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Examiners' Report
March 2013

GCSE Biology 5BI2F 01

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Introduction

The majority of candidates made an excellent attempt at answering all of the questions on the examination paper; it is evident that many have been given good guidance on strategies to use to tackle issues that have arisen in previous series. For example, most candidates are now showing their calculations in response to questions testing mathematical skills and adding key details in answers to some recall questions where previous omissions have meant that candidates failed to obtain full marks. Questions requiring scientific interpretation and analysis were particularly well done, which indicates that many candidates at Foundation level are developing good skills that, in the majority of cases, were awarded full credit.

There are still various areas of development that should be addressed at Foundation level:

- Understanding what the question is asking and responding with information that meets only the requirement(s) of the question: too many responses included irrelevant information, which for many unfortunately led to marks being deducted from a potentially higher score for more concise answers.
- Subject knowledge in specific areas: it was evident that some candidates misinterpreted what the question was asking or lacked the subject knowledge needed to give an appropriate response.
- Structuring extended answers to promote better achievement: in a few cases, candidates structured their answers based on information given in previous questions and they should be encouraged not to do this unless the question is one in a series linked to particular information or to a specific set of data. This was particularly the case for Q3(b)(ii) , an investigation into fertilisers.

Responses to the 6-mark questions were varied, with candidates generally performing better on the structures and functions of the heart than on water transport in plants, although the difference in performance across the two extended answer questions was clearly due to the depth of candidates' subject knowledge of each topic. Many answers to the question on the heart were outstanding, with significant attention paid to details that linked structure to function. Transport of water through a plant, even though well attempted, produced less successful results, which clearly highlighted a lack of subject knowledge or, at the very least, understanding that was confused or lacked detail.

The extended answer questions are proving a challenge for the least able candidates, who might be encouraged to work on strategies to develop scientific literacy and essay writing. Including mind-maps and other memory techniques on the examination paper might be one way in which candidates could incorporate and link information that could then be adapted into the 'essay-style' response required. Such preliminary work on the paper in preparation for the final response might well gain the candidate further credit.

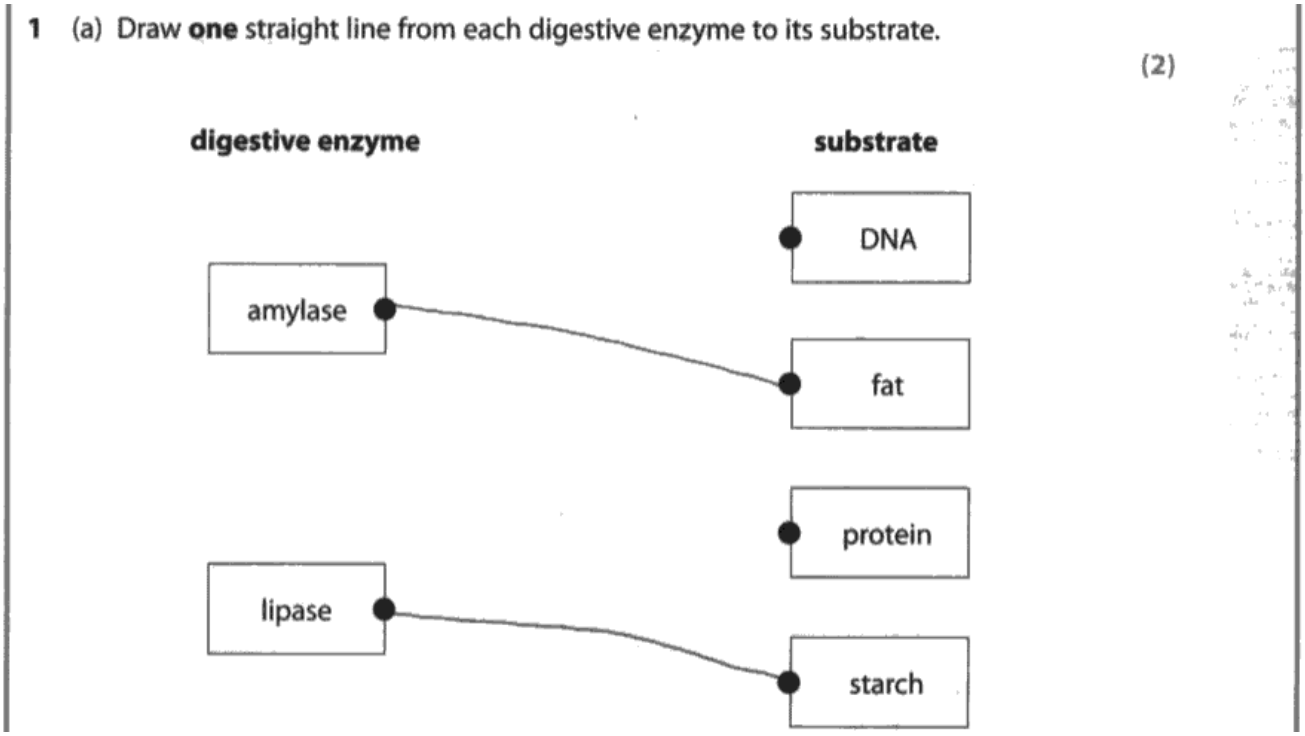
This report provides exemplification of candidates' work, together with tips and/or comments, for a selection of questions. The exemplification will come mainly from questions that required more complex responses from candidates.

Digestive enzymes

Question 1(a)

Responses to this question enjoyed varied success with most candidates gaining at least 1 mark, most commonly for linking amylase to starch. Some candidates failed to follow the instruction and drew two lines from each enzyme, which cancelled out any marks they might have gained.

Less able candidates failed to demonstrate their understanding of enzymes or gain credit for their response to this question. Although only a few candidates were unsuccessful in their answer, it is evident that there is a general lack of knowledge in this subject area among candidates working below grade D.



ResultsPlus
examiner comment

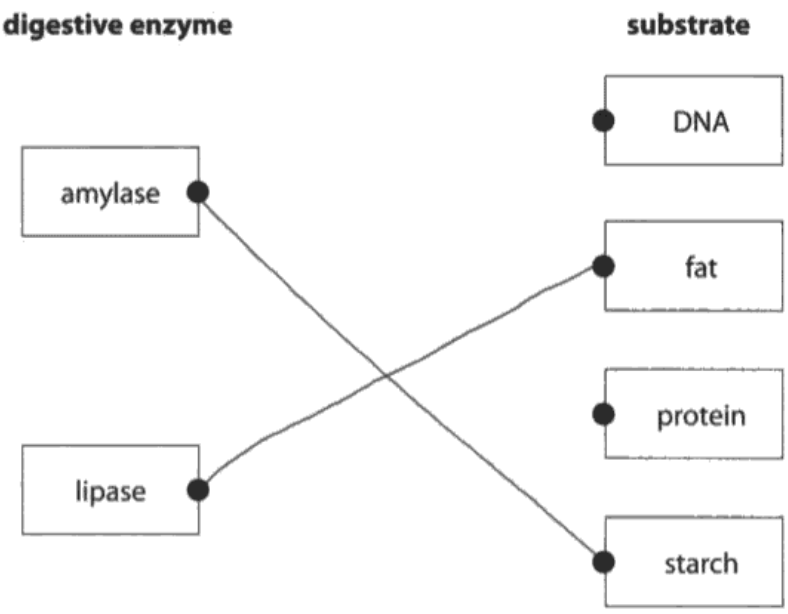
Some candidates are clearly unaware of the substrates for the enzymes shown. In this case, although the candidate has selected the two correct substrates from the list given, they have not linked them to the correct enzyme and therefore gained no marks.

ResultsPlus
examiner tip

Read the question carefully and follow the instructions closely. This question asks for one line to be drawn. Drawing any more than this will lead to marks being cancelled.

1 (a) Draw **one** straight line from each digestive enzyme to its substrate.

(2)

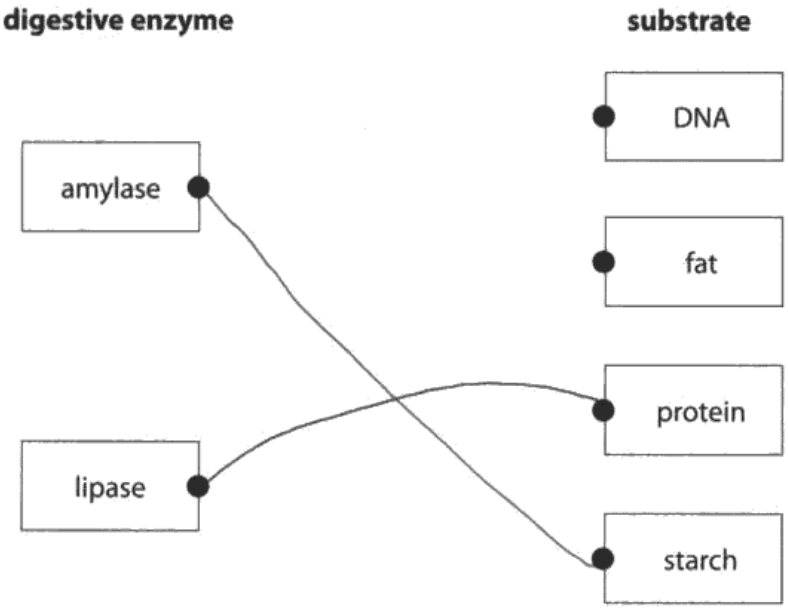


ResultsPlus
examiner comment

This response gained both available marks for linking each enzyme with its correct substrate. The majority of candidates gaining 1 mark for their response did so by linking amylase to its correct substrate rather than lipase.

1 (a) Draw **one** straight line from each digestive enzyme to its substrate.

(2)



ResultsPlus
examiner comment

This response gained 1 mark for linking amylase to its substrate but failed to link lipase correctly. This was a common error.

