

Examiners' Report  
June 2012

GCE Biology 6BI01 01

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## Introduction

This paper appears to have worked very well with only a few questions (for example some of the multiple choice questions) achieving the full spread of marks. Very few questions were left blank and there was no evidence in the majority of papers that candidates had insufficient time to complete the paper.

It was pleasing to see that many candidates have learnt from previous papers and reports and there are fewer examples of 'amount', 'chronic villus sampling' and stating ratios when asked for a probability. Unfortunately, too many candidates do not read the questions carefully and happily try and answer a question that has been asked on a previous paper rather than the question in front of them. This was particularly evident with question 4(c) and 7(b)(iv).

Candidates also need to check their answers for sense. For example why spend all of their time describing the full circulation of blood around the body when they are asked to describe the structure of the heart? Why will the pH increase if acid is released? In an experiment to investigate the effect of changing substrate concentration on the rate of triglyceride hydrolysis – why vary enzyme concentration, and why would you use a beetroot?

Some candidates lost marks through poor literacy and basic numeracy (for example calculating a percentage change); others through carelessness and only making one clear statement when a question carries two or more marks.

Having said this, there were large numbers of excellent responses; often being concise, clear and comprehensive, showing a good use of technical terms and biological names.

The multiple choice questions in question 1 caused few problems with the majority of candidates getting each question correct, with the exception of 1(c), where only two thirds of candidates correctly identified the correct bond.

## Question 1(g)

These responses are a cross section of the range of marks on offer. More candidates gained all four marks than scored no marks.

Most candidates stated correctly that mRNA leaves the nucleus and is used in translation. Few candidates told us that mRNA is a copy of the coding strand of the DNA and that it binds to the ribosome. The most frequent mistake was to say that mRNA is a copy of DNA, without specifying the strand involved in being copied or to describe the translation of DNA, sometimes in a wrong manner.

The majority of candidates recognised that tRNA is involved in translation, carries amino acid and binds to codons present in mRNA. Few candidates told us that two tRNA bring amino acids together for peptide bonds to be formed. A common mistake was to state the tRNA is made of amino acids.

This is an example of a good response scoring all four marks available.

(g) Describe the role of each of the following in protein synthesis.

(4)

mRNA Complementary bases paired <sup>ing from</sup> to the template strand on the DNA molecule. It is messenger RNA and once replicated from the DNA transports the information from the nucleus through the nuclear envelope to the ribosome. Made up from <sup>free</sup> mononucleotides joined together. Involved in transcription

tRNA Transfer RNA carries amino acids and the complementary triplet base pairs to the ribosome in order for translation to take place. Enable complementary base pairing between the codon and the anticodon ~~at~~ the ribosome and for amino acids to bond together with peptide bonds to form a protein.



**ResultsPlus**  
Examiner Comments

This candidate has gained credit for recognising that mRNA is formed from complementary base pairing to part of the DNA and that it can be transported out of the nucleus. The tRNA has also been correctly described as carrying amino acids and being involved in translation, with anticodons interacting with codons.



This response scores three of the four available marks.

(g) Describe the role of each of the following in protein synthesis.

(4)

mRNA mRNA is used in the process of transcription. The DNA unwinds and free nucleotides join up complementary to the DNA. This forms the mRNA which then leaves the <sup>nucleus</sup> through a <sup>pore</sup> in the nuclear envelope. The mRNA is then <sup>transported to ribosomes to attach</sup> joined ~~to~~ to anti-codons on amino acids.

tRNA Is used to transport amino-acids which have an anti-codons to the rRNA (ribosomes). They are used in translation. Have amino acids attached which then form polypeptides to form a protein by forming peptide bonds between amino acids.



**ResultsPlus**

**Examiner Comments**

This response gained credit for recognising that mRNA can leave the nucleus and be transported to ribosomes, tRNA transporting amino acids and tRNA being used in translation.

Please note that free nucleotides complementary to DNA are not enough for a mark as they could be describing replication.



**ResultsPlus**

**Examiner Tip**

Transcription only copies a small part of the DNA so this should be made clear in any description of transcription.

This response scores no marks.

(g) Describe the role of each of the following in protein synthesis.

(4)

mRNA Messenger RNA is present at the point of the triplet code and converts the mRNA by bases to tRNA amino acids.

tRNA Transfer RNA is the amino acids that are chained together to form proteins.



**ResultsPlus**

**Examiner Comments**

This response illustrates some of the problems a few candidates had by confusing RNA, amino acids and DNA.



**ResultsPlus**

**Examiner Tip**

Check that you understand that DNA and RNA are essentially codes and that proteins are made from the amino acids joined together in a specific order during translation.

## Question 2(a)(i)

This question was designed to be a straightforward recall question asking candidates to compare monosaccharides and disaccharides. Many candidates made two clear comparative comments, but a significant number only made one comment and still others failed to compare the two types of molecule. Pleasingly a few candidates made valid comparisons between the structural formulae of the two types of molecule.

This response scores both marks available.

2 Carbohydrates are important components of our diets.

(a) Distinguish between the structures of each of the following pairs of carbohydrate molecules.

(i) Monosaccharides and disaccharides

(2)  
Monosaccharides are single sugar units such as glucose, in monosaccharides there is only one single sugar unit, a hexose sugar, with the formula  $(C_6H_{12}O_6)_n$ . Disaccharides contain two single sugar units reacted together in a condensation reaction and the disaccharide contains the two sugar units held by a glycosidic bond.



**ResultsPlus**

**Examiner Comments**

This candidate has recognised two clear differences between the two types of molecules - the number of sugar units and the presence of the glycosidic bond. The formula for monosaccharides alone is not enough for a mark by itself as no direct comparison has been made to the disaccharide structure.



**ResultsPlus**

**Examiner Tip**

When asked to distinguish between two things make sure you make a comparative point that clearly refers to both things being compared.

This response scores no marks.

2 Carbohydrates are important components of our diets.

(a) Distinguish between the structures of each of the following pairs of carbohydrate molecules.

(i) Monosaccharides and disaccharides

(2)  
A monosaccharide is a single carbohydrate molecule and is not attached to anything. A Disaccharide is 2 carbohydrate molecules joined together.



**ResultsPlus**  
Examiner Comments

Carbohydrate molecule is too vague for credit as a disaccharide is also a single carbohydrate molecule.



**ResultsPlus**  
Examiner Tip

Make sure you express yourself clearly when describing molecules.

This response scores one of the two marks available.

2 Carbohydrates are important components of our diets.

(a) Distinguish between the structures of each of the following pairs of carbohydrate molecules.

(i) Monosaccharides and disaccharides

(2)  
monosaccharides = one sugar molecule, disaccharides = two sugar molecules. Both straight chain.  
glucose = monosaccharide lactose = glucose and galactose therefore disaccharide.



**ResultsPlus**  
Examiner Comments

One relevant comparison between the two molecules has been made.



**ResultsPlus**  
Examiner Tip

If a comparative question is worth two marks make sure you include two clear statements.

## Question 2(a)(ii)

This question asked candidates to compare amylose and amylopectin. A higher proportion of candidates managed to score both marks for this question than they did for question 2ai. On the whole there was a good recall of the differences in bonding and branching between the two molecules. Unfortunately some candidates did not make comparative comments e.g. just pointing out that amylopectin is branched without commenting on the lack of branches with amylose. A few candidates thought that amylose is a monosaccharide and a few confused amylose and amylase.

This response scores both available marks.

(ii) Amylose and amylopectin (2)

Amylose contains 1-4 glycosidic bonds between glucose molecules and has no side branches, it has a coiled structure. Amylopectin has 1-4 and 1-6 glycosidic bonds, has side branches. ~~and is no such~~ Both are found in starch



**ResultsPlus**  
Examiner Comments

This candidate has compared the bonding and branching between the two molecules and has also correctly pointed out that amylose is a coiled molecule.

This response scores one of the two marks available.

(ii) Amylose and amylopectin (2)

Amylose has 1,4 glycosidic links <sup>which</sup> and ~~it~~ is a straight chain, whereas amylopectin is 1,6 glycosidic links and it is a branched chain.



**ResultsPlus**  
Examiner Comments

This candidate has correctly compared the straight chain with the branched chain of amylopectin. However, the comparison of the bonds is not clear enough for credit as amylopectin has 1-4 as well as 1-6 glycosidic bonds.

This response scores one mark.

(ii) Amylose and amylopectin

(2)

Amylose is curled into a coil so its very compact. made of  $\alpha$  glucan like amylopectin but amylopectin is ~~straight~~ branched so it can easily be broken down as the peptide bond can be got at by enzymes



**ResultsPlus**

**Examiner Comments**

This candidate has correctly identified that amylose is a coiled molecule. However, the comment about amylopectin being branched is not sufficient for credit as no clear comparison has been made with amylose and peptide bonds are incorrect.



**ResultsPlus**

**Examiner Tip**

When asked to distinguish between two molecules make sure you make a comparative comment that refers to both molecules.

## Question 2(b)

This question achieved an exact spread of marks with a third of candidates scoring 0, a third scoring 1 and a third scoring both marks available. There were some very good answers where candidates demonstrated a good understanding of diet and energy balance. However, some candidates focussed on the storage properties of carbohydrates rather than why an excess could cause weight gain. Some candidates thought that carbohydrates contain fat and others thought that rather than being a source of energy carbohydrates used energy to be digested and broken down.

This response scored both marks available.

(b) Explain why a diet consisting of a high proportion of carbohydrates could lead to obesity. (2)

A high intake of carbohydrates would change the energy budget significantly. If the intake is higher than the output through exercise and other methods then there will be weight gain because the excess energy and carbohydrate calories will be stored as fat.

(Total for Question 2 = 6 marks)



**ResultsPlus**

**Examiner Comments**

This candidate has recognised that weight gain is a consequence of energy imbalance.



**ResultsPlus**

**Examiner Tip**

To improve this answer it could be made clearer that carbohydrates are a source of energy and that it is the carbohydrates that are being converted to fat (not the energy).

This response scored one of the two marks available.

(b) Explain why a diet consisting of a high proportion of carbohydrates could lead to obesity. (2)

Because <sup>excess</sup> carbohydrates are converted into ~~fats~~ <sup>fatty</sup> and fats are store in the adipose ~~tissu~~ tissues.



**ResultsPlus**

**Examiner Comments**

This candidate correctly recognises that excess carbohydrates can be stored as fat. Where the fats are stored is not directly relevant to the question asked so does not gain any extra credit for this information.

This response scores no marks.

(b) Explain why a diet consisting of a high proportion of carbohydrates could lead to obesity. (2)

Contain high proportions of saturated fats which are bad and can cause obesity.



**ResultsPlus**

**Examiner Comments**

A common error with this question was in candidates thinking that carbohydrates contain fats or LDLs which is why they contribute to obesity.



**ResultsPlus**

**Examiner Tip**

Remember the key to weight gain or loss is the energy balance of the body.



This response also scored no marks.

(b) Explain why a diet consisting of a high proportion of carbohydrates could lead to obesity.

(2)

Carbohydrates are excellent storage molecules, they are insoluble in water so they will last a long time. Also they are compact and do not swell with water via osmosis so they store very easily leading to obesity.



**ResultsPlus**

**Examiner Comments**

A significant number of candidates got distracted by the storage properties of some carbohydrates and either focussed on how good they are to store, or how long it takes to break them down.



**ResultsPlus**

**Examiner Tip**

Just because a molecule can be stored it will not automatically cause obesity.

### **Question 3(a)**

Most candidates had good knowledge of the heart and could name many of its structures, however, candidates may have achieved more marks if they structured their answer to avoid them getting into a muddle or included a labelled diagram. Too many answers gave an account of the cardiac cycle and full circulatory system or described the functions rather than the structures of the heart and therefore missed marks by not answering the question that had been asked.

