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Examiners' Report
June 2015

GCSE Biology 5BI2F 01

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Introduction

This paper was attempted well by most candidates who demonstrated excellent knowledge of some biological concepts and skill in graphical analysis and data manipulation. Several questions across the paper were particularly accessible to a range of abilities who gave good, detailed responses that were credited accordingly. Candidates' good understanding of digestion in question 1, the role of oxygen in question 3a, photosynthesis in 4a, and cell structure in 5d was noted in particular with many candidates gaining excellent scores for the first of the extended answer question which was particularly encouraging. The attempts by candidates to produce a quantitative response was also carried out well, with many demonstrating good analytical and interpretational skills, although there were common areas where students demonstrated weaknesses, particularly in the calculation of a percentage for question 6aii. A significant number of candidates lost marks by providing responses that lacked clarity despite their response implying that they were familiar and comfortable with the topic area. The use of scientific terminology and sentence structure was generally weak for questions requiring more lengthy responses. This was disappointing as were the numerous responses that were seen that basically repeated the stem of the question. This was particularly evident in questions such as 5e where many just stated that 'Golden rice is more healthy' or in question 3bi where several candidates simply stated that 'walking faster affects the amount of oxygen used'. There were pockets of topic areas where many candidates were challenged. In some cases it was evident that some candidates did read the question properly but failed to absorb any accompanying information that was given. For question 5e, for example, the majority of candidates failed to recognise that the mass of apples and the volume of pectinase was a constant and therefore gave answers based around increasing these factors in order to produce more apple juice. This lost many candidates marks. Similarly for question 3bi, a percentage of students gave an answer that linked oxygen used with the distance walked rather than the speed of walking, which again lost them marks. Question 4cii was particularly poorly answered showing a lack of understanding of active transport. Most candidates described the passage of minerals through the plant i.e. 'they go in through the roots, up the stem and to the leaves' without touching on the actual process of active transport. Instead, students tended to include information on osmosis (albeit just a mention of the term) and many were confused about concentration gradients.

Question 1 (a)

The first question on the paper was intended to be a gentle start to the examination for foundation candidates. The words provided in the box, however, proved tricky for less able candidates who appeared to choose words randomly to complete the sentences about digestion.

A fair number of candidates were able to score full marks on this first question in the paper by correctly identifying the words from the box to complete the passage. However, the distracters caused issues for a significant group who were clearly lacking in knowledge and understanding of digestion.

(a) Use words from the box to complete the sentences.

(2)

active	amino	DNA	lactic	soluble

During digestion, large molecules are broken down into

small soluble molecules.

Proteins are large molecules that are broken down into amino acids.

ResultsPlus
Examiner Comments

This response gained the full 2 marks for completing the passage about digestion with the correct words.

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Examiner Tip

There are likely to be a few questions like this on a foundation paper where the answers are given and students just have to choose the correct one from a list. Read through all of the words in the box before deciding which to use in an answer.

Candidates that failed to score any marks for their response to this question were not consistent in the words they chose to complete the passage - there was no commonality in their choice of answers. The words chosen were completely random and included one of any out of the list given.

(a) Use words from the box to complete the sentences.

(2)

active	amino	DNA	lactic	soluble

During digestion, large molecules are broken down into

small active molecules.

Proteins are large molecules that are broken down into Soluble acids.

ResultsPlus
Examiner Comments

This candidate failed to score any marks for their answer. 'Active' was seen often as the word chosen to complete the first sentence although other, incorrect words from the box were also used by others who were unsure of the aim of digestion.

ResultsPlus
Examiner Tip

Read through sentences like this once they have been completed to make sure that they make sense. Check whether the completed sentences given relate to the topic being tested.

One of the most frequently seen incorrect answers was, in completing the second sentence of the passage, candidates including 'lactic' as their answer.

(a) Use words from the box to complete the sentences.

(2)

active	amino	DNA	lactic	soluble

During digestion, large molecules are broken down into

small amino molecules.

Proteins are large molecules that are broken down into lactic acids.

ResultsPlus
Examiner Comments

This candidate was unable to score any marks for their response. Although they had chosen 'amino' correctly, they failed to place this correctly in the passage. Had the candidate thought more carefully about their second response 'lactic' they may have realised that this was not linked to digestion of protein.

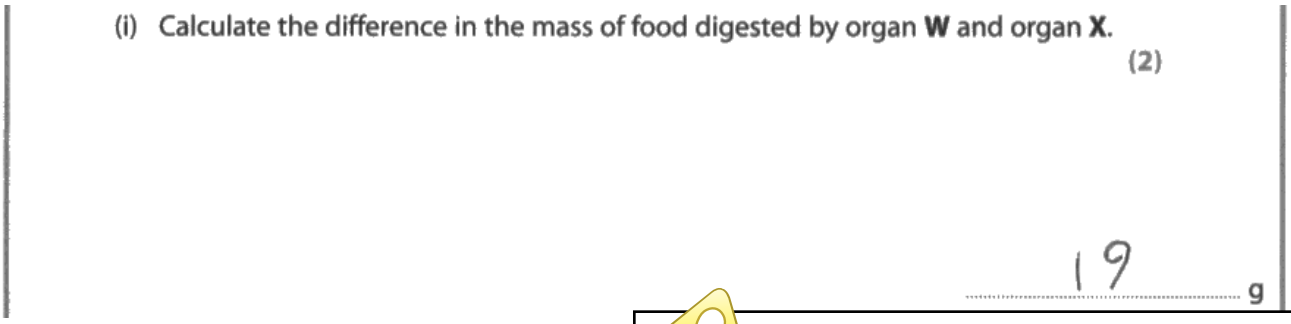
ResultsPlus
Examiner Tip

Take care in choosing the correct words from a box to complete sentences. Some words may sound like they fit but are not linked to the topic being tested.

Question 1 (b) (i)

On the whole, this simple calculation was performed well by the majority of candidates. Most were able to correctly extract information from the graph to calculate the difference in the mass of food digested by the two organs stated. Out of the few candidates that were unable to score two marks, some showed working out which included correct data from the graph and for this they were awarded one mark. Others recieved zero for just providing an incorrect answer with no working.

A fair number of candidates gave a final answer without showing any working out. Where the final answer was incorrect, candidates who failed to show working out denied themselves the possibility of one mark.


(i) Calculate the difference in the mass of food digested by organ **W** and organ **X**.

(2)

19 g

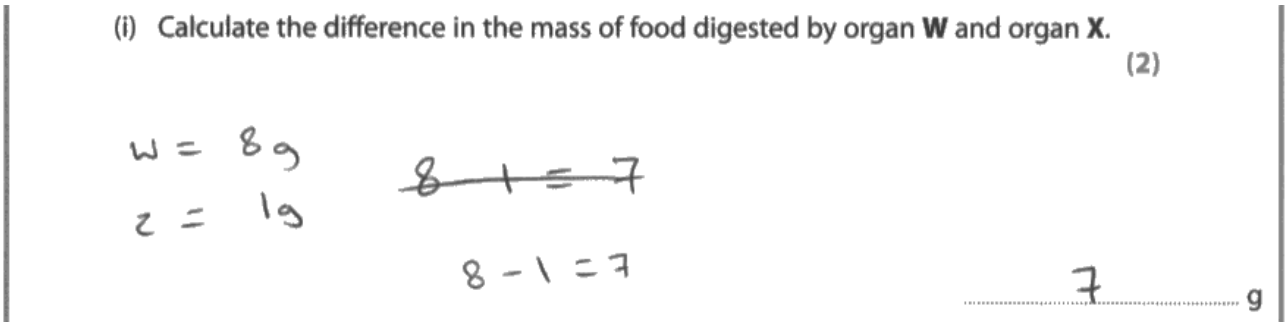
ResultsPlus
Examiner Comments

This candidate gave a final, incorrect answer without showing any working out.

ResultsPlus
Examiner Tip

Always show working out for questions involving calculations regardless of how simple the calculation may seem.

Few candidates failed to score for this particular item with even less providing figures in their working that seemed completely random. However, this did occur occasionally indicating that less able candidates struggled to interpret the simple data shown in the bar graph.


(i) Calculate the difference in the mass of food digested by organ **W** and organ **X**.

(2)

W = 8g

Z = 1g

~~8 - 1 = 7~~

8 - 1 = 7

7 g

ResultsPlus
Examiner Comments

Although this candidate has shown working, only one of the figures in their calculation (8g) relates to the question. In this case, the candidate has carried out a calculation involving data shown for organ Z rather than organ X.

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Examiner Tip

Read the question carefully and check through answers to calculations

There were few candidates that scored one mark for their response purely by nature of the question. Most either scored 2 or 0, the latter being those that failed to extract the correct details from the graph. However, infrequently, candidates did manage to gather the correct data but then failed to put these figures into the correct calculation. These candidates scored one mark for showing some skill in reading from the graph.

(i) Calculate the difference in the mass of food digested by organ **W** and organ **X**. **(2)**

W: ~~8+37~~ 8×37 = 296

8+37 = 45

296

..... g

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Examiner Comments

This candidate scored one mark for correctly extracting '37' and '8' from the graph despite using these figures in the wrong calculation.

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Examiner Tip

Some answers given to calculations just don't fit! Look at the worked out answer and compare to the data given to see if what has been given is logical.

Question 1 (c)

Candidates that were successful in their response to this item generally used very simple language to describe the role of peristalsis in digestion. At times it was clear that candidates understood that peristalsis involved the movement of food in some way but where it was moved to varied significantly. Responses that gave details such as 'moves food to the heart' or to another part of the body that was scientifically incorrect failed to gain the mark.

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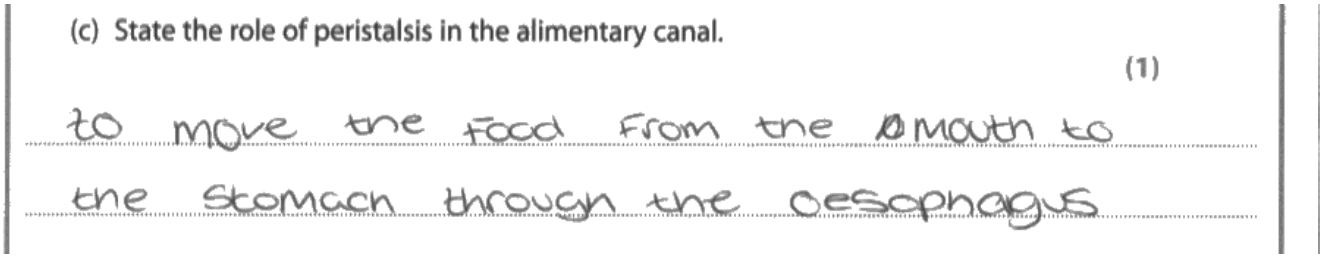

(c) State the role of peristalsis in the alimentary canal.

(1)

to move the food from the mouth to the stomach through the oesophagus

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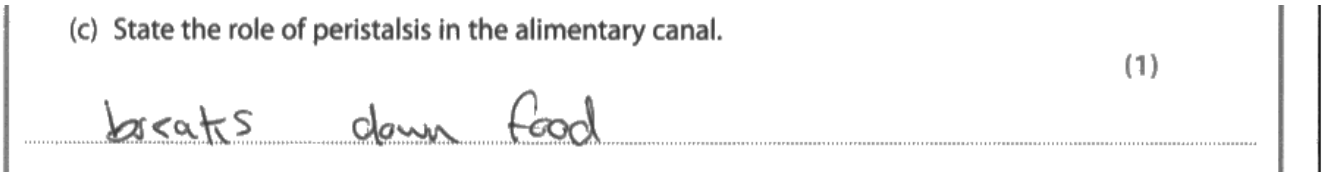
Examiner Comments

The answer given by this candidate was expressed well. Few responses included scientific detail that reflected a good understanding of peristalsis. Many candidates simply stated 'moves' or 'pushes' food, whereas a very limited number added further information to state where food was moved from and where it was moved to.

