

Examiners' Report
June 2018

IAL Biology WBI01 01

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Introduction

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

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

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

Many candidates have clearly made good use of past papers and mark schemes, but it is important for candidates to understand the scientific principles covered in the specification so they can apply them to new contexts and not write a rehearsed answer to a question that has been asked in the past. This was evident particularly in Q5a(ii) which asked specifically about CHD as opposed to CVD- many candidates simply regurgitated a rehearsed answer relating specifically to CVD and hence lost marks.

Standards in terms of grade boundaries and level of difficulty of the paper were very pleasing overall and were comparative with the 1706 series with both a mean and standard deviation difference of +0.8

Question 1 (b) (ii)

Candidates were provided with data showing the energy obtained from different food sources and the corresponding BMI in 3 people L, M and N. They were then asked to suggest a lifestyle difference to account for the difference in values between person L and M

This question was fairly well answered and many scored 1 mark, though some incorrectly related the answer to BMI or discussed only L or M but not both.

(ii) Suggest a difference in **lifestyle** that could explain the differences between person L and person M.

(1)

Person M's diet must consist of fast fo food high in cholesterol levels such as fast food, therefore ~~the~~ person M's carbohydrate is much higher unlike person L who must be eating to each balanced meals.



This response scores 0



Make sure statements used are comparative

(ii) Suggest a difference in **lifestyle** that could explain the differences between person L and person M.

(1)

Person M is more physically active than person L



The response below scores 1 mark

Question 1 (b) (iii)

Well answered in general by most candidates, over two thirds scoring 2 marks. However some incorrectly stated that statins were used to reduce blood pressure i.e. confused them with antihypertensives.

(iii) Using the information in the table, explain why a doctor might prescribe statins for person N.

(2)

Because person N has high BMI and it can lead to obesity, so by prescribe statins can help him get the correct BMI.



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Examiner Comments

This response scores 0 marks as refers to BMI not cholesterol/lipids

lifestyle compared to person L.
(iii) Using the information in the table, explain why a doctor might prescribe statins for person N.

(2)

Statins help reduce the cholesterol levels in the blood which could be way to high in Person N as his BMI is 30 and a poor diet with a lot of saturated fats can lead to high cholesterol which can lead to plaque depositing under the coronary artery walls. This can lead to strokes.



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Examiner Comments

mp2 then 1 clearly stated=2 marks

Question 2 (b)

Well answered in general-a common question on past papers

(b) Explain what is meant by the term **gene**.

(2)

A gene is a part of DNA



Lacking in relevant detail-0 marks

(b) Explain what is meant by the term **gene**.

(2)

a sequence of bases found on
* a DNA molecule, it provide the sequence
for amino acids in order to make proteins



2 marks-mp1 on line 1 and mp2 on line 3

Question 2 (c)

Candidates were asked to describe the process of DNA replication. This is a question that has been asked as a QWC in several past papers and a lot of candidates seem to have learnt the mark scheme verbatim. A pleasing number were able to write a coherent, logical and detailed description of the process many gaining all four available marks. Lower level answers lacked detail and often gained only mps 1 and 6. Some candidates incorrectly described the process of transcription and were therefore limited to a maximum of 2 marks-mps 1 and 2.

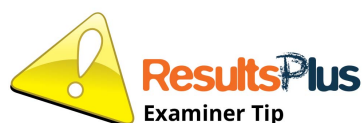
(c) Describe the process of DNA replication.

(4)

DNA helixos breaks the hydrogen bonds between nitrogenous basses in the polynucleotide. The DNA is now eposed to free neucleotides attatching by the base pairing rule. The neucleotides are attatched together by the enzym DNA polymerase. The new pair of DNA would have a completely differant strand and one parent strand. Semiconservative replication.



2 marks awarded both on the first line-mp6 for DNA helicase (spelling allowed as phonetic) and mp4 for breaking hydrogen bonds. There is insufficient detail for mp 2 or 3-base pairing rule is ignored-there needs to be a refernece to complementary bases. Mp6 could also have been awarded on line 5 for a correct reference to DNA polymerase.



Learn names of enzymes involved and their correct roles in the process

(c) Describe the process of DNA replication.

(4)

DNA double helix unzips using DNA helicase
each ~~strand~~ ^{nucleotides} ~~bases~~ ^{nucleotides} line up in front of each
single strand and complementary base
pairing takes place, hydrogen bonds
form between bases then the two
strands, one from the original DNA and
one copied form a ~~dot~~ double helix
using DNA polymerase.



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Examiner Comments

High level answer gaining 4+ marks-mp 1/6/2/3/4 in that order and answered in a logical sequence

Question 2 (d)

Candidates were asked to explain the role of RNA in translation. Although a similar question has been asked previously candidates struggled to provide sufficient detail to gain full marks. The question was therefore a good discriminator at the A grade boundary. Only 12% gained 3 marks. Lower level answers lacked detail and tended to talk about RNA in general instead of mRNA and tRNA separately. Some candidates did not read the question correctly and discussed differences in structure rather than function.

(d) Explain the roles of RNA in translation.

(3)

RNA is used to produce the complementary amino acids in reference to the nitrogenous bases produced in transcription, as each codon is read three at a time to produce the amino acid.



0 marks-too general in content

one newly made strand. so DNA replication is

(d) Explain the roles of RNA in translation.