This question was assessed for QWC (quality of written communication) with an emphasis on spelling technical terms correctly. The most common spelling errors were *atriums and ventricals*. Candidates were able to generally score well on this item, with most gaining between 3 to 5 marks. Interestingly, very few candidates made use of diagrams in their answers, those that did often picked up marks easily by clearly showing where structures were positioned in the heart. Candidates often pointed out that there were 4 chambers, but did not always refer to the position of the atria relative to the ventricles. There were only a few simple and clear descriptions of separation of the sides and surprisingly few references to the muscular nature of the walls. Many stated that the 'left side was thicker than the right side' without reference to the ventricles, atria or walls. Marks were commonly gained for clear descriptions of the position of the AV valves and indeed it was pleasing to see good and correct descriptions referring to the positions of bicuspid and tricuspid valves. However, inevitably there were a small number of candidates who mixed these up and stated them the wrong way round. With the semilunar valves, many responses simply referred to these being between the respective ventricle and artery, without actually stating their location just within or at the beginning of the arteries. There were a small number of answers which included tendons/tendinous cords. Some references were seen for SAN / Sino atrial node and a minority referred to coronary arteries covering the heart walls or bringing oxygenated blood / nutrients to the heart. The better answers clearly linked the aorta, vena cava, pulmonary artery and vein to the correct chambers by statement, but these marks were often gained by candidates describing the correct blood flow sequence.

This response scores all five marks available.

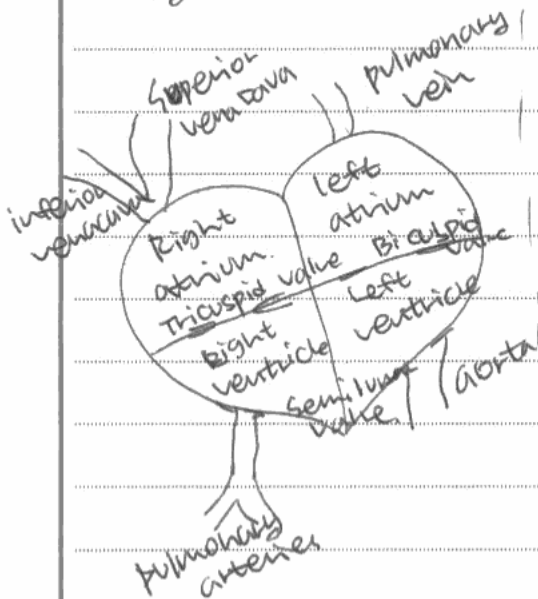
3 Many animals, such as mammals, have a heart and circulation. This helps them to meet their requirements by overcoming the limitations of diffusion.

\*(a) Describe the structure of the mammalian heart.

(5)

Normally ~~the~~ the mammalian's heart has double circulation system so the circulatory process takes twice in ~~one~~ <sup>each</sup> circuit of the heart.

eg. human's heart. ; There are 2 atria and 2 ventricles in the heart.



There is tricuspid valve between right atrium and right ventricle and bicuspid valve between left atrium and left ventricle. Semilunar valves between ventricles and aorta or pulmonary arteries prevent blood flowing back to the heart. Normally left ventricle has thick wall to push blood <sup>all</sup> around the body.

however relatively thin wall in right ventricle prevent damage to lungs and delicate lung cells.

~~the~~ Atria has very thin wall than ventricles because they need to push ~~the~~ blood relatively 'short distance' to ventricles.



**ResultsPlus**  
Examiner Comments

This response more than covers enough marks to score the maximum marks available, it also demonstrates the value of a quick sketched diagram to help clarify points made.

The text covers the separation of the left and right sides, the 4 chambers, position of the AV valves and the relative thickness of the ventricle wall. The diagram helps clarify some of these points and also makes it clear which atria the veins enter and the relative positions of the atria and ventricles. The arteries are associated with the correct ventricles, but are clearly drawn in the wrong position so would not gain credit.



**ResultsPlus**  
Examiner Tip

Don't be afraid to sketch a diagram or graph where it is appropriate to help explain points in an extended written answer.

This response scores two of the five marks available.

3 Many animals, such as mammals, have a heart and circulation. This helps them to meet their requirements by overcoming the limitations of diffusion.

\*(a) Describe the structure of the mammalian heart.

(5)

A mammals ~~heart~~ heart has 4 chambers.  
At the top are a right and left ~~to~~ atrium and at the bottom ~~is~~ there is a right and left ventricle. Within these chambers there a valves that stop blood backflow such as the semilunar valve. Connected to the heart are some veins and arteries to carry the blood away. The aorta is the biggest and thickest. It carries blood under high pressure away from the heart to the rest of the body. It then returns de-oxygenated blood to the heart through the venacava. The pulmonary artery takes deoxygenated blood to the lungs and the pulmonary vein receives the reoxygenated blood. The heart also has a vast network of blood vessels as it requires alot of oxygen and ~~nut~~ nutrients.



**ResultsPlus**  
Examiner Comments

This candidate gains credit for recognising the number and relative positions of the 4 chambers of the heart. Unfortunately it is a typical example of where although the candidate recognises other features of the heart and circulation they are expressed too vaguely to be worthy of credit. For example it is not clear where the named blood vessels and valves are and the coronary blood vessels are not named.



**ResultsPlus**  
Examiner Tip

When answering an extended question about the structure of an organ construct your answer carefully to make sure details are fully described and correct technical names are used.

This response scores one of the five marks available.

3 Many animals, such as mammals, have a heart and circulation. This helps them to meet their requirements by overcoming the limitations of diffusion.

\*(a) Describe the structure of the mammalian heart.

(5)

The mammalian heart use mass transport to supply the specialised organs with nutrients. Mammalian heart has a double-circulatory system. Where the left side of the heart pumps oxygenated blood to the whole body and the right side of the heart keeps the deoxygenated blood separate. The structure helps it diffuse minerals more efficiently than a single-circulatory system. Diffusion occurs easily in mammalian heart because the cells gets a constant supply of oxygen through the blood being transported.



**ResultsPlus**

**Examiner Comments**

This candidate gains credit for the description of the left and right sides being separate. The role of the heart and circulation is covered, but the question asks for the structure of the heart to be described which is clearly not described in this response. Unfortunately this is a common fault of many candidates' answers.



**ResultsPlus**

**Examiner Tip**

Read the question carefully and make sure you answer the question asked.

### **Question 3(b)**

Most candidates said that the heart has to pump the blood a long way around the body of the giraffe, that the giraffe needs a circulation to provide oxygen because diffusion alone is not efficient, due to a low surface area to volume ratio. Some candidates said that the blood needs to be pumped at high pressure and that the giraffe has a double circulatory system. Few candidates said that capillaries are needed to ensure that all parts of the giraffe body are close to the blood supply and even less that oxygen is needed for the high metabolic rate of the giraffe or that the circulatory system helps regulation of body temperature.

There were some nice descriptions in the best answers linking the idea of double circulation to the high blood pressure and pumping blood a long way, as well as the pressure being less high for pumping to the lungs to avoid damage.

Surface area to volume ratio was frequently not fully understood with the result that candidates said it is large in a giraffe. A few candidates even referred to the giraffe needing to be active to catch its prey.



This response scores all four marks available.

(b) Giraffes are very tall mammals found roaming the plains of Africa. Two giraffes are shown in the photograph below.



Using the information in the photograph and your own knowledge, explain the importance of the heart and circulation to the giraffe.

(4)

A giraffe is a large multicellular animal with a low surface area to volume ratio so it cannot rely on diffusion to get oxygen ~~and~~ around its body and remove carbon dioxide. A large strong heart ~~is~~ creates sufficient pressure to pump the large volume of blood that a giraffe needs around its body. The pressure created by the heart also allows oxygen ~~and~~ rich blood to travel up a giraffe's long neck to its ~~tail~~ head.



**ResultsPlus**

**Examiner Comments**

This candidate recognises the problems and limits of a large body size and what the heart is used for.



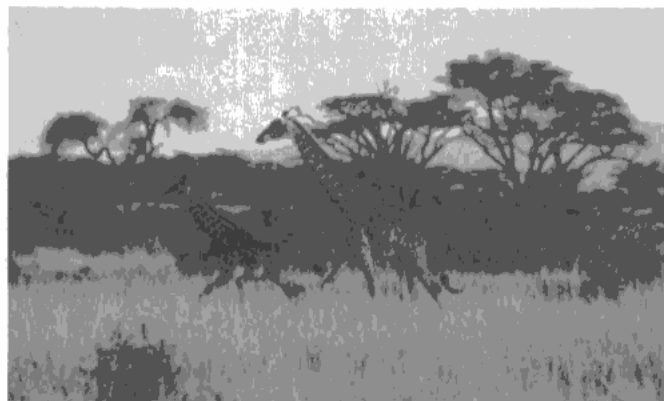
**ResultsPlus**

**Examiner Tip**

Please note that 'sufficient pressure' is not the same as 'high pressure' and therefore this response would not receive the mark for the heart producing high blood pressure.

This response scored two of the available four marks.

(b) Giraffes are very tall mammals found roaming the plains of Africa.  
Two giraffes are shown in the photograph below.



Using the information in the photograph and your own knowledge, explain the importance of the heart and circulation to the giraffe.

(4)

- the giraffe has a large surface area: volume ratio so cannot get all its gas requirements via diffusion
- the giraffe will require a heart and circulation more than most mammals as they need blood to travel from the heart to the brain, which is very far away due to its long neck
- as giraffes are very tall a circulatory system is important to make sure nutrients are carried to every part of the animal in its blood

(Total for Question 3 = 9 marks)



### ResultsPlus Examiner Comments

This candidate recognises that diffusion is not sufficient by itself and that the blood carries nutrients around the body. However, they have not made it clear what the heart does to get blood all the way up to the brain and they have made the common mistake to state that a large body gives an animal a large surface area to volume ratio.



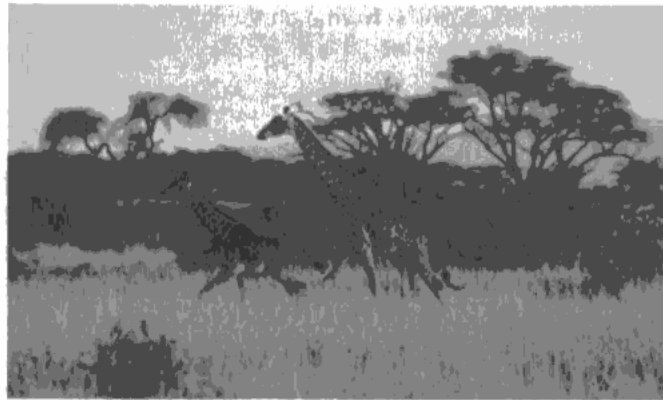
### ResultsPlus Examiner Tip

Remember large bodies mean a very large volume so normally the surface area to volume ratio is small.



This is a typical example of a response that did not receive any marks.

(b) Giraffes are very tall mammals found roaming the plains of Africa.  
Two giraffes are shown in the photograph below.



Using the information in the photograph and your own knowledge, explain the importance of the heart and circulation to the giraffe.

(4)

The heart is important because it is needed for the giraffes respiration and produce sufficient energy for it to use. It needs the heart for movement, Gas exchange and destroy wastes of the body.



**ResultsPlus**  
Examiner Comments

This candidate has not expressed themselves clearly enough, or included sufficient detail for credit expected at AS level.



**ResultsPlus**  
Examiner Tip

Make sure answers include detail covered at the level expressed in the AS specification content.

### **Question 4(a)**

Most candidates stated that the enzyme increases the rate of reaction. Some candidates said that the rate of reaction with the enzyme present is non-linear and correctly manipulated figures. It was pleasing to see that most candidates did phrase this correctly along the lines that there was a decreasing rate of increase in the rate of reaction with increasing substrate concentration.

