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Examiners' Report
November 2012

GCSE Biology 5BI2F 01

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November 2012

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Introduction

Many candidates of all abilities demonstrated good subject knowledge on many of the items on this paper. Most candidates attempted all questions with answers that implied a fair or good understanding of the principles of biology. Although there were some answers for a few items on the paper that were not awarded credit due to their lack of clarity, there were very few questions left unanswered. This strongly indicates that candidates of all abilities had fair access to all questions and that each made an excellent attempt at responding with what were, for the majority, relevant and creditworthy answers.

Very few candidates were fazed by the extended answer questions which is really encouraging and, of those that attempted these questions, the vast majority scored good marks. Skills in interpretation and analysis were, in many cases, used to good effect and the literacy demands of the extended answer questions were suitably met by the majority

For the very few candidates that did not achieve as well on the extended answer questions, the main issue appeared to be the provision of information that side-tracked from the main topic of the question. Although these answers were, on the whole, clearly written, showing good literacy skills and also a good understanding of the subject covered in their answer, the information provided did not focus wholeheartedly on the scientific detail of the indicative content highlighted in the mark scheme. This may be a point worthy of communicating to candidates: do not deviate from the topic of the question.

Mathematical skills were well demonstrated throughout the paper, not only in questions where straightforward calculations were expected but also in questions where application of mathematical skills were required. Few candidates failed to score on these questions, with a major downfall for those that didn't being the omission of the calculation used to work answers. Centres are advised to encourage candidates to show all steps taken in carrying out calculations rather than just providing a final answer as methodology could gain candidates credit.

In some cases, the handwriting of candidates made some responses very difficult to decipher and this was particularly the case when it was combined with weak spelling and grammar and/or their inappropriately contextualised use of biological terminology. Candidates who wrote in short, clear sentences were nearly always more successful in gaining good marks than candidates whose ability to communicate in appropriately detailed and grammatically correct language was limited. However, these cases were a minority and the credit gained by most for their attempt on this paper provides an accurate reflection of their competency in this subject.

This report will provide 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.

Question 1 (a)

Most candidates scored at least 2 out of the 3 marks available for this question. Many read carefully through the list of words given to them and the other information provided to successfully complete the passage with the correct details. It was evident in some cases that candidates were unaware of the outcome of mitosis and this was where the candidates that only scored 2 marks for their response failed to score.

The vast majority of candidates scoring 2 out of the 3 marks failed to complete the first sentence in the passage correctly. Although the majority were aware that the outcome of mitosis involved the production of specific types of cell, either haploid or diploid, an apparent lack of understanding of mitosis meant that many incorrectly guessed between these two options and failed to score a mark for this part of the question.

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

(3)

chromosomes		cytoplasm	diploid
haploid	nucleus	carbohydrate	gametes

When a human body cell divides by mitosis, two haploid body cells are produced.

Each of the cells produced contain identical sets of chromosomes in their ~~gametes~~ nucleus.

ResultsPlus
examiner comment

This example of a 2-mark response clearly shows some misunderstanding of mitosis or of the meaning of haploid and diploid. Although the candidate is likely to have limited their options to two words from the box, haploid and diploid, they have unfortunately chosen the incorrect option in this case.

ResultsPlus
examiner tip

An understanding of key terms and words underlies success in most aspects of this examination paper. Being able to apply these terms is equally important. Candidates that struggle with this may benefit from being given books separate from their main notes book that can be used as a glossary and/or a spelling book. Practice at using key words and terms in various contexts is crucial in helping candidates to not only strengthen their subject-based vocabulary but also in helping them to develop good, coherent expression in questions demanding extended responses.

Few candidates failed to gain more than two marks for this question. It was clear from the responses made that this was due to a lack of understanding of key scientific terminology and/or the context in which the correct words had to be placed. Some candidates input words that made no sense in the context given and this apparent lack of awareness limited the score that some candidates gained for this question.

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

(3)

~~chromosomes~~		cytoplasm	diploid
haploid	~~nucleus~~	~~carbohydrate~~	gametes

When a human body cell divides by mitosis, two carbohydrate body cells are produced.

Each of the cells produced contain identical sets of chromosomes in their nucleus.

ResultsPlus
examiner comment

This response indicates some confusion over the scientific terminology given in the box. The word used to complete the first sentence in the passage is clearly incorrect and implies confusion in the candidate's understanding of either the word itself and/or the passage given for the candidate to complete.

ResultsPlus
examiner tip

Reinforce the meaning of key scientific terminology frequently, using candidate-built glossaries or display boards that show how key words are used in various contexts.