*** (Answer Continued in page 9) semi-conservative (3)

~~DEF~~ mRNA is involved in transcription which take place in the nucleus. The genetic code is copied on to the mRNA using the anti-sense strand as a template. The mRNA then leaves the nucleus and gets attached to ribosomes where it undergoes translation. Each mRNA contains a codon which joins with the anticodon in the tRNA by hydrogen bonds. The sequence of codons in the mRNA codes for the sequence of amino acids in the ***

(Total for Question 2 = 10 marks)

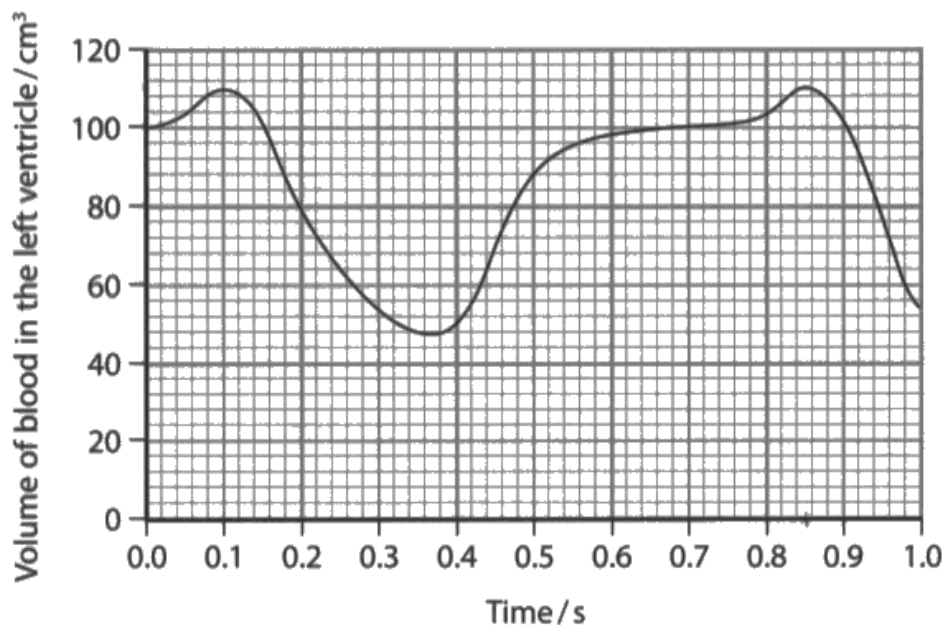


Good answer-3 marks-mp1 (genetic code is copied..line 2/3) mp2 (gets attached to ribosomes...line 5) and mp4 (a codon which joins with the anticodon..lines 7/8)

Question 3 (b) (i)

Candidates were provided with a graph showing the changes in the volume of blood in the left ventricle during one second then asked to use the graph to calculate heart rate. Some candidates did not read the correct section of the graph and/or performed an incorrect calculation. A whole number answer was expected

(b) The graph below shows the changes in the volume of blood in the left ventricle during one second.



(i) Using the information in the graph, calculate the heart rate.

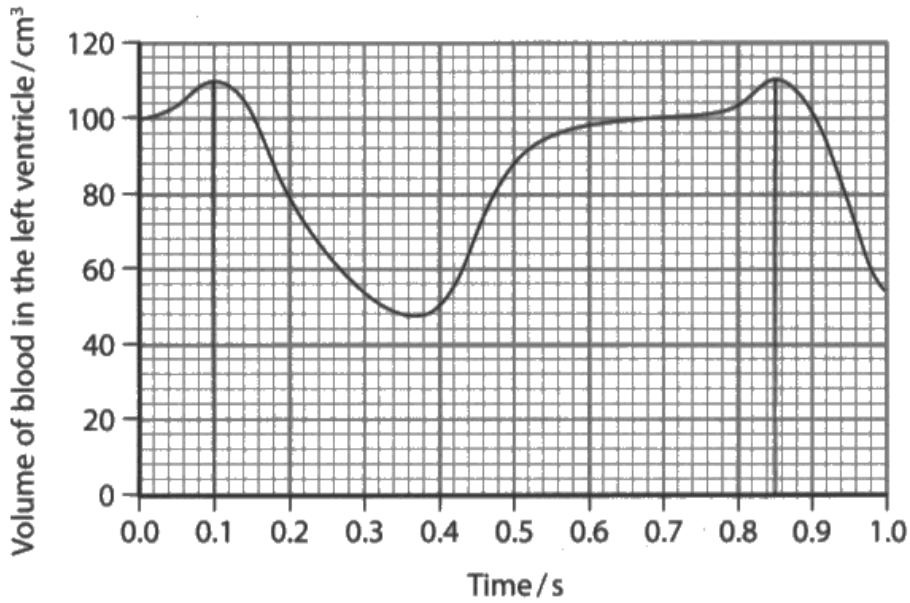
(2)

70.6 beats min⁻¹



No working out and final answer incorrect. 0 marks

(b) The graph below shows the changes in the volume of blood in the left ventricle during one second.



(i) Using the information in the graph, calculate the heart rate.

1 beat \rightarrow (0.85 - 0.1 = 0.75 s)

(2)

$$\frac{1}{0.75} \times 60$$

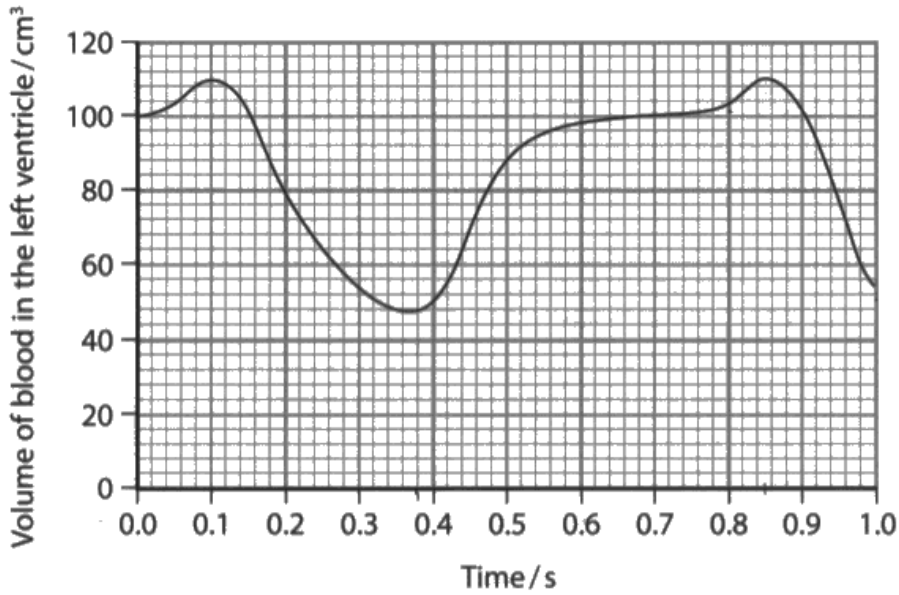
.....80..... beats min⁻¹



2 marks

Question 3 (b) (ii)

Using their answer from 3bi) candidates were asked to calculate the volume of blood pumped out of the left ventricle in a minute. Only a few gained both marks



(i) Using the information in the graph, calculate the heart rate.