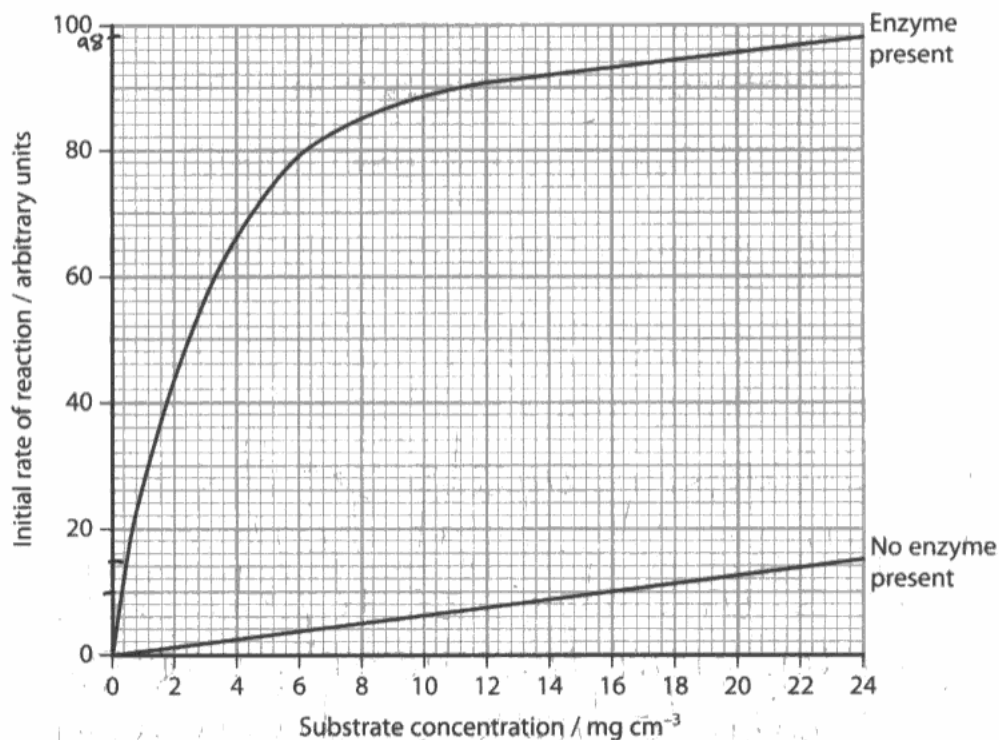
However, only a few candidates spotted that the increase in rate of reaction is the same with or without the enzyme present above substrate concentrations of 10/12.

The most common mistakes were to link the increase in the rate of reaction to the increase in substrate concentration; to state that the rate of reaction slowed down at higher concentrations; or to just quote figures straight from the graph without manipulating them.

This response scored both marks available.

4 Enzymes are biological catalysts. They are involved in many chemical reactions in the body, including the digestion of lipids.

(a) The graph below shows the effect of an enzyme on the initial rate of reaction at different concentrations of the substrate.



Describe the effects that the enzyme had on this reaction.

It increased the rate of reaction. At concentration of  $24 \text{ mg cm}^{-3}$ , with no enzyme present, rate of reaction was 15 arbitrary units. With enzyme, rate of reaction was 83 units higher at 98 arbitrary units. (2)



**ResultsPlus**

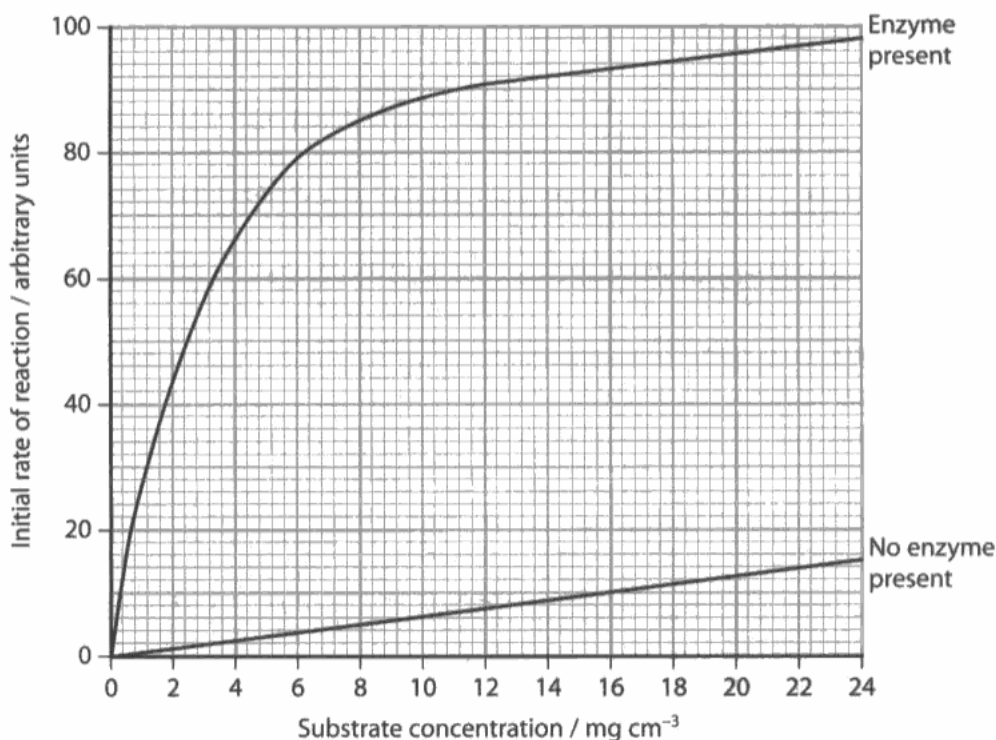
**Examiner Comments**

This candidate has recognised the effect of the enzyme and illustrated it with a correct manipulation of the figures by stating how much higher the rate is at a particular concentration.

This response scored one of the two marks available.

4 Enzymes are biological catalysts. They are involved in many chemical reactions in the body, including the digestion of lipids.

(a) The graph below shows the effect of an enzyme on the initial rate of reaction at different concentrations of the substrate.



Describe the effects that the enzyme had on this reaction.

(2)

The presence of an enzyme significantly increased the initial rate of reaction for all substrate concentrations compared to the experiment where no enzyme was present.



### ResultsPlus Examiner Comments

This response is typical of the large number of responses which scored just one mark for recognising that the enzyme increases the rate of reaction.



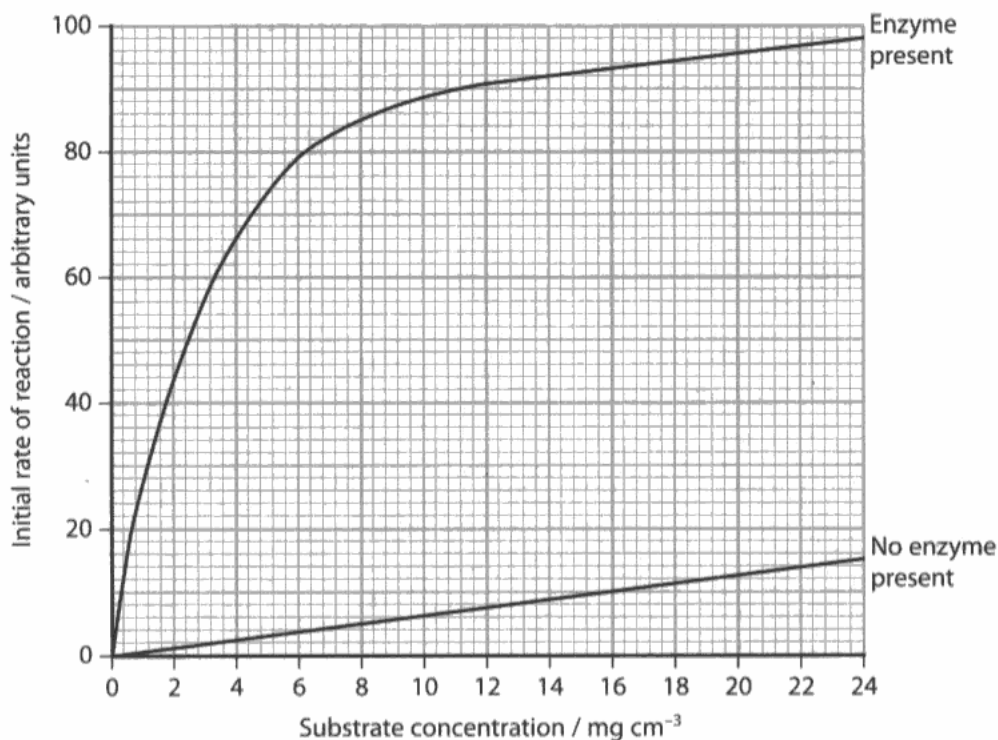
### ResultsPlus Examiner Tip

When describing a graph worth more than one mark identify any changes in the trend shown in the data and/or manipulate figures to illustrate the point made.

This response scored both marks available.

4 Enzymes are biological catalysts. They are involved in many chemical reactions in the body, including the digestion of lipids.

(a) The graph below shows the effect of an enzyme on the initial rate of reaction at different concentrations of the substrate.



Describe the effects that the enzyme had on this reaction.

(2)

The enzyme increased the initial rate of reaction. It was most effective while the substance concentration was low. From 12 mg the rate of reaction increased the the same amount for the enzyme as it did for the one without it.



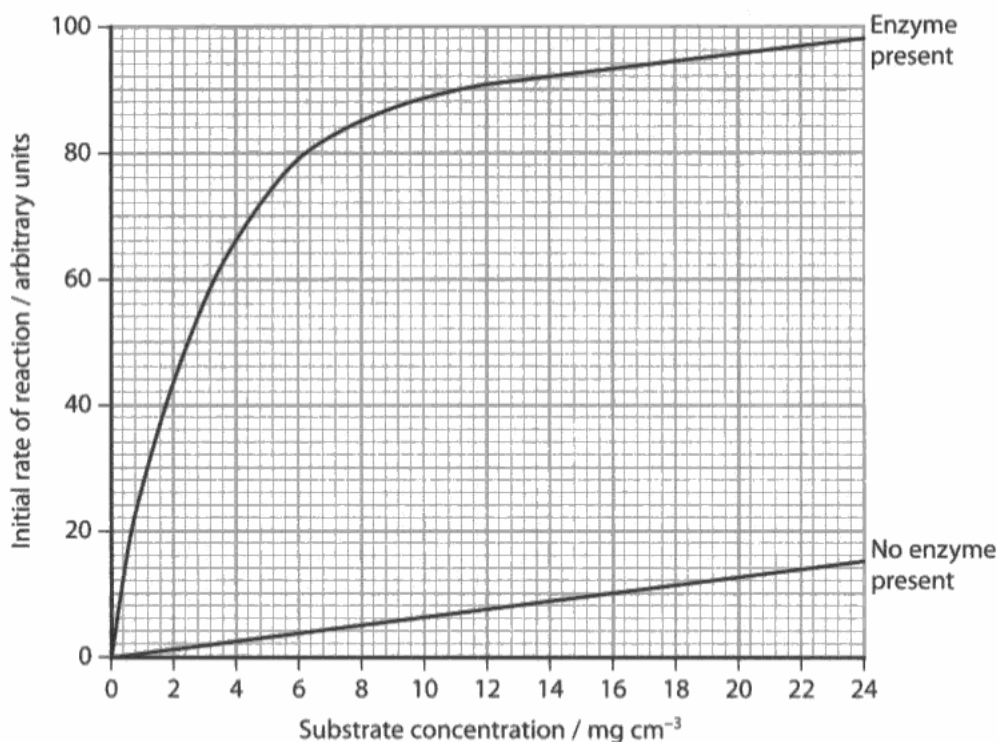
**ResultsPlus**  
Examiner Comments

This candidate has recognised that the enzyme increases the initial rate of reaction, but they have also spotted that the rate of increase changes and actually matches the increase of rate without the enzyme at the higher concentrations.

This response scores no marks.

4 Enzymes are biological catalysts. They are involved in many chemical reactions in the body, including the digestion of lipids.

(a) The graph below shows the effect of an enzyme on the initial rate of reaction at different concentrations of the substrate.



Describe the effects that the enzyme had on this reaction.

(2)

The greater the concentration of substrate, the faster the initial rate of reaction - therefore showing that the enzyme had lowered the activation energy for the reaction to occur



**ResultsPlus**

**Examiner Comments**

This response is typical of those that failed to score any marks as they have not answered the question asked. They are asked to describe the effects of the enzyme and instead describe the effects of the substrate concentration. They explain what the enzyme does, but again that has not been asked in the question.



