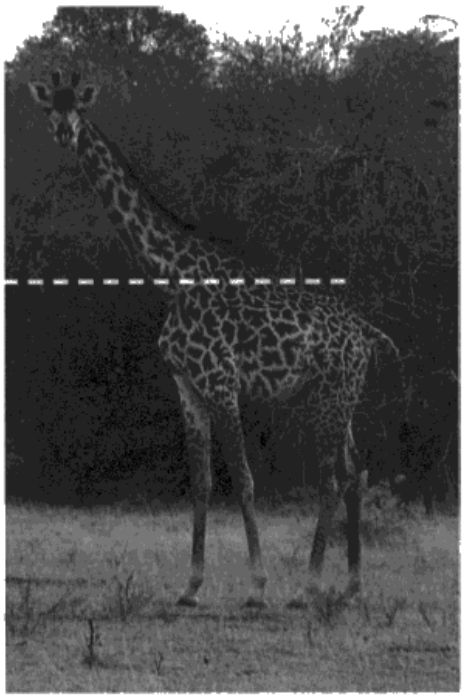
Examiner Comments

Another clear response which was awarded the same three mark points as the previous one.

Question 7 (a)

We allowed quite a wide range of values but felt that as the candidate was asked to estimate the length of the neck it would be inappropriate to allow more than one decimal place in their answer.

7 The photograph shows an adult giraffe.



(a) Estimate the length of the neck of this giraffe from the shoulders, using the information in the photograph.

(1)

4.5cm → 3m

3cm → 2m

Answer 2m m

ResultsPlus
Examiner Comments

An acceptable value.

(a) Estimate the length of the neck of this giraffe from the shoulders, using the information in the photograph.

(1)

$3m \longrightarrow 4.4\ cm$

$x \longrightarrow 3\ cm$

$x = \frac{3 \times 3}{4.4}$

$= 2.045$

Answer 2.05 m

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Examiner Comments

Too many decimal places, although they are within our range of acceptable values.

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Examiner Tip

With the introduction of level 2 maths for this specification, you need to think very carefully about the appropriateness of the number of decimal places you give your answer to, unless the question specifies how many is required.

Question 7 (b)

The responses to this question were quite disappointing as many candidate ignored the hint given in part (a) and wrote excessively about the heart needing to be large due to the large surface area to volume ratio of the giraffe.

(b) The heart of an adult giraffe can be 60 cm long.

Explain why the heart of a giraffe needs to be so large.

(2)

The giraffe has a long neck, that leads to its brain. Having a large heart enable blood to be pumped at a greater pressure to ~~the~~ extended parts of the body such as its brain if it were to survive. If not, the coronery arteries would carry ~~less~~ ~~de~~oxygenated blood at a low pressure ~~to supply the brain cells~~. and the brain cells would be deprived of oxygen.

ResultsPlus
Examiner Comments

This candidate thought about the context of the question, looked at the photograph and gave us a response worth full marks.

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Examiner Tip

Look for clues in the stem of the question and in previous parts of the question to help you answer a question part. The photograph was there for a reason and you were asked to estimate the length of the neck to get you thinking about the distance of the brain from the heart.

(b) The heart of an adult giraffe can be 60 cm long.

Explain why the heart of a giraffe needs to be so large.

(2)

~~It has to pump blood to a~~

- Blood has to be pumped at a high pressure, to the top of the heads as well, therefor the heart has to be able withstand this, ~~heart~~ so a strong, large heart's needed.

- The giraffe has a very small surface area to volume ratio, it has a very large body, which requires alot of blood to stay alive.

~~trees for it does some activities such as walk, reach top of~~ the ~~food which ~~her~~ needs energy. Provided by~~

ResultsPlus
Examiner Comments

We awarded two marks for the content of the first paragraph. We could ignore the irrelevance written in the second paragraph as it did not contradict any of the marks already awarded.