(2)

$$\cancel{60 \div 5.4 = 11.1 \text{ beats min}^{-1}}$$

$$60 \div 0.38 = 157.9 \text{ beats min}^{-1}$$

157.9 beats min⁻¹

(ii) Using your answer to (i) and the information in the graph, calculate the volume of blood pumped out of the left ventricle in each minute.

(2)

$$\cancel{60 \div 0.85 =}$$

$$\cancel{0.85 = 110}$$

$$\cancel{60 = x}$$

$$157.9 \times 110 = 17369 \text{ cm}^3$$

$$\cancel{0.85 x = 110 \times 60}$$

$$\cancel{x = \frac{77647 \text{ cm}^3}{0.85}}$$

$$\cancel{7765 \text{ cm}^3}$$

$$17369$$

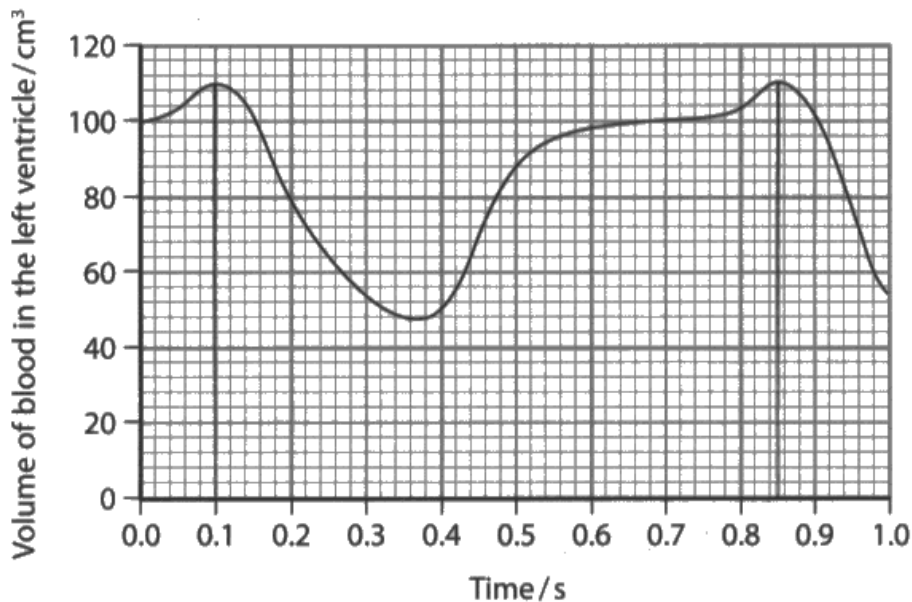
$$\cancel{7765}$$

17369 cm³



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Examiner Comments

No awardable content-0 marks



(i) Using the information in the graph, calculate the heart rate.

$$1 \text{ beat} \rightarrow (0.85 - 0.1 = 0.75 \text{ s})$$

(2)

$$\frac{1}{0.75} \times 60$$

80 beats min^{-1}

(ii) Using your answer to (i) and the information in the graph, calculate the volume of blood pumped out of the left ventricle in each minute.

$$110 - 47 = 63 \text{ cm}^3$$

$$\cancel{63} \rightarrow 1 \text{ second}$$

$$60 \text{ seconds} \rightarrow 63 \times 80$$

5040 cm^3



ResultsPlus
Examiner Comments

2 marks awarded

Question 3 (c)

Candidates were asked to describe the role of the cardiac cycle in moving blood through the heart. Few gained full marks and often answers lacked detail as they simply traced the journey of the blood through the heart without specifically referring to atrial and ventricular diastole and systole.

(c) Describe the role of the cardiac cycle in moving blood through the heart.

(3)

Deoxygenated blood is pumped from the right part of the heart towards the lungs where it becomes oxygenated and moves back to the left part of the heart where it is pumped to the rest of the body. The cardiac cycle also maintains a high concentration gradient for efficient diffusion. In large organisms it is also responsible for mass flow and overcoming diffusion limitations.



Lacking in detail and does not answer question-0 marks

(c) Describe the role of the cardiac cycle in moving blood through the heart.

(3)

During atrial systole the atria ~~const~~ contracts and the SL valves are closed, the AV valves are open and as the pressure in the atria increases blood passes into the ventricle filling it with blood. During ventricular systole the ventricles contract and the AV valves are closed to prevent blood flowing backwards into the atria and the SL valves are open as blood is ~~pump~~ pumped through the aorta to the rest of the body and through the pulmonary arteries to the lungs. During ~~di~~ diastole the ventricles relax the SL valves ~~are~~ close, the AV valves open and the atria starts filling with blood again and as the pressure in the atria increases blood starts to trickle into the ventricles.



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Examiner Comments

Excellent well structured answer gaining all 3 marks

Question 3 (d)

Candidates were asked to explain the advantages of a double circulatory system to mammals. This question has been asked on past papers and was generally well answered. Most candidates gained mp1 for reference to blood being separated and better answers also included mp 2 and 4 though mp3 was less frequently seen as reference was made to speed of delivery of oxygen to tissues rather than the amount transferred being higher.

(d) Explain the advantages of the double circulatory system found in mammals.

(3)

Double circulatory systems allow blood to pass twice through the heart in a single cycle. Also, double circulatory systems allow for mammals of a large surface area to volume ratio, to overcome diffusion limitations, as well as facilitating with the metabolic rate of the organism (as in mammals, this is relatively high).



Incorrect context-0 marks

(d) Explain the advantages of the double circulatory system found in mammals.

(3)

~~The double~~ It is responsible for different pressures around the body. If the blood pumped to the lungs was of the same pressure as it is to the rest of the body, the lungs would be destroyed. It also maintains a high concentration gradient around the body. Mammals have millions of cells ~~also~~ with a high metabolic rate so the double circulatory system ensures mass flow as well as efficient gas exchange. The double circulatory system also ensures that the oxygenated blood ~~does not~~ mix with the deoxygenated blood as the two different bloods take different routes.