ResultsPlus
Examiner Tip

Try to use correct scientific terminology in answers.

A significant number of candidates gave a role for peristalsis in the 'breakdown' or 'digestion' of food. Such responses implied chemical digestion and were not awarded the mark. If this detail was given alongside correct information linked to the movement of food, then it was ignored and the mark was awarded.


(c) State the role of peristalsis in the alimentary canal.

(1)

breaks down food

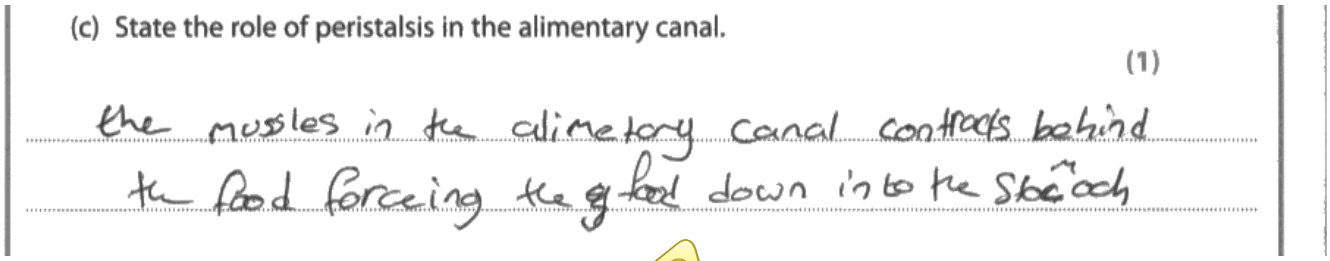
ResultsPlus
Examiner Comments

This response did not gain the mark for stating that peristalsis is involved in the breakdown of food.

ResultsPlus
Examiner Tip

It appears to be a very common misconception that peristalsis or the role of the oesophagus are somehow linked to the digestion of food. Digestion or breakdown of food is a chemical process that is not linked to this part of the digestive system. The role of peristalsis in the alimentary canal is mechanical.

Very few responses were structured with clarity and this introduced ambiguity. These were, unfortunately, unsuccessful in gaining marks but there were a very limited number of candidates that described clearly and succinctly, using good scientific terminology, the role of peristalsis in the alimentary canal.


(c) State the role of peristalsis in the alimentary canal.

(1)

the muscles in the alimentary canal contracts behind the food forcing the food down into the stomach

ResultsPlus
Examiner Comments

This is an excellent response that uses good, scientific terminology to describe the role of peristalsis.

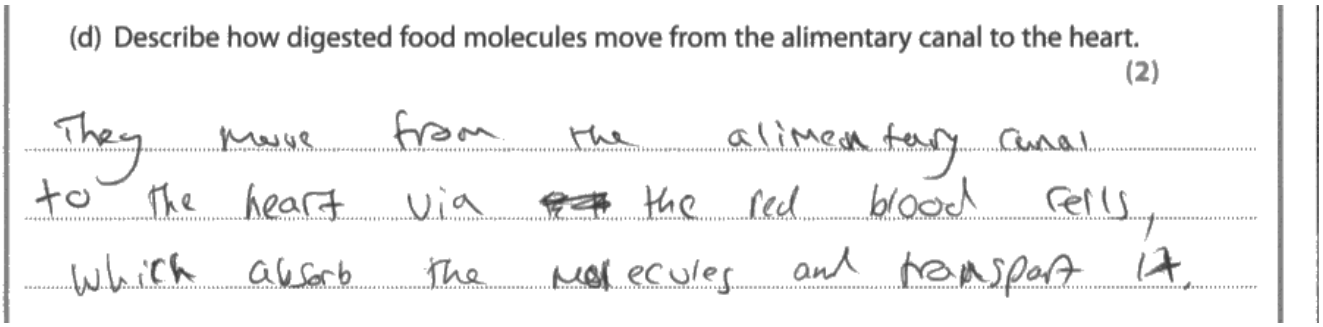
ResultsPlus
Examiner Tip

In questions where a candidate is required to 'state' a role or a fact, a great deal of scientific information is not usually needed. Although it is expected that candidates can use scientific terms correctly, a brief response that 'states' a fact is more often sufficient.

Question 1 (d)

Some of the responses to this question were very similar to the responses to the previous question where details included 'moves food' to various parts of the body. In general, responses to this question were weak. The information included in answers made it quite clear that candidates were challenged by the question and were unable to apply their understanding. 'Veins' or 'capillaries' were the least most common detail in responses, although one mark was most frequently gained by those who were aware that food is transported in the blood.

Many candidates were aware that food is transported in the blood although plasma was infrequently mentioned. Most often, candidates preferred to use terms such as blood system or just blood which were acceptable alternatives to plasma. Responses including incorrect scientific detail were frequently seen regarding the movement of food once it was out of the digestive system. For example, some candidates mentioned that it travelled in arteries or gave names of veins that were incorrect.



(d) Describe how digested food molecules move from the alimentary canal to the heart.

(2)

They move from the alimentary canal to the heart via ~~the~~ the red blood cells, which absorb the molecules and transport it.

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Examiner Comments

There were many candidates that attempted to describe how food was moved from the alimentary canal to the heart but the information contained in the response was very confused. The content of a large number of responses suggested that candidates were very unclear on their understanding of diffusion and transportation of nutrients. This candidate understands that food moves into the blood although unfortunately has stated that it is transported by red blood cells which is clearly wrong.

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Examiner Tip

Find ways to associate key words with specific topics in the specification by carrying out mind-maps or other techniques. For example, diffusion, large surface area and enzymes are all words that can be linked to the digestive system.

The most common correct answer given by students included information on the *blood* transporting the food to the heart. This detailed appeared in a variety of ways; bloodstream, blood vessels, blood system and others which were deemed acceptable alternatives to plasma given in the mark scheme.

(d) Describe how digested food molecules move from the alimentary canal to the heart.
(2)

They travel through the bloodstream into the ventricles of the heart

ResultsPlus
Examiner Comments

One mark was obtained by this candidate for recognising that food was transported to the heart via the bloodstream.

ResultsPlus
Examiner Tip

Always look at how many marks are allocated to a question and give as many points in an answer as there are marks.

More able candidates were able to score at least two marks for their response although the content for which the marks were given varied. One of these marks was generally awarded for transport in the *blood* but the other mark was given for information that could have covered any one of the other marking points on the mark scheme.

(d) Describe how digested food molecules move from the alimentary canal to the heart.
(2)

They move from the villi from the large intestine and are absorbed into the blood stream and are carryed by the plasma in the blood

ResultsPlus
Examiner Comments

This response is written very clearly and shows a good understanding of what happens to food molecules at the end of the digestive process. Here, the candidate has covered two marking points in their answer; villi/absorbed and bloodstream/plasma.

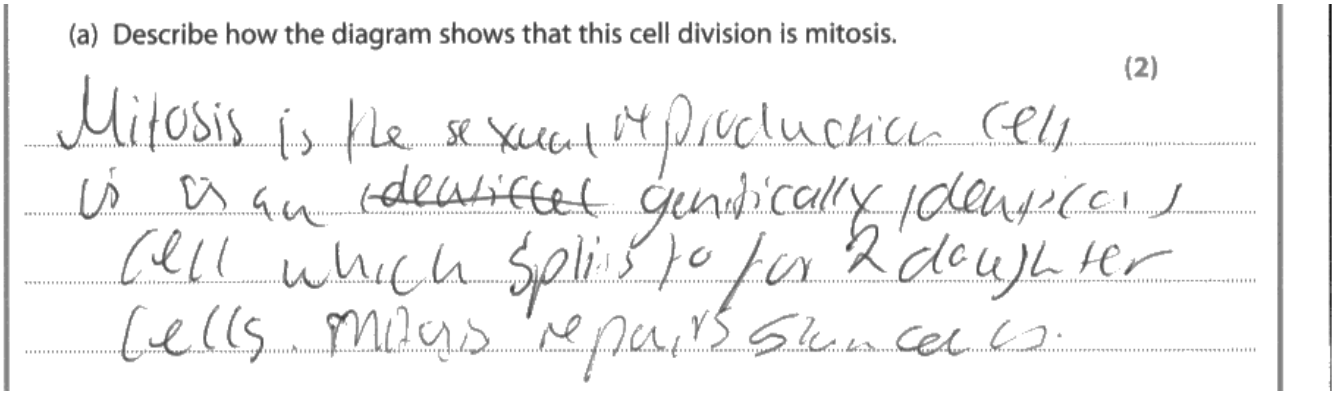
ResultsPlus
Examiner Tip

When using scientific terminology in an answer, make sure that it is used correctly i.e. that it makes sense, and in the correct context.

Question 2 (a)

Although many candidates gained one out of the two marks for their response to this question, much of the detail provided was very brief and missed key pieces of detail that would have strengthened the answer to guarantee the mark. It is important that students portray their understanding that cells produced by mitosis are *genetically* identical and refrain from using 'clone' unless they have made it clear that clones do have identical genes. Some candidates gave responses that included details on meiosis. For example 'it is mitosis because it doesn't make 4 cells' or 'it is mitosis because there aren't 2 cell divisions' and so on. These responses were vague and as the question did not require students to make a comparison between the two types of cell division, no marks were awarded.

Candidates scoring two marks gained these mostly from stating that 2 cells were formed and these cells contained information in the form of genes/chromosomes/DNA. Many candidates failed to state that the cells produced were 'genetically identical' and although this would have been much preferred they were not penalised for this.


(a) Describe how the diagram shows that this cell division is mitosis.

(2)

Mitosis is the sexual reproduction cell is an ~~identical~~ genetically identical cell which splits to for 2 daughter cells. Mitosis repairs skin cells.

ResultsPlus
Examiner Comments

This response gained full marks for clearly covering two marking points; genetically identical and 2 daughter cells.

ResultsPlus
Examiner Tip

Where diagrams are provided with questions, use them to help build responses. They usually contain all the information needed to gain full marks for an answer.

Most candidates gained one mark for recognising that two cells were produced by mitosis. In many cases, the sentence structure was poor or the wording of the details given ambiguous or lacking depth to be able to award any further marks.

(a) Describe how the diagram shows that this cell division is mitosis.

(2)

As the one parent cell is splitting to make two daughter cells

ResultsPlus
Examiner Comments

This response is typical of the majority that received one mark for their answer. Most candidates were able to identify that two cells were produced.

ResultsPlus
Examiner Tip

If a question is worth 2 marks, then two key points need to be included in a response.

Some responses were poorly structured which meant that no marks could be awarded. In several cases, candidates mentioned 'identical chromosomes' but failed to put this into the correct context. At times, details included the number of chromosomes produced and frequently this included 46 or 23 which is clearly not case in the diagram shown.

(a) Describe how the diagram shows that this cell division is mitosis.

(2)

The shows it as when it divides it turns out to be two identical chromosomes

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Examiner Comments

This candidate failed to gain a mark for implying that the cell itself divides into chromosomes. Despite mentioning that the chromosomes are identical, the context in this case negates any mark that might have been awarded.

ResultsPlus
Examiner Tip

Don't assume that questions on cell division are always about human cells. If there is no information around the diagram to state that it is a human cell, then it isn't!