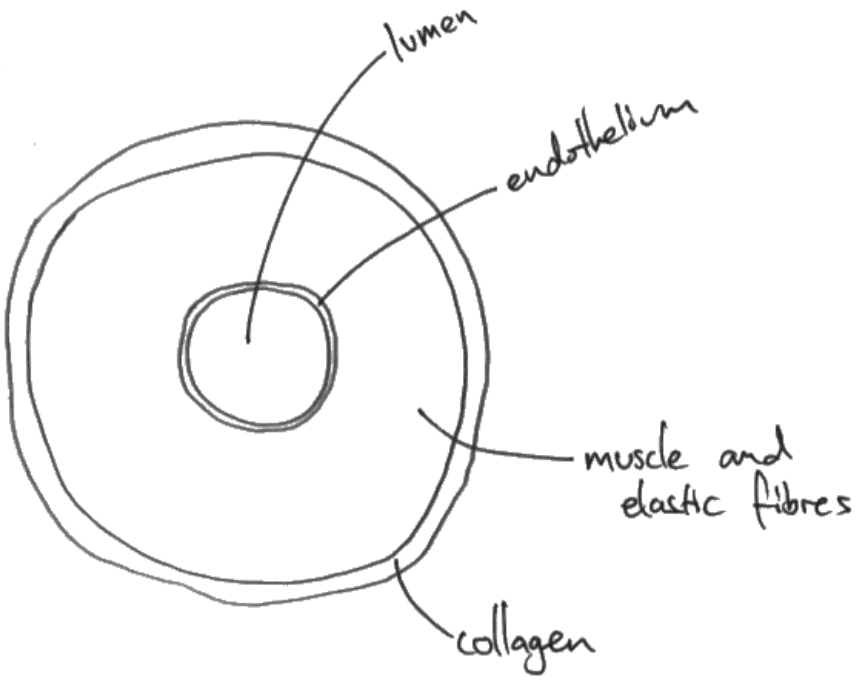
Question 7 (c) (i)

A whole range of diagrams were drawn of an artery. The quality of these diagrams seemed to be very centre-based with some diagrams being detailed and accurately labelled and other diagrams being barely even of GCSE quality.

(c) The arteries near the heart of a giraffe are highly elastic.

(i) Draw a labelled diagram of an artery, as seen in section.

(3)



ResultsPlus
Examiner Comments

This was awarded the drawing mark and both label marks. We were not necessarily expecting the names of the layers, but at least a description, as detailed here.