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Examiner Comments

3 marks-mp 4 3 and 1 in that order

Question 4 (a)

Candidates were asked to state two structural differences between saturated and unsaturated fats. This question was generally well answered. mp1 was sometimes not awarded as there was reference to only single and double bonds rather than C-C bonds specifically. We did not accept branched as an equivalent term to straight in mp2.

4 Human diets contain both saturated and unsaturated lipids.

(a) Give **two** differences between the structures of saturated and unsaturated lipids.

(2)

- 1 ~~unsatur~~ Unsaturated only contain single bonds but saturated bonds contain double and triple bonds.
- 2 unsaturated lipids have more hydrogen atoms than saturated lipids.



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Examiner Comments

No awardable content-0 marks. The candidate does not refer to carbon bonds specifically so mp1 cannot be awarded here. The second statement is incorrect-unsaturated lipids have fewer hydrogen atoms(for the same number of carbons) than saturated lipids



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Examiner Tip

If a question asks for differences, make sure to compare both things or use comparative language such as higher/lower, fewer/more in order to gain marks.

4 Human diets contain both saturated and unsaturated lipids.

(a) Give **two** differences between the structures of saturated and unsaturated lipids.

(2)

- 1 ~~Saturated lipids contain~~ Unsaturated lipids contain carbon-carbon double bonds in their fatty acid chain whereas saturated lipids do not.
- 2 Saturated lipids have a greater hydrogen to carbon ratio than unsaturated lipids.



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Examiner Comments

mp1 and mp2 (converse) in that order=2 marks

Question 4 (b) (i)

Candidates were given a table of data which compared the effect of diet rich in saturated and unsaturated fats on their mean blood cholesterol level and chance of death. This was generally well answered though fewer were able to access marking point 2.

Question 4 (b) (ii)

Candidates were asked to suggest two limitations of the design of the experiment carried out on saturated and unsaturated fats. This was well answered. However some candidates talked specifically about how the investigation could be improved and therefore were awarded no marks

(ii) Suggest **two** limitations in the design of this investigation.

(2)

1 The amount of test subjects ~~should have been~~ weren't the same.

2 Other factors were not kept constant so ~~reliability of data is~~
there is a low reliability to the result of the investigation.



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Examiner Comments

1 mark for reference to other factors not being constant

(ii) Suggest **two** limitations in the design of this investigation.

(2)

1 ~~See~~ Death from all causes during the investigation. other factors could have been a cause to their death.

2 The people selected aren't the same level. Saturated lipids re Diet had less people in partaking. Compare to people partaker in Unsaturated diet.



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Examiner Comments

2 marks

(ii) Suggest **two** limitations in the design of this investigation.

(2)

- 1 The investigation lasted for only 4.5 years. A significant difference cannot be seen in such a short time.
- 2 The other causes causing deaths are not investigated to draw a clear conclusion about the effects of the two different diets.



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Examiner Comments

2 marks

(ii) Suggest **two** limitations in the design of this investigation.

(2)

- 1 The number of people that received saturated and ~~was~~ unsaturated lipids are different.
- 2 Investigation should last for a larger period than 4.5 years.



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Examiner Comments

0 marks

Question 5 (a) (i)

This was a word completion exercise about CVD which was very well answered with a high level of candidates gaining full marks

5 Obesity is one risk factor for cardiovascular disease (CVD).

(a) Coronary heart disease is one type of cardiovascular disease.

(i) Read through the following passage on atherosclerosis, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

In atherosclerosis, the endothelium cells lining the artery are damaged. This damage triggers an response.

White blood cells collect at the site and accumulate large quantities of

the lipid fibrinogen. This develops into a fatty deposit called fibrin.



1 mark only for endothelium

5 Obesity is one risk factor for cardiovascular disease (CVD).

(a) Coronary heart disease is one type of cardiovascular disease.

(i) Read through the following passage on atherosclerosis, then write on the dotted lines the most appropriate word or words to complete the passage.

(4)

In atherosclerosis, the endothelia cells lining the artery are damaged. This damage triggers an inflammatory response.

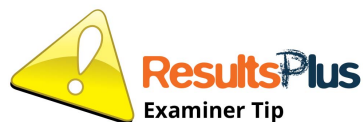
White blood cells collect at the site and accumulate large quantities of

the lipid cholesterol. This develops into a fatty deposit

called plaque.



All 4 marks



Read through the whole paragraph upon completion to ensure that it makes sense

Question 5 (a) (ii)

Candidates were asked to suggest how atherosclerosis can result in coronary heart disease. Some candidates did not read the question closely enough and based their answers specifically on cardiovascular disease. Hence they talked generally about arteries rather than specifically the coronary artery for mp1. Most candidates were easily able to access mp4 though this was negated if they also went on to mention a CVD such as a stroke

(ii) Suggest how atherosclerosis can result in coronary heart disease.

(3)

In atherosclerosis, the lumen in the arteries becomes more narrow because of the ~~the~~ plaque that builds ~~up~~ up and ~~becomes~~ ~~harder~~ becomes more hard. ~~This~~ ~~is~~ Because the lumen is more narrow ~~there is~~ ~~an~~ it will cause a high blood pressure. Also not enough oxygen can be passed through the narrow artery so we have a less oxygen to be transported around the body.



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Examiner Comments

0 marks-the candidate refers only to arteries in general not the coronary artery and so is not awarded mp1. A lack of oxygen is mentioned but not specifically to the heart so we cannot award mp3.

(ii) Suggest how atherosclerosis can result in coronary heart disease.

(3)

Coronary arteries carry oxygenated blood to the heart. Atherosclerosis ~~only occurs~~ is most likely to occur in arteries as they have higher blood pressure and so more chance of endothelium cells being damaged. If it happens in the coronary arteries then the heart cells ~~will~~ will have limited blood supply or not at all if vessel becomes completely blocked. Cells stop respiring aerobically and start anaerobic respiration and cells may even die as a result of the lack of oxygen supply from blood causing coronary heart disease.



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Good answer-3 marks

Question 5 (b) (i)

Candidates were given a rather complex table of data in this question.