Question 1(b)(iii)

Many candidates were able to give responses to this question that were structured clearly and went straight to the point, choosing two different aspects of the data shown to gain full marks. Most 2-mark answers included a comment comparing the maximum activity of each enzyme, which also made reference to the pH at which each enzyme was most active. The majority of candidates who included details about optimum activity in their answer tended to use data extracted from the graph to support the comparison made.

Although a large number of candidates were able to gain at least 1 mark for their response to this question, the structure of many answers implied little understanding of the information in the graph. It appeared that some candidates were unaware that pepsin and trypsin were enzymes themselves, rather than that they contained enzymes, and this was evident in a large number of responses that included comments such as 'trypsin's activity of enzymes was higher than pepsin' or 'pepsin's enzymes had a pH of 3'.

A number of candidates referred to the shape of each graph as a rate or time and consequently compared the 'speed' at which each enzyme worked, eg 'trypsin takes longer to work than pepsin'.

Very few candidates used the word 'range' to describe the pH values over which each enzyme was active, although most who did touch on this point did gain 1 mark for their response. A fair number of candidates referred to the enzymes themselves having a particular pH rather than referring to the conditions in which they were active and other responses were too vague to receive credit. It was pleasing to see the term 'optimum' crop up in numerous responses and be used correctly to define the difference in the optimum pH of trypsin and pepsin.

Some candidates referred to the enzymes being an 'acid' or 'alkali' or implied that each enzyme had its own pH. This was a fairly common error among less able candidates, who are likely to have misinterpreted the information given.

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 Trypsin works at a higher PH than Pepsin.

2 Trypsin has a higher PH which suggests that it is Stronger than Pepsin.

ResultsPlus
examiner comment

This example gained 1 mark for the first part of the response. The second part clearly refers to trypsin having a particular pH itself, rather than its activity being influenced by the pH, although even if this part of the answer had been formulated along these lines, it would simply have repeated what had been said previously.

ResultsPlus
examiner tip

Try not to repeat points. This question asks for 'two ways', ie two **different** aspects of the data provided.

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 Pepsin is a acid whereas trypsin is a alkali.

2 The two enzymes need different ~~enzymes~~ pH's to be able to do there job.

ResultsPlus
examiner comment

This response implies that the candidate has misinterpreted the information given on the graph and scores zero marks. No credit has been gained for referring to pepsin as an acid and trypsin as an alkali or for the second part of the response, which does not distinguish clearly between the 'different pH's' needed by the enzymes.

ResultsPlus
examiner tip

Study the information on graphs carefully before attempting to answer the question. Read both axes of the graph to ensure that that there is a full awareness of what the data is showing.

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 The activity of pespin is lower on graph than tryspin.

2 pespin works at lower PH's than tryspin.

ResultsPlus
examiner comment

This response gained both marks for making two clear comparisons between the maximum activity of each enzyme and the pH at which each is active.

ResultsPlus
examiner tip

Use data extracted from graphs to support answers where possible, although make sure that the data extracted is correct. Reading incorrectly from graphs could lead to marks being lost.

(iii) Using the graph, describe **two** ways in which the activity of pepsin is different to the activity of trypsin.

(2)

1 Pepsin's activity speeds up alot faster than trypsin.

2 Trypsin's optimum pH is pH 9, whereas pepsin's optimum pH is pH 3

ResultsPlus
examiner comment

This is an example of a partial misinterpretation of the data shown in the graph and scored only 1 mark. The candidate has mentioned that pepsin 'speeds up faster', which is likely to be an interpretation of the gradient of the graph when the gradient represents activity at discrete pHs.

ResultsPlus
examiner tip

Read the axis labels of the graph, which should provide guidance on the content of a response. In this case, there is no time value given; therefore, this is not a factor that should have been included in a response.

Question 1(b)(iv)

The majority of candidates were able to state the difference in the activity but were then unable to extend their answer to explain why this difference occurred.

Few candidates were able to apply their understanding of the effects of pH on the structure of the enzyme to include details about denaturing. This, therefore, restricted the total marks awarded for the majority to 1 for this question.

Candidates who were able to score the full 2 marks tended to include the term 'denature', although many responses referred to this in a context that was only just acceptable. Few, if any, responses were seen that included details of the active site or the inability of the enzyme to bind to its substrate. Candidates who gained 2 marks generally did so by including a reference to the optimum pH of trypsin and to it denaturing at pH 11.

Candidates gaining 1 mark revisited the idea of the optimum pH being 9 (therefore it is less active at pH 11) and this, being the most common answer, was generally well expressed. It was unfortunate that some candidates chose to refer to enzyme 'reactivity' rather than 'activity', which lost them marks. Candidates must be aware of the role of enzymes as catalysts – they do not take part in the reaction itself.

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

Because it has reached it's optimum pH 9, after this is will no longer work as it starts to denature so at pH 11 it will no longer work.

ResultsPlus
examiner comment

This response gained full marks for suggesting that the optimum pH is when the enzyme is working at its maximum rate (and therefore it will not work as well at another pH) and also for explaining why the activity decreases at pH 11. As with most 2-mark answers, the explanation makes reference to denaturing.

ResultsPlus
examiner tip

Be careful with the use of the term 'denature'. Several responses mentioned that the enzyme had 'denatured' at pH 11, which is clearly not the case. Some activity was still evident at pH 11, so at this point the enzyme was in the process of denaturing.

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

Trypsin's optimum PH is at 9 so the enzyme has been at its optimum digesting level and the process is coming to an end.

ResultsPlus
examiner comment

This response illustrates a typical 1-mark answer that failed to provide an explanation of why there is a difference in activity at each pH.

ResultsPlus
examiner tip

Be aware that an 'Explain' question demands a response that includes scientific information. This information is usually not found in any graphs or data provided with the question but comes from the candidate's knowledge and understanding of the subject.

(iv) Explain why the activity of trypsin is different at pH 11 compared to pH 9.

(2)

Because the higher the PH the less reactive it will be. It has to be on a certain point to get the trypsin working properly

ResultsPlus
examiner comment

This response used the word 'reactive' in relation to the enzyme and lost the mark that it would otherwise have gained if it had used the term 'active'. No credit could be given.

Useful bacteria

Question 2(b)(i)

This was generally very well answered with candidates able to follow the instructions to determine the difference in the number of useful bacteria.

Most candidates gained full marks, with approximately half giving a calculation to show how they had arrived at their answer.

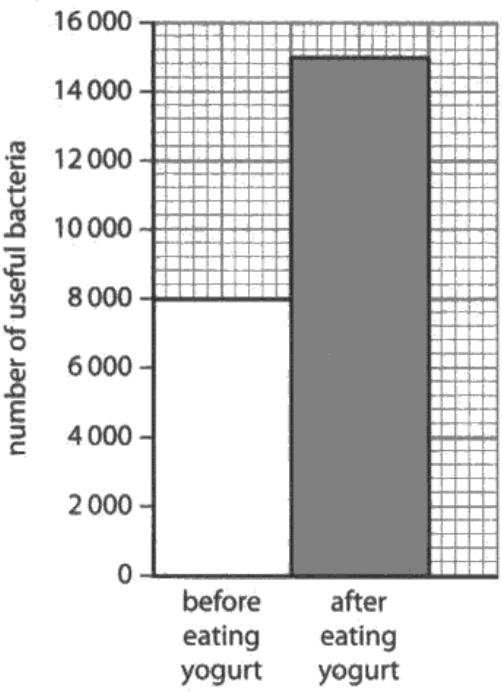
Of the few candidates who did not read from the graph correctly, some credit was given to calculations that were within the tolerance stated by the mark scheme.

Other responses just gave an incorrect raw answer that was within the tolerance and, if a calculation had been shown, might well have scored 1 mark.

There was, unfortunately, some carelessness in the calculations carried out. For example, the correct values might have been incorporated into a correct calculation but with an incorrect final answer, eg 15 000 – 8000 = 700.

(b) The graph shows the number of useful bacteria in part of the digestive system of a person before and after eating yogurt.

The yogurt contained prebiotics.



(i) Calculate the difference between the number of bacteria present in the digestive system before and after the yogurt was eaten.

(2)

14 500
- 8 000
6 500

6500 useful bacteria

ResultsPlus
examiner comment

In this instance, the candidate has read the tallest bar incorrectly and used this figure to subtract 8000 from. As the number used, 14 500, is within the tolerance on the mark scheme, 1 mark was awarded for the calculation being completed correctly.

ResultsPlus
examiner tip

Read the values given on the Y axis carefully to ensure that the correct data is extracted from graphs. In this case, the increments rise by 2000 each time, so the value found directly between 14 000 and 16 000 has to be 15 000.

(i) Calculate the difference between the number of bacteria present in the digestive system before and after the yogurt was eaten.

(2)

15000 − 8000 = 7000

7000 useful bacteria

ResultsPlus
examiner comment

This is an example of a well-presented answer that gained the candidate full marks. The correct values derived from the graph are shown in a correct calculation that concludes with the final value of 7000.

ResultsPlus
examiner tip

Show your working at every opportunity and set this out in a way that is easy to follow. Even if the values in the calculation are incorrect, marks could be gained.

(i) Calculate the difference between the number of bacteria present in the digestive system before and after the yogurt was eaten.

(2)

6500 useful bacteria

ResultsPlus
examiner comment

This example shows a final incorrect answer. The answer given might well have been calculated using values within the tolerance given on the mark scheme but unfortunately the working has been omitted. It might have received 1 mark if the calculation had been shown, but as presented it gained no credit at all.

ResultsPlus
examiner tip

Always show working out to questions requiring some form of calculation. Marks cannot be lost for showing working out, but they can certainly be gained.

Question 2(b)(ii)

The vast majority of candidates were able to state correctly the effect of prebiotic yoghurt on the number of useful bacteria in the digestive system. Some emphasised this effect with words such as 'massive' or 'rapid' and others used the data calculated from the previous question to state by how much the number of useful bacteria increased.