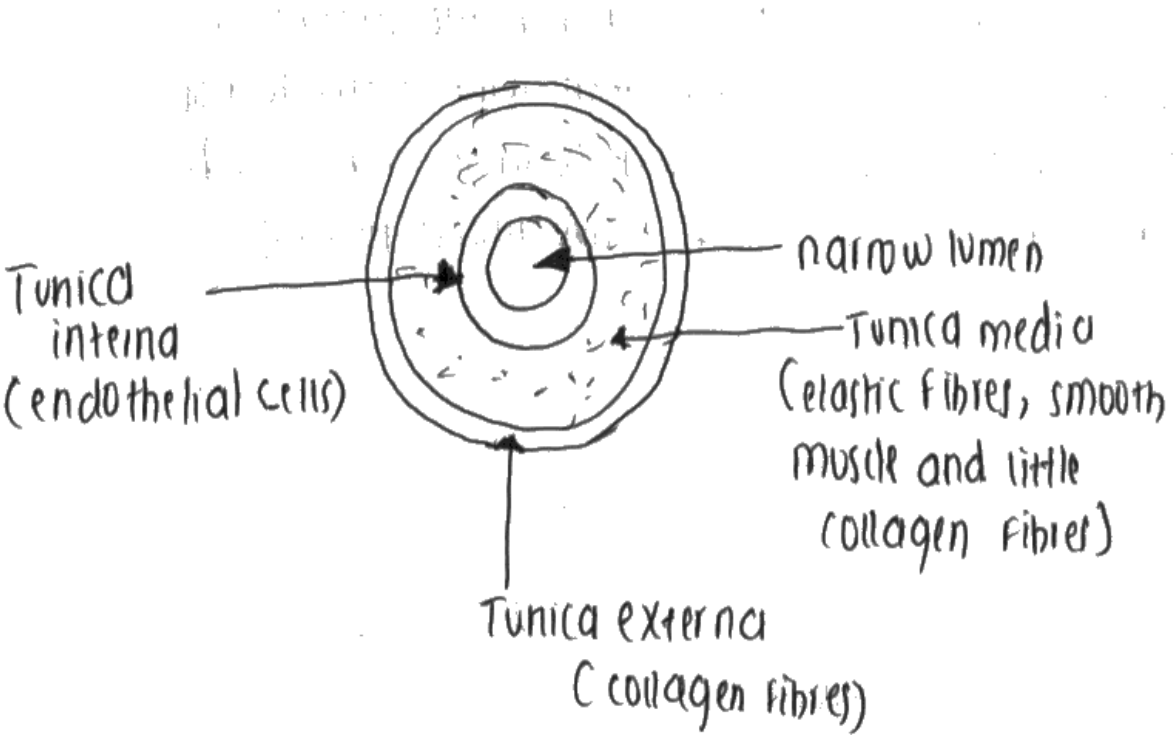
ResultsPlus
Examiner Tip

If you are expected to know the structure of something, be prepared to describe this structure in words or to produce an accurate labelled diagram.

(c) The arteries near the heart of a giraffe are highly elastic.

(i) Draw a labelled diagram of an artery, as seen in section.

(3)



ResultsPlus
Examiner Comments

Another diagram awarded full marks. We did not award, but ignored, the label for the tunica intima as the arrow was not really pointing to the right structure.

ResultsPlus
Examiner Tip

Always ensure that your label lines are touching or are ending in the structure that you are trying to label.

Question 7 (c) (ii)

Responses to this question were very disappointing as many just referred to the elastic fibres stretching and recoiling without linking each property to its specific function.

(ii) Explain why the arteries near the heart of a giraffe are highly elastic.

(2)

So they can be able to ~~stret~~ stretch and ~~reco~~ recoil. to maintain pressure.

ResultsPlus
Examiner Comments

This is an example of where 'stretch and recoil' were rolled into one. They had linked this with maintaining pressure. The additional guidance could be awarded.

ResultsPlus
Examiner Tip

Remember that you are answering an AS paper and not a GCSE paper, so the quality of your response needs to be higher than what you may have written at GCSE.

Question 7 (d) (i)

Many responses were awarded the first mark point but few candidates then linked their response to the actual question being asked.

(d) Damage to the legs of the giraffe could result in excessive bleeding.

To prevent excessive bleeding, the capillaries near the surface of the skin are very narrow.

(i) Explain why very narrow capillaries prevent excessive bleeding.

(2)

Less blood is allowed to flow through the capillaries, so when there is a cut, a small blood clot can stop bleeding quickly, due to a small cross-sectional area of the capillaries. It takes a shorter time for a large enough clot to form.

ResultsPlus
Examiner Comments

Both of our marks are illustrated here.

ResultsPlus
Examiner Tip

Make sure your response actually answers the question and gives as many points as there are marks allocated to the question.

Question 7 (d) (ii)

Some candidates scored both marks for this question but there were several who made one of two common errors. There were candidates who thought that the red blood cells had to be small because the capillaries were narrow and there were others who thought that the large surface area to volume ratio meant that more oxygen could be carried inside the cells.

(ii) The red blood cells of the giraffe are about one third the size of human red blood cells, so that they can pass through the very narrow capillaries.

The small size of the red blood cells ensures that the legs of the giraffe have a good supply of oxygen.

Explain why smaller red blood cells increase the supply of oxygen to the legs.

(2)

Smaller blood cells have a larger surface area to volume ratio (SA:Vol) so has a higher rate of diffusion at the surface (it is more efficient) as substances have to travel a shorter distance. This means oxygen will efficiently diffuse out of red blood cells into tissues due to a shorter diffusion pathway and a larger SA:Vol.

ResultsPlus
Examiner Comments

This candidate's response was awarded both of our mark points.

Question 8 (b) (i)

Naming the bond did not cause any problem to the vast majority of the candidates. The most common error referred to the bond as a dipeptide bond.

(b) Only the silkworms that have been selectively bred can use AzPhe in the synthesis of protein.

During translation, AzPhe joins to two other amino acids by condensation reactions.

(i) Name the covalent bond that joins two amino acids in a condensation reaction.

(1)

peptide bond

ResultsPlus
Examiner Comments

Perfect.

Question 8 (b) (iii)

This question was not well-answered. The third mark point was most commonly seen followed by the second one. We had hoped to see the fourth mark point as this is about the role of tRNA which candidates ought to know.

(iii) Transfer RNA (tRNA) is involved in translation. The amino acid AzPhe requires a special tRNA molecule during the synthesis of silk.