**ResultsPlus**

**Examiner Tip**

Read the question carefully and answer the question asked.



### Question 4(b)(i)

Over three quarters of candidates correctly recognised that it would be an ester bond broken. The most common mistakes involved naming glycosidic, peptide and hydrogen bonds.

(b) Lipases are enzymes that are involved in the breakdown of lipids, such as triglycerides.

(i) Name the bond broken by lipases.

(1)

ester



**ResultsPlus**  
Examiner Comments

This is a typical response that scored the mark.

(b) Lipases are enzymes that are involved in the breakdown of lipids, such as triglycerides.

(i) Name the bond broken by lipases.

(1)

glycosidic



**ResultsPlus**  
Examiner Comments

This is an example of one of the most common errors resulting in the mark not being awarded.

### Question 4(b)(ii)

Most candidates correctly recognised that glycerol and fatty acids were the products of the breakdown of triglycerides. The most common error was to include water as a product of this hydrolysis reaction.

Marks were also lost for triglycerides, oxygen, energy, or glycogen. Several candidates referred to fatty acid tails.

We were pleased to see propan1,2,3-triol occasionally.

This response scores both available marks.

(ii) Name **two** products formed from the breakdown of triglycerides by lipases. (2)

1 glycerol

2 fatty acids



**ResultsPlus**  
Examiner Comments

This is an example of the most common correct response.

This response scored no marks.

(ii) Name **two** products formed from the breakdown of triglycerides by lipases. (2)

1 Glucose

2 water



**ResultsPlus**  
Examiner Comments

This response illustrates two of the most common errors:

- confusing glucose and glycerol; and
- thinking that water is a product of a hydrolysis reaction.



**ResultsPlus**  
Examiner Tip

Remember that condensation reactions remove water and hydrolysis reactions add water to the molecules.



### Question 4(b)(iii)

There were an alarmingly high number of candidates who thought that the pH would increase some even qualifying this with the recognition that there would be more acid present. Some responses ignored the question asked and wrote about enzymes and rates of reaction instead. As a result only just over half of the candidates actually managed to obtain this mark.

This response gained the available mark.

(iii) Suggest what effect the breakdown of triglycerides could have on the pH of a reaction mixture.

(1)

A break down of triglycerides would decrease the pH (reaction mixture would become <sup>more</sup> acidic).



**ResultsPlus**

**Examiner Comments**

This candidate has correctly recognised that the mixture would become more acidic and therefore the pH will decrease.

This response scores no marks.

(iii) Suggest what effect the breakdown of triglycerides could have on the pH of a reaction mixture.

(1)

it could cause the pH of a reaction mixture to increase.



**ResultsPlus**

**Examiner Comments**

This response illustrates the most common error - i.e. forgetting which way round the pH scale goes.



**ResultsPlus**

**Examiner Tip**

Check answers carefully to make sure they make sense - is producing a lot of fatty **acids** likely to make the mixture more alkaline/less acidic?

## Question 4(c)

A number of candidates described the catalase experiment from the January paper, others included potatoes, beetroots and a variety of other variations of core practicals. Many candidates correctly referred to a range (or a number) of different substrate concentrations, but a sizeable number of candidates described a range of enzyme concentrations while keeping the substrate concentration constant. This was disappointing, considering the amount of information the candidates had to help them using the graph at the beginning of the question. Candidates who described a different experiment from the one asked for managed to gain access to a reasonable number of marks for recognising key design features of a plan.

Many candidates referred to repeats for reliability and also for controlling variables such as temperature or volume of solutions. Pleasingly, some candidates also clearly referred to the value of repeats without the enzyme and to controlling the lipase concentration. It was also pleasing to see a number of references to equilibrating the solutions and then mixing the enzyme and substrate.

It was disappointing to note the number of candidates who still insist on using the word 'amount', or describing room temperature as a reliable control variable.

Responses ranged widely from poorly expressed answers lacking in detail to very fine answers, clearly expressed, some of which gathered around 8 or 9 marking points for a maximum of 5.

There were many responses with descriptions of how to plot and draw a graph as if this were part of the experimental procedure.

Some candidates spent some time on safety – goggles, lab coats and the effect on any animals in work area.

This response scores all five marks available.

\*(c) The action of lipase can be investigated using a triglyceride as the substrate.

Describe an experiment, using lipase and a triglyceride, that could be carried out to collect data to plot a graph similar to the one shown in part (a).

(5)

Make about 10 solutions of the triglyceride each with a different concentration, ~~all~~ including a control with no triglyceride in. ~~Make~~ Use the same triglyceride in each solution. Measure the pH change in the first minute using an indicator (such as universal indicator - this will require the solution to be continuously stirred with something sterile); this will give the initial rate of reaction in pH/minute. Repeat the tests with the same concentrations but this ~~page~~ time with the addition of lipase. Use the same volume and concentration of lipase each time when adding it to a solution. Ensure all other variables

are kept constant throughout the experiment such as volume of substrate solution, amount of indicator, temperature. Repeat the whole experiment twice (so having done it 3 times in total) and average the results. Plot a graph of rate of reaction against concentration of substrate ~~one~~ with two lines - one for without enzyme and one for with the enzyme.



## ResultsPlus

### Examiner Comments

This is example of a candidate who clearly understands both the context of the investigation and the key elements of what to include in a plan. This candidate has actually met ten separate mark points through their clear description of the different variables and how to measure them (including the rate of reaction), the need to mix the solutions, what to repeat and suitable controls etc.



## ResultsPlus

### Examiner Tip

Use excellent examples like this to explore the features of a good exam description of a practical, but do not learn it under the assumption that we will ask the same question about the same practical in next year's exam!

This response scored two marks.

\*(c) The action of lipase can be investigated using a triglyceride as the substrate.

Describe an experiment, using lipase and a triglyceride, that could be carried out to collect data to plot a graph similar to the one shown in part (a).

(5)

- cut potato in same sized discs
- put in boiling test tube <sup>in</sup> ~~with~~ <sup>water bath</sup> distilled water
- add buffer solution
- put stop on and lead a hollow tube to a <sup>tube</sup> ~~water~~ containing ~~water~~
- count bubbles produced in 3 mins
- calculate volume of oxygen produced
- repeat two further time with same <sup>number</sup> ~~amount~~

of potato <sup>discs</sup> and <sup>then</sup> with different number of potato discs.

Independent Variable: concentration of enzyme  
→ number of potato discs

dependent variable: oxygen produced per time

control variable: temperature

time

pH



### ResultsPlus

#### Examiner Comments

This response is typical of many candidates who ignored the context of the investigation, but still managed to pick up a couple of marks for experimental design features - in this case control of temperature and measuring the time for the reaction. Using a buffer to control the pH is not useful in this context and the repeats are not clear or appropriate for the context of the investigation.



### ResultsPlus

#### Examiner Tip

Don't ignore the question and answer a question you hoped would appear on the paper instead.

This response scored one mark.

\*(c) The action of lipase can be investigated using a triglyceride as the substrate.

Describe an experiment, using lipase and a triglyceride, that could be carried out to collect data to plot a graph similar to the one shown in part (a).

(5)

Different solutions of <sup>the same</sup> pH were placed in dishes and small amounts varying between 10 - 50 ml of lipase and triglycerides were added to the solutions.

This was repeated twice giving 10 results.

The mean was then calculated and the

Solutions with the highest PH level showed what the reaction levels would be.

The variables were kept the same such as temperature and amount of concentration used.

The experiment could be improved if more results were taken.



### ResultsPlus Examiner Comments

This candidate has a partial idea of what the context of the investigation is but loses marks for lack of clarity. They gain a mark for a clear control variable (temperature). (Note amount of concentration would not gain the mark). Just what is repeated is not clear and the dependent and independent variables are not clear.



### ResultsPlus Examiner Tip

When describing an experiment make sure you clearly state dependent, independent and control variables and how they can be measured. Do not use amounts - use a variable that is measurable such as volume. Make it clear what you are repeating.

This response scores no marks.

\*(c) The action of lipase can be investigated using a triglyceride as the substrate.

Describe an experiment, using lipase and a triglyceride, that could be carried out to collect data to plot a graph similar to the one shown in part (a).

(5)

Measuring the beetroot permeability, in this experiment we would be measuring permeability. In which in this case would be investigating the lipase using triglyceride as the substrate. The change in colour of the beetroot would determine how ~~much~~ permeable the substance is.



### ResultsPlus Examiner Comments

This is typical of the candidate who is ignoring the context of the question and has got themselves confused - hoping for a question about a different core practical.



### ResultsPlus Examiner Tip

Use the context of the whole question to help cue you into what might be needed.

### Question 5(a)

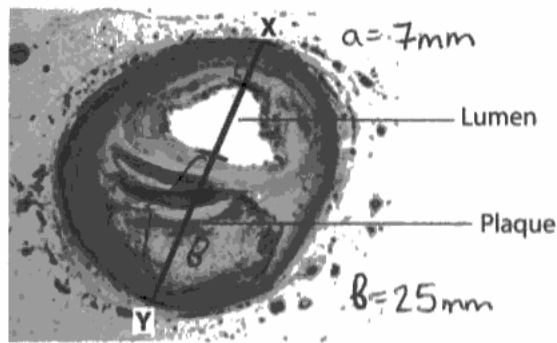
There were many clear and good answers to this question, with a pleasing number giving good, clear working with their answers. However, there were many who simply wrote down figures without clear presentation and some lost the final mark because they did not supply any units. Also, a significant number of candidates did not read the question carefully and made incorrect measurements, such as the X-Y distance, the thickness of the lumen and the thickness of the plaque alone.

A variety of ways of calculating the increase were allowed, but several candidates who tried struggled to calculate a percentage increase correctly.

This response scores all three marks available.

- 5 Cardiovascular disease (CVD) is responsible for many deaths. One cause of CVD is atherosclerosis.

The photograph below shows a section through an artery with a plaque (atheroma) from a patient with CVD.



- (a) Calculate the increase in the thickness of the artery wall where the plaque is located. Take your measurements along the line labelled X and Y. Show your working.

$$\begin{array}{r} \text{artery wall with } \text{\textcircled{X}} \text{ plaque} - \text{artery wall with no plaque} \\ B \text{\textcircled{X}} - a \\ 25 - 7 \\ 18\text{mm} \end{array} \quad (3)$$

Answer 18mm



**ResultsPlus**  
Examiner Comments

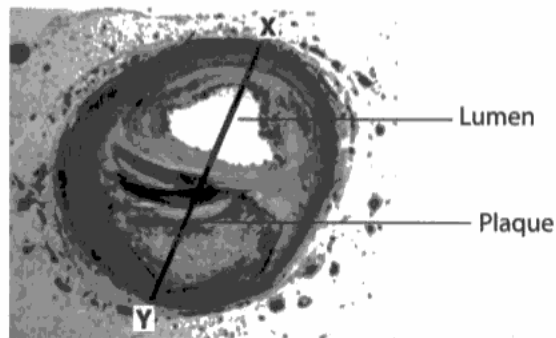
This candidate has measured (and annotated) the thickness of the two walls and clearly calculated the difference including correct units to gain all available marks.



This response scores all three marks available.

- 5 Cardiovascular disease (CVD) is responsible for many deaths. One cause of CVD is atherosclerosis.

The photograph below shows a section through an artery with a plaque (atheroma) from a patient with CVD.



- (a) Calculate the increase in the thickness of the artery wall where the plaque is located. Take your measurements along the line labelled X and Y. Show your working.

(3)

$$\begin{aligned} \text{original thickness} &= 8 \text{ mm} \\ \text{new thickness} &= 26 \text{ mm} \\ \text{increase} &= \frac{\text{change}}{\text{original}} = \frac{26 - 8}{8} = 2.25 \times \text{larger} \\ &= 225\% \text{ increase} \\ \text{increase} &= 26 - 8 = 18 \text{ mm bigger} \end{aligned}$$

Answer 2.25 x thicker



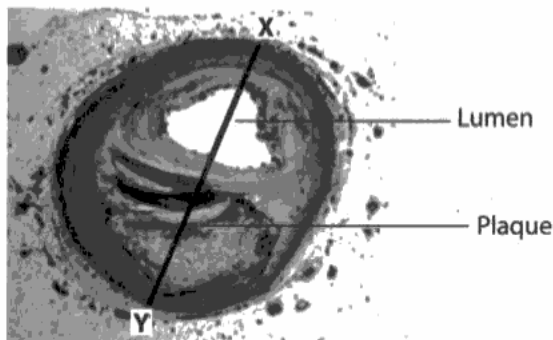
**ResultsPlus**  
Examiner Comments

Both of the correct measurements have been made and the candidate has included three acceptable ways of expressing the increase in thickness of the artery wall.