For candidates who included incorrect data in their response, with this data clearly being lifted from their answer to the previous question, an error carried forward was applied to ensure that candidates were not penalised for previous mistakes made.

The most common incorrect answers implied some confusion among candidates regarding what the question was asking. These candidates attempted to describe the role of prebiotics or useful bacteria in the body, rather than the effect of the prebiotics on the number of bacteria. A fair number of incorrect responses covered information relating to the immune system, reduced risk of cancer and other details that failed to gain the candidates any marks as they simply did not answer the question.

Other less common incorrect answers muddled the prebiotics with the bacteria and stated that 'the number of prebiotics [rather than bacteria] increased' or that 'eating yoghurt increases the number of prebiotics'.

(ii) Describe the effect on the number of useful bacteria after eating yogurt containing prebiotics.

(1)

the number of useful bacteria has increased

ResultsPlus
examiner comment

This is an example of a response gaining the single available mark for stating clearly that there is an increase in the number of useful bacteria in the digestive system after eating prebiotic yoghurt.

ResultsPlus
examiner tip

Answers that are well written and go straight to the point are far more likely to gain a mark. This is a 1-mark question that demands only one piece of information. Lengthy answers are unnecessary and can detract from the key issues that gain marks.

(ii) Describe the effect on the number of useful bacteria after eating yogurt containing prebiotics.

(1)

~~the bacteria helps your bones~~ & it gets rid of any bad bacteria cells in your body because yogurt bacteria cells are good bacteria.

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examiner comment

This response attempts to describe the effect that useful bacteria have in the body. There is no detail that implies that the number of useful bacteria increases, so no marks could be awarded.

ResultsPlus
examiner tip

Highlight the key points in the question – what is the question asking you to do? In this case 'number' would be highlighted as would 'useful bacteria'. This will help to focus your answer on the details needed to gain marks.

(ii) Describe the effect on the number of useful bacteria after eating yogurt containing prebiotics.

(1)

The effect would be it gives the person more energy and it is healthier.

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examiner comment

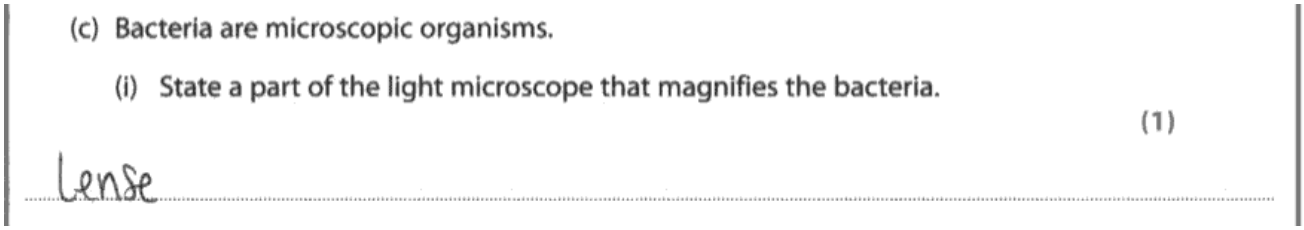
This response is another example of an attempt to describe the effect of the useful bacteria on the body rather than to describe the effect of prebiotics on the number of useful bacteria. This candidate did not gain the mark.

Question 2(c)(i)

This question was answered very well by the majority of candidates who gave 'lens' as their answer, albeit in a variety of forms. An unusually high number of candidates gave the incorrect spelling for 'lens', writing 'lense' as their answer, although this was not penalised.

Few candidates gave the full correct name of the part of the microscope that magnifies images, the objective lens, many preferring to describe it as the 'magnifying lens', 'microscopic lens' or, most commonly, 'eyepiece lens', which, again, they were not penalised for.

Incorrect answers more often related to specific parts of the microscope that are not involved in the magnification of images, including 'eyepiece', 'mirror' and 'focusing wheel'.



(c) Bacteria are microscopic organisms.

(i) State a part of the light microscope that magnifies the bacteria.

(1)

Lense

ResultsPlus
examiner comment

This is an example of a correct response that shows the common misspelling of 'lens'. Few candidates were able to provide the full name given to the part of the microscope that magnifies bacteria, with the majority just stating 'lens' for the mark.

ResultsPlus
examiner tip

Keeping a glossary of key terms that show their correct meaning and spelling will increase scientific literacy. This reduces the risk of spelling a word in such a way that may give it a different meaning, which could lead to marks being deducted.

(c) Bacteria are microscopic organisms.

(i) State a part of the light microscope that magnifies the bacteria.

(1)

Objective lens.

ResultsPlus
examiner comment

This response was one of the few that gave the full name for the part of the microscope that magnifies bacteria, gaining the 1 mark on offer.

(c) Bacteria are microscopic organisms.

(i) State a part of the light microscope that magnifies the bacteria.

(1)

magnifing glass

ResultsPlus
examiner comment

This candidate gained no mark for giving 'magnifying glass' as their answer. This is not the scientific name of the part of the light microscope that magnifies bacteria.

ResultsPlus
examiner tip

Make sure always to use the correct scientific terms.

Question 2(c)(ii)

Most candidates referred to clarity and detail in one sentence for the full 2 marks, with many adding appropriate information in their response. The majority of candidates preferred to use the term 'more clear' rather than 'clarity', which was perfectly acceptable.

Most candidates made good use of the images shown and their own knowledge of bacterial structure to gain at least 1 mark. The majority of 1-mark answers included information about the structures of the bacterial cell that could be seen using an electron microscope, but not a light microscope, although this extra detail formed part of the same marking point and could not be credited separately.

Other responses scoring 1 mark mentioned that a 'larger image is seen', although this answer was less common.

Candidates who failed to obtain a second mark or to gain any marks were generally vague in their answers, stating that the electron microscope could 'zoom in more' or 'allowed you to see the image more closely'. Very few left this question blank and for this they should be commended.

(ii) Describe **two** advantages of using an electron microscope to view bacteria.

(2)

an electron microscope allows you to see the flagellum. it also allows you to see more detail rather than just the shape of the bacteria.

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This response gained just 1 mark for stating that greater detail can be seen using an electron microscope. It gives the example of the flagellum as a structure that might be seen using an electron microscope, which is not shown in the photograph taken from a light microscope, but this is part of the same marking point: the mark could have been awarded for 'more detail' or for 'the flagellum' but not both.

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In questions such as this, it is important that any structures mentioned are those that can be seen in the images. Don't include structures that cannot be clearly seen and never include structures that are not found in bacterial cells at all.

(ii) Describe **two** advantages of using an electron microscope to view bacteria.

(2)

* You can find out the bacteria's Shape and Structure.

* you can identify if it's good bacteria or bad bacteria.

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This response failed to secure any marks. The candidate has made a fair attempt at giving an advantage of the electron microscope in the first part, although the information is too vague to gain a mark. The second part is irrelevant and seems likely to have been added as a guess rather than application of knowledge.

ResultsPlus
examiner tip

Use all the information given in the question to help with answers. This question could have been answered correctly by more candidates just by comparing the two images provided.

(ii) Describe **two** advantages of using an electron microscope to view bacteria.

(2)

Electron microscopes can make the bacteria look alot bigger magnifies it more. can ~~[illegible]~~ be seen in more detail.

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examiner comment

This example of a 2-mark response gives clear information on the advantages of using an electron microscope. The response states that the bacteria 'look alot [sic] bigger' and goes on to clarify this by stating that the electron microscope 'magnifies it more'. One or other of these statements would have been acceptable for 1 mark. The second mark is gained by the reference to 'more detail' seen with the electron microscope. A clear, well-structured answer.

ResultsPlus
examiner tip

Beware of giving information that covers the same point twice, which would make it eligible for only 1 mark. If a question asks for two points to be included in an answer, make sure they are two **different** points.

Question 2(c)(iii)

This was a well-answered question despite the variation in the spelling of 'flagellum'. In a very few cases the spelling was so poor that no mark could be awarded. 'Flagellum' was the most common correct answer, followed closely by 'cell wall' and then 'cell membrane', both of which scored candidates a mark.

The most common incorrect answers included structures that could not be seen in the photographs or that were not present in bacterial cells at all. These included 'plasmid', 'nucleus' and 'tail'.

(iii) Name **one** structure of the bacterial cell that can be seen in the image from the electron microscope.

(1)

Nucleus

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This candidate failed to gain the mark for 'nucleus', which is not present in bacterial cells.

ResultsPlus
examiner tip

Make sure that the structures given in a response relate to the question being asked.

(iii) Name **one** structure of the bacterial cell that can be seen in the image from the electron microscope.

(1)

cell wall

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examiner comment

This is an example of a response gaining the mark for correctly identifying the cell wall as a structure seen using the electron microscope.

Plant growth

Question 3(a)(i)

The more able candidates identified mitosis as the type of cell division taking place in the root of the plant, with less able candidates making a noble attempt at giving an answer that unfortunately gained no marks. In this question, candidates were expected to link their understanding of mitosis in forming 'body cells' to that of the plant and this proved to be a challenge for those working below a grade D.

It may be that the higher achievers were able to eliminate meiosis on the basis of their understanding that this type of division takes place to produce gametes and that the diagram clearly did not give any information related to reproduction.

Candidates who were unsuccessful in their attempt at answering this question gave a variety of responses, some of which were unrelated to the context. It is evident from this that some candidates struggle in their understanding and/or knowledge of cell division and being able to apply this to an unfamiliar context.

(i) State the type of cell division taking place in the root.

(1)

mitosis.

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Answers to this question were clear-cut – they were either right or wrong. This candidate gained the mark for correctly stating the type of cell division taking place in the root of the plant.

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There are only two types of cell division, with one being involved in the production of sex cells. In this case, it is clear that no sex cells were being produced so that can only leave mitosis as the answer.

(i) State the type of cell division taking place in the root.

(1)

growth

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examiner comment

This candidate clearly understood the reason for cell division in the root but failed to mention the type of cell division taking place (mitosis) that brings about growth.