Question 1(c)(i)

A fair number of candidates found this question rather challenging, not necessarily in its subject area but in being able to express their response in a detailed manner conversant to expectations. Many responses vaguely implied a sense of understanding of the use of embryonic stem cells but their answers failed to add the necessary details to score more than 1 mark for this question. The candidates that did score at least 1 mark for this question did so for recognising that embryonic stem cells were undifferentiated, with those scoring 2 marks adding further correct detail by stating that they could differentiate into other (body) cells for marking point 2. Many candidates made statements that referred to mitosis in their answer, stating that it would help scientists to better understand this process, and more vague responses such as 'to understand the human body' failed to score. For the third marking point, some candidates gave responses that were along the right lines, but just missed the mark by omitting specific detail or by a simple misconception. For example 'repairing damaged cells' did not gain credit, whereas 'repairing body tissues/organs' was worthy of the mark.

Many candidates scored at least one mark for this question although 3-mark answers were not common. This was mainly due to misconception of the use of embryonic stem cells and vague answers that lacked detail or gave slightly incorrect information. There were a number of responses that touched on marking point 3. Answers in this case generally stated that embryonic stem cells could 'cure disease', rather than being more specific and stating 'genetic disease' or naming a disease that these stem cells could potentially treat.

(c) Embryonic stem cells divide by mitosis.

(i) Explain why embryonic stem cells are useful in medical research.

(2)

Because ~~embryonic~~ embryonic stem cell ~~has~~ can differentiate into any cells they want to and a person with a disease could be helped because the embryonic stem cell will change to turn into something that is needed, to cure that person

ResultsPlus
examiner comment

This response failed to gain marking point 3 for its vagueness in stating, in so many words, 'cure disease'. However, the candidate has correctly mentioned that embryonic stem cells can differentiate into any cells and this has gained them one mark for their answer.

ResultsPlus
examiner tip

Candidates need to be aware of the potential uses of stem cell technology. It is important that they are clear in what they can and can't treat, eg 'repairing body cells' would be incorrect, but 'repairing body tissues' would be perfectly acceptable as a good answer.

Many 1-mark answers identified the role of embryonic stems cells in the repair of body tissues, although several responses failed to gain a second mark for their vagueness in the use of stem cells to 'cure disease'.

(c) Embryonic stem cells divide by mitosis.

(i) Explain why embryonic stem cells are useful in medical research.

(2)

embryonic stem cells are useful because if ~~an~~ muscle tissue is damaged these cells can repair them. They can also cure diseases.

ResultsPlus
examiner comment

This response clearly gains 1 mark for giving a correct use of embryonic stem cells. It is unfortunate that the remainder of the response is too vague to be awarded a further mark. If the response had given more detail such as 'cure genetic disease' or had named a disease that stem cells have the potential to treat then a second mark could have been given.

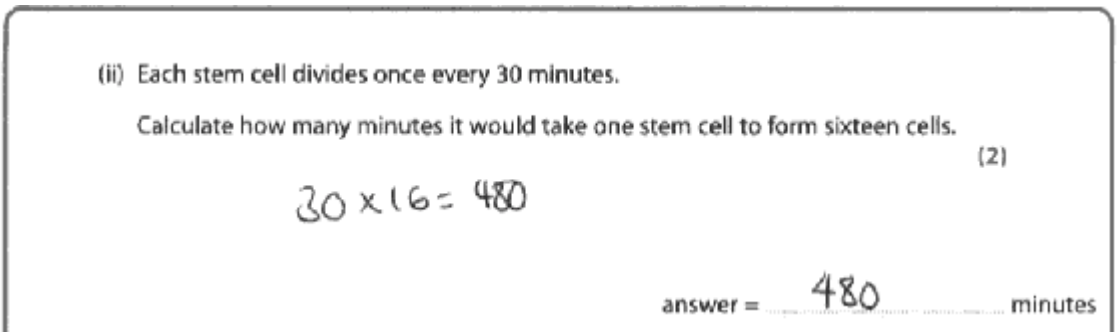
ResultsPlus
examiner tip

Candidates should be made aware that the term 'disease' covers a multitude of examples, including disease caused by bacteria and viruses. Disease caused by HIV, for example, is unlikely to be treated with stem cells. Answers from candidates in this respect require more detail, with specific examples if appropriate.

Question 1 (c)(ii)

Many candidates scored full marks on this question, showing both their calculation and final answer or just by giving the correct final answer. A fair number of candidates were aware that their calculation needed to include a multiplication of 30, information that was given to them in the question and therefore were given credit for showing this in their calculation. Unfortunately, this was also where many candidates came down. Many of the calculations given by candidates multiplied 16 by 30, with 16 being the number of cells produced after the 30 minutes. This resulted in an answer of 480 which many candidates gave as their answer but failed to show their working, thus scoring no marks. Those that did clearly show their calculation – ie 16 × 30 – were awarded 1 mark.