They were required to compare perceived risk of developing CVD compared to the actual risk. Many did not understand the data and either made vague statements or simply compared data that was irrelevant. Better candidates were able to look at each of the three levels of risk—below average, average and above average and make comparative statements including a correct manipulation. This was a good discriminator for the A grade boundary

- (b) In a study, people were asked to state whether they thought their risk of developing CVD was below average, average or above average. This was recorded as perceived risk.

The perceived risk was then compared with their actual risk of developing CVD determined from their BMI.

The results are shown in the table below.

		Actual risk of developing CVD based on BMI (%)			
		below average	average	above average	total
Perceived risk of developing CVD (%)	below average	25	15	17	57
	average	11	9	10	30
	above average	3	4	6	13
	total	39	28	33	100

- (i) Using the information in the table, describe how the perceived risk of developing CVD compares with the actual risk of developing CVD.

(3)

To begin with the perceived risk of developing CVD was lower than the actual risk of developing CVD.

The perceived risk of developing CVD was underestimated compared to the actual risk of developing CVD based on BMI.

~~From the table we can see for instance the actual risk of developing CVD based on BMI is if your BMI is below average 25.~~



This candidate simply repeats the stem of the question-0 marks

- (b) In a study, people were asked to state whether they thought their risk of developing CVD was below average, average or above average. This was recorded as perceived risk.

The perceived risk was then compared with their actual risk of developing CVD determined from their BMI.

The results are shown in the table below.

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Perceived risk of developing CVD (%)	below average	25	15	17	57
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	above average	3	4	6	13
	total	39	28	33	100

- (i) Using the information in the table, describe how the perceived risk of developing CVD compares with the actual risk of developing CVD.

(3)

A minor percentage of people perceive a ^{above average} higher risk of developing a CVD as compared to the actual risk of developing CVD. The perceived ^{higher above average risk} risk is for ~~the~~ developing CVD is 20% lower than the ~~higher risk for actual~~ actual. On the other hand, more people perceive they ~~are~~ their risk of developing CVD to be ~~18%~~ more than below average ~~as~~ than as compared to the actual statistics.



Good answer-mp 3 4 and 1 in that order.



Read the data carefully-use paper to write down calculations. When quoting % changes be sure to say whether it is a decrease or increase rather than simply a change in & to avoid losing marks.

Question 5 (b) (ii)

Here candidates were asked to suggest why people with a high BMI might not believe they are at increased risk of CVD. Most candidates gained one mark for a general statement ie mp1 or 2., which could be written in a variety of ways. Higher level answers often gained mp3 for explaining that BMI does not differentiate between percentage body fat and muscle mass.

(ii) Suggest why some people with a high BMI might not believe they are at an increased risk of developing CVD.

(2)

They might think that because sometimes diseases are inherited by their parent and the parents are not affected they would have no problem either.



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Examiner Comments

1 mark-mp2. This is equivalent to "no family history"

(ii) Suggest why some people with a high BMI might not believe they are at an increased risk of developing CVD.

(2)

Because they might see other people who have a high BMI and they appear to be perfectly fine so they underestimate the risk of happening to them. Also, it could be so because they enjoy eating and are used to doing so, so they don't see that they are at risk of developing CVD due to their high BMI.



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Examiner Comments

2 marks awarded

(ii) Suggest why some people with a high BMI might not believe they are at an increased risk of developing CVD.

(2)

This is because they might believe that because their weight is low, that they are unlikely to be at risk with CVD, their weight to height ratio might be good therefore they do not think that they are at risk for developing CVD.



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Answer is too vague to qualify for a mark and scores 0.

Question 6 (a)

This is a commonly asked question-define the term gene mutation which most candidates know

- 6 Cystic fibrosis is a genetic disorder that can affect many body systems, including the respiratory system.

(a) Cystic fibrosis results from the expression of inherited gene mutations.

State what is meant by the term **gene mutation**.

(1)

A change in the sequence of the DNA.



0 marks-no ref to bases

- 6 Cystic fibrosis is a genetic disorder that can affect many body systems, including the respiratory system.

(a) Cystic fibrosis results from the expression of inherited gene mutations.

State what is meant by the term **gene mutation**.

(1)

~~Is a change in DNA base seq DNA or~~
Is a change in base sequence of DNA.



Correct definition-1 mark

Question 6 (b)

Candidates were asked to explain how a child can have cystic fibrosis when neither of the parents does. This is a familiar scenario, however the context used this year is different in terms of candidates would usually be asked to draw a genetic diagram. Hence some candidates struggled to provide a clear coherent explanation. Many gained 1 or 2 marks typically for stating that CF is a recessive disorder, and that the parents were carriers. More able candidates then went on to gain mps 2 and 4. Few gained full marks. Some candidates did not read the question and talked at length about the actual disorder and how the mutation leads to thick mucus etc. A good discriminator between grades

*(b) Explain how a child can have cystic fibrosis when neither of the parents has this disorder.

(5)

Cystic fibrosis is a recessive disorder. Both of the parents were ^{heterozygous} healthy carriers ^{so} and they had a 25% chance of having a child with cystic fibrosis. For this to happen the child has to inherit the recessive cystic fibrosis allele from both parents, to have the homozygous recessive genotype which causes the cystic fibrosis phenotype.



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mp1 3 4 and 2 in that order-full marks



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Examiner Tip

Learn the difference between a gene and an allele!

*(b) Explain how a child can have cystic fibrosis when neither of the parents has this disorder.

Cystic fibrosis is caused by a deletion mutation, on chromosome 7, and the affected (5) The parents could be carriers of cystic fibrosis, meaning they carry a recessive allele for cystic fibrosis, and they are heterozygous to the disease. If both parents are heterozygous and carriers of the allele of cystic fibrosis, then there is 25% chance that their child would have cystic fibrosis and this can be shown by a punnett square, showing the gametes of both parents. So the child is homozygous recessive for cystic fibrosis since it is caused by a recessive allele.

Gametes	C	c	
C	CC	Cc	CC = homozygous dominant, healthy
c	Cc	cc	Cc = heterozygous = carriers cc = homozygous recessive

The 'cc' genotype in the Punnett square is circled. An arrow points from it to the text: "25% suffer from cystic fibrosis". Another arrow points from the circled 'cc' to the text: "shorter than the healthy section and 3 DNA bases are missing, resulting in frameshift. Causing excessive thick sticky mucus in the pancreatic duct, and respiratory system."