(i) State the type of cell division taking place in the root.

(1)

meiosis

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This candidate was clearly aware that meiosis is a type of cell division. It is evident, however, that they lacked an understanding of the outcomes of meiosis. If they had been more aware, they might have understood that the diagram does not show the production of gametes and they might instead have chosen mitosis as their answer.

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Learn the differences between meiosis and mitosis and apply understanding of both methods of cell division to different contexts.

Question 3(a)(iii)

There was a general lack of understanding of cell differentiation among candidates, although in this case the context of the question may have proved more of a challenge to less able candidates than expected. Responses were poor with very few candidates gaining any marks. It is likely that candidates are familiar with cell differentiation in animals, and what the outcomes of this process are, but few were able to relate this understanding to cell differentiation in plants.

The majority of candidates chose to discuss the growth of root cells, root cell division, death and elongation (from the diagram), rather than specialisation leading to a specific function, with many using words or sentences from other parts of the question in a vain attempt at providing a description. Other responses described how roots absorbed water for photosynthesis, going on to give irrelevant detail about root cells getting longer in order to obtain water.

Only the most able candidates were able to obtain the full 2 marks for responses that recognised that cell differentiation included specialisation leading to a specific function. Some candidates also gave examples of specialised cells, such as root hair cells or xylem vessels, indicating an excellent understanding of this topic and skill at applying knowledge to a context that they are unlikely to have come across before.

(iii) Describe what happens to the root cells during cell differentiation.

(2)

During cell differentation root cells are being specialised for a spesific function, they are also forming new root cells.

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This is an excellent response, which scored full marks. Three key marking points have been included in the answer, which gives clear information on what happens to the root cells during differentiation.

ResultsPlus
examiner tip

Cell differentiation involves the same processes regardless of whether it takes place in animals or plants. Learn to apply your knowledge and understanding of this process to a variety of contexts.

(iii) Describe what happens to the root cells during cell differentiation.

(2)

The root cells elongate which gives it a greater surface area for cell differentiation to occur.

ResultsPlus
examiner comment

This is a typical example of a response that failed to gain any marks. Many candidates were under the impression that the root cells just grew longer during cell differentiation, with some extending their answer to give reasons why the roots needed to grow longer.

(iii) Describe what happens to the root cells during cell differentiation.

(2)

It becomes specialised, where as before it was unspecialised

ResultsPlus
examiner comment

This response gained 1 mark for correctly stating that cells become specialised during cell differentiation. It failed to gain the second mark as it did not include details about how specialised cells have specific functions.

ResultsPlus
examiner tip

Note the number of marks allocated to specific questions and ensure that your response provides adequate detail for the number of marks stated.

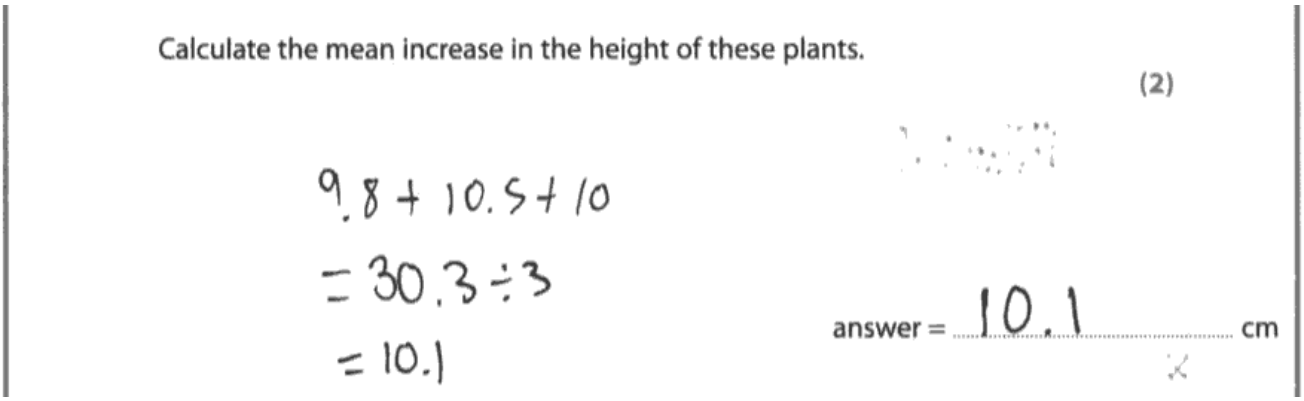
Question 3(b)(i)

This question was answered well, with the vast majority of candidates gaining both marks, setting out their calculations clearly and placing the correct final answer in the space provided. It was pleasing to see that the majority understood how to calculate a mean.

Where marks were lost, candidates failed to divide their sum by 3, giving 30.3 as a final answer without showing any working out, or carried out an incorrect calculation by multiplying heights rather than adding.

Other candidates demonstrated a lack of understanding of the order of operations in a calculation, and probably applied this misunderstanding in their use of a calculator to arrive at an incorrect answer.

Many of the candidates who failed to gain marks did not show their working and gave an incorrect raw answer which, if shown with the working, might have gained them a maximum of 1 mark.


Calculate the mean increase in the height of these plants.

(2)

9.8 + 10.5 + 10

= 30.3 ÷ 3

= 10.1

answer = 10.1 cm

ResultsPlus
examiner comment

This response gained full marks. The correct total of 30.3 has been given for the addition; the correct division sum has then been carried out to arrive at 10.1. If the correct answer had been given without any other details, this would also have been worthy of both marks. If the correct sum of 30.3 had been shown, but the division calculation had ended up at the wrong answer overall, 1 mark in total could still have been awarded for the 30.3. This highlights the importance in a calculation of showing the working out.

ResultsPlus
examiner tip

Ensure that final answers are placed in the space provided so that it is clear to the examiner what your final answer actually is.

Calculate the mean increase in the height of these plants.

(2)

answer = 7.1 cm

ResultsPlus
examiner comment

This candidate has given no indication of how they have arrived at an answer of 7.1. If they had shown a calculation, they might have gained 1 mark.

Calculate the mean increase in the height of these plants.

(2)

9.8 + 10.5 =

19 + 1.3 = 20.3

20.3 + 10 = 30.3

30.3 ÷ 3 = 11.1

answer = 11.1 cm

ResultsPlus
examiner comment

This response gained 1 mark overall. Although the final answer is incorrect, the candidate has correctly carried out part of the calculation to arrive at an answer of 30.3.

Question 3(b)(ii)

Many candidates were able to score at least 1 mark for this question by recognising that Fertiliser A had the greatest effect on plant growth. Nearly all candidates were able to state that all of the fertilisers caused the plants to grow more and several made attempts at incorporating data from the previous question involving the growth of a different set of plants without fertiliser.

Less successful candidates attempted to give details of why fertilisers promote growth, including information about nutrients and photosynthesis, which were ignored in the grading of the response.

Other descriptions were too vague, eg 'fertilisers affect plants differently', without adding depth to incorporate information about how each fertiliser affected growth. Overall, a well-answered question with a large number of candidates giving two descriptive points that earned them full marks.

(ii) In a second investigation, another three tomato plants each had a different fertiliser, **A**, **B** or **C**, added to their soil.

The mean increase in the height of each plant, after two months, is shown in the table.

	Fertiliser		
	A	**B**	**C**
increase in height of tomato plant / cm	20.4	14.6	10.6

Describe the effect of these fertilisers on the height of the tomato plants.

(2)

Fertiliser A increase the rate of growth by ~~double~~ almost double what fertiliser C did.

ResultsPlus
examiner comment

This candidate has clearly identified the effect of Fertiliser A (increased plant growth) and made a comparison with Fertiliser C, gaining 2 marks for the response.

Describe the effect of these fertilisers on the height of the tomato plants.

(2)

All ~~of the~~ the heights of the plants increased but at different heights and some not as well.

ResultsPlus
examiner comment

This response gained 1 mark for identifying the overall effect of the fertilisers on plant growth. A further mark could have been gained by analysing the data more closely to make a comparison between the effects of each fertiliser.

ResultsPlus
examiner tip

Use the information given in questions as much as possible. In cases where the question presents data, use this to support descriptions or explanations.

Describe the effect of these fertilisers on the height of the tomato plants.

(2)

the fertilisers made the plants height increase

ResultsPlus
examiner comment

This response gained 1 mark for identifying the correct effect that the fertilisers had on plant growth. This score could have been improved by making a comparison of the effects of the fertilisers.

Question 3(b)(iii)

This was another well-answered question, with many candidates gaining full marks for giving details of other measurements that could be taken to test the effect of fertilisers on the growth of plants. Very few, however, included a measurement of stem width. More often, responses that did mention a measurement of the stem gave details on measuring its height, which gained no marks.

Among the less successful candidates, some gave various answers not linked to a measurement of any kind and went on to provide details on how they would make the previous experiment more valid by describing the control variables; some stated that the plants should be given more water or sunlight; others gave vague responses such as 'measure the leaves' or implied a repeat of the previous investigation, eg 'measure the height of the stem'.

A few candidates were aware of the different measurements that could be taken but were unable to express their responses with the clarity necessary to gain full marks. In some cases a list of measurements was given in which some details were incorrect. This unfortunately led to marks being negated.

(iii) The student thought that fertilisers might also affect the growth of tomato plants in other ways.

Suggest **two** other measurements of the plant the student could make to test this idea.

(2)

1 Size of the tomatoes.

2 The width of the stem.

ResultsPlus
examiner comment

This response gained the full 2 marks. The candidate has given two valid measurements that can be taken to test the effect of fertilisers on plant growth.

ResultsPlus
examiner tip

Read the question carefully to make sure that the information you provide meets the requirements of the question. In this case, the question asks for 'two **other** measurements', which means that any details incorporated into a response regarding the height of the plants, the focus of the previous question, will be disregarded.

(iii) The student thought that fertilisers might also affect the growth of tomato plants in other ways.