Suggest why AzPhe is **not** inserted into proteins in silkworms that have not been selectively bred.

(3)

As they are not selectively bred, they will not have ~~the gene that codes for the production of the special~~ the gene that produces the special tRNA. As the tRNA is absent, the A2Phe cannot be translated and held by peptide bonds so, the synthetic silk fibres are not produced.

ResultsPlus
Examiner Comments

An example of a better response seen.

(iii) Transfer RNA (tRNA) is involved in translation. The amino acid AzPhe requires a special tRNA molecule during the synthesis of silk.

Suggest why AzPhe is **not** inserted into proteins in silkworms that have not been selectively bred.

(3)

Silkworms that have not been selectively bred will not have this specific tRNA molecule. This is because the transcribed mRNA in this type of silkworm will not have the triplet codon that codes for AzPhe and hence there won't be a tRNA molecule with a complementary anti-codon in order to translate and produce AzPhe.

ResultsPlus
Examiner Comments

Another example of one of the better responses seen.

Question 8 (c) (i)

A range of ratios were seen for this response. A significant number of candidates did not know how to express a ratio.

(c) Part of a silk molecule contains 1100 amino acids. In natural silk, 1% of the amino acids are phenylalanine.

In modified silk, 16% of the phenylalanine molecules are replaced by AzPhe.

(i) Calculate the ratio of phenylalanine to AzPhe in this part of a modified silk molecule.

(2)

- 1100 × 1% = 11 phenylalanine
- 11 × 16% = 1.76 replaced by AzPhe
- remaining phenylalanine = 11 − 1.76 = 9.24
- $\frac{9.24}{1.76}$: = 21 : 4

Answer 21 : 4

ResultsPlus
Examiner Comments

We were allowing the ratio rounded down to the two lowest whole numbers.

ResultsPlus
Examiner Tip

Check what mathematical skills you are supposed to have and ensure that you know how to do them before your exams. A list can be found in the spec so ask your teacher or check the website.

Question 8 (c) (ii)

We felt that the candidates could take two different approaches to this question, so this was taken into account in our mark scheme by having two possible sets of marks. Few answers went into sufficient detail to score more than one or two marks. We appreciate that this is the last question on the paper and time was probably beginning to run out, although there was no evidence that the paper was too long.

(ii) The R group of phenylalanine is smaller than the R group of AzPhe.

Suggest how inserting an amino acid with a larger R group could affect the properties of silk fibres.

(4)

This affects the protein's primary structure as a different R group would mean a different amino acid and hence a different sequence. The secondary structure may be affected. The R group determines the position and type of bonds such as disulfide bridges and hence alters the protein's tertiary structure. This A larger R group also means that the protein may not fold as tightly. ~~and so this~~ The ~~a hydrogen~~ silk fibres may be less strong and rigid and may be made more flexible, because of this.

ResultsPlus
Examiner Comments

An example of one of the better responses that we saw.

(ii) The R group of phenylalanine is smaller than the R group of AzPhe.

Suggest how inserting an amino acid with a larger R group could affect the properties of silk fibres.

(4)

The primary structure would change and the folding of the protein would change ~~to~~ due to changes in the type and positioning of bonds between R-Groups. Hence the tertiary structure changes. Due to a larger R-Group, the silk is much more stronger as the bonding between R-Groups have increased. Thus the properties of the silk fibres would double.

ResultsPlus
Examiner Comments

This is another good example but has taken on the alternative approach to the answer.

Paper Summary

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

- Candidates can still use papers from the previous specification to practice questions that cover topics common to both specifications.
- Candidates should be taught how to do the types of calculations that are listed in the specification and that they are taught how to recognise how many decimal places or significant figures that should be given in their final answer.
- Candidates need to be aware of what is expected by each of the command words that are listed in the specification.
- Candidates should be prepared to both describe and draw structures that are listed in the specification.
- Candidates need to be constantly reminded to write as many AS level points as there are marks allocated to a particular question; using old spec past paper questions will be very useful in giving candidates this practice.
- Candidates need to be taught how to decide what needs to be included in a levels-based question to access the level 3 response marks; using UK home spec papers would help here as they include questions of this style.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

http://www.edexcel.com/iwantto/Pages/grade-boundaries.aspx