Excellent answer-4 marks. mp2 could have been awarded from the diagram here and they also get mp5 for correctly detailing one of the effects of CF ie thick, sticky mucus

*(b) Explain how a child can have cystic fibrosis when neither of the parents has this disorder.

(5)

A gene mutation ~~is the~~ occurs and the DNA sequence is altered. So the primary structure for the CFTR protein is different so there are different R groups which cause the ~~protet~~ protein to fold differently. Different bonds form because of the different R groups, so the shape of the active site changes and the substrate is no ~~to~~ longer able to bind onto the ~~sub~~ active site marking the ~~CFTR~~ CFTR protein faulty. CFTR protein will no longer be able to diffuse calcium ions in mucus, so water will not be able to diffuse into mucus by osmosis ~~to~~ so the child will ~~be~~ end up having thick sticky mucus and the cystic fibrosis disease.



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Examiner Comments

This candidate does not discuss the actual genetics of CF but does gain mp5 for an effect. 1 mark in total.

Question 6 (c) (i)

Candidates were given a table of data to analyse which compared the effect of age on lung infection from two different types of bacteria. They were asked to use this information to describe the relationship. Poor answers simply described the relationship and generally gained 1 mark for mp1, whereas better answers looking at the trends of each bacteria individually over time and including a relevant and correct calculation to support the answer.

(c) Two bacteria that can cause lung infections are *P. aeruginosa* and *S. aureus*.

The table below shows information on the percentage of people of different ages with cystic fibrosis who are infected with these bacteria.

Bacteria	Percentage of people with cystic fibrosis who have a lung infection (%)				
	5 years old	15 years old	25 years old	35 years old	45 years old
<i>P. aeruginosa</i>	34	70	82	82	75
<i>S. aureus</i>	42	45	35	31	25

(i) Using the information in the table, describe the relationship between the age of a person and the incidence of these bacterial infections.

(3)

From 5 to 25 years old the percentage of people with cystic fibrosis increases. But from 35 ~~and~~ until 45 it ~~decreases~~ there is a low decrease. For example the mean percentage increase of lung infection ~~from people~~ from people of 5 to 25 years is approximately 20 percent.



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Examiner Comments

Here the candidate describes the data but does not tell us which bacteria they are discussing and therefore is awarded no marks

(c) Two bacteria that can cause lung infections are *P. aeruginosa* and *S. aureus*.

The table below shows information on the percentage of people of different ages with cystic fibrosis who are infected with these bacteria.

Bacteria	Percentage of people with cystic fibrosis who have a lung infection (%)				
	5 years old	15 years old	25 years old	35 years old	45 years old
<i>P. aeruginosa</i>	34	70	82	82	75
<i>S. aureus</i>	42	45	35	31	25

(i) Using the information in the table, describe the relationship between the age of a person and the incidence of these bacterial infections.

(3)

As age increases the incidence of *S. aureus* infections decreases. The incidence of *P. aeruginosa* infections generally increases with age, with a 36% higher rate at 15 years than 5 years, but between 35 and 45 years the incidence decreases by 7%, and stays the same between 25 and 35 years.



A good well structured answer-3 marks

Question 6 (c) (ii)

This question was generally well answered with many able to score maximum marks, generally mp1 2 and 3. mp4 and 4 were rarely seen

- (ii) Suggest why people with cystic fibrosis are more likely to have lung infections than people without cystic fibrosis.

(3)

Because of sticky and thick mucus that blocks bronchioles. Also ~~because of~~ people with cystic fibrosis has no rapid gas exchange and cannot breathe well. Moreover people with cystic fibrosis has high concentration gradient of gases.



This answer scores 1-mp1 on first and second line

- (ii) Suggest why people with cystic fibrosis are more likely to have lung infections than people without cystic fibrosis.

(3)

Mucus is used to trap bacteria and microbes. Since mucus is very thick and sticky, cilia are not able to push the mucus towards the throat so the mucus remains inside the lungs. Since gas exchange decreases anaerobic conditions might take place which help the growth of bacteria.



3 marks-mp1 2 and 3

Question 7 (a)

Candidates were asked to define the term enzyme. This was well answered

7 Enzymes are involved in many chemical reactions.

(a) State what is meant by the term **enzyme**.

(1)

It speeds up reactions without being used up.



Too vague-0 marks

7 Enzymes are involved in many chemical reactions.

(a) State what is meant by the term **enzyme**.

(1)

Enzymes are biological catalysts that speed up chemical reactions and remain unchanged in the end.



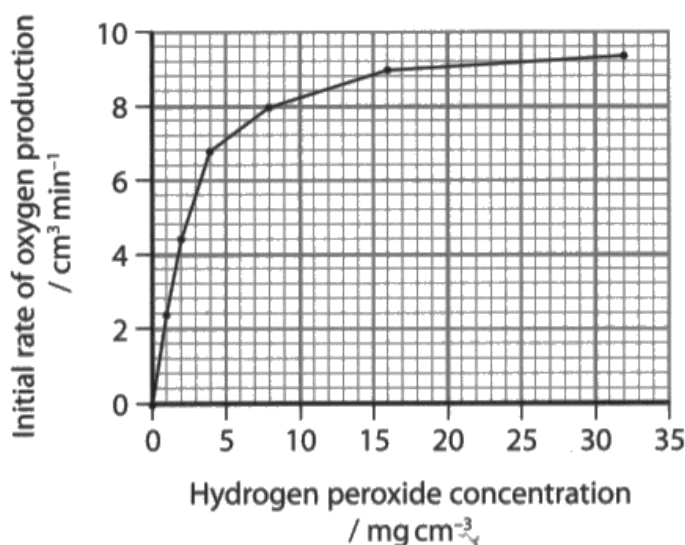
This response gains 1 mark

Question 7 (b) (i)

Candidates were asked to explain why the initial rate is used as a measurement in enzyme based reactions which look at the effect of substrate concentration. This topic is historically difficult for candidates and very few gained both marks. A large number of candidates talked about this being used as a comparison to give valid results

(b) Catalase is an enzyme that breaks down hydrogen peroxide into water and oxygen.