Suggest **two** other measurements of the plant the student could make to test this idea.

(2)

1 The water intake

2 The level of photosynthesis

ResultsPlus
examiner comment

The ideas mentioned in this response would not give a reliable or valid picture of the effect of fertilisers on plant growth, so were awarded no marks. This candidate is likely to have not fully understood the aim of the investigation carried out or may have misinterpreted the question.

(iii) The student thought that fertilisers might also affect the growth of tomato plants in other ways.

Suggest **two** other measurements of the plant the student could make to test this idea.

(2)

1 The size of the tomatoe.

2 The size of the stem and leaves.

ResultsPlus
examiner comment

This candidate has clearly understood the measurements that can be taken to investigate the effect of fertilisers on plant growth. However, the second part of the response mentions 'the size of the stem', which is vague and could mean height, a measurement that was not admitted due to it being the subject of the previous question. Although 'the size of the leaves' would have been adequate for 1 mark, this has not been allowed as a direct result of the comment made about the stem. The response gains 1 mark overall for stating that the size of the tomatoes could be measured.

ResultsPlus
examiner tip

A list rule applies in examinations. In this response, three measurements have been given when only two were asked for. One of the measurements given is incorrect so 1 mark is deducted from the total score that the response could have gained. Give only the number of responses required unless there is absolutely no doubt that all details given are correct.

Stem cells

Question 4(a)(i)

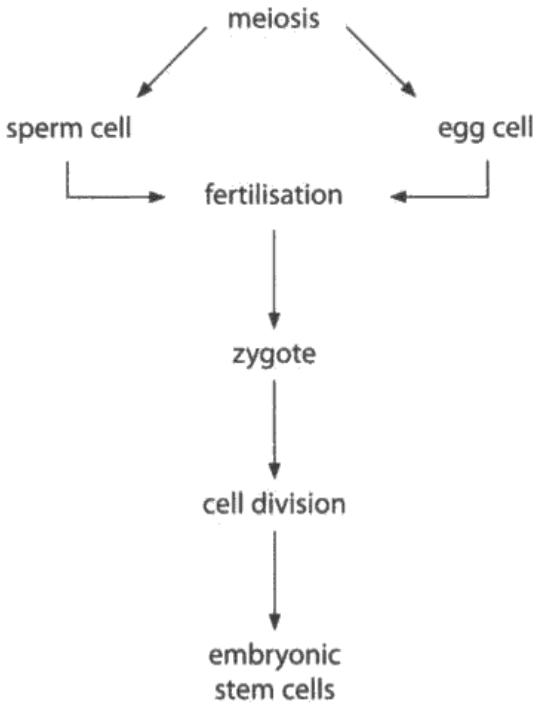
This question gained varied responses, with more able candidates scoring at least 1 mark. Less able candidates tended to describe the diagram and gave answers based on the production of embryonic stem cells; some failed to identify the sperm and egg as gametes or sex cells, with these being the direct product of meiosis.

Some candidates described the differences between the processes of meiosis and mitosis rather than the differences between the types of cell that each produced and consequently failed to gain any marks.

The majority of 1-mark answers mentioned that meiosis results in the production of sex cells or gametes. Very few used the term 'haploid' in their answer and even fewer described sex cells as being genetically different.

Many candidates who failed to gain full marks simply misinterpreted the question and discussed the pros and cons of embryonic stem cells. The diagram seemed to mislead such candidates into thinking that stem cells were a direct product of meiosis, which led to some providing details that might have been placed better in a response to a subsequent question.

4 The diagram shows how embryonic stem cells are produced.



(a) (i) Describe how the cells produced by meiosis are different from body cells.

(2)

The cells produced by meiosis are ~~formed stem stem cells.~~
~~Stem cells are blank cells and are adequate for cloning cells.~~
Sex cells, meaning they're for fertilising and the end forming an embryo

ResultsPlus
examiner comment

This candidate gained 1 mark for identifying that meiosis produces sex cells.

ResultsPlus
examiner tip

Avoid using terms derived directly from the question or a diagram as this could be taken as just a repeat of the question. Try to use alternative scientific terms which, in this case, would include 'gametes' or 'sex cells'. 'Sperm' or 'egg cells' were not credited as their inclusion provided no evidence of subject knowledge or understanding.

(a) (i) Describe how the cells produced by meiosis are different from body cells.

(2)

They produce 4 haploid daughter ~~cells~~ cells.

ResultsPlus
examiner comment

The 1 mark awarded for this response is not for the fact that four cells are produced, as this describes an outcome of the process of meiosis, but rather for the mention that these cells are haploid.

ResultsPlus
examiner tip

Use any diagrams given to help with responses, although avoid describing what the diagram shows. Interpret the information and then use the information gathered to form a response that gives enough detail to justify the marks allocated.

(a) (i) Describe how the cells produced by meiosis are different from body cells.

(2)

They are diggerent grom body cells because stem cells can repair damaged cells e.g. if you replace a damaged gaulty cell that has caused Huntingtons disease; the stem cell may be able to repair it.

ResultsPlus
examiner comment

This candidate has misunderstood the diagram, interpreting meiosis as a process resulting in the production of embryonic stem cells. The candidate has made an attempt at describing how stem cells are different from body cells and, apart from the information being irrelevant to the question, it is also incorrect. No marks were gained for this response.

ResultsPlus
examiner tip

Read through the information given in diagrams carefully and use only the information necessary to form a focused response. In this case, the question asks only about the cells produced by meiosis, ie the sex cells, not about embryonic stem cells, which are the product of several processes shown in the diagram.

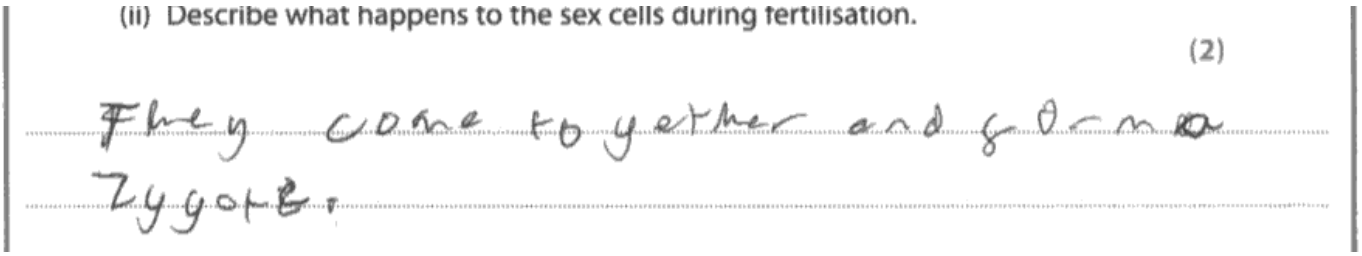
Question 4(a)(ii)

A fair number of candidates lost marks for using the term 'fertilise' to describe the process of fertilisation, with many responses basically repeating the question – 'the sperm fertilises the egg' was common but unfortunately gained no credit.

Candidates scoring 1 mark were able to structure their answer more appropriately, using terminology that implied an understanding of the process of fertilisation. Simple statements such as 'the sperm joins with the egg' or 'the sperm and egg combine' were worthy of 1 mark, although more vague statements that failed to gain a mark included 'the sperm and egg meet'.

More able candidates were able to extend their answer to obtain full marks for their response, most commonly to include information relating to the formation of a zygote, but very few candidates included detail that implied the mixing of genetic information.

There was some confusion over terminology or a misunderstanding of the outcome of fertilisation; many candidates stated that an embryo or foetus was formed as a result of the process.


(ii) Describe what happens to the sex cells during fertilisation.

(2)

They come together and form a Zygote.

ResultsPlus
examiner comment

This response gained 1 mark for stating that a zygote is formed following fertilisation. Unfortunately, the phrasing of the sentence to describe what happens to the sex cells, ie 'They come together', does not provide an accurate picture of the fertilisation process and was not awarded a mark.

ResultsPlus
examiner tip

Correct use of appropriate terminology is very important in all topics. Some candidates structured their response in such a way that made it clear that the egg and sperm cell combine or join without using these terms. Although it is preferable to use scientific terminology to minimise the risk of losing marks, there are alternative ways to express knowledge and understanding. As long as these ways provide an accurate description, credit will be given.

(ii) Describe what happens to the sex cells during fertilisation.

(2)

during fertilisation the sperm cells go into the egg cell to fertilise the egg and then is a zygote then the cells divide into 2 then 4 and so on until it forms a child.

ResultsPlus
examiner comment

This response makes clear that the egg and sperm cell join together so the candidate gained 1 mark for the first part of the answer. It also clearly states that a zygote is formed once the 'sperm cells go into the egg cell', which gained the second mark.

ResultsPlus
examiner tip

An effective way to show understanding of a process is by providing a definition. Responses that just repeat the question (eg in this case, by using the word 'fertilise') will not gain marks.

(ii) Describe what happens to the sex cells during fertilisation.

(2)

during fertilisation the sperm ~~cell~~ fertilises the egg cell, turning it into a zygote, which divide into embryonic stem cells.

ResultsPlus
examiner comment

This candidate gained 1 mark for recognising the zygote as the outcome of the fertilisation process. No mark was awarded for 'the sperm fertilises the egg' because greater detail than this was expected.

ResultsPlus
examiner tip

Repeating or rewording the question will not gain marks. Ask yourself, does your response really answer the question or is it just repeating what the question says?

Question 4(b)

The majority of candidates made a good attempt at providing one advantage and one disadvantage in their response and in many cases scored well. However, it appears that this is a challenging area for a fair number of candidates who were unable to structure their response to illustrate a sound understanding of the topic.

Advantages gained candidates a mark more commonly than disadvantages, which were more vague and included phrases such as 'playing God' or 'it doesn't always work'.

Candidates who did gain a mark for stating a disadvantage gave more detail in their answer and justified their ethical approach, eg 'some people do not agree as they believe that an embryo has a right to life' was perfectly adequate, whereas 'some people disagree' was too vague to reward.