Question 2 (b)

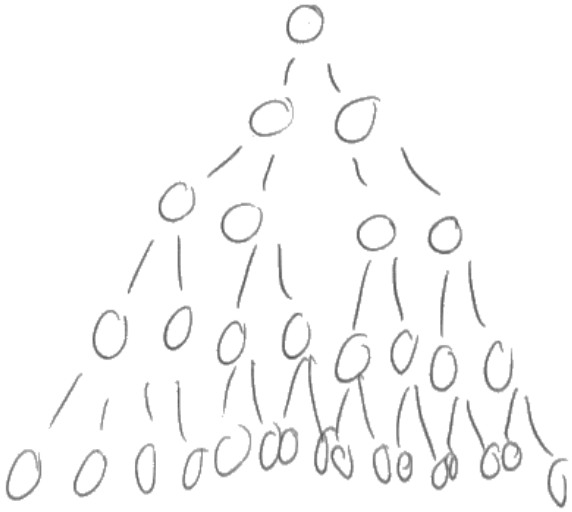
A significant number of candidates scored 1 out of the 2 marks available for this question. It was unfortunate that these candidates tended to include Day 1 in their calculation of how many cells would be produced and so arrived at the answer of 5 days. These and other candidates gave clear diagrams showing doubling, which were credited. Few candidates were able to arrive at the final correct answer and some presented a random figure, with an incorrect diagram or with no diagram, for no marks.

Many candidates gave a final answer of 5 as they included day 1 in their calculation. For most of these candidates a diagram showing that doubling took place was included, which was credited with one mark.

(b) A skin cell divides by mitosis once every day to produce new skin cells.

Calculate how many days it would take to produce 16 skin cells from one skin cell.

(2)



5 days

ResultsPlus
Examiner Comments

This response was typical of many where the candidate has included Day 1 in their calculation to arrive at a total of 5 days.

ResultsPlus
Examiner Tip

Working out can sometimes be shown as a diagram as this question shows but make sure that these are drawn clearly within the space given.

Most candidates made an attempt at answering this question but for those with a less than sound understanding of mitosis this question presented a challenge. The diagram given to the students was not used effectively by many candidates to help them with the calculation despite this clearly showing a cell dividing into 2 new cells each day.

(b) A skin cell divides by mitosis once every day to produce new skin cells.

Calculate how many days it would take to produce 16 skin cells from one skin cell.

(2)

1 cell = 1 per day
× 16 = 16 cells.

16 days

ResultsPlus
Examiner Comments

A fair number of candidates failed to include the doubling process seen in mitosis and showed information that implied one new cell was produced from the parent cell each day. This led to a final, incorrect answer of 16 days. Most of these candidates failed to include diagrams but did show working out that failed to gain credit as there was no evidence of doubling.

ResultsPlus
Examiner Tip

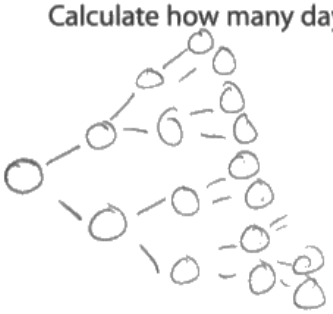
Always use all available information in a question to help construct answers. Diagrams in particular can act as a prompt to help structure responses.

Some candidates scored one mark for diagrams showing doubling but then included a random final answer that did not appear to relate to the diagram that they had drawn in any way. A final answer of 8 days was seen fairly frequently although it was unclear how this figure was arrived at.

(b) A skin cell divides by mitosis once every day to produce new skin cells.

Calculate how many days it would take to produce 16 skin cells from one skin cell.

(2)



8 days

ResultsPlus
Examiner Comments

This candidate scored one mark for showing doubling in the diagram they had drawn. It could be assumed that their final incorrect answer of 8 relates to the number of cells that they have drawn in the final stage of their diagram.

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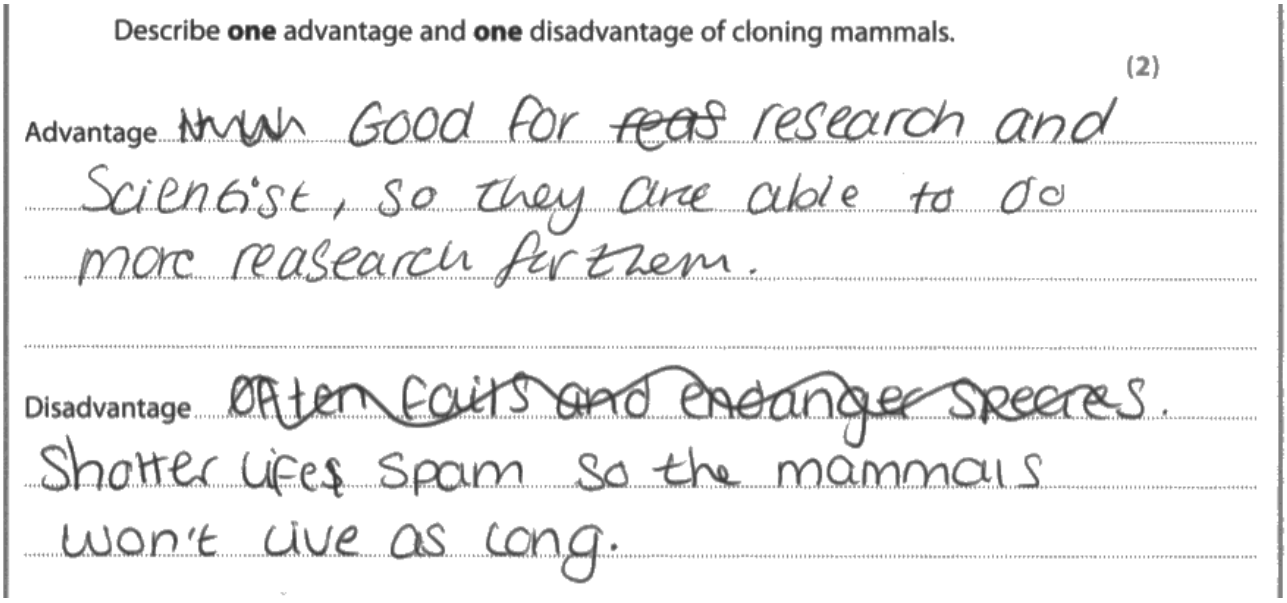
Examiner Tip

On a foundation paper the answer line in a question such as this will, more often than not, give the units. Make sure the answer written in this space relates to the units given.

Question 2 (c)

Some candidates had trouble expressing their ideas clearly or in sufficient depth and others gave information that implied some understanding of the pros and cons of cloning but named features or disadvantages that did not relate to cloning at all. For advantages, answers such as 'the cloned mammal inherits desirable features' or 'the cloned mammal will have the same features as its parent' were seen often. Few candidates made reference to religious issues as a disadvantage of cloning although those that did failed to gain a mark for stating that 'it's playing around with lives' or similar. Good answers were seen from many candidates who tended to focus their answers around preventing extinction and shorter life span. Other correct answers included details related to health issues, although these were sometimes too vague to award marks: e.g. the animals got ill. Many candidates had the idea that any genetic defect in the parent would be seen in the clone.

Less common correct answers included details about transplants or research, although this was generally coupled with either a shorter life span for a further mark or that the clone would have some form of health issue. Candidates that did include shorter life span in their answer did not give any indication of why this was the case with clones. Although this information was not needed to gain the mark it would have been nice to see some more deep understanding coming across in the responses. The named health issues given on the mark scheme were not seen, although some students did include details such as 'weakened immune system' which, although not incorrect, failed to gain a mark as no further detail was provided on how this would affect health.


Describe **one** advantage and **one** disadvantage of cloning mammals.

(2)

Advantage Good for ~~eas~~ research and Scientist, so they are able to do more research furthem.

Disadvantage Often fails and endanger species. Shatter lifes spam so the mammals won't live as long.

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Examiner Comments

This candidate scored full marks for giving one correct advantage and one correct disadvantage. Although the information given for the advantage lacked some depth - the response would have been strengthened by giving further detail on the type or aim of the research carried out - the candidate did translate some understanding of an advantage of cloning. Many candidates gave shorter life span for a disadvantage and in this case this information gained this student a second mark.

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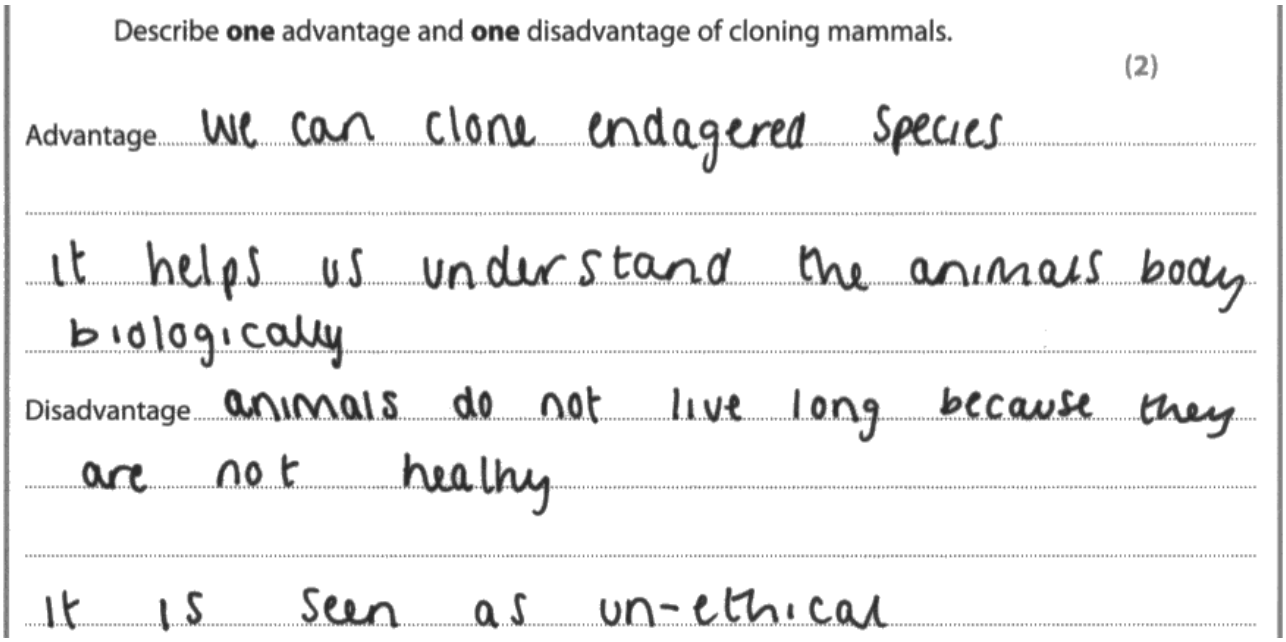
Examiner Tip

Usually in questions of this nature examples need to be given. For example, stating that 'clones get ill' would not be enough but stating that 'clones get ill as they have breathing difficulties' gives a named health issue that can be credited with a mark.

A very popular, correct answer for an advantage included details that referred to preventing extinction in some way. Although most of these responses gained the advantage mark, others were vague e.g. it increases the population was seen often and failed to gain credit.


Describe **one** advantage and **one** disadvantage of cloning mammals.

(2)

Advantage We can clone endagered species

It helps us understand the animals body biologically

Disadvantage animals do not live long because they are not healthy

It is seen as un-ethical

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Examiner Comments

This candidate refers to endangered species in their response and although it does not directly state that it conserves species it is implied and therefore gained the advantage mark. The second mark was gained for the disadvantage most commonly seen - shorter life span.

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Examiner Tip

Be wary about using 'immoral/unethical' in responses without providing reasons why.

Many candidates attempted to describe how features from the parent were seen in the clone produced although failed to structure their answer clearly or gave answers that were too vague. A significant number of candidates neglected to name a feature of the parent that would be seen in the clone.

Describe **one** advantage and **one** disadvantage of cloning mammals.

(2)

Advantage

if you have a good Dog and you want the same aspects of it again

Disadvantage

its very exspective

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Examiner Comments

The answer provided by this candidate failed to name a 'cloned' feature and was typical of a large number of responses where vague details failed to gain a mark. A fair number of candidates also referred to cost as a disadvantage without supporting this with further information that may have gained them a mark.

ResultsPlus
Examiner Tip

Try to refrain from referring to cost in an answer e.g. 'it's expensive' without explaining why.

Question 2 (d)

Responses to this question were varied, with some candidates scoring full marks for their choice of words to complete the sentences and others seeming to guess and choosing words randomly from the box.