This response scored one of the available three marks.

5 Cardiovascular disease (CVD) is responsible for many deaths. One cause of CVD is atherosclerosis.

The photograph below shows a section through an artery with a plaque (atheroma) from a patient with CVD.



(a) Calculate the increase in the thickness of the artery wall where the plaque is located. Take your measurements along the line labelled X and Y. Show your working.

(3)

$$\begin{aligned} X \& \# Y &= 4.5 \\ \text{wall w/Plaque} &= 2.5 \\ 4.5 - 2.5 &= 1 \quad \text{Plaque} = 2.3 \\ 4.5 - 1.3 &= 3.2 \quad \text{Lumen} = 1.3 \\ 3.2 - 2.3 &= 0.9 \end{aligned}$$

Answer 0.9



### ResultsPlus Examiner Comments

This response is typical of the many candidates who measured the wrong parts of the diagram because they did not read and interpret the question and diagram carefully. They were awarded one mark for the measurement of the wall with the plaque, but none of the other measurements or calculations included are relevant.



### ResultsPlus Examiner Tip

When asked to calculate the increase in a value make sure you measure the value before and after or with and without the change.



### Question 5(b)(i)

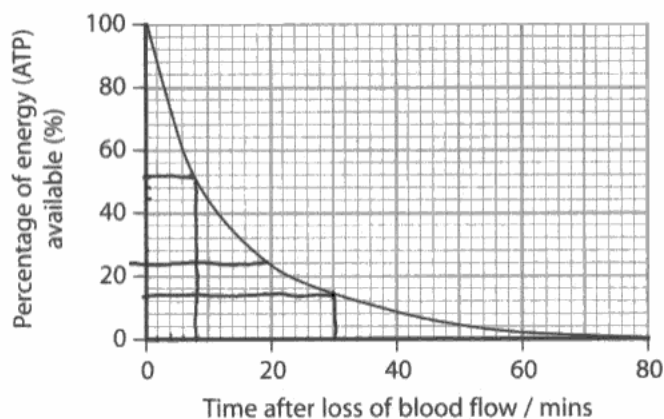
The vast majority of candidates were able to clearly express the decrease of energy with time and many of the better answers included a description of the fall in ATP/energy getting less with time. Pleasingly, there were some correct manipulations made from the graph at various points. However, many candidates simply quoted figures and candidates sometimes manipulated incorrect figures (by misreading the scale) taken from the graph. Some candidates inevitably insisted on an explanation of the changes, rather than a description as asked for.

This response scores both marks available.

(b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



(i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

Initially when at 0 mins loss of blood flow the percentage of ATP available is 100%. Then the largest drop is in the next 20 mins where 76% drop in available ATP, then it continues to drop at a lesser rate until the at 80 mins where there is no ATP available.



**ResultsPlus**  
Examiner Comments

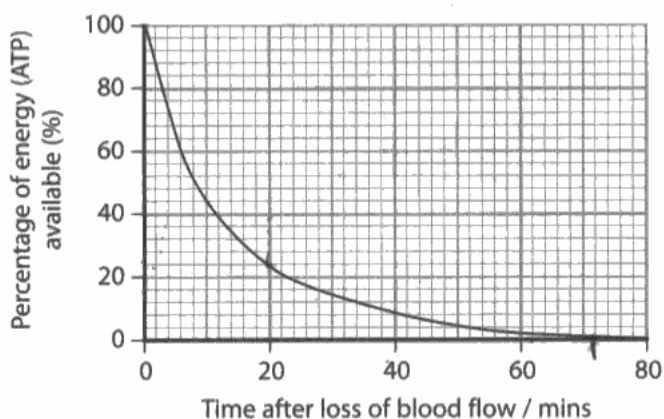
The candidate has identified the correct trend and also recognised that the decrease is not at a constant rate for the second mark.

This response scores both marks available.

(b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



(i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

There is a rapid decrease of energy (ATP) available in the first 20 minutes as it decreases by 76%. Between 0 and ~~20~~<sup>72</sup> minutes the percentage of ATP overall decreases from 100% to 0%.



### ResultsPlus Examiner Comments

This candidate correctly states the trend and illustrates it with a suitable manipulation of the data - in this case calculating the drop in the first 20 minutes.



### ResultsPlus Examiner Tip

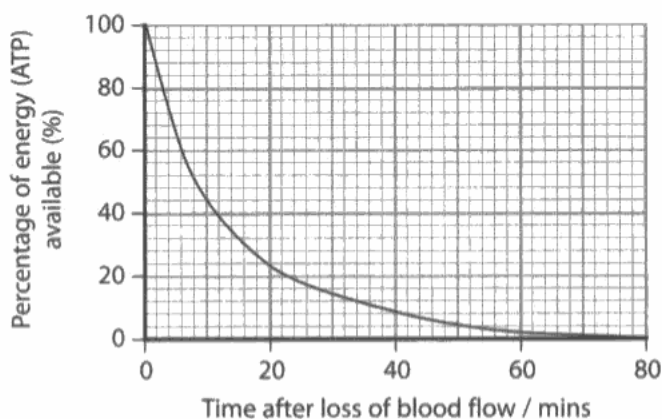
It is always worth manipulating figures e.g by calculating a change to illustrate points made in an answer.

This response scored no marks.

(b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



(i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

ATP is a source of energy used in active transport. It is used when taking a substance from an area of ~~low~~ concentration to an area of ~~low~~ high concentration. To move the blood where there isn't any to where there needs to be.



### ResultsPlus Examiner Comments

This is an example of a candidate not reading the question carefully and therefore missing the point significantly.



### ResultsPlus Examiner Tip

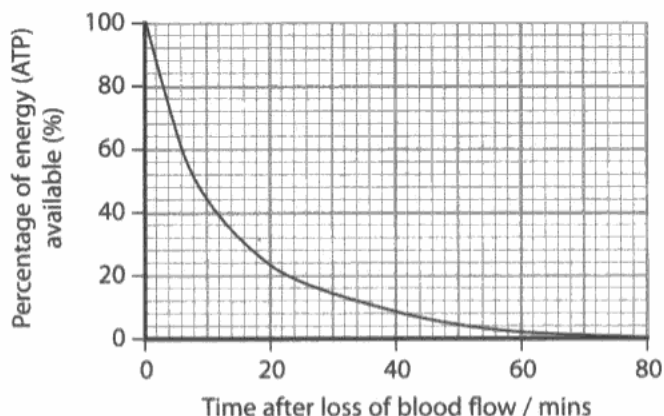
When asked to use the information from a graph to describe a change you need to describe the trend in the data shown.

This response gains one of the two marks available.

(b) The plaque often increases in size and can block the artery. If the artery supplying blood to the heart becomes blocked, blood no longer flows to the heart muscle cells. Shortly after the loss of blood flow, heart muscle cells stop contracting and start to die.

In the heart muscle cells, energy (ATP) is made available from respiration.

The graph below shows how the energy (ATP) available to heart muscle cells changes with time, after the loss of blood flow.



(i) Using the information in the graph, describe how the energy (ATP) available to the heart muscle cells changes with time after the loss of blood flow.

(2)

The percentage of energy (ATP) decreases as the time after blood loss increased. At 0 mins the percentage on energy available is 100%. At 20 mins the energy percentage is 24%. At 40 mins the percentage energy is 8%. At 60 mins the energy percentage is 2% and at 80 mins the energy percentage is at 0%. Therefore the ATP runs out over 80mins (they die)



### ResultsPlus Examiner Comments

This candidate has gained a mark for identifying the overall trend. However, just reading off values from the graph does not count as a manipulation of the figures and does not demonstrate that the candidate understands the change in rate of decrease.



### ResultsPlus Examiner Tip

Describing data does not mean turning the data from a graph back into a set of separate data points.

## Question 5(b)(ii)

There were many very clear answers gaining both marks and the majority of candidates had the idea of less oxygen available, but not all were able to score the second mark for the effect this would have on respiration. However, a significant number of candidates did not appreciate that the loss of blood flow led to decreased oxygen supply or glucose supply and therefore decreased respiration. Many answers also referred to transport of ATP by blood.

This response scores both marks available.

(ii) Suggest why there are changes to the available energy (ATP) in the heart muscle cells following the loss of blood flow. (2)

Artery to the heart becomes blocked, oxygen ~~is~~ cannot reach to the heart muscles. Heart muscles ~~are not able~~ <sup>cannot</sup> ~~to~~ respire aerobically to produce <sup>ATP</sup> oxygen. Respiration stops and ATP is not generated.



### ResultsPlus Examiner Comments

The candidate correctly recognises that the loss of blood flow prevents oxygen reaching the heart muscles and therefore stops aerobic respiration.

This response scored no marks.

(ii) Suggest why there are changes to the available energy (ATP) in the heart muscle cells following the loss of blood flow. (2)

ATP energy is carried in the blood.  
After the loss of the flow of blood, the supply of ATP is cut off.



### ResultsPlus Examiner Comments

Unfortunately many candidates like this one have the misconception that ATP is carried by the blood.



### ResultsPlus Examiner Tip

Remember ATP is generated inside cells by the process of respiration. The blood supplies the chemicals needed for respiration in the cells (oxygen and glucose for aerobic respiration).



### Question 5(b)(iii)

Most candidates correctly stated that after 8 min insufficient energy is available for contraction and /or after 20 min the energy level is too low to sustain life. Some of them identified the correct values for energy available at 8 and 20 minutes. Few candidates said that lactic acid inhibits contraction and few answers were given regarding another use of energy. When lactic acid was mentioned, it was not always qualified in the context of inhibition of enzymes or contraction.

Common mistakes include:

- The idea that the heart can no longer contract as there is not enough blood to contract;
- Failing to refer to energy/ATP, often talking simply about less blood or oxygen being available;
- Incorrect reading of energy levels at 8 and 20 min;
- The idea that blood brings energy/ATP to the cells.

This response scores all three marks available.

(iii) About 8 minutes after the loss of blood flow, the heart muscle cells no longer contract. After about 20 minutes, the heart muscle cells begin to die.

Using the information in the graph and your own knowledge, suggest explanations for the timings of these two events.

In the first 8 mins of the loss of <sup>(3)</sup> blood flow, there has already been a decrease of 50% of available (ATP) energy so the cells do not have the energy to contract. After about 20 minutes, there is only around 24% of energy (ATP) available which is not enough for the heart muscle cells to function and so begin to die.



**ResultsPlus**  
Examiner Comments

This candidate has correctly identified why the heart muscle cells stop contracting and then die at the correct time points due to lack of energy and has also used the graph to identify the ATP levels that correspond to these stages.

This response scored two of the three marks available.

(iii) About 8 minutes after the loss of blood flow, the heart muscle cells no longer contract. After about 20 minutes, the heart muscle cells begin to die.

Using the information in the graph and your own knowledge, suggest explanations for the timings of these two events.

(3)

After 8 minutes it stops contracting as this is a metabolic process which requires energy to do so from the blood. At 8 minutes there is 88% of ATP available so it only stops contracting to save energy - not to die. However at 20 minutes there is only 24% of ATP available, therefore the muscle cells do not have enough ATP to survive and begin to die.



### ResultsPlus Examiner Comments

This candidate correctly identifies the energy available at 20 mins and what happens as a result. However, the heart does not stop contracting to save energy.



### ResultsPlus Examiner Tip

Remember muscle contraction requires energy in the form of ATP and the heart has no conscious choice over what it does.

This response scores no marks.

(iii) About 8 minutes after the loss of blood flow, the heart muscle cells no longer contract. After about 20 minutes, the heart muscle cells begin to die.