Some candidates chose to discuss the characteristics of stem cells rather than give an advantage of their use in research, eg 'they can divide any number of times', which was insufficient, or focused their answer on their use in IVF, which was irrelevant.

Very few candidates, even those scoring full marks, made use of the term 'differentiate', which was disappointing, preferring to refer to differentiation as 'cells changing into other types of cell' or 'turning into different types of cell'.

Many responses provided adequate detail to gain full marks and these were more commonly gained by candidates who included information about cures for named diseases and about a justified ethical issue.

(b) Suggest **one** advantage and **one** disadvantage of using embryonic stem cells in scientific research.

(2)

Cures to diseases, such as motor neurone disease and paralysation could be created, but Religions beliefs claim taking embryonic cells is ~~Similar~~ killing an unborn child etc.

ResultsPlus
examiner comment

This example gives a clear advantage and disadvantage of the use of stems cells in research and gained 2 marks. For the advantage, a cure for a named disease has been given, with motor neurone disease being an acceptable example. The disadvantage is based on religious belief, which has been elaborated upon by the addition of the phrase 'killing an unborn child'.

ResultsPlus
examiner tip

Take care in giving names of diseases that may be a focus for embryonic stem cell research. Not all diseases can be treated or potentially cured as a result of the outcomes of embryonic stem cell research. It is likely that potential cures or treatments for genetic disease alone can be determined from embryonic stem cell research so mentioning a named non-genetic disease is unlikely to gain marks.

(b) Suggest **one** advantage and **one** disadvantage of using embryonic stem cells in scientific research.

(2)

advantage - embryonic stem cell ~~are~~ ~~undifferint~~ undifferentiated, so can be used to repair the body. disadvantage - some people dont think it is right to use embryonic cells

ResultsPlus
examiner comment

This response gained 1 mark. The wording of the advantage given is borderline – it mentions that stem cells are undifferentiated but fails to state that they can be encouraged to 'change' into any cell type. It goes on to state that they can be used to 'repair the body', which does not fully meet the marking criteria and is rather vague, although, combined with the previous detail, is adequate for 1 mark. The details given for the disadvantage are not justified, with no information offered on **why** 'some people don't think it is right to use embryonic cells', so a second mark was not awarded.

ResultsPlus
examiner tip

When a question requires an answer that involves an ethical issue, the details provided need to be justified. It is not enough just to state that 'some people disagree' or that 'it is against some religious beliefs'. Extend answers to include information that describes **why** some people disagree or **why** it is against some religious beliefs.

(b) Suggest **one** advantage and **one** disadvantage of using embryonic stem cells in scientific research.

(2)

Embryonic cell can differentiate into any type of cell, therefore it is very useful in medicine, in order to replace damaged or injured body cells. However, it is unethical to use embryonic cells because they are considered to be a potential life, a human being.

ResultsPlus
examiner comment

This response is the 'perfect' 2-mark answer, clearly describing an advantage and a disadvantage of the use of embryonic stem cells in scientific research.

ResultsPlus
examiner tip

Some candidates failed to gain a mark because they stated that embryonic stem cells can be used to 'repair damaged cells'. This is not possible. 'Replacing' damaged cells is fine but 'repairing' them is not possible.

Question 4(c)(i)

This question was answered particularly well by candidates of all abilities who are clearly well versed in the structure of DNA. Many candidates gained full marks with clear, well-written answers using good scientific terminology. Candidates who did not gain full marks generally failed to include key points about the structure of DNA and did not provide enough information, while others were unclear about DNA structure.

Only the very weakest candidates were unable to describe DNA as a double helix, despite the diagram, which was provided deliberately for support. Many of these candidates made an attempt to describe the role of DNA rather than provide the necessary detail regarding its structure.

Those candidates gaining 1 or 2 of the 3 marks allocated mainly lost marks due to lack of clarity of expression. Some candidates were confused by what bases actually are, mixing them up with proteins or amino acids, and others tended to omit information relating to base-pairing.

The 3-mark responses inevitably included information about the double helix (although very rarely did candidates mention 'two strands'); named bases, which were often given as correct complementary pairs; and mentioned the hydrogen bonds, which were frequently (and correctly) described as 'weak'.

(c) The diagram shows a section of a DNA molecule.

(i) Describe the structure of a DNA molecule.

(3)

the DNA molecule has a double helix

ResultsPlus
examiner comment

This response merited only 1 of the 3 marks because it gives just one piece of information about the structure of DNA.

ResultsPlus
examiner tip

Use the mark allocation as a guide to how much information should be included in a response.

(c) The diagram shows a section of a DNA molecule.

(i) Describe the structure of a DNA molecule.

(3)

dna is a wire with genetic codes traveling through it. they travel through the twirley bit and that makes up our body Genes.

ResultsPlus
examiner comment

This response lacks clarity and provides no detail that meets the requirements of the question. This candidate is clearly unsure of the structure of DNA despite the diagram provided for support. No marks were awarded.

ResultsPlus
examiner tip

Use all of the information given in a question to help structure a response, even diagrams. A clear description of the diagram provided for this question, for example, could have gained candidates at least 1 mark by identifying 'two strands'.

(c) The diagram shows a section of a DNA molecule.

(i) Describe the structure of a DNA molecule.

(3)

The structure of a DNA molecule is called a double helix. The DNA molecule has complementary ~~pairs~~ base pairs (Guanine - Cytosine and Adenine - Thymine) that are joined together by weak hydrogen bonds.

ResultsPlus
examiner comment

This is an excellent 3-mark answer that provides all the necessary detail to be awarded full credit.

Exercise and blood flow

Question 5(a)(ii)

Most candidates recognised that the volume of blood pumped by the heart increased with an increase in exercise intensity, although too many failed to analyse the graphical information closely to give a more detailed description of the volume of blood being pumped at **each different** level of exercise intensity. This was more likely an oversight by candidates, who possibly did not read the question carefully or slowly enough to digest what it was actually asking. Nevertheless these candidates, more often than not, gained at least 1 mark for their answer.

The majority of candidates scored 1 of the 2 marks available. Most candidates described the overall trend of the graph, which was an acceptable answer, but very few indeed identified the plateau shown from low to moderate exercise intensity.

A second mark was gained infrequently but, when it was awarded, candidates had made a correct comparison of data extracted from the graph, giving actual volumes of blood leaving the heart, for example at low intensity and maximum intensity. Very few candidates compared the volume of blood leaving the heart at every level of exercise intensity.

A fair number of candidates lost marks by giving reasons why the volume of blood leaving the heart increased with an increase in exercise intensity, including information that would have gained them full marks for the subsequent question but scored nothing for this one. This implies confusion between the command words 'explain' and 'describe'; this question did not require an explanation but rather a description of what the data in the graph showed.

Other candidates failed to gain marks because they focused on irrelevant detail, such as an increase in heart rate or blood flow, without linking their answer to the data provided by the graph.

(ii) Using information in the graph, describe the effect of different levels of exercise intensity on the volume of blood leaving the heart.

(2)

If the exercise intensity increases, so does the volume of blood leaving the heart.

ResultsPlus
examiner comment

This response gained 1 mark for recognising that the volume of blood leaving the heart increases with an increase in exercise intensity. This was an acceptable answer as it accurately described the overall trend shown by the graph. It failed to gain the second mark because it did not provide adequate detail on the effect of the different levels of exercise intensity on the volume of blood leaving the heart.

ResultsPlus
examiner tip

Read the question carefully and highlight the key points it is asking you to cover in your response. In this case, the response needs to give a comparison of the effect of the different levels of exercise intensity on the volume of blood leaving the heart.

(ii) Using information in the graph, describe the effect of different levels of exercise intensity on the volume of blood leaving the heart.

(2)

The more exercise intensity there is the high amount of oxygen is needed to get around to ~~come please pleat complete~~ Complete respiration so the tube where Red blood cells leave expand.

ResultsPlus
examiner comment

This response failed to gain any marks as it made no attempt to explain why the volume of blood leaving the heart increased with an increase in exercise intensity. Some of the detail given here would have been awarded marks for the subsequent question but unfortunately the expected interpretation of the graph was not forthcoming and the response was therefore not creditworthy.

ResultsPlus
examiner tip

Understand the difference in the meaning of the command words used in a question. An explanation requires a response to include scientific information whereas a description does not – the information needed to answer a 'describe' question is provided in the question, usually in the form of a graph or table of data.

(ii) Using information in the graph, describe the effect of different levels of exercise intensity on the volume of blood leaving the heart.

(2)

At rest Level it's 70cm³ but you can see this increases as the ~~exercising~~ execising gets more intense it rises to 90cm³ for low and moderate but then picks up ~~speed~~ at high 110cm³ then 150cm³ maximum.

ResultsPlus
examiner comment

This candidate has analysed the graph carefully and extracted three correct pieces of information to gain both marks. The response clearly details the overall trend shown by the data and identifies the plateau shown between low and moderate exercise. It has also quoted correct volumes from the graph, comparing the volume of blood leaving at rest with the volume leaving at low/moderate exercise intensity.

ResultsPlus
examiner tip

Analyse graphs carefully and, if necessary, separate the graph into sections that show variation in trends. Discuss each section separately and then make a comparison of each section.

Question 5(a)(iii)

Candidates continue to find linking exercise to energy/oxygen demand, heart rate and blood flow a challenge and this has restricted the marks allocated to responses in many previous examinations. This was also the case for responses to this question where misconceptions persist in this topic area.

Many candidates correctly identified a greater demand for oxygen, although too many incorrectly expressed the idea that energy was delivered to muscles, rather than describing its release through aerobic respiration taking place inside muscle cells. The phrase 'aerobic respiration' was generally used out of context and appeared, for much of the time, as a 'spare part' that could not be awarded credit due to the vagueness surrounding its mention.