There were roughly equal numbers of students that gained one and two marks for their answer to this question. The most common error seen in responses was the choice of word for the number of cells produced, with many candidates choosing two. Also seen frequently was the term 'stem cells' that was used to complete the first sentence.

(d) Some cells divide by meiosis.

Use words from the box to complete the sentences.

(2)

double	two	stem cells	four	gametes

Meiosis is used in sexual reproduction to produce gameten.

Meiosis produces four haploid cells.

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Examiner Comments

This candidate gained two marks for correctly choosing the terms to complete the sentences about meiosis.

ResultsPlus
Examiner Tip

Make sure that the differences between meiosis and mitosis are fully understood. It might help to learn this by drawing up a table and listing the features of each.

The use of 'stem cells' to complete the first sentence was commonly seen in students' responses that failed to gain full marks for this question. The most common incorrect answer chosen to complete the second sentence was 'two'.

(d) Some cells divide by meiosis.

Use words from the box to complete the sentences.

(2)

double	two	stem cells	four	gametes

Meiosis is used in sexual reproduction to produce Stem Cells.

Meiosis produces double. haploid cells.

ResultsPlus
Examiner Comments

This candidate failed to gain any marks for their choice of words to complete the sentences.

Question 3 (a)

Many candidates recognised that there would be an increase in the demand for oxygen with an increase in activity, although a significant number failed to link this to respiration and a greater energy demand. Most commonly, candidates included 'muscles' in their response and implied an awareness that oxygen was needed for them to work harder and this gained many full marks for their answer. As seen repeatedly in previous examination series, many candidates failed to imply 'more' oxygen or simply stated that the athlete would 'breathe in oxygen' which were too vague to award. Other candidates included details such as 'oxygen was needed by the blood' or by 'red blood cells' which missed the point, and there was some confusion over aerobic and anaerobic respiration.

Some responses that gained full marks were less clear in their content and included information that added some ambiguity. In a few cases this negated marks, but for the majority of the details provided were sufficient to award.

(a) The athlete runs faster in a race than when she is training.

Explain why running faster changes the volume of oxygen used per minute.

(2)

This is because more oxygen is taken in to the muscles and lungs, resulting in he having much more energy as when she is running fast it causes her to breath in alot of oxygen resulting in her speed to increase

ResultsPlus
Examiner Comments

This candidate gained full marks for covering three marking points in their response.

Most two mark responses were awarded for including clear detail covering marking points 1 and 3. Answers in this respect were to the point and unambiguous although there were few where benefit of the doubt was given.

(a) The athlete runs faster in a race than when she is training.

Explain why running faster changes the volume of oxygen used per minute.

(2)

When you run faster like you have to use your muscles more and that means that your muscles will be doing more work. Muscles require oxygen so more oxygen will be needed so larger amounts of blood will be able to be oxygenised then travel to the muscle.

ResultsPlus
Examiner Comments

This response was awarded 2 marks for clearly stating that the muscles would need more oxygen.

ResultsPlus
Examiner Tip

Always remember that even at rest oxygen is needed by muscles. During more rigorous activity, more oxygen will be needed. This is a point that is often overlooked in responses.

Many candidates scored well on this question, mostly for covering marking points 1 and 3 in their answer. Although respiration and energy demand was rarely seen, some candidates included one or the other of the remaining marking points in their answer to give good, detailed responses.

(a) The athlete runs faster in a race than when she is training.

Explain why running faster changes the volume of oxygen used per minute.

(2)

The more you run the more oxygen your body needs as muscles need more energy. So * running faster requires more oxygen intake.

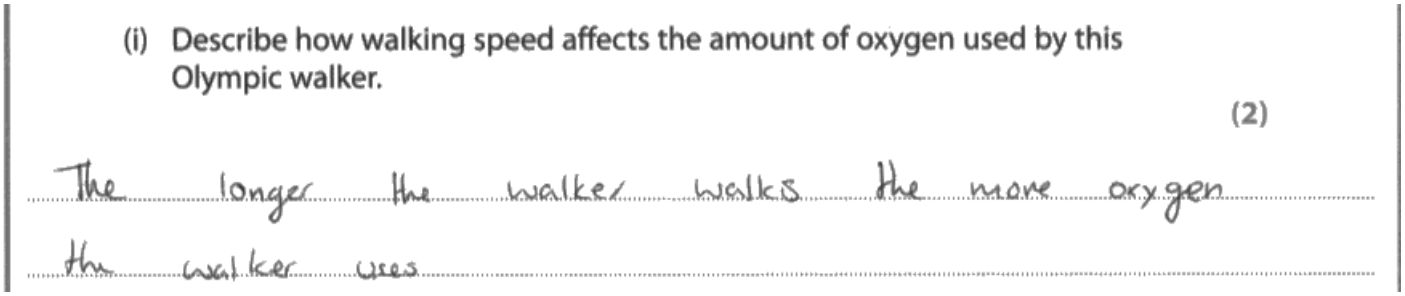
ResultsPlus
Examiner Comments

This candidate included details that covered 3 marking points to gain full marks for their answer. This response is unambiguous and shows a good understanding of the reasons why changes in the body take place during more rigorous activity.

Question 3 (b) (i)

A significant majority of candidates scored one mark for their response to this question as they failed to include data extracted from the graph to support their answer. A fair number of students misinterpreted what the graph was showing and discussed oxygen intake as the athlete walked further rather than faster and this failed to gain a mark. Some students that did quote data to support a correct qualitative answer misread the graph and included incorrect data, and therefore failed to obtain a second mark for their response.

A number of candidates did not interpret the graph correctly and either misunderstood or misread what the data was showing. Even though most were aware that oxygen intake increased, a mark was lost by stating 'as the Olympic walker walked further,' or similar.



(i) Describe how walking speed affects the amount of oxygen used by this Olympic walker.

(2)

The longer the walker walks the more oxygen the walker uses

ResultsPlus
Examiner Comments

This response failed to gain any marks as it mentions about the walker walking for 'longer' rather than faster as shown by the data in the graph. The candidate also neglected to include data extracted from the graph.

ResultsPlus
Examiner Tip

Questions that require analysis of graphs for 2 marks inevitably require qualitative data supported by data from the graph. It is always better not to quote numbers directly from graphical data but to manipulate data in some way, e.g. calculate a difference.

Most candidates obtained one mark for correctly reading the information from the graph to conclude that more oxygen was taken in as the speed of the Olympic walker increased. It was unfortunate that most of these responses failed to extract data from the graph to gain a second mark.

(i) Describe how walking speed affects the amount of oxygen used by this Olympic walker.

(2)

As the speed of walking increases, the oxygen used increases. Olympic walker needs more oxygen to keep on walking as she needs glucose.

ResultsPlus

Examiner Comments

This candidate scored one mark for covering the first marking point in their response. Had they included data extracted from the graph, for example quoted the amount of oxygen used at 14 km/hr then a second mark would have been awarded.

There were few candidates that failed to score a mark for their answer to this question but those that were unsuccessful generally provided responses that just did not answer the question. Many of these tried to explain why oxygen intake increased rather than simply describe what was shown in the graph.

(i) Describe how walking speed affects the amount of oxygen used by this Olympic walker. (2)

Walking causes the muscles to constantly be moving so it is slowly using up oxygen.

ResultsPlus
Examiner Comments

This candidate failed to gain any marks as their response included details that did not answer the question. Although they mention that muscles are using up oxygen, this does not describe the relationship between oxygen and the speed of walking.

ResultsPlus
Examiner Tip

Make sure that you know the difference between command words such as 'describe' and 'explain'.

Question 3 (b) (ii)

Some candidates included details about oxygen in their answer to this question but failed to imply that enough oxygen was being supplied to the muscles. Others gave information such as 'not a lot of oxygen being used' which also failed to gain credit. A significant number of responses gave irrelevant details that included warming up and/or cooling down processes such as stretching or made comments about how the athlete was well trained and so didn't get cramp. Some comments on lactic acid were incorrect - 'lactic acid prevents cramp' or that it 'prevents injury' or 'more oxygen is used so lactic acid builds up'. Marking point 3 was covered mostly by candidates discussing aerobic respiration rather than anaerobic, the latter much less frequently seen in the correct context in the answers given.

It was unfortunate that not all candidates who mentioned 'lactic acid' in their response did so in the context of the question but rather gave a definition of anaerobic respiration. These answers failed to gain credit for this marking point. Candidates scoring two marks tended to include information incorporating marking points 2 and 4, with marking point 3 being covered by some who discussed aerobic rather than anaerobic respiration.

(ii) Explain why this Olympic walker did not get cramp in their muscles when walking at a speed of 4 km / hour.

(3)

Because the muscles were not being worked fast enough. The muscles were getting the right amount of oxygen they needed. They did not have to use anaerobic respiration which uses carbon dioxide instead of oxygen. Anaerobic respiration also produces lactic acid which causes muscles to cramp.

ResultsPlus
Examiner Comments

Had this candidate linked the information given on lactic acid to the context of the question then the response would have gained 3 marks rather than the two marks obtained. This was commonly seen where lactic acid was mentioned and many candidates lost a mark for simply defining anaerobic respiration.

ResultsPlus
Examiner Tip

This question is not directly about aerobic or anaerobic respiration but concerns processes in the context of the Olympic walker. Straight definitions are unlikely to gain any marks in this case.

Responses gaining one mark were more common that those gaining two or three marks, the latter very rarely seen.

A significant number of responses mentioned that the Olympic walker was 'not using very much oxygen' which was incorrect and which indicated some confusion amongst candidates understanding of the cause of cramp.

(ii) Explain why this Olympic walker did not get cramp in their muscles when walking at a speed of 4 km / hour.

(3)

They weren't using up as much Oxygen so there wasn't a lack of it in the muscles to cause cramp. There was also still enough lactic acid in the body.

ResultsPlus
Examiner Comments

This response does not start well with the candidate mistakenly thinking that the absence of cramp was due to little oxygen being used by the walker. However, this does not negate the next part of the response that clearly states that enough oxygen was supplied to muscles. The details given on lactic are incorrect and not credited.

ResultsPlus
Examiner Tip

The underlying concepts for this question focus on anaerobic respiration. Think about what this process involves and then structure your answer to fit the context of the question. This last sentence of this response contradicts the previous sentence given although as it is a separate marking point the candidate has not been penalised in this case.

Very few responses seen were credited with the full three marks allocated to this question. However, where complete answers were given they tended to cover the last three marking points.

(ii) Explain why this Olympic walker did not get cramp in their muscles when walking at a speed of 4 km / hour.

(3)

They were getting enough oxygen for their respiration, meaning that no lactic acid was produced, which is what causes cramp. They were using aerobic respiration, not anaerobic.

ResultsPlus

Examiner Comments

This is a good response by a candidate who has given very clear details that explain why the Olympic walker did not get cramp. This answer was awarded 3 marks for covering marking points 2 to 4.

Question 3 (c)

There was a variety of incorrect responses seen here. These included 'oxygen', 'protein' and 'nitrogen'. The majority of candidates scored the mark here for showing their understanding of aerobic respiration.

(c) Complete the word equation for aerobic respiration.

(1)

glucose + oxygen ⟶ carbon dioxide + water

ResultsPlus
Examiner Comments

This candidate scored one mark for correctly completing the equation with carbon dioxide.

ResultsPlus
Examiner Tip

Avoid writing formulae in questions that ask for a word explanation.

A smaller percentage of candidates were unsuccessful in their response to this question. The answers given in these cases varied significantly with no real common incorrect answer seen.

(c) Complete the word equation for aerobic respiration.

(1)

glucose + oxygen ⟶ light energy + water

ResultsPlus
Examiner Comments

This candidate may have been confused aerobic respiration with the process of photosynthesis and failed to gain a mark for 'light energy'.

ResultsPlus
Examiner Tip

Learn the word equation for aerobic respiration. The reverse of this process is basically photosynthesis.