Using the information in the graph and your own knowledge, suggest explanations for the timings of these two events.

(3)

After a short amount ~~amount~~ of time there is ~~no~~ need for the heart to contract as there is no flow of blood and no oxygen being supplied to the heart. After about 20 minutes the heart is oxygen deprived and slowly begins to die because it cannot ~~survive~~ survive without oxygen.



### ResultsPlus Examiner Comments

This response is typical of those who focus purely on the supply of oxygen, ignoring the information on the graph which is about ATP levels. Many candidates also convey that the heart stops contracting out of choice either because there is no blood (like this example), or in order to conserve energy/oxygen.



### ResultsPlus Examiner Tip

When asked to use information from a graph in your answer check carefully what has been measured on the graph?



### Question 5(b)(iv)

Many candidates scored both marks recognising that blood flow provides the cells with oxygen so that respiration can start again. However, there were frequent references to the idea that once blood flow is restored, it carries ATP to the cells; also common was the idea that energy is required for respiration. There were also many references to the idea that once blood flow was restored, cell division could start again to save the heart.

This response scores both marks available.

(iv) If blood flow is restored within 30 minutes, most heart muscle cells will eventually recover. Suggest an explanation for this recovery. (2)

Oxygen is replenished, so the lactic acid produced inside the cardiac muscle cells can be converted back into pyruvate & aerobic respiration can begin again, leading to the production of ATP so the heart can function.



**ResultsPlus**  
Examiner Comments

This candidate recognises that the flow of blood brings oxygen and that the oxygen can help deal with the build-up of lactic acid.

This response scored one of the two marks available.

(iv) If blood flow is restored within 30 minutes, most heart muscle cells will eventually recover. Suggest an explanation for this recovery. (2)

~~When~~ Some cells will still be alive, these cells will receive the fresh blood supply and begin to respire again, this can then produce new cells that are alive and replace the ones that have died.

(Total for Question 5 = 12 marks)



**ResultsPlus**  
Examiner Comments

The candidate correctly recognises that the restoration of blood flow enables respiration to start again, but neglects to mention what is carried in the blood that enables the respiration to take place.

### Question 6(a)(i)

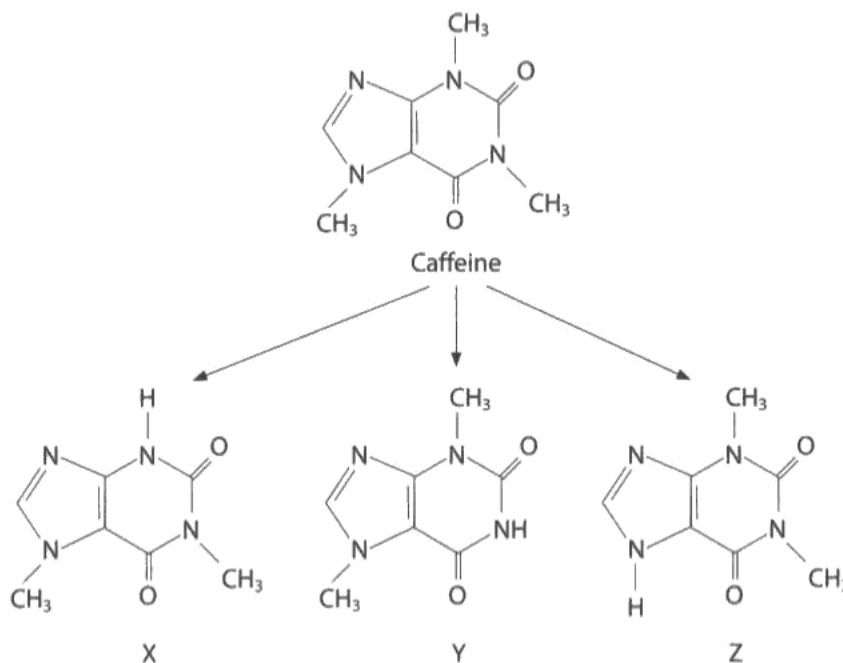
The majority of candidates could correctly name groups found within amino acids that were not present in caffeine – particularly amine and carboxylic acid groups. A few candidates had drawn an amino acid on the paper so that they could compare it visually with caffeine – a useful strategy for some.

This response scored both available marks.

- 6 Caffeine is a drug frequently consumed in a number of drinks such as coffee, cola, hot chocolate and tea.

Caffeine is broken down in the liver by a group of enzymes called cytochrome P450 oxidase.

- (a) The diagram below shows the structure of caffeine and its three breakdown products, X, Y and Z.



- (i) Using the information in the diagram, give **two** reasons why caffeine is **not** an amino acid.

(2)

1 It doesn't have a COOH group.

2 It doesn't have an NH<sub>2</sub> group.



**ResultsPlus**  
Examiner Comments

This candidate has correctly identified two key groups found in amino acids but not caffeine.



**ResultsPlus**  
Examiner Tip

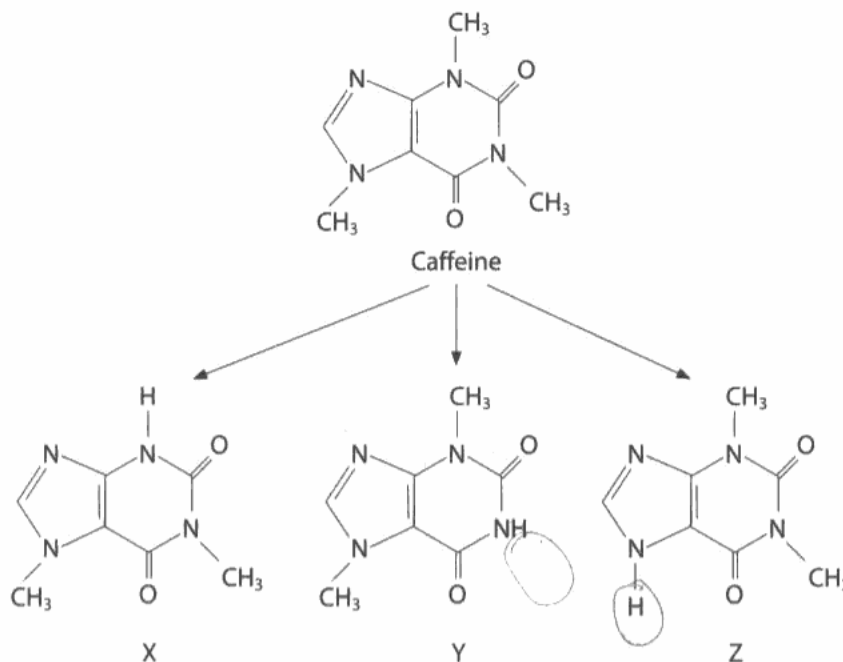
Many candidates named the groups rather than include the formula - either is acceptable in this context.

This response scored one of the two available marks.

- 6 Caffeine is a drug frequently consumed in a number of drinks such as coffee, cola, hot chocolate and tea.

Caffeine is broken down in the liver by a group of enzymes called cytochrome P450 oxidase.

- (a) The diagram below shows the structure of caffeine and its three breakdown products, X, Y and Z.



- (i) Using the information in the diagram, give **two** reasons why caffeine is **not** an amino acid.

(2)

1 It doesn't have an amino acid group

2 There are no peptide bonds.



**ResultsPlus**  
Examiner Comments

The lack of amino group is correct. However, mentioning peptide bonds was a common error.



**ResultsPlus**  
Examiner Tip

A single amino acid does not contain a peptide bond - they are only formed when amino acids are bonded together.

## Question 6(a)(ii)

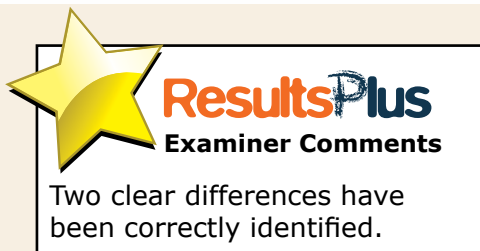
Many candidates wrote clear answers correctly identifying that  $\text{CH}_3$  and H were bonded in different positions in the three molecules. A few excellent responses identified that the products were isomerically different.

However, many candidates did not express themselves very clearly in this question and answers sometimes had to be read very carefully to decipher their meaning. In a few cases candidates failed to count atoms correctly.

This response scores both marks available.

(ii) Using the information in the diagram, state **two** differences between the breakdown products. (2)

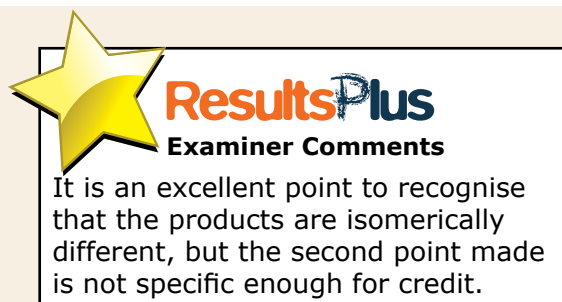
- ~~Y contains an NH~~ ~~no other products contain this~~  
The  $\text{CH}_3$  groups change position on each product
- The Nitrogen bonded to a single hydrogen changes place in each product



This response scores one mark.

(ii) Using the information in the diagram, state **two** differences between the breakdown products. (2)

- They are isomerically different from each other
- Some of the bonds are different



This response scored one mark.

- (ii) Suggest why there are changes to the available energy (ATP) in the heart muscle cells following the loss of blood flow.

(2)

ATP energy is carried in the blood.

After the loss of the flow of blood, the supply of ATP is cut off.



**ResultsPlus**  
Examiner Comments

The first difference is correctly identified, but this candidate, along with several others, could not count the number of Nitrogen atoms correctly.

### Question 6(a)(iii)

Most candidates managed to score at least 1 mark in this question by stating that an enzyme is specific to its substrate.

Fewer candidates correctly referred to the difference in shape/structure of the products only stating that they were "different products". Many candidates also just referred to "more than one enzyme" needed only (as stated in the question) and did not deduce that P450 consists of at least three enzymes/active sites.

Some candidates explained that more enzymes would be needed to speed up reactions to break down caffeine faster.

This response scores all three marks available.

(iii) Using the information in the diagram and your own knowledge of enzyme action, suggest why cytochrome P450 oxidase consists of more than one type of enzyme.

(3)

As enzymes have highly specific active sites where only one substrate can fit and form the right bonds - ~~as there are three~~ as there are three products with different chemical structures - it must mean that cytochrome P450 must have 3 enzymes types to break caffeine in such a way.



**ResultsPlus**

**Examiner Comments**

This candidate recognises that enzymes are specific, the products have different structures and therefore there must be 3 enzyme types to produce the three different products.

This response scored one mark.

(iii) Using the information in the diagram and your own knowledge of enzyme action, suggest why cytochrome P450 oxidase consists of more than one type of enzyme.

(3)

Because three products are produced. Each enzyme has a specific active site that only a specific substrate can ~~fit~~<sup>bind</sup> to. As a result, more than one type of enzyme is needed to ~~produce~~ break down caffeine into its three break down products.



**ResultsPlus**

**Examiner Comments**

This is a typical example of one of the most common answers for this question. The candidate recognises that enzymes are specific, but they do not state what is different about the products and state that more than one type of enzyme is needed (as stated in the question stem).



**ResultsPlus**

**Examiner Tip**

Remember, you are not likely to score marks for repeating information from the question stem.

This response scores no marks.

(iii) Using the information in the diagram and your own knowledge of enzyme action, suggest why cytochrome P450 oxidase consists of more than one type of enzyme.

(3)

More than one type of enzyme is needed to ~~extract~~ break down caffeine because there are 3 different products. Each product has a different shaped active site ~~to~~ and only the right shaped key can fit into the enzyme, so for more than one product more enzymes are needed.



**ResultsPlus**

**Examiner Comments**

Several candidates confuse the enzyme and substrate/product and, as in this example, they state that the active site is part of the product and not the enzyme.



**ResultsPlus**

**Examiner Tip**

Remember the substrate fits into the active site of the enzyme.