Very few candidates mentioned the need for increased glucose delivery to muscle cells but focused on the transport of oxygen for 1 mark and those gaining further marks often linked oxygen to a reduction in the build-up of lactic acid.

Successful responses from less able candidates gave more simple information, commonly based on reduced muscle cramp, or made a loose link between more energy and the ability to work (muscles) harder or for longer. A common incorrect answer was that muscles needed more blood, with no further detail.

The best responses included key details that were rarely seen in the correct context in responses that did not score full marks. Although answers gaining full credit were not common for this question, those that were seen tended to include information on oxygen, energy demand and an inference about a reduction in the build-up of lactic acid.

(iii) Explain why it is important to have a change in blood flow to muscles during exercise.

(3)

because muscles (cells) needs oxygen ~~to eat~~ and glucose to respire, the higher the exercise intensity the more oxygen and glucose is needed. So, a higher heart beat means quicker blood flow to muscles. The blood contains oxygen and glucose.

ResultsPlus
examiner comment

This is an excellent response that portrays a clear understanding of why a change in blood flow to muscles is important during exercise. The details include a mention of glucose, which was rarely seen in responses in general, and correctly link a greater demand for oxygen and glucose to respiration. Full marks were awarded.

ResultsPlus
examiner tip

The key to a successful response to questions based on this topic is to remember the word equation for aerobic respiration and then to describe what this equation shows. It is also important not to confuse aerobic with anaerobic respiration.

(iii) Explain why it is important to have a change in blood flow to muscles during exercise.

(3)

Muscles need oxygen so when exercising more blood will be pumped around meaning muscles will get oxygen.

ResultsPlus
examiner comment

This is an example of a 1-mark response that includes correct details about the need for oxygen.

(iii) Explain why it is important to have a change in blood flow to muscles during exercise.

(3)

It is important because the muscles need blood to work. If you start to exercise the more the muscles move so the more blood they need.

ResultsPlus
examiner comment

This example was typical of several responses that mentioned the importance of a greater blood flow without going into any further detail. This barely deviates from the wording of the question and gained no marks.

ResultsPlus
examiner tip

Give more detail than that provided in the question. In this case, you need to explain **why** a greater blood flow is needed.

Question 5(b)

There are clearly many candidates who fully understand the workings of the heart and many excellent responses were seen. This meant that all 6 marks were frequently awarded with very few significant literacy errors to necessitate loss of the Quality of Written Communication (QWC) mark. These Level 3 responses really did stand out from the responses awarded lower levels, and provided details that clearly linked structure to function with minor, if any, scientific error.

The difference between the responses given at each level was significant. Candidates presenting a Level 2 response usually included incorrect details on the functions of some of the structures. In linking two of the structures with their functions, the correct information was most commonly given about the vena cava and the right atrium, although Level 2 candidates appeared to depend more heavily on the diagram provided. As with Level 3 responses, Level 2 candidates rarely dropped the QWC mark.

At both Levels 1 and 2, candidates made similar mistakes: the right/left atria or ventricles store blood, (named) blood vessels pump blood, and the events in the left and right side of the heart were confused, often reversing the flow of blood from ventricles to atria.

To attain Level 1, responses needed to correctly link one structure to its function. These candidates relied mainly on the diagram to form their response but the functions of each named structure (from the diagram) were often confused. The structure chosen varied but most candidates commonly mentioned the ventricles 'pumping' or the atria 'receiving blood'; however, sentence structure lacked clarity in many cases. Many answers at this level, despite being quite lengthy, seemed to be the result of guesswork, where structures were 'picked off' from the diagram and discussed with very limited accuracy.

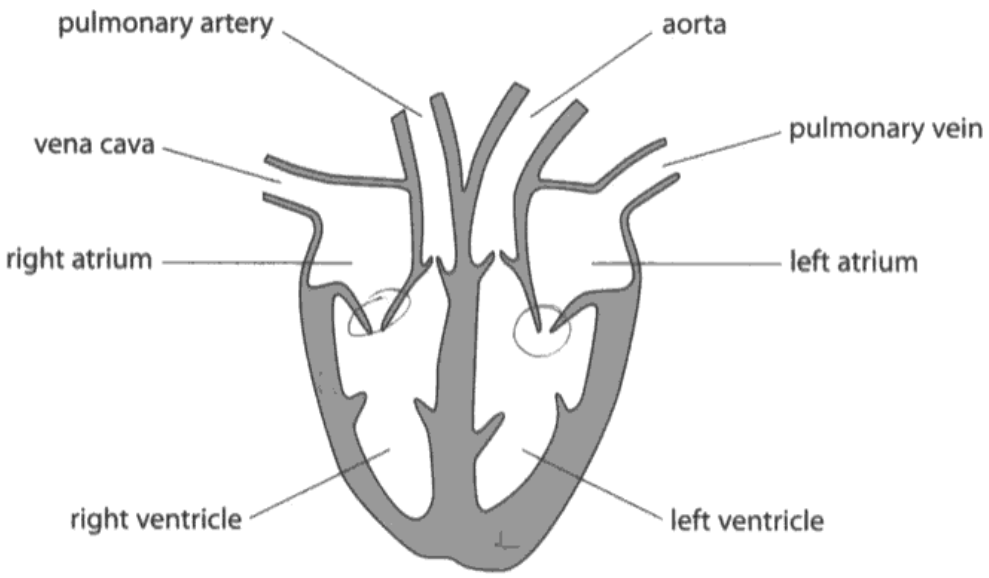
Many candidates were under the impression that deoxygenated blood became oxygenated in the heart, or implied that the pulmonary artery and vein were linked (blood was passed directly from one to the other), while other responses simply stated, correctly or incorrectly, the direction of blood flow through the heart, without linking structure to function.

This question, more than any in the whole paper, seemed to encourage the use of poor terminology: the use of 'flaps' instead of 'valves' was common as was 'blood being pushed' or 'squeezed' out of the heart, with the latter often linked to the blood vessels rather than the ventricles.

Other incorrect responses included details about how blood looped between the two sides of the heart, eg 'blood flows from the right atrium to the left atrium', or how blood flowed between the four major vessels, without mentioning the actual structures of the heart.

Some excellent detail was seen in descriptions of the structures of arteries and veins, although in many cases this detail failed to link structure to function, which restricted the marks awarded.

*(b) The diagram shows a heart.



Explain how the structures of the heart are related to their function.

(6)

The structure of the heart is very complicated. The left side of the heart is thicker than the right so it pumps more blood. The right atrium and the left atrium valves stops the back flow of blood. The pulmonary atery and the pulmonary vein both have big gaps to let huge amount of de-oxygenated blood and oxygenated blood through. The heart is also split into two seperate areas that so that the oxygenated blood and the de-oxygenated don't mix and so it can be a double pump one side pumping to the body the other pumping to the lungs.

ResultsPlus
examiner comment

This response clearly identifies the role of the valves and states that the division of the heart into two sides separates the oxygenated and deoxygenated blood. This detail was awarded 4 marks – Level 2.

ResultsPlus
examiner tip

Annotate the diagram with further detail if necessary. This may help you to structure a response that includes information worthy of a higher mark.

Explain how the structures of the heart are related to their function.

(6)

Structures in each side of the heart provide for their half. The pulmonary artery and aorta supply blood to the heart, the atriums allow the blood to pass through and be filtered, this blood is stored in the ventricles and the veins take blood away to supply the rest of the body.

ResultsPlus
examiner comment

In this example, the candidate has made an attempt to link structures to functions although the detail is incorrect. To achieve Level 1, the information must include detail that links at least one structure of the heart to its function. No marks could be awarded here.

ResultsPlus
examiner tip

Make use of flow charts to help you remember the correct passage of blood flow through the heart and build on this to link the main structures with their function.

Explain how the structures of the heart are related to their function.

(6)

Each Atrium have valves which are there so blood doesn't flow in the opposite direction. These valves are directed one way to allow it to do this. The muscles around the heart are there for pumping the blood either to the lungs or around the body.

ResultsPlus
examiner comment

This response focuses mainly on the valves but correctly links them to their role in the heart. No credit could be given for the information about the muscles as this is vague – further detail relating to the ventricles is needed to improve the mark awarded for this Level 1 answer.

Explain how the structures of the heart are related to their function.

(6)

Deoxygenated blood enters through the Vener cava into the right atrium to then pass through the valve (to stop back flow of blood) where it will then enter the right ventricle it will then exit through the pulmorary artery to be sent to the lungs to become oxygenated. The artery is thick because a lot of blood gets pumped through. Oxygenated blood enters through the pulmonary vein into the left atrium, through the valve into the left ventricle and out the aorta. The pulmonary vein is thin however has thicker walls than cappillaries to so blood can travel quickly

ResultsPlus
examiner comment

This response meets the Level 3 criteria in that it links three structures to their correct functions; veins delivering blood to the heart, the atria receiving blood and the valves preventing backflow. The information given is communicated clearly and is worthy of the QWC mark. Full marks were awarded.

ResultsPlus
examiner tip

When describing the functions of the structures of the heart, it is best to start with either of the veins that bring blood into the heart. Then follow the passage of the blood through each consecutive structure, linking each structure with its function.

Transport in plants

Question 6(a)(ii)

Most candidates were able to identify chloroplasts in the palisade cell as one adaptation for photosynthesis, although many failed to mention that these structures absorb sunlight, preferring to state that the chloroplasts contained chlorophyll for a second mark.

Candidates gaining 1 mark gave a variety of responses that were shared evenly across all marking points. Absorption of light was often linked to a thin cell wall/membrane or a large surface area, not true for the single cell but an adaptation of the leaf in general. A description of the leaf rather than the cell was common, including correct, albeit irrelevant, details on stomata, which most candidates were unable to identify in the previous question.

Less able candidates just gave a list of cell structures, often mentioning mitochondria and the cell wall, which are features of plant cells but not adaptations for photosynthesis.

(ii) Explain how structure **C** is adapted for photosynthesis.