Question 4 (a)

Some excellent responses were seen for this question, with many students showing a good understanding of the factors needed for photosynthesis. Many two mark answers were given with few candidates failing to gain any marks at all. Candidates scoring one mark tended to refer to light and more often failed to include 'photosynthesis' in their answer. A common misconception seemed to be that the plastic cover prevented the plants from being eaten by 'animals' or 'insects' or that it 'trapped heat' which may have been correct had the focus of the question not been on the transparency of the plastic cover. Other candidates were incorrect in their thinking that the plastic cover allowed the plants greater access to oxygen or carbon dioxide or that it allowed the farmer to see his plants.

Most answers to this question scored full marks where candidates clearly understood the reason for the plastic cover being transparent. These candidates were credited for including details about light and photosynthesis in their response.

(a) Explain why it is important that the clear plastic cover is transparent.

(2)

So the plant has sunlight to undertake photosynthesis to make food and grow.

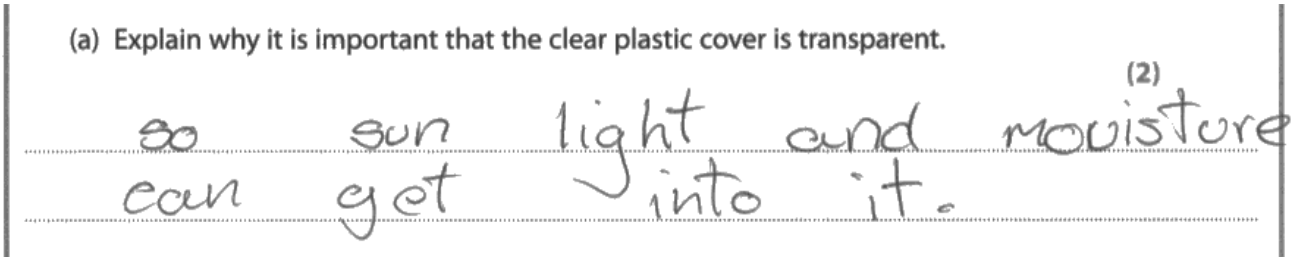
ResultsPlus
Examiner Comments

This response was typical of many who scored two marks. It clearly gives the correct reason why the plastic cover was transparent and explains this by stating that light was needed for *photosynthesis*.

ResultsPlus
Examiner Tip

Questions that ask you to explain a fact or situation will expect some scientific detail in a response.

Marginally more candidates scored one mark than candidates scoring two. These candidates most often neglected to include details about photosynthesis in their answer and gained one mark for understanding that the plants needed access to light thus the plastic cover being transparent.


(a) Explain why it is important that the clear plastic cover is transparent.

(2)

so sun light and moisture can get into it.

ResultsPlus

Examiner Comments

This response was awarded one mark for mentioning that light was able to get to the plants through the transparent cover.

Question 4 (b) (i)

On the whole this was a well answered question with a greater percentage of candidates scoring 2 than any other mark. Many candidates scoring one mark seemed to understand how to calculate a mean but neglected to state that the heights of the plants were added together. Others gaining one mark appeared not to read the question properly and stated that the total height would be divided by 20 (the number of plants outside and under the cover) rather than just the 10 plants under the plastic cover. Other candidates lost marks for using the number of days in their answer, i.e. dividing by the number of days/30.

A number of candidates failed to understand the question, and misinterpreted it as asking how the height was measured. These candidates did not score any marks for their answer. Other students omitted key details such as adding the heights of the plants under the cover or gave incorrect details such as dividing by the number of days rather than the number of plants under the plastic.

(b) (i) After 30 days, the gardener measured the height of each plant.

Describe how to calculate the mean height of the plants grown under the clear plastic cover.

(2)

with a Ruler OR a tape measure

ResultsPlus
Examiner Comments

This response failed to score a mark. The candidate has misread the question to give a response that describes how the height of the plants could be measured.

ResultsPlus
Examiner Tip

Take time to read each question carefully. Read the question twice before attempting an answer.

A common mistake made by many candidates was not being clear in what measurements were added together. Candidates that failed to state that the heights of the plants were added were not awarded the first marking point.

(b) (i) After 30 days, the gardener measured the height of each plant.

Describe how to calculate the mean height of the plants grown under the clear plastic cover.

(2)

You would measure all 10 plants, add up the ~~me~~measurements and the divide the answer by 10.

ResultsPlus
Examiner Comments

This answer lacks some clarity in what measurements were added. It can't be assumed that the measurements in this case were the heights of the plants - the candidate needed to make this very clear in their response. Consequently, this answer gained only one mark for stating that the measurements were 'divided by 10'.

ResultsPlus
Examiner Tip

Be very clear in your answers, adding appropriate detail where necessary. The examiner will not 'fill in the gaps' for you in an answer. It is up to the candidate to make it perfectly clear what they are referring to in their response.

Another common incorrect answer seen often included information on determining the median height rather than adding the heights together. Where this information was given, it was rare that the candidate scored any mark at all although if a mark was obtained, it was most likely for giving correct details regarding division.

(b) (i) After 30 days, the gardener measured the height of each plant.

Describe how to calculate the mean height of the plants grown under the clear plastic cover.

(2)

Measure all the plants ~~de~~ put them in size order and see which one is in the middle of the sequence.

ResultsPlus
Examiner Comments

This response failed to gain any mark for describing how to determine the median height.

ResultsPlus
Examiner Tip

Learn the difference between mean and median.

Question 4 (b) (ii)

The vast majority of candidates were successful in their answer to this question with most correctly calculating the difference between the mean heights of the plants after 30 days. Where candidates failed to score a mark, a variety of different, and sometimes quite complex, calculations were shown for working out which ultimately arrived at the incorrect answer. These candidates were clearly unaware that a straightforward subtraction calculation was expected.

Question 4 (c) (i)

Most candidates were unaware that the root hair cell was adapted to take in minerals and water from the soil. A range of incorrect answers were given, some of which bore no relation to plants at all.

(c) (i) Some gardeners add fertiliser, containing mineral ions, to the soil around their plants.

Name the plant cell that is adapted to take in mineral ions and water from the soil.

(1)

Stem Cell

ResultsPlus
Examiner Comments

This candidate failed to gain a mark for giving stem cells as the plant cell most adapted to taking in mineral ions and water from the soil.

ResultsPlus
Examiner Tip

It is always a good idea to guess an answer if you have no idea of the correct response, but try to give details related to the topic of the question.

Disappointingly few candidates are aware of the role of root hair cells and most failed to recognise that these were the plant cells adapted to taking in water and mineral ions from the soil.

(c) (i) Some gardeners add fertiliser, containing mineral ions, to the soil around their plants.

Name the plant cell that is adapted to take in mineral ions and water from the soil.

(1)

Root hair cell.

ResultsPlus
Examiner Comments

This response was one of few that gained one mark. Only the more able candidates were able to recall the correct information to gain the mark for their response.

ResultsPlus
Examiner Tip

It is important to remember how different plant and animal cells are adapted to carry out their function.

Question 4 (c) (ii)

There is a widespread and significant lack of understanding of the process of active transport. Despite the majority of candidates attempting to answer this question and filling the space available for the answer, most failed to include the key information needed to gain credit. Incorrect responses generally missed the point of the question and discussed how ions were passed from the roots to the leaves or they described how substances were absorbed by osmosis despite the question clearly asking for information on active transport. Many details related to diffusion were seen, i.e. substances travel from a 'high to low concentration' and descriptions or roles of the xylem and phloem vessels were given as well as poor terminology such as roots 'suck up' minerals. The vast majority of candidates failed to recognise that active transport required energy, a marking point that was very rarely awarded.

Some candidates were aware that a concentration gradient was involved, although, more often than not, got this the wrong way round. This information was probably the nearest that a candidate came to scoring any marks and it was unfortunate in these cases that knowledge seemed to be confused with other transport methods.

(ii) Describe how active transport moves mineral ions from the soil into plants.

(3)

Roots absorb minerals from the soil ~~using~~ through active transport from a reigon of high concentration to a reigon of low concentration.

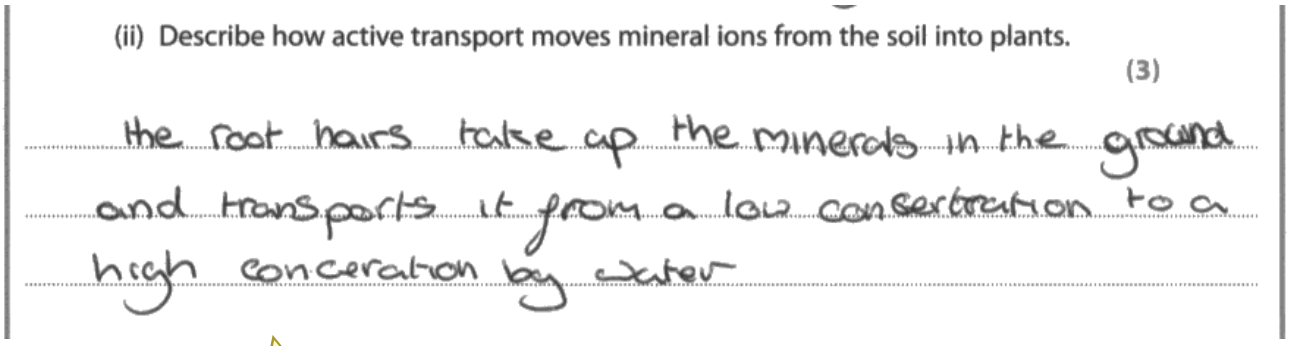
ResultsPlus
Examiner Comments

This candidate seems to have confused active transport with diffusion. The details stating that minerals move from a 'high to low concentration' are incorrect for active transport, and score no marks.

ResultsPlus
Examiner Tip

At GCSE, active transport is the only process that moves substances from a LOW concentration to a HIGH concentration. The other methods that you need to know at this level move substances from a high to low concentration.

Most candidates' responses that included details linked to a concentration gradient confused active transport with other processes such as osmosis (most commonly) or diffusion. Responses like these which stated that minerals were transported from a high to low concentration failed to score. Correct information regarding concentration gradients were rarely seen.



(ii) Describe how active transport moves mineral ions from the soil into plants.

(3)

the root hairs take up the minerals in the ground and transports it from a low consertration to a high concerration by water

ResultsPlus

Examiner Comments

If one mark was obtained by candidates, it was generally for information linked to a concentration gradient. In this case, the candidate scored one of three marks available for correctly stating that minerals were transported from a low to high concentration.

ResultsPlus

Examiner Tip

Be aware that mineral ions in the soil are dissolved in water. The water is transported into root hair cells by osmosis, down a concentration gradient, whereas the dissolved minerals are transported by active transport up a concentration gradient.

Most candidate responses gave a description of the movement of minerals from the soil through to the leaves of the plant. This information often gave the correct direction of transport throughout the plant, including good terminology such as xylem, and osmosis correctly, although it did not answer the question.

(ii) Describe how active transport moves mineral ions from the soil into plants.

(3)

The mineral ions are taken in through the xylem. They are then taken up the stem and are used by the plant ~~for~~ for respiration, food etc.

ResultsPlus
Examiner Comments

This candidate did not focus their answer on active transport and how this method transports minerals into the plant. There are further errors in this response: mineral ions are not taken in by the xylem and the description of the use of mineral is vague and irrelevant.

A minority of candidates scored 2 marks for their answer. If these were seen it was generally marking points 2 and 3 that were included in the response.

(ii) Describe how active transport moves mineral ions from the soil into plants.

(3)

active transport requires energy as it is going from a low concentration to a high concentration. mineral ions travel from the roots, through the xylem then to different parts of the plant.

ResultsPlus
Examiner Comments

This response was one of the very few that obtained 2 marks. Marking points 2 and 3 are clearly covered here.