## **Question 6(b)**

There were some very clearly expressed answers, but also some candidates did not refer to validity, despite this being asked for specifically in the question. They stated that a particular conclusion was 'true', 'false', 'correct' or 'incorrect'.

The lack of volume control was the most commonly expressed reason given, but it was pleasing to see some references to the number of drinks tested or not being able to calculate the concentration in all the drinks.

Some candidates correctly referred to the fact that coffee and hot chocolate did have different concentrations, but they did not always pair this up with a correct statement about validity.

When giving reasons for their answers some candidates included references to a lack of repeats. Many did not understand the difference between 'content' and 'concentration' and did not appreciate that without a stated volume it is impossible to calculate a concentration.

This response scores all three marks available.

(b) A student decided to investigate the concentration of caffeine in four drinks: coffee, cola, hot chocolate and tea.

The student's results are shown in the table below.

Drink	Volume of drink	Caffeine content / mg
coffee	200 cm <sup>3</sup>	135
cola	1 can	80
hot chocolate	200 cm <sup>3</sup>	10
tea	1 cup	50

The student made two conclusions from these results.

Conclusion 1 "Different drinks have different concentrations of caffeine."

Conclusion 2 "Coffee has the highest concentration of caffeine."

Comment on the validity of these conclusions. Give reasons for your answer.

(3)

Conclusion 1 This is not very valid as ~~the~~ he has ~~not~~ different volumes of drink, ~~you can~~ 1 can is an inaccurate measurement and could be ~~at~~ any thing it could be much less than 200cm<sup>3</sup>

Conclusion 2 This is also invalid as it does not state how much coffee was used and you cannot compare to the others as there are inaccurate measurements and there is no control and it doesn't tell you if he repeated the test to make it reliable.

(Total for Question 6 = 10 marks)



**ResultsPlus**

**Examiner Comments**

The candidate makes comments on the validity of each conclusion and explains their reasons for doubting the validity.

This response scores two of the three marks available.

(b) A student decided to investigate the concentration of caffeine in four drinks: coffee, cola, hot chocolate and tea.

The student's results are shown in the table below.

Drink	Volume of drink	Caffeine content / mg
coffee	200 cm <sup>3</sup>	135
cola	1 can	80
hot chocolate	200 cm <sup>3</sup>	10
tea	1 cup	50

The student made two conclusions from these results.

Conclusion 1 "Different drinks have different concentrations of caffeine."

Conclusion 2 "Coffee has the highest concentration of caffeine."

Comment on the validity of these conclusions. Give reasons for your answer.

(3)

Conclusion 1 This conclusion is valid because the caffeine contents are all different depending on what type of drink is.

Conclusion 2 This conclusion is not valid because different ~~concentrations~~ volumes of drinks were used so therefore this experiment does not show valid data.



**ResultsPlus**  
Examiner Comments

The candidate makes a correct comment on the validity of the second conclusion and explains their reasons for doubting the validity. However, they have confused concentration and content for the first conclusion.

This response scores two of the three available marks.

(b) A student decided to investigate the concentration of caffeine in four drinks: coffee, cola, hot chocolate and tea.

The student's results are shown in the table below.

Drink	Volume of drink	Caffeine content / mg
coffee	200 cm <sup>3</sup>	135
cola	1 can	80
hot chocolate	200 cm <sup>3</sup>	10
tea	1 cup	50

The student made two conclusions from these results.

Conclusion 1 "Different drinks have different concentrations of caffeine."

Conclusion 2 "Coffee has the highest concentration of caffeine."

Comment on the validity of these conclusions. Give reasons for your answer.

(3)

Conclusion 1 They could have used a wider range of drinks for comparison instead of just 4.

Conclusion 2 Different volumes of drink were used, these are for all the coffee contents will be different, for example coffee could have more caffeine in it.



### ResultsPlus Examiner Comments

Two correct comments have been made - one for each conclusion. However, the candidate has not answered the question fully as they have not commented directly on the validity.



### ResultsPlus Examiner Tip

Read the question carefully and make sure you respond to the instructions given.

## Question 7(a)(i)

A high percentage of candidates correctly quoted antihypertensives, although antihypersensitives and antihypotensives were incorrect versions of the type of drug. A significant number of candidates correctly identified diuretics, ACE inhibitors and beta blockers as types of drug to reduce blood pressure. However, many candidates incorrectly quoted statins or aspirin.

7 A large number of doctors routinely prescribe drugs to treat patients who are over 80 and have high blood pressure.

(a) (i) Give the name of the type of drug that is used to treat high blood pressure.

(1)

ACE inhibitors



**ResultsPlus**  
Examiner Comments

This is an example of a correct response that gained the mark.

7 A large number of doctors routinely prescribe drugs to treat patients who are over 80 and have high blood pressure.

(a) (i) Give the name of the type of drug that is used to treat high blood pressure.

(1)

antihypertensives



**ResultsPlus**  
Examiner Comments

This is an example of the most common correct response.

7 A large number of doctors routinely prescribe drugs to treat patients who are over 80 and have high blood pressure.

(a) (i) Give the name of the type of drug that is used to treat high blood pressure.

(1)

STATINS



**ResultsPlus**  
Examiner Comments

This is an example of one of the most common errors that failed to score the mark.

## Question 7(a)(ii)

On the whole this question was poorly answered with just over half of candidates failing to score any marks because they did not read and answer the question carefully. For example, a significant number of candidates simply stated that old age leads to high blood pressure while others indicated that older people cannot exercise, described how the drugs work to lower blood pressure, or thought that there were few side effects so people could self-medicate. Alarming a few candidates thought that side effects wouldn't matter because the patient was old anyway. A surprisingly large number of candidates made no reference at all to CVD.

The better responses clearly stated the effect of both age and high blood pressure on CVD etc. However, many candidates scored only 1 mark by only referring to either older people or to high blood pressure.

This response scores both available marks.

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs. (2)

*Right*

Because age and high blood pressure are risk factors for cardiovascular disease. Decreasing the blood pressure through the use of anti-hypertensives will help to decrease the risk of cardiovascular disease such as cardiac arrest.



**ResultsPlus**  
Examiner Comments

This candidate correctly identifies that both age and high blood pressure are risk factors for CVD.

This response scores one of the available two marks.

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs. (2)

Patients over 80 have a much higher risk of cardiovascular problems and so are given these drugs to prevent them.



**ResultsPlus**  
Examiner Comments

This candidate clearly recognises that old age is a risk factor for CVD, but does not make any comment about high blood pressure.

This response scored no marks.

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs.

(2)

when they once started to get these drugs they need to take them routinely otherwise there is always a change of high blood pressure and normal blood pressure, which than has a bad effect on the heart.



**ResultsPlus**

**Examiner Comments**

Several candidates, such as this one, focussed on interpreting the routine prescription as the need to take a full course of the medicine (a little like needing to complete a course of antibiotics), rather than answering the question about why these particular patients need the drugs.

This response scores no marks.

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs.

(2)

The older the person, the more likely ~~is~~ it is to have high blood pressure so they take them to reduce blood pressure. It is easier and cheap ~~and don't have to~~ to take them and also they are more likely to suffer from high blood pressure occasionally.



**ResultsPlus**

**Examiner Comments**

Many candidates explained that older people are more at risk of high blood pressure. However, the question asks why older patients who have high blood pressure are prescribed the drugs.



This response scores no marks.

(ii) Explain why many patients, who are over 80 and have high blood pressure, are routinely prescribed with these drugs.

(2)

Prevents angiotensin II being produced from its inactive form  
angiotensin II. This means vasoconstriction of blood vessel  
is decreased, lowering blood pressure.



**ResultsPlus**  
Examiner Comments

This candidate explains how the drug works, rather than why these patients need the drug.



**ResultsPlus**  
Examiner Tip

Read the question carefully and answer the question asked.

## Question 7(b)(i)

This was generally very well answered with the vast majority of candidates referring to the idea of a control group for comparison and many also referring to the placebo effect. The idea of both groups given 2 tablets was rarely seen.

This response scores both marks available.

- (i) Explain why the patients in group B were given two tablets that had no drugs in them.

(2)

Because group B were given a placebo. This is ~~to~~ used as a control, to <sup>obtain</sup> give valid comparison. This is to check if the drug actually works or if they are just getting better because they think they're taking the drug.



**ResultsPlus**

**Examiner Comments**

This candidate recognises that group B is a control group and clarifies that the tablets with no drugs in them are a placebo.

## Question 7(b)(ii)

Many candidates answered this question well by making clear comparisons of the changes to systolic and diastolic blood pressure in both groups. Some correctly manipulated the figures to illustrate their answers. Well constructed answers enabled candidates to gain all of the available marks quickly, clearly and concisely.

However, there were a wide range of mistakes made by many candidates, for example:

- not referring to systolic and diastolic blood pressure, but to blood pressure in general;
- attempts to manipulate data were spoiled by lack of accuracy in reading figures off the graph;
- many just compared group A and group B with phrases like "Group A had a lower systolic pressure than group B";
- some just stated that diastolic pressure is always lower than systolic pressure;
- some candidates found it difficult to clearly express themselves with this question and poor use of language in many cases made it quite difficult to tease out the marks in some very long winded responses.

This response scored all three marks available.

(ii) Using the information in the graph, describe the results of this study. (3)

patients in group A showed a lowering in systolic and diastolic pressure. Diastolic being a <sup>smaller</sup> ~~big~~ difference in blood pressure than the decrease in systolic pressure when treated with the drug. Patients in group B showed almost no change in diastolic blood pressure, whereas showed around a 3 decrease of 3 kPa blood pressure for systolic pressure.



**ResultsPlus**

**Examiner Comments**

The candidate correctly describes the changes in the two different blood pressures and compares them clearly between the two groups.

This response scores no marks.

(ii) Using the information in the graph, describe the results of this study.

(3)

The patients given the tablets had lower blood pressure than patient B's. At the end of 5 years diastolic blood pressure for Group A was 10 and for group B was ~~11.4~~ <sup>11.4</sup> and for systolic pressure Group A was 17.2 and Group B was 19.8



**ResultsPlus**

**Examiner Comments**

Stating that the blood pressure is lower does not make it clear what changes have happened over time. Blood pressure is also too vague when the graph shows both systolic and diastolic pressures. Just quoting figures from the graph does not clearly indicate trends and does not count as manipulating figures.



**ResultsPlus**

**Examiner Tip**

Take care to be specific about what you are describing, particularly when there is more than one line on a graph. Manipulate figures by calculating changes etc, rather than just quoting figures from a graph.

### Question 7(b)(iii)

Many candidates failed to clearly address this question properly by giving vague answers about measuring the whole pressure, or the mean pressure. The better candidates were able to gain the mark and clearly state that it was to compare the effect of the drugs on both types of pressure.

(iii) Suggest why both the systolic and diastolic blood pressures were recorded in this study. (1)

As they are independent is it important to check both.  
To see if both or only one is affected.



**ResultsPlus**

**Examiner Comments**

This response is typical of those that scored the mark.

(iii) Suggest why both the systolic and diastolic blood pressures were recorded in this study. (1)

To calculate the mean blood pressure from the two as the systolic is the maximum and diastolic the minimum.



**ResultsPlus**

**Examiner Comments**

This response is typical of those that failed to score the mark.

## Question 7(b)(iv)

A lot of candidates failed to see the word 'benefits' in the stem of the question and consequently answered a question that they thought they were asked (and have been asked in the past). For example, they focussed on a range of control variables such as life-styles and gender rather than measuring benefits resulting from the drugs. Those who read the question properly were able to gain the mark from reference to the incidence of CVD or heart attacks etc as well as a number stating that heart rate should be measured.

(iv) Suggest what else could have been recorded in this study to provide more evidence of other benefits of treating these patients with the drugs. (1)

~~The heart rate~~ The number of cases of Cardio-vascular disease in order to determine how much the drug reduces the risk



**ResultsPlus**  
Examiner Comments

This is a typical example of a response that scored the mark.

This response scored no marks.

(iv) Suggest what else could have been recorded in this study to provide more evidence of other benefits of treating these patients with the drugs. (1)

Gender of the patient



**ResultsPlus**  
Examiner Comments

This is typical of the other variables that candidates responded with when they did not focus on the question asking them about measuring other benefits.