Many candidates multiplied 16 (the number of cells produced after 30 minutes) by 30 (the number of minutes) to arrive at an answer of 480. These candidates were awarded 1 mark for recognising that ×30 was needed in their calculation.



(ii) Each stem cell divides once every 30 minutes.

Calculate how many minutes it would take one stem cell to form sixteen cells.

(2)

30 x 16 = 480

answer = 480 minutes

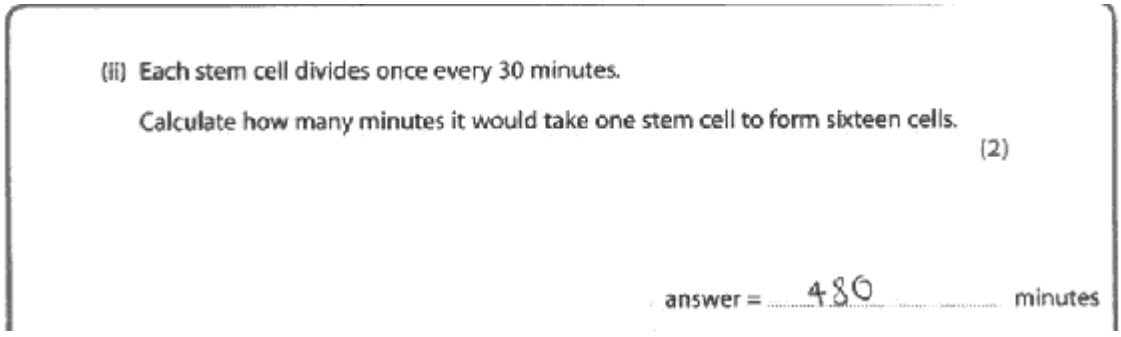
ResultsPlus
examiner comment

This answer receives one mark for showing a calculation that includes ×30. Although they have not given the correct figure to multiply by 30, they have recognised that 30 minutes is the time given for which the final number of cells is to be determined.

ResultsPlus
examiner tip

It is important that candidates always show their workings to mathematical questions clearly. Calculations on their own, even if the answer is incorrect, could potentially gain them a mark.

A fair number of candidates gave the calculation 16 × 30 to arrive at an answer of 480. Some candidates gave a clear calculation on how they arrived at this answer and others failed to this, only just providing the final answer without any indication on how they obtained this.



(ii) Each stem cell divides once every 30 minutes.

Calculate how many minutes it would take one stem cell to form sixteen cells.

(2)

answer = 480 minutes

ResultsPlus
examiner comment

This response received no marks. There is no calculation shown to provide evidence that ×30 has been used to arrive at the answer of 480.

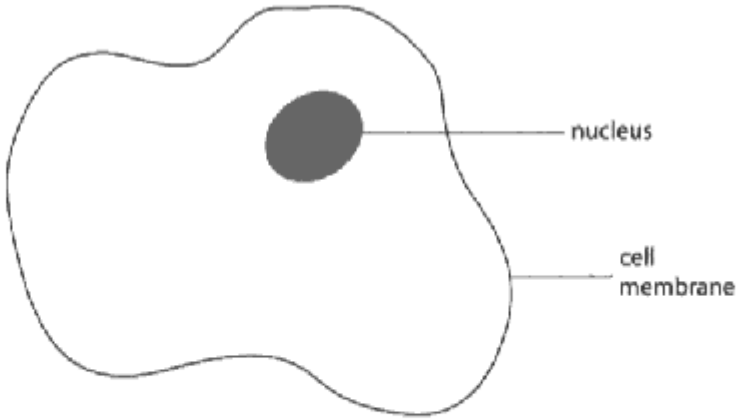
ResultsPlus
examiner tip

Candidates should be encouraged to show how they work out their answers. Their calculation should be presented clearly, to minimise the risk of not being awarded credit for lack of clarity.

Question 2 (a)(ii)

Mathematical skills were demonstrated well by all candidates for this question, regardless of ability. Most candidates arrived at the correct answer, whether a calculation was shown or not, and received credit for their response. The very occasional division was noted in few responses which, unfortunately, did not attract any marks. Where candidates were unable to provide answers on the actual question paper, but instead gave typed responses to this question, very few gave the calculation used to work out their answer. In these cases, no credit could be given for a calculation when the answer stated on the typed script was incorrect. Other incorrect answers, again very few, gave a calculation that quoted an incorrect length for the cell, usually with decimal place being incorrect e.g. 0.05 mm rather than the length of 0.005 mm as quoted in the question.

(ii) The diagram shows an animal cell as seen using a light microscope.



not to scale

The length of this cell before it is magnified is 0.005 mm.

Calculate the length of the image after it has been magnified x400.

(2)

0.005 x 400 = 2

answer = 2. mm

ResultsPlus
examiner comment