Question 5 (b)

Many candidates were able to score at least one mark for their response to this question, with a large number of responses including good diagrams which gained credit where correct. Where diagrams were not given, 'twisted ladder' was credited with full marks for an adequate description of a double helix although a range of other terms were used to describe the 'spiral' shape, most of which were suitable. Candidates that did not supply a diagram generally gave a good written response that clearly described the meaning of the term 'double helix' with most gaining a mark for their understanding of two strands. A surprising number of candidates were also aware that the strands were held together by (weak) hydrogen bonds which was excellent although it was unfortunate that some candidates impulsively associated the double helix with DNA and focused their answer on details linked to this, such as base-pairing, for no credit.

Many candidates scored at least one mark for their response to this question, mostly for describing a double helix being made up of 'two strands,' although 'strands' was not always the term used. Other one mark answers included a mention of hydrogen bonds or attempted to describe the helical shape as 'twisted' or 'spiral' or 'coiled'.

(b) Scientists discovered that a DNA molecule is a double helix.

Describe the meaning of the term **double helix**.

(2)

A double helix is where the DNA are joined up by weak hydrogen bonds.

ResultsPlus
Examiner Comments

This response was awarded one mark. The candidate recognised that hydrogen bonds were part of the double helix structure and was credited for this understanding.

ResultsPlus
Examiner Tip

Don't assume that a double helix structure will always be associated with DNA. This question simply asked for a description of a double helix i.e. describing its shape rather than a description of the structure of DNA. Many candidates were under the impression that they had to describe the structure of DNA and failed to gain any marks.

Many candidates attempted to describe the term 'double helix' and although the preferred terminology wasn't always used, their descriptions were sufficient to award marks. Various terms were used as alternatives to marking point 2, most of which were acceptable and thus many candidates were able to score at least one mark for their response.

(b) Scientists discovered that a DNA molecule is a double helix.

Describe the meaning of the term **double helix**.

(2)

two single strands twirled together to make a spiral shape.

ResultsPlus
Examiner Comments

This candidate gained full marks for a good description of the term 'double helix'.

Question 5 (c)

Most candidates obtained the mark for their response to this item. Where answers were unsuccessful, it was mostly for labelling a part of the cell other than the nucleus, although a minority failed to ensure that their label line actually touched the nucleus.

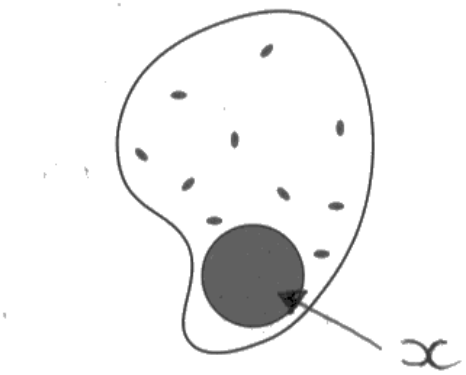
Most candidates followed the instructions of the question and added a clear label line to the nucleus of the cell.

(c) The diagram shows an animal cell.

Draw a line to the part of the cell that contains most of the DNA.

Label this line **X**.

(1)



ResultsPlus
Examiner Comments

This response gained one mark for correctly labelling the nucleus of the cell.

ResultsPlus
Examiner Tip

Ensure that instructions given by the question are followed carefully. Although a label line with X was asked for in this case, some candidates gave 'nucleus' as an alternative to X. This was credited but other incorrect structures were not despite the nucleus being correctly labelled.

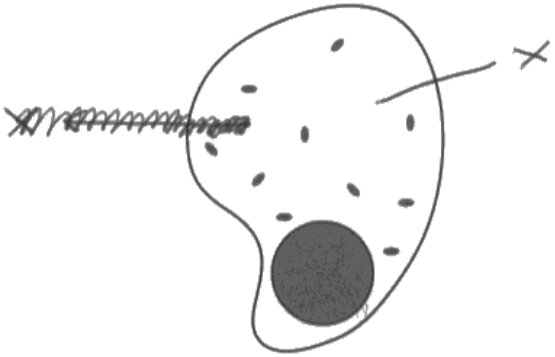
The most common incorrect answers involved candidates labelling the cytoplasm of the cell with a line labelled X.

(c) The diagram shows an animal cell.

Draw a line to the part of the cell that contains most of the DNA.

Label this line **X**.

(1)



ResultsPlus
Examiner Comments

This response failed to gain a mark as the label line is directed to the cytoplasm of the cell rather than the nucleus.

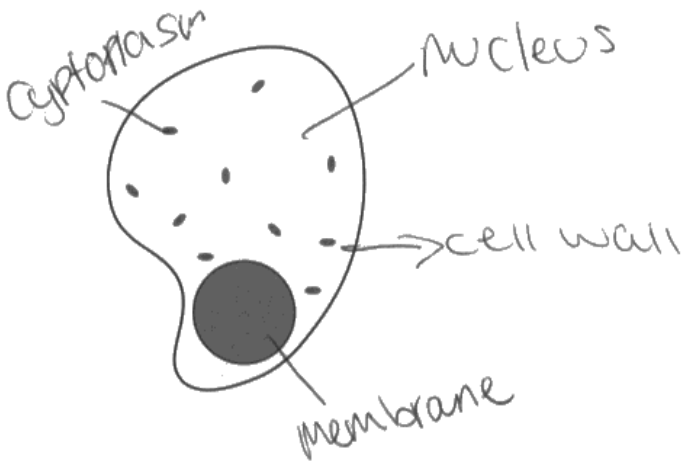
Few candidates were unsuccessful in answering this question. Those that did not score the mark most often labelled the incorrect part of the cell although a minority failed to read the question properly and provided a response that failed to cover the marking point.

(c) The diagram shows an animal cell.

Draw a line to the part of the cell that contains most of the DNA.

Label this line **X**.

(1)



ResultsPlus
Examiner Comments

This candidate attempted to label the various parts of the cell which were not credited.

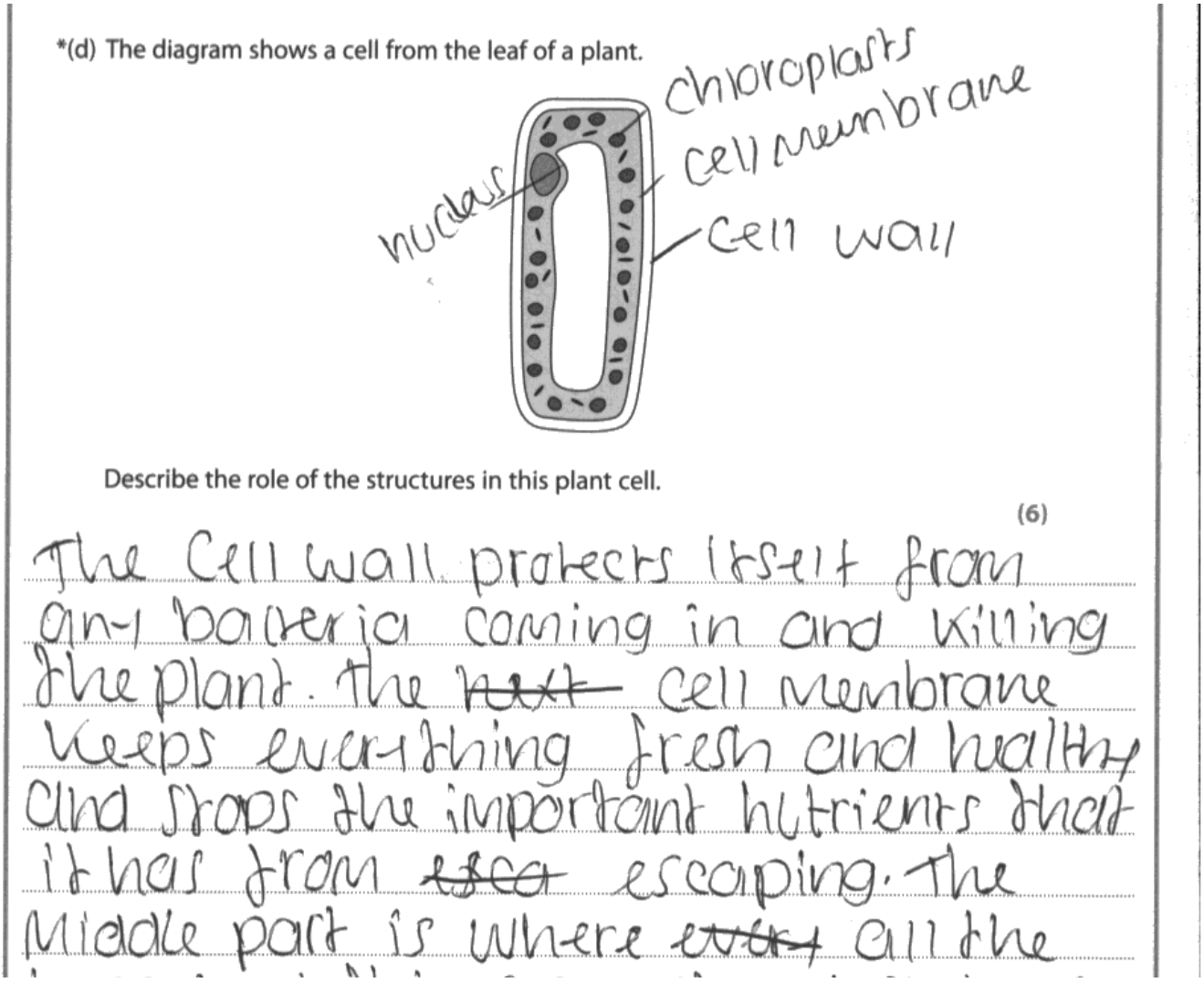
ResultsPlus
Examiner Tip

Read the question carefully. For questions like this, it is easy to guess an answer if you are unsure but make sure your response does relate to instruction given i.e. one line labelled X

Question 5 (d)

Many candidates made an excellent attempt at answering this question with many scoring at least 4 marks for being able to link at least two structures found in the plant cell with their function. Although some candidates were unable to do this, it was evident that the majority were at least aware of the different structures found in the cell, even though they were unable to link them to their correct function. There were many examples of candidates labelling the cell correctly and if no written information was given, this was credited as a level 1 response as some understanding was shown. A pleasing number of students covered a large proportion of the indicative content in their answer with a few adding even more detail, such as ribosomes (with their role) included. Where there were errors in responses, these were mainly for stating the wrong function for a particular structure, although some candidates mixed up the role of chlorophyll with the cytoplasm and the role of the mitochondria. There were other details that were confused; the role of the cell wall and cell membrane were often mixed up and there was frequent mention of the role of the stomata, which was not credited. A few students misunderstood the question and gave details of adaptations of the whole leaf to photosynthesis, although these were infrequent. On the whole, candidates found this question very accessible and it was very pleasing to see all ability ranges gain credit for their answers.

There were many responses that correctly labelled the structures of the plant cell and, irrespective of any written information supplied, this alone was credited with two marks. Other candidates providing a level 1 response gave some correct information about the cell structures, with some linking one structure with a function. Although other structures may have been mentioned in the written details, further content was not credited, most often for giving incorrect science.



important things are stored such as the nutrients, oxygen and everything else that it needs to work. The Chloroplasts also protect and help it function. And the Nucleus helps the plant ~~have in~~ photosynthesise. and is where all the information is stored, telling the plant how to work.