The graph below shows the effect of catalase on the initial rate of reaction at different concentrations of hydrogen peroxide.



(i) Explain why it is necessary to measure the initial rate of reaction when investigating the effect of substrate concentration on enzyme activity.

(2)

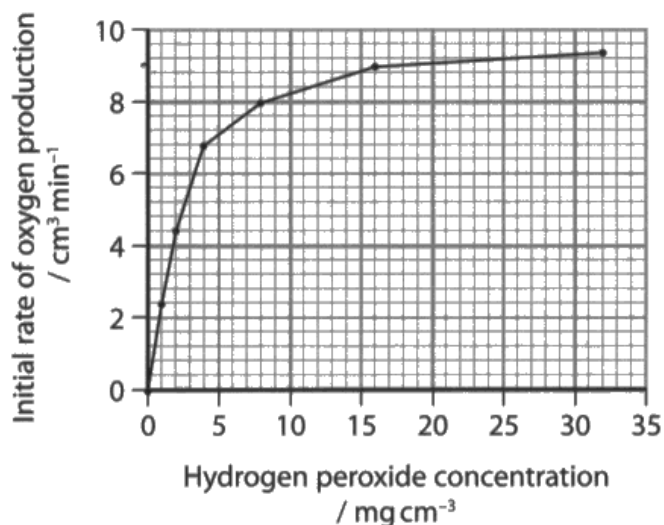
In the beginning, the substrate is not the limiting factor since there is a high concentration of substrate. But as the reaction proceeds the ~~substrate~~ ~~rate~~ ~~of~~ ~~the~~ ~~reaction~~ becomes constant and reaches an equilibrium and starts to decrease, so the substrate becomes the limiting factor. Also, ^{measuring the} initial rate helps us to understand whether something else like the pH or ~~temp~~ or the enzyme concentration becomes the limiting factor.



This is an example of an excellent answer which gains 2 marks

(b) Catalase is an enzyme that breaks down hydrogen peroxide into water and oxygen.

The graph below shows the effect of catalase on the initial rate of reaction at different concentrations of hydrogen peroxide.



(i) Explain why it is necessary to measure the initial rate of reaction when investigating the effect of substrate concentration on enzyme activity.

(2)

In order to check how much the rate has increased by. Also, to compare the changes ~~between~~ ^{between} initial rate of reaction and rate of reaction after ~~the~~ concentration is changed. This can help come to a conclusion, for example: a higher concentration ~~shows~~ ^{shows} a higher rate of reaction



This does not provide the correct explanation-0 marks

Question 7 (b) (ii)

Candidates were given a graph which showed the effect of the enzyme catalase on the initial rate of reaction for different concentrations of the substrate hydrogen peroxide.

The question asked them to use the information in the graph to explain this effect. Lower level answers simply described the graph with a manipulation of data. Higher level answers describes the graph AND went on to explain its shape in terms of limiting factors or occupation of active sites. This was an excellent discriminator for the A grade boundary.

(ii) Using the graph, explain the effect of substrate concentration on the activity of catalase.

(3)

The effect of substrate concentration on the activity of catalase causes the initial rate of oxygen production to increase and remain relatively stagnant at approximately $9 \text{ cm}^3 \text{ min}^{-1}$, and having the highest hydrogen peroxide concentration of approximately 31 mg cm^{-3} . (Causes both factors to increase).



Does not provide an explanation and was deemed too vague to be awarded mp1-0 marks

(ii) Using the graph, explain the effect of substrate concentration on the activity of catalase.

(3)

Higher substrate concentration will lead to higher activity of catalase. When the substrate concentration is low, only some of the active sites ^{of enzyme} are occupied by substrate. In this time, substrate concentration is the limiting factor. When the substrate concentration increase, there are more collision between enzyme and substrate and a higher chance for forming enzyme substrate complex, so the rate of reaction increase. When the enzyme concentration is too high, all the active sites ^{of enzyme} are occupied by substrate and the reaction rate level off, or increase in reaction rate slow down. In this time, the limiting factor will be enzyme concentration.



ResultsPlus
Examiner Comments

This is an excellent answer which provides both a clear description and explanation and was awarded all 3 marks

Question 7 (c)

This was a 5 mark QWC question with the emphasis on clarity of expression. Candidates were asked to describe an experiment they could carry out to collect data similar to the experiment in part b). A small number of candidates talked about core practicals that were not enzyme related eg Daphnia but most were able to talk with some clarity about an enzyme related practical. Lower level answers commonly gained mp 5 and 6 for reference to repeats and controlling variables respectively. Better candidates were able to gain 5+ marks.

***c) Describe an experiment that could be carried out to collect data to plot a graph similar to the one shown in part (b).**

(5)

We need to have different concentrations of the substrate which is hydrogen peroxide and have the same volume of enzyme which is catalase. We put in 7 different test tubes with different concentrations of hydrogen peroxide from (0, 5, 10, 15, 20, 25, 30 mg cm⁻³). We need to control temperature so we put them inside a water bath at a steady temperature. We use our equipment accordingly and put a gas syringe connected to the test tubes and using a stop watch we will measure the initial rate of oxygen production in cm³ min⁻¹ every minute (regular intervals). We need to carry out repeats at each concentration in order to find the mean, and then plot our data on a suitable graph similar to the one shown in part (b).



ResultsPlus
Examiner Comments

Model answer. This candidate gains all 7 possible marking points in the following order-
mp1/6/7/2/4/3/5



For questions requiring an extended response, ensure the number of comments made equates to the number of marks available.

*(c) Describe an experiment that could be carried out to collect data to plot a graph similar to the one shown in part (b).