**ResultsPlus**  
Examiner Tip

Read the question carefully, it is not asking for a list of variables that should have been controlled in the study.

## Question 8(a)(i)

A common error here was not to refer to DNA in the answer related to a specific gene mutation. The better candidates did refer to this and clearly explained the change in base sequence or quantity of DNA. There were a few responses referring to insertion, deletion etc, but a significant number of candidates spoiled answers with references to changes in amino acid sequence in genes/DNA or alteration of cells.

This response scores both marks available.

8 Cystic fibrosis and albinism are examples of recessive genetic disorders. Krabbe disease is another example of a recessive genetic disorder. Krabbe disease is caused by mutations in the GALC gene, resulting in a deficiency of an enzyme called galactocerebrosidase.

(a) Explain the meaning of each of the following terms.

(i) Mutation (2)

A change in the sequence <sup>of bases in</sup> of DNA which can result in a change of the amino acid order and therefore a misreading of the DNA which results in non-functioning gene proteins for genes.



**ResultsPlus**  
Examiner Comments

The candidate has described what is changed in the DNA for both marks.

This response gains one of the two marks available.

8 Cystic fibrosis and albinism are examples of recessive genetic disorders. Krabbe disease is another example of a recessive genetic disorder. Krabbe disease is caused by mutations in the GALC gene, resulting in a deficiency of an enzyme called galactocerebrosidase.

(a) Explain the meaning of each of the following terms.

(i) Mutation (2)

• a random change of the DNA,  
• mutated - changed into something else



**ResultsPlus**  
Examiner Comments

The candidate has recognised what is altered, the DNA, but has not described what the nature of the change is.



**ResultsPlus**  
Examiner Tip

Remember if a question is worth two marks more detail or two clear statements are often required.



This response gains one of the two marks available.

8 Cystic fibrosis and albinism are examples of recessive genetic disorders. Krabbe disease is another example of a recessive genetic disorder. Krabbe disease is caused by mutations in the GALC gene, resulting in a deficiency of an enzyme called galactocerebrosidase.

(a) Explain the meaning of each of the following terms.

(i) Mutation

(2)

A mutation is when there is a change in the sequence of base pairs. There are 5 types of mutation: substitution, duplication, inversion, deletion and insertion



**ResultsPlus**  
Examiner Comments

This candidate has explained what the change is, but has not stated which molecule is altered.

### Question 8(a)(ii)

It was pleasing to see the large number of candidates who were able to express themselves very clearly here, demonstrating a good understanding of the term recessive. However, there were a few candidates that simply referred to 'not dominant' or 'never expressed' or 'not expressed' or 'carry disease'. There were also several irrelevant references to inheritance in answers.

(ii) Recessive (1)

A gene or allele that is not expressed in the phenotype unless two recessive alleles are present.



**ResultsPlus**  
Examiner Comments

This is an example of the common correct response.

(ii) Recessive (1)

Not shown in phenotype if a dominant allele is present.



**ResultsPlus**  
Examiner Comments

This response illustrates another common way of acceptably expressing what recessive means.

This response scores no marks.

(ii) Recessive (1)

The recessive genes may or may not be passed on. Dominant genes are passed on. Recessive are not always.



**ResultsPlus**  
Examiner Comments

Many candidates who failed to score the mark concentrated on inheritance rather than expression of the characteristic.

This response scores no marks.

(ii) Recessive (1)  
means that the disease will be passed on if the recessive allele is present. NHS



**ResultsPlus**  
Examiner Comments

Many candidates associate recessive genes with disease and disorders.



**ResultsPlus**  
Examiner Tip

A genetic disorder could be caused by a recessive or dominant allele. It is also important to remember that genes are not only associated with diseases and disorders - they do a lot more as well.

## Question 8(b)

This was generally well answered with many candidates correctly describing the effects of a mutation on primary structure, the shape of protein/enzyme (3D/tertiary structure) and on the active site, thus gaining all 3 marks. There were only a few candidates who identified the potential effect of incorrect stop codons and only a few on no synthesis or incomplete synthesis of the enzyme. A number of candidates vaguely referred to the enzyme not functioning.

This response scores all three marks available.

(b) Suggest how a mutation in the GALC gene could result in a change in the enzyme galactocerebrosidase.

(3)

A mutation in GALC gene leads to a change in the primary structure of the enzyme. This leads to different amino acids being formed and so are bonded differently. This can change the shape of the enzyme and so the enzyme may no longer be specific to carry out its function. The active site of the enzyme will be different and so will not be able to catalyse any ~~substrate~~ substrate.



**ResultsPlus**

**Examiner Comments**

This candidate has correctly identified that the mutation will affect the primary structure of the protein that will change the 3D shape and therefore the active site of the enzyme will be changed.

This response scores one of the three marks available.

(b) Suggest how a mutation in the GALC gene could result in a change in the enzyme galactocerebrosidase.

(3)

The mutation in the gene could lead to an enzyme difference if <sup>the mutation changes</sup> ~~it~~ blocks the active sites of ~~the~~ enzyme. The enzyme would then not be able to bind with a substrate



**ResultsPlus**  
Examiner Comments

This candidate has correctly identified what will happen to the enzyme for a mark, but has not answered the question which asks them how the mutation results in the change.



**ResultsPlus**  
Examiner Tip

Read the question carefully and answer the question asked!

This response scores no marks.

(b) Suggest how a mutation in the GALC gene could result in a change in the enzyme galactocerebrosidase.

(3)

If there is a mutation in the GALC gene the enzyme therefore may not function properly so it will need to be replaced by a healthy gene in order for it to work again. The enzyme galactocerebrosidase could be ~~possibly~~ found in another <sup>section of</sup> chromosome and may have a different function. The person <sup>with</sup> the GALC gene will have a disorder in the making of the enzyme.



**ResultsPlus**  
Examiner Comments

This is an example of a candidate who has failed to focus on what has been asked by the question.

### Question 8(c)

This was well answered by most candidates and most candidates made use of a Punnett square to support their answer. However, by jumping straight into the Punnett square, candidates often lost some of the available marks by not giving parental genotypes clearly and/or the corresponding phenotypes for the possible children's genotypes. Pleasingly, there were very few answers which quoted ratios.

This response scored all five marks available.

(c) Two parents are both carriers of the recessive allele for Krabbe disease.

In the space below, draw a genetic diagram to show the possible genotypes and phenotypes of their children.

Use the genetic diagram to find the probability of these parents having a child with Krabbe disease.

$K = \text{dominant allele (non-carrier)}$   
 $k = \text{recessive faulty allele}$

Parental genotype:  $Kk$   $Kk$   
 Parental gametes:  $K$   $k$   $K$   $k$   
 F<sub>2</sub> filial generation genotype:  $KK$   $Kk$   $kK$   $kk$   
 F<sub>2</sub> filial generation phenotype: not affected, carrier, carrier, affected.  
 Probability:  $\frac{1}{4}$



#### ResultsPlus Examiner Comments

This candidate has not used the more common Punnett square, but has managed to clearly label and set out their diagram so that all the required information is clear.



#### ResultsPlus Examiner Tip

Please note: Carrier is not a good description of a phenotype, but was decided that it was acceptable in this context. Ideally the phenotype for the  $Kk$  should also have been not affected (or similar).

This response scored three of the available five marks.

(c) Two parents are both carriers of the recessive allele for Krabbe disease.

In the space below, draw a genetic diagram to show the possible genotypes and phenotypes of their children.

Use the genetic diagram to find the probability of these parents having a child with Krabbe disease.

(5)

Handwritten genetic diagram for a monohybrid cross. The diagram shows two Punnett squares. The top one is crossed out with diagonal lines. The bottom one is labeled 'father' on the left and 'mother' on the right. The alleles are F and f. The possible genotypes for the offspring are FF, Ff, Ff, and ff. A circled fraction  $\frac{1}{4}$  is written next to the Punnett square. Below the diagram, the probability is written as  $\frac{1}{4}$  25%.

	F	f
F	FF	Ff
f	Ff	ff

Probability  $\frac{1}{4}$  25%



### ResultsPlus Examiner Comments

By using the Punnett square the candidate has correctly identified the gametes and potential F1 genotypes and gone on to calculate the correct probability. However, they have not made the parental genotypes clear and have not linked the F1 genotypes to the potential phenotypes.



### ResultsPlus Examiner Tip

Punnett squares are useful tools, but don't forget to make sure you clearly express the information requested in the question.



This response scores four of the five marks available.

(c) Two parents are both carriers of the recessive allele for Krabbe disease.

In the space below, draw a genetic diagram to show the possible genotypes and phenotypes of their children.

Use the genetic diagram to find the probability of these parents having a child with Krabbe disease.

parental genotypes :  $Rr \times Rr$  (5)

phenotypes : recessive carrier  $\times$  recessive carrier

gametes :  $(R)$  or  $(r)$   $\times$   $(R)$  or  $(r)$

gametes	$R$	$r$
$R$	$RR$	$Rr$
$r$	$Rr$	$rr$

offspring phenotypes:  
25% normal  
25% Krabbe.  
50% carrier

Probability 25%



**ResultsPlus**

**Examiner Comments**

This candidate has covered all the required information - unfortunately the offspring phenotypes are not clearly linked to the corresponding genotype. This was quite a common mistake.

## Question 8(d)

Many candidates correctly referred to amniocentesis or chorionic villus sampling, with the usual incorrect spellings sometimes appearing (aminocentesis and chronic villus sampling). A small number of answers had correct descriptions of the processes. However, there were plenty of answers which were vague and referred to genetic screening or even gene therapy, etc.

This response gains the mark.

(d) State how these parents could determine whether or not their unborn child has Krabbe disease. (1)

*Using amniocentesis, they could extract some foetal cells from the amniotic fluid and test them for the disease*



**ResultsPlus**  
Examiner Comments

As well as naming a suitable technique, this candidate has also provided a partial description of the technique.

This response scores no marks.

(d) State how these parents could determine whether or not their unborn child has Krabbe disease. (1)

*Chronic Villus Sampling*



**ResultsPlus**  
Examiner Comments

Thankfully this spelling mistake is becoming slightly less frequent.



**ResultsPlus**  
Examiner Tip

When a spelling mistake changes the meaning of the word you will not gain credit. Read back your answers to yourself and make sure it is at least spelt phonetically to avoid mistakes.

This response scores no marks.

(d) State how these parents could determine whether or not their unborn child has Krabbe disease.

(1)

Embryo testing or gene therapy while the unborn baby is in the womb.



### ResultsPlus Examiner Comments

This example illustrates two common mistakes:

1. embryo testing is too vague for an answer to how the parents could determine if the unborn child has the disease;
2. gene therapy was a common incorrect response.



### ResultsPlus Examiner Tip

Remember gene therapy is designed to provide working copies of genes into the body and is not a screening technique.

## Paper Summary

To help candidates prepare for this paper in future, please take note of the following points:

- read the whole question carefully, including the introduction, to help relate your answer to the context asked. You should read the question through carefully at least once and then write down your knowledge and understanding in a way that answers the question;
- don't assume that the question asked is the same as that which has appeared on a previous paper;
- read your answers back carefully – do they answer the question, have you made at least as many clear points as marks are available, and have you made any silly mistakes (e.g. which way round is the pH scale?);
- check that you understand the difference between related molecules and processes covered in the AS specification;
- when asked to distinguish between two things make sure your answer is comparative and mentions both things being compared;
- include a calculation whenever you are asked to describe or compare numerical data (particularly data presented in graphs);
- don't be afraid to include a sketch diagram or graph if it will help add clarity to your answer;
- when describing the measurement or control of variables, be specific about what is to be measured e.g. volume or mass, and avoid vague terms such as amount;
- remember that room temperature is not a reliable variable;
- pay particular attention to spelling, the use of technical names and terms, and organisation of your answer in QWC labelled extended writing questions;
- explore and assess examples of candidate responses from this report to help you understand what makes a good response to different types of question, and exemplify the level of knowledge and understanding expected at AS level.

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