ResultsPlus
Examiner Comments

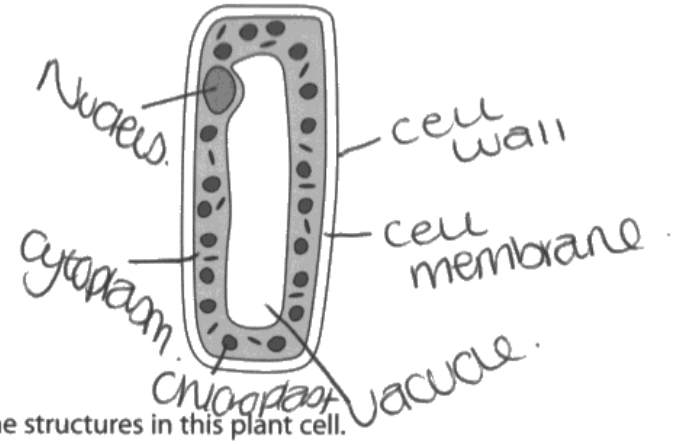
This candidate has correctly labelled the cell structures for 2 marks. Their written response also includes a correct function for the cell wall although the remainder of the response is confused or vague. The response communicates information clearly, despite much of the detail being incorrect. Consequently the QWC mark is awarded.

ResultsPlus
Examiner Tip

It is a good idea to label diagrams where this might help structure a response. As long as a description is provided (as requested by the question) answers might be better laid out in a table to avoid omitting details.

Level 2 candidates most often included correct details that covered the role of the cell wall and nucleus with many responses linking a third structure to its function. The majority of answers were written clearly and therefore the QWC mark was not deducted from the overall mark obtained. The role given for the vacuole was frequently incorrect. Some candidates gave 'protection' as the role of the cell wall without further detail although this was deemed acceptable and taken into account when awarding the response as a whole.

*(d) The diagram shows a cell from the leaf of a plant.



Describe the role of the structures in this plant cell.

(6)

The nucleus helps contra the cell and it's movement). The cell wall helps protect the cell as well as the cell membrane which allows water, glucose etc in ~~or~~ and out of the cell. The cytoplasm is where most of the chemical reacrions occur and the vacuae helps increase the surface area meaning it helps the cell take in sunlight for photosynthesis.

ResultsPlus
Examiner Comments

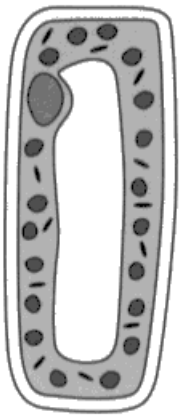
This candidate linked to structures to their correct functions and gained 4 marks. Although there is some incorrect detail in this response, this did not negate any of the marks awarded for the correct information given. This student has labelled the cell correctly and had they given the correct roles for another two of the structures they had highlighted then they could have gained 6 marks rather than the 4 awarded.

ResultsPlus
Examiner Tip

Make sure you learn the function of each part of a cell.

A good number of candidates gave very clear descriptions of the roles of the various structures found in the cell. These level 3 responses reflected excellent knowledge, were written very clearly and were to the point. The structures covered most commonly in answers that gained 6 marks were the cell wall, nucleus, cell membrane and cytoplasm with the vacuole and mitochondria being the least popular.

*(d) The diagram shows a cell from the leaf of a plant.



Describe the role of the structures in this plant cell.

(6)

The large and flat leave has a broad surface area to absorb enough light for photosynthesis. The air spaces, often called stomata allow efficient gaseous exchange to take place. The mitrochrondria is used to allow respiration. The nucleus contains the important genetic information. The cell wall protects the cell. Additionally, the cell membrane controls the materials of which enter and exit the cell e.g carbon dioxide, oxygen, water and glucose. Moreover, the large green chloroplasts are needed for effective photosynthesis to function. The petioles absorb lots of light ready for photosynthesis.

ResultsPlus
Examiner Comments

Although part of this response gives details on how the leaf as a whole is adapted to its function, the candidate has named four distinct structures found in the cell and linked these clearly and correctly to their function to provide a level 3 response.

ResultsPlus
Examiner Tip

Avoid adding extra detail to answers that does not directly answer the question. This detail will not gain marks and there is the possibility that incorrect information provided could limit the number of marks obtained.

Question 5 (e)

There were common errors seen across candidate responses to this question, mainly linked to the 'content' of golden rice. These included details such as 'low fat' or 'high in carbohydrates' as well as it being 'more healthy' or 'contains vitamins' without referring to vitamin A, with many candidates specifying vitamin C. Several answers gained credit for their reference to vitamin A, although these failed to add further information to describe the benefit of this to eyesight, thus restricting the mark obtained to one. Some candidates seemed confused by *genetically modified* and proceeded to give information about the production of insulin or keratin for nails and hair. Good two mark answers mentioned vitamin A and linked this to a benefit related to eye health, e.g. improved eyesight or reduced blindness.

(e) Golden rice has been produced by genetic engineering.

Explain the health benefits of eating golden rice.

(2)

Golden rice has been genetically modified to enhance the diet of third world countries. Vitamin A deficiency has been a problem causing blindness and even death in young people. The rice has had beta-carotene genetically added in order to combat the lack of Vitamin A as the two are linked, beta-carotene is rich in vitamin A.

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

This response gained full marks for clearly describing the role of beta carotene and implying its benefit to eye health.

ResultsPlus
Examiner Tip

Be specific when describing the benefit of vitamin A to eyes. Vague answers such as 'it helps eyes' will not be awarded a mark.

A fair percentage of responses failed to gain any marks for their vagueness. Details in this respect ranged from 'it's more healthy' to 'it helps your eyes' which was on the right track but failed to provide sufficient detail to consider awarding.

(e) Golden rice has been produced by genetic engineering.

Explain the health benefits of eating golden rice.

(2)

golden rice can be beneficial because Scientists have genetically engineered it to be better for you than normal rice.

ResultsPlus
Examiner Comments

This response was typical of the lack of depth seen in many responses and failed to score any marks. 'It's better for you' needed to be clarified and if this candidate had done so may have been awarded one mark.

Most candidates that gained one mark for their answer were aware that golden rice contained more vitamin A although they failed to clarify the benefit of this on health.

(e) Golden rice has been produced by genetic engineering.

Explain the health benefits of eating golden rice.

(2)

Golden rice contains vitamin A which means that it's consumers will no longer suffer a deficiency. However it is quite expensive due to it's beneficial qualities of supplementing the human body with positive vitamins.

ResultsPlus
Examiner Comments

The response by this candidate starts off well by mentioning that golden rice contains vitamin A although the remaining details are vague. It appears that the student is aware that a lack of vitamin A is detrimental to health although has neglected to mention the symptoms of a 'deficiency'.

ResultsPlus
Examiner Tip

Be aware of the mark allocation for responses to questions and be sure to include as many points in an answer as there are marks.

Question 6 (a) (i)

This question was answered well by a significant number of candidates who were able to analyse the data in the table and use their findings to estimate the volume of apple juice that should be obtained when 3 cm^3 of pectinase was added. Although a range of values were seen in student responses these were mostly within the tolerances given in the mark scheme and consequently the vast majority of candidates scored well on this question. Few students complicated matters by attempting to carry out calculations that were unnecessary and inevitably led to a final answer that failed to gain them a mark. Of the incorrect answers seen, these were mostly a case of poor judgement with many of the final values falling outside the upper part of the range shown in the mark scheme.

Unsuccessful responses were significantly less frequent than those that were successful. Candidates failing to score tended to carry out irrelevant calculations or gave a random number only. These candidates were unaware that all that they had to recognise the pattern in the data shown in the table and slot in a number that 'fit'.

6 Pectinase is an enzyme that is used to extract juice from apples.

In an investigation, 1 cm^3 of pectinase was added to 1 kg of chopped apples.

After 20 minutes, the volume of juice produced was measured.

This was repeated using different volumes of pectinase.

The table shows the results of this investigation.

volume of pectinase added / cm^3	volume of apple juice produced / cm^3
1	180
2	212
3	
4	269
5	300

(a) (i) Estimate the volume of apple juice that should be produced when 3cm^3 of pectinase was added.

(1)

300
−180
120

120 cm^3

ResultsPlus
Examiner Comments

This candidate failed to understand how to estimate the volume of apple juice produced when 3 cm^3 of pectinase was added. Their working shows that they have calculated an increase in the volume of apple juice produced rather than estimated a volume produced. Their answer failed to score the mark that was allocated to this question.

ResultsPlus
Examiner Tip

Not all questions that involve numbers in some way expect a calculation to be carried out. Some just require simple interpretation, so avoid being misled into carrying out a more complicated calculation that is not necessary. Read the question and all the other information carefully.

Few candidates failed to obtain a mark for their answer to this question although those that were unsuccessful generally carried out an unnecessary calculation or presented a random number with no indication of how this was arrived at. Where incorrect responses were seen, the final answers given showed no pattern. This implied that some candidates were either unaware of how to give an estimation or that they simply did not read the question properly.

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In an investigation, 1 cm^3 of pectinase was added to 1 kg of chopped apples.

After 20 minutes, the volume of juice produced was measured.

This was repeated using different volumes of pectinase.

The table shows the results of this investigation.

volume of pectinase added / cm^3	volume of apple juice produced / cm^3
1	180
2	212
3	57
4	269
5	300

(a) (i) Estimate the volume of apple juice that should be produced when 3cm^3 of pectinase was added.

(1)

57 cm^3

ResultsPlus
Examiner Comments

This type of response was relatively rare but typical of a few that failed to gain a mark. The answer given appears completely random and doesn't even fit the pattern shown by the rest of the data in the table. It is difficult to conclude how this candidate arrived at this answer.

ResultsPlus
Examiner Tip

Look for patterns in data and, in this particular case, be confident that your answer follows the pattern shown by the rest of the data.

A significant number of candidates were able to make sense of the data given and estimate a value that followed the pattern shown in the table. The majority of these values were within the 240 to 245 range with fewer falling below this.

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After 20 minutes, the volume of juice produced was measured.

This was repeated using different volumes of pectinase.

The table shows the results of this investigation.

volume of pectinase added / cm^3	volume of apple juice produced / cm^3
1	180
2	212
3	244
4	269
5	300

(a) (i) Estimate the volume of apple juice that should be produced when 3cm^3 of pectinase was added.

(1)

244 cm^3

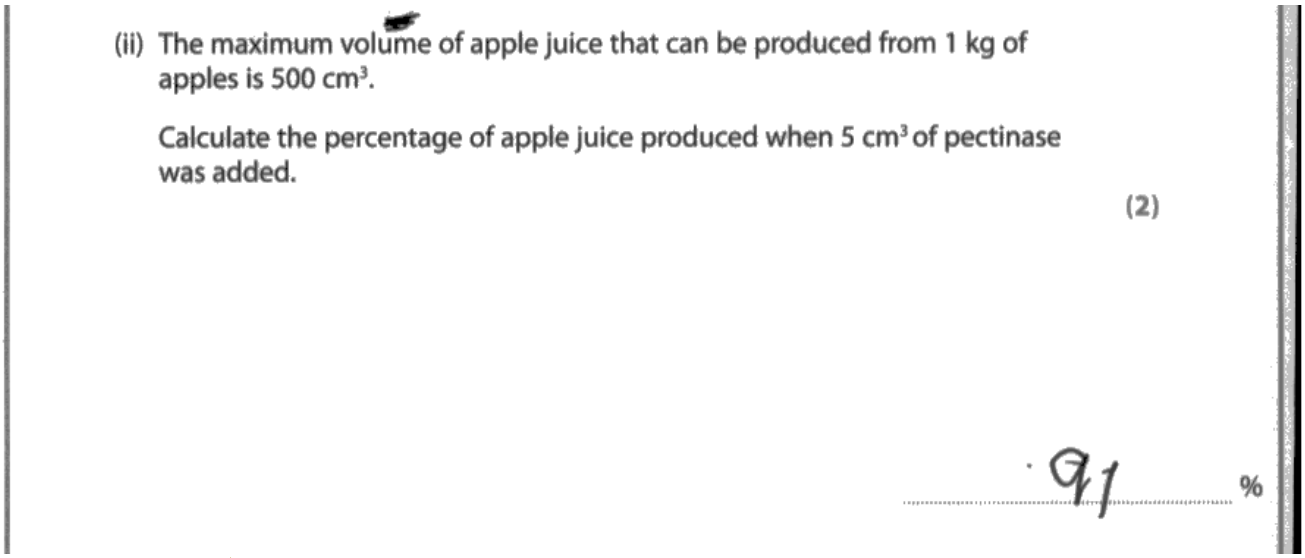
ResultsPlus
Examiner Comments

This candidate gave a correct final response that was typical of many and scored one mark.