(5)

To begin with we create ^{five different} at least ^{different} different concentrations solutions of the same substrate, ^(Hydrogen peroxide) enzyme from 0% to 40 35% We use the same volume of enzyme ^(catalase) ~~the~~ in each test tube we place the different concentrations, then we add the same volume enzyme in each test tube, ~~we~~ using a timer we measure the ^{initial rate of water production.} ~~time that it takes for the tube to react, then we measure the water that was produced after each reaction~~ ^{the average of initial rates} ~~the average of initial rate~~ of water production ^{over average of each reaction, and the average of water produced.} We make sure to keep the temperature of the room constant using an air conditioner. Then we plot the different hydrogen peroxide concentration of the x-axis and the ^(Total for Question 7 = 11 marks) average initial rate of ~~total~~ water production on the ~~y~~ y-axis



mp1 and 6-2 marks

Question 8 (a)

Candidates were asked to name the factor released by platelets to initiate the clotting process. The majority answered correctly for 1 mark.

8 Blood loss from damaged vessels is reduced by the clotting process.

(a) Name the factor released by platelets that initiates the clotting process.

(1)

serotonin



Incorrect answer-0 marks awarded.

8 Blood loss from damaged vessels is reduced by the clotting process.

(a) Name the factor released by platelets that initiates the clotting process.

(1)

Thromboplastin



1 mark for thromboplastin

Question 8 (b)

The stem of the question told candidates that EDTA is a substance which binds strongly to calcium ions. They were then asked to suggest why it is added to blood before storage. A pleasing number of candidates were able to gain both marks.

(b) When blood is stored, it is mixed with EDTA.

EDTA binds strongly to calcium ions.

Suggest why EDTA is added to blood before storage.

(2)

Because if it doesn't bind to calcium ions the thromboplastin released by platelets will be activated and convert prothrombin into the enzyme thrombin if calcium ions are in the right concentration. In this way it makes them "disappear" so the blood clotting cascade is not triggered.



Good answer-2 marks

(b) When blood is stored, it is mixed with EDTA.

EDTA binds strongly to calcium ions.

Suggest why EDTA is added to blood before storage.

(2)

Because vitamin K and calcium catalyses the ~~reaction~~ conversion of insoluble fibrinogen to an insoluble fibrin. ~~the~~ fibrin creates a mesh. So no reaction will occur.



Incorrect biology-0 marks

Question 8 (c) (i)

Candidates were asked to explain how primary structure of protein of fibrinogen produces fibrin. Similar questions in a different context have been asked in previous series. Some candidates went into detail about amino acid structure but did not extend their description further than secondary structure and were therefore limited in the number of marks they could access. A high percentage of candidates produced a clear accurate answer and gained all 4 marks which was pleasing.

(c) During the clotting process, the soluble protein fibrinogen is converted to insoluble fibrin.

(i) Explain how the primary structure of fibrinogen produces this soluble protein.

(4)

Primary structure is the sequence of amino acids. ~~Difference in b~~ ^{There} There is a difference in bonding (hydrogen bonds, disulphide bridges) between R groups. This would lead to a difference in tertiary structure of the protein.



ResultsPlus
Examiner Comments

mp1 and 2-insufficient for mp2-2 marks in total

(c) During the clotting process, the soluble protein fibrinogen is converted to insoluble fibrin.

(i) Explain how the primary structure of fibrinogen produces this soluble protein.

(4)

To begin with primary structure is the sequence of amino acids in the peptide bond. Fibrinogen is soluble, because it's a polar, meaning that it has hydrophilic ends that can bind to other hydrogens. ~~The primary structure~~



ResultsPlus
Examiner Comments

mp1 only. mp6 is not awarded as there is no reference to the orientation of hydrophilic parts

(c) During the clotting process, the soluble protein fibrinogen is converted to insoluble fibrin.

(i) Explain how the primary structure of fibrinogen produces this soluble protein.

(4)

The primary structure is a sequence of amino acids in a polypeptide chain. It then forms an alpha helix or a beta ~~sheet~~ pleated sheets with hydrogen bonds. The tertiary structure is then formed, which has hydrogen bonds, hydrophobic bonds, ionic bonds, and disulfide bonds. The tertiary ~~star~~ structure is a 3D globular protein which is soluble. It is soluble because the hydrophilic parts ~~are~~ are on the outside of the protein and the hydrophobic ~~are~~ are on the ~~inside~~ inside of the protein.



ResultsPlus
Examiner Comments

mp1 2 5 and 6 in that order. Good answer-4 marks awarded



ResultsPlus
Examiner Tip

Make use of past mark schemes and clips present in examiners reports as part of revision.

Question 8 (c) (ii)

Candidates were asked to suggest how fibrinogen is converted to fibrin by protease. This was a high level question and only a few candidates were able to gain both marks.

(ii) Fibrinogen is converted into fibrin by a protease enzyme.

Suggest how the structure of fibrinogen is changed to form fibrin.

(2)

The shape of the active sites changes. It can bind to a substrate substrates to form enzyme substrate complex. It's ~~active~~ active site can now bind to more substrates, so it is soluble.



No marks awarded

(ii) Fibrinogen is converted into fibrin by a protease enzyme.

Suggest how the structure of fibrinogen is changed to form fibrin.

(2)

Fibrinogen is globular and fibrin is a fibrous protein.



No marks awarded

(ii) Fibrinogen is converted into fibrin by a protease enzyme.

Suggest how the structure of fibrinogen is changed to form fibrin.

(2)

~~Thrombin, an active enzyme can~~

The protease enzyme assist in the breaking of soluble fibrinogen to insoluble fibrin by helping in breaking bonds or providing optimal PH - The structure changes by removal of OH molecule which would make it non polar and therefore insoluble.



Excellent answer-both marks awarded

Paper Summary

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

- Read the whole question carefully, including the introduction, to help relate your answer to the context. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question.
- Read your answers back carefully – do they answer the question, have you made at least as many clear points as marks are available?
- When asked to distinguish between two things make sure your answer is comparative and mentions both things being compared or uses comparative language.
- When asked to describe data, either graphs or tables, look first for the main trends i.e. the overall changes, correlation and describe these. You need then to make a judgment about the usefulness of any mathematical manipulation of the data and this should only be carried out if it adds value to your written description.
- Do not be afraid to include a sketch diagram, flow chart or graph if it will help add clarity to your answer.
- When describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount.
- Pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions.
- Include the stages in a calculation and set out the answer carefully so that the examiner can follow the working.
- Explore and assess examples of candidate responses from this report and others 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.

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>