(2)

Structure C is adapted for photosynthesis as it contains a nucleus, a cell wall, cells and the chondrea.

ResultsPlus
examiner comment

This response is typical of those given by candidates less familiar with the adaptations of the plant cell for photosynthesis. It earned no marks because none of the marking criteria was met.

ResultsPlus
examiner tip

Providing a list of features, some of which are incorrect, can negate marks. In this case, if chloroplast had been included in the list of structures given, it would not be rewarded as the candidate has left it to the examiner to 'choose' the correct response rather than making their answer clear.

(ii) Explain how structure **C** is adapted for photosynthesis.

(2)

It contains chloroplasts which absorb light. It also has sap where reactions occur concerning photosynthesis.

ResultsPlus
examiner comment

This 2-mark response clearly identifies chloroplasts that adapt the plant cell for photosynthesis due to their ability to absorb light. Further information has been included about sap, which is irrelevant, but in this case it does not negate the marks awarded.

ResultsPlus
examiner tip

Don't confuse the adaptations of a cell for photosynthesis with the adaptations of the leaf in general. Candidates scoring 1 mark most often quoted a correct structure but then failed to state how this structure adapted the cell for photosynthesis.

(ii) Explain how structure **C** is adapted for photosynthesis.

(2)

Structure C is adapted for photosynthesis because it contains chloroplasts. The chloroplasts are used to expand on the way photosynthesis occurs to enhance greenness of the plant.

ResultsPlus
examiner comment

This response gained 1 mark for correctly identifying chloroplasts as a structure involved in photosynthesis but the lack of information on how this structure adapted the cell for photosynthesis prevented a further mark being awarded.

Question 6(b)(i)

Most candidates were able to use the graph appropriately to extract the optimum temperature for photosynthesis. Although the answers given mostly fell within the allocated range of temperatures, some candidates gave 30°C or higher, which was not what the graph showed. However, the majority of incorrect answers failed to include the units, or gave incorrect or incomplete units for the temperature, despite making a correct interpretation of the graph.

(i) State the optimum temperature for photosynthesis.

(1)

26°c approx

ResultsPlus
examiner comment

The figure of 26°C falls within the allowed range and the correct units have been given for temperature, so 1 mark was awarded.

ResultsPlus
examiner tip

When quoting numbers, make sure that the correct units are added if they are not already given to you. The units to use are usually clearly stated on the axis labels of graphs, or in column headings of tables.

(i) State the optimum temperature for photosynthesis.

(1)

30 °C

ResultsPlus
examiner comment

At 30°C the graph shows the rate of photosynthesis dropping so this figure was not acceptable and no mark was awarded.

ResultsPlus
examiner tip

Analyse graphs and other data carefully before extracting information to use in a response.

(i) State the optimum temperature for photosynthesis.

(1)

26

ResultsPlus
examiner comment

Although this candidate has interpreted the graph correctly and given the right figure for temperature, they have failed to include the correct units, which should also have been extracted from the graph. No marks were given.

ResultsPlus
examiner tip

It is often the case that where units are not already provided in the space allocated for the answer, the candidate is expected to provide this detail.

Question 6(b)(ii)

The majority of candidates scored 1 of the 2 marks allocated for this question. Most were able to identify a correct limiting factor but then failed to state how this factor affected the rate of photosynthesis.

Many candidates incorporated the question into their answer in addition to stating a limiting factor, eg 'not enough light will affect the rate of photosynthesis', which did not provide enough detail to gain a second mark.

'Weather' appeared fairly often as a named limiting factor but this was usually too vague to reward, although some of the candidates choosing to name this 'factor' did manage to justify it with further information that, in some cases, met the expected criteria and gained full marks.

Disappointingly, 'temperature' also appeared far too frequently, considering that the question instructed candidates not to use this as an example.

(ii) Temperature can be a limiting factor.

Describe how another limiting factor could affect the rate of photosynthesis.

(2)

Not enough light could affect the rate of photosynthesis or not enough carbon dioxide

ResultsPlus
examiner comment

The content of this response is typical of those scoring 1 mark. A repeat of the question is given rather than a description of how the named limiting factor affects the rate of photosynthesis.

(ii) Temperature can be a limiting factor.

Describe how another limiting factor could affect the rate of photosynthesis.

(2)

Another limiting factor that could affect the rate of photosynthesis is the weather, if there is not enough sunlight for the plants to photosynthesise then this will effect it.

ResultsPlus
examiner comment

This candidate gave 'weather' as a limiting factor which, on its own, did not gain a mark. However, the response then specifies sunlight, which gained 1 mark, and makes an attempt to describe how sunlight affects the rate of photosynthesis, although the latter part of the response is too vague to lift the overall mark to 2.

ResultsPlus
examiner tip

Add more detail to responses where appropriate in order to clarify statements made.

(ii) Temperature can be a limiting factor.

Describe how another limiting factor could affect the rate of photosynthesis.

(2)

The amount of sunlight can affect the rate of photosynthesis because the more light there is, the faster photosynthesis can happen. If there's no light photosynthesis will not happen.

ResultsPlus
examiner comment

This 2-mark response reflects the content of most responses that were awarded full marks. It identifies light as the limiting factor and explains how this factor affects the rate of photosynthesis.

ResultsPlus
examiner tip

If a question asks for one named factor, restrict your response to one factor. Providing two or more factors could negate marks if any of those listed are incorrect.

Question 6(c)

The quantity and detail of information provided by candidates in answer to this 6-mark question were significantly lower than for Q5(b), with many responses showing varying degrees of disorganisation. It may have been the lack of a diagram that reduced the length of responses in this case, meaning that candidates were reliant solely on their subject knowledge in order to gain marks.

The quality of the responses, including some Level 3 answers, implied a significant lack of knowledge and a misunderstanding of the transport of water through plants, with many candidates digressing from the question topic to focus on events occurring in the leaves, mainly photosynthesis, rather than from the roots to the leaves.

There was much confusion about how water travelled through the stem and many of the candidates who made an attempt to describe water flow through the stem incorrectly stated that this happened by active transport or, less frequently, by osmosis. The functions of xylem and phloem vessels were also confused; stomata often replaced xylem vessels as did phloem vessels.

Many candidates felt the need to describe the process of rain or water falling onto soil and being absorbed by the soil while others described (incorrectly) how water was absorbed by the leaves.

The correct use of the term 'osmosis' was mainly limited to the Level 3 responses, many of which included a usually correct definition of this process. Although simply written, the Level 3 responses tended to go straight to the point and be very clear-cut, describing how water enters the root hairs and travels through the xylem to the leaves.

The majority of Level 2 responses were also simply expressed but included detail that met the criteria for 4 marks. The QWC mark for Level 2 answers was rarely deducted; candidates were able to communicate their understanding in a coherent manner despite their subject knowledge being limited in many cases.

Candidates achieving a Level 1 mostly gave the basic 'into roots, up stem' approach whereas more able candidates could specify more precisely that water entered the plant through root hair cells, this also being the most common answer among Level 2 candidates.

Many candidates across Levels 1 and 2 chose to use less appropriate terminology to describe how roots take in water: the phrases 'suck up' and 'drinking' were common.

*(c) Describe how water enters plants from the soil and is transported to the leaves.

(6)

The absorbs into the soil and absorbed into the roots, once in the roots it travels up the plant by a term called osmosis.

ResultsPlus
examiner comment

This Level 1 response has correctly identified the entry point for water – the roots – but also gives an example of a misconception shared by candidates of various abilities that water travels through the stem by osmosis.

ResultsPlus
examiner tip

In order to gain marks in an examination, the correct terminology must be used in the correct context. In this case, use of the term 'osmosis' was not rewarded as the context in which it is mentioned is incorrect.

*(c) Describe how water enters plants from the soil and is transported to the leaves. (6)

The water is trasported through the roots then into the robes hairs which takes it to a tube called xylem which transports the water to the leaf.

ResultsPlus
examiner comment

This is a typical example of a Level 2 response. The candidate has recognised that water enters through the root hair (cells), just a step further than the Level 1 response above, and it goes on to include information on water flow through the xylem vessels towards the leaves.

ResultsPlus
examiner tip

Questions that ask 'how' usually expect a process or processes to be described or explained. In this case, the question expects not only a description of how water is transported but also how it is transported **through the different structures**. These structures should be named in the order in which water flows through the plant.

*(c) Describe how water enters plants from the soil and is transported to the leaves.

(6)

The roots suck up water and minerals from the ground through active transport and once the water has got to the leaves the xylem filters water through by mitosis. then the water is used for photosynthesis.

ResultsPlus
examiner comment

This is an example of a Level 1 response that shows limited understanding of the topic. The candidate has recognised that water enters through the roots but has, unfortunately, missed out on further marks by failing to mention that water enters the roots by osmosis. Although the xylem is mentioned, the function given for this vessel is incorrect.

ResultsPlus
examiner tip

Encourage the use of correct terminology rather than less appropriate and non-scientific terms that lower the quality of the response.

Summary

- Many candidates performed extremely well on this paper – some of the answers given to more challenging areas of the specification were outstanding.
- Understanding of more complex areas of biology has shown a general improvement, with many candidates able to transfer their knowledge appropriately to meet the requirements expected. There are, however, still pockets of misconception and in some areas a real lack of understanding, and it would be worth considering tackling these to ensure that candidates are fully prepared for future examinations.
- Transport of water through plants; the functional components in prebiotic foods; embryonic stem cells and the issues surrounding their use; and the topics covering reproduction and cell division all presented a real challenge to a large number of candidates, who seemingly lacked the knowledge to gain full credit for their answers.
- A few candidates lacked the ability to express their responses clearly and this was linked in many instances to misinterpretation of the question. In these cases, responses were vague and did not provide the depth necessary to gain marks.
- Conversely, data analysis and interpretation were carried out extremely well by candidates of all abilities; this is a real credit to centres that have focused on developing these skills.

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