Question 6 (a) (ii)

Only the most able candidates were able to successfully calculate a percentage using the data given them. Many candidates failed to select the correct data to work with and ultimately arrived at the wrong value. Some candidates were able to select 500 and 300 to use in a calculation but the sum carried out was incorrect, whereas others had difficulty in selecting the correctly value from the table (300) and provided a calculation that included 500 only. Candidates that gave an incorrect final answer and neglected to show their working out potentially deprived themselves of a mark, although a number of students that did not give the right final answer showed clear working that included the values 500 and 300, for one mark.

Many candidates that did not give the correct answer also failed to show any working out. This meant that no consideration could be given to deriving the correct values to put into a calculation. This deprived many candidates of a mark.



(ii) The maximum volume of apple juice that can be produced from 1 kg of apples is 500 cm^3.

Calculate the percentage of apple juice produced when 5 cm^3 of pectinase was added.

(2)

91 %

ResultsPlus
Examiner Comments

The final answer given by this candidate is incorrect and no working out is shown. Consequently no marks can be awarded.

ResultsPlus
Examiner Tip

Always show working out to questions that require a quantitative answer.

Even though some candidates failed to arrive at the correct answer, some showed their working out and were fortunate to gain one mark. This was the case when the calculations given included relevant data, in this case 500 and 300, irrespective of the type of calculation that was carried out. These candidates were credited for understanding that these two numbers were needed in some way to work out the percentage of apple juice obtained using 5 cm^3 of pectinase.

(ii) The maximum volume of apple juice that can be produced from 1 kg of apples is 500 cm^3.

Calculate the percentage of apple juice produced when 5 cm^3 of pectinase was added.

(2)

500 - 300 = 200

50% = 250
25% = 125

15%

45 %

ResultsPlus
Examiner Comments

This candidate gained one mark for their understanding that 500 and 300 were needed in a calcualtion. Although the subtraction given was the wrong type of calculation to slot these figures into this was ignored.

ResultsPlus
Examiner Tip

Use the space available for this type of question to show clear working out to calculations.

Question 6 (a) (iii)

Too many candidates failed to read the question properly and simply stated that a greater volume of juice could be obtained by adding more apples and more pectinase. The question clearly gave set volumes of these, although most candidates overlooked this and therefore were not awarded marks. Candidates that were aware of factors that affect enzyme activity gained at least one mark, mostly for stating that an increase in temperature would increase the volume of apple juice. Logical thinking by others, who realised that leaving the reaction to run for a longer period of time would also increase production, was also awarded. Very few candidates simply said 'increase surface area', but rather described a way of doing this, including 'chop apples into smaller pieces' for instance.

Few candidates scored full marks, but the more able candidates commonly made reference to a change in temperature and an increase in surface area in their answer. Most of these comments failed to include preferred terminology; the term 'optimum' was rarely seen in responses.

(iii) Suggest **two** ways of increasing the volume of apple juice produced when 5 cm^3 of pectinase is added to 1 kg of chopped apples.

(2)

Maintain a constant temperature of 40°C as this is optimum

Level for enzymes to work at.

Also using correct pH levels increases the enzyme activity.

ResultsPlus
Examiner Comments

This response gained two marks. The candidate has recognised that a change in temperature and pH will increase the volume of apple juice produced.

ResultsPlus
Examiner Tip

Never repeat the working of the question in an answer.

Some candidates had a very good understanding of the factors that affect enzyme activity and were able to demonstrate their knowledge in their response and apply it to the context of the question. A minority of the more able candidates gave more than 2 marking points in their answer although these were infrequently seen.

(iii) Suggest **two** ways of increasing the volume of apple juice produced when 5 cm^3 of pectinase is added to 1 kg of chopped apples.

(2)

Two ways of increasing the volume of apple juice produced when $5cm^3$ of pectinase is added to 1 kg of chopped apples is by leaving it for more than 20 minutes and increasing the surface area of the chopped apples

Two of increasing the volume of apple juice produced is by increasing the surface area of the apple by chopping it up more. Also by increase the temperature

ResultsPlus
Examiner Comments

Few responses were as detailed as this. Most two mark responses mentioned a change in temperature along with details covering another marking point although a reference to pH was rarely seen. This candidate has covered three clear marking points in their answer and was awarded full marks.

ResultsPlus
Examiner Tip

Make sure that you follow the instructions given by the question. This question asks for two ways of increasing the volume of apple juice produced. Providing more than this could be seen as a list and therefore the list rule may be applied where marks could be lost.

Of the responses that were awarded a mark, one mark was most often given. Candidates were credited mainly for giving details that related to an increase in surface area without actually mentioning this directly and others were given a mark for information related to a change in temperature.

(iii) Suggest **two** ways of increasing the volume of apple juice produced when 5 cm^3 of pectinase is added to 1 kg of chopped apples.

(2)

Crusing the apple into smaller pieces to give it a larger surface area and to reduce the size so the enzyme is more effective

ResultsPlus
Examiner Comments

This one mark response was one of the very few that actually stated 'larger surface area' to explain why chopping the apples would increase the volume of apple juice produced. This was a good answer.

ResultsPlus
Examiner Tip

Factors affecting enzyme activity are the underlying principles for this question. Any response that includes details of a factor that will increase the activity of an enzyme would have been awarded a mark although be aware of the details already given by the question.

Question 6 (b)

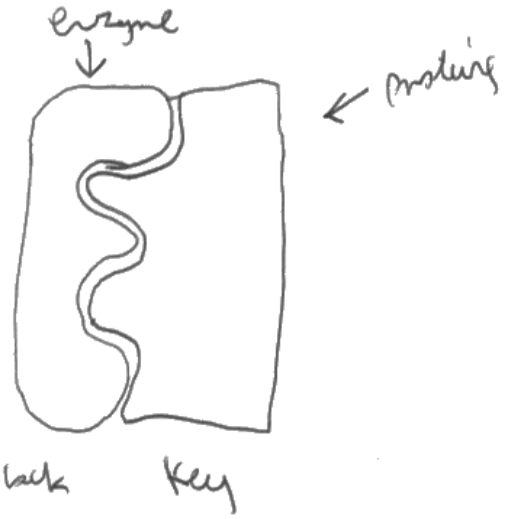
This topic is an area of biology where candidates' knowledge and understanding are particularly weak. Of the responses that were awarded marks, Level 1 was the most popular with candidates scoring 2 marks, for basic details that were mostly supported by diagrams. Few candidates mentioned enzyme-substrate complexes, with the majority mistakenly thinking that an enzyme would join with another enzyme making enzyme 'pairs' that were complementary to each other. Where the lock and key hypothesis was mentioned, candidates inevitably got it the wrong way round, stating that the enzyme was the key and the substrate the lock. Some candidates confused the lock and key hypothesis with DNA and discussed base-pairing in some detail. The term 'substrate' was very infrequently used, and a large number of unlabelled or incorrectly labelled diagrams failed to gain credit. There were a number of candidates who failed to attempt this question at all.

Higher-scoring responses generally included an annotated diagram along with written information that covered some of the indicative content. Written responses alone rarely obtained more than 2 marks at best. Some Level 2 responses gave good diagrams that could have moved the answer into Level 3 had they been annotated in more detail.

*(b) Explain the action of enzymes in terms of the lock and key hypothesis.

You may use labelled diagrams to illustrate your answer.

(6)



The lock/enzyme has to match with the [illegible] key/protein to work.

- Enzymes are biological catalysts
- Enzymes decrease in the strength and in the shape therefore
- Enzymes have the same but different protein join them
- Optimum [illegible] working temperature is body temperature

ResultsPlus
Examiner Comments

The written response given by this candidate is weak and only covers one aspect of the indicative content - i.e. biological catalyst. The diagram in this case moved the answer into Level 2 where the enzyme is referred to as the lock and is shown to have a complementary shape to the 'key' (which has been labelled 'protein' by the candidate). This response gained 4 marks.

ResultsPlus
Examiner Tip

In most cases, unannotated diagrams will not gain marks but they can obtain marks if they are clearly drawn and fully labelled.

Candidates that failed to provide a diagram with a written response, despite the prompting given, generally failed to obtain more than 2 marks for their answer. Information was generally very confused and incorrect referring to enzymes joining with other enzymes and then splitting with little mention of a substrate or by confusing ownership of the active site. Credit was mostly gained by Level 1 candidates for including information that related directly to enzymes such as their 'specific shape' with many candidates making reference to denaturing.

*(b) Explain the action of enzymes in terms of the lock and key hypothesis.

You may use labelled diagrams to illustrate your answer.

(6)

~~Enzymes have a specific shape~~
Enzymes contain an active site. The active site has a specific shape so that the two enzymes can enter it. The enzymes act as the key and the active site is the lock. The enzymes then enter the active site and both merge together but the active site cannot hold them so the enzymes merge together and are released out of the active site. These two enzymes have become one. This could be a more useful enzyme.

ResultsPlus
Examiner Comments

This candidate gives some correct detail about the active site of the enzyme although the remainder of the response is confused. Typically, the candidate implies enzymes joining together with one enzyme joining the active site of another. A very limited understanding of the lock and key hypothesis has been demonstrated for 2 marks.

ResultsPlus
Examiner Tip

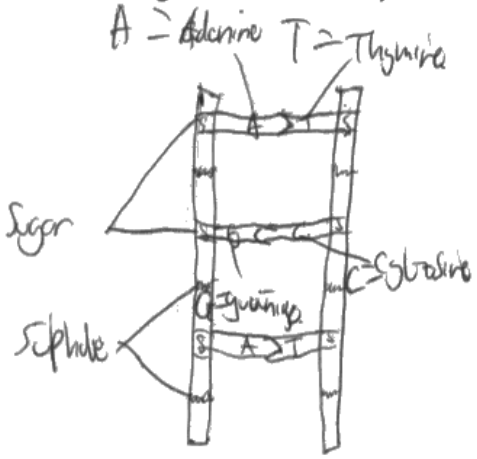
Take the opportunity to present answers as diagrams where appropriate, in addition to a written response, but don't forget to ensure that they are fully labelled.

There were a fair number of candidates who muddled the lock and key hypothesis with the structure of DNA and protein synthesis. These candidates described complementary base-pairing in some detail, most often correctly although the information given bore no relation at all to the question. Unfortunately these candidates failed to gain any credit for the details they gave.

*(b) Explain the action of enzymes in terms of the lock and key hypothesis.

You may use labelled diagrams to illustrate your answer.

(6)



The lock and key hypothesis is down to the linking of enzymes and how certain enzymes link with each other. For example the diagram above shows Adenine and Thymine link together due to ~~their~~ their shape so do Guanine and Cytosine but however Adenine and Cytosine would not link together because their lock and key shapes do not link into eachother, that of the lock and key hypothesis shows the action of enzymes.

ResultsPlus
Examiner Comments

This candidate has confused the way enzymes work with their substrates with complementary base-pairing. The content of this response was frequently seen in many answers but did not relate to the question at all.

ResultsPlus
Examiner Tip

The only link between the structure of DNA and enzymes is that DNA contains the code to produce enzymes. Don't get this mixed up with the lock and key hypothesis which is a very different concept.

Paper Summary

Based on the performance on this paper, candidates should:

- Show all working out to questions that require calculations to be carried out
- Use scientific terminology in their response and apply this to the context of the question
- Learn the difference between the different methods of transport across cell membranes
- Learn the difference between the lock and key hypothesis and complementary base-pairing
- Extract data from the graph to describe what the graph shows
- Refrain from copying text from the question into their answer without adding further details
- Read all information very carefully before attempting to answer the question

Grade Boundaries

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

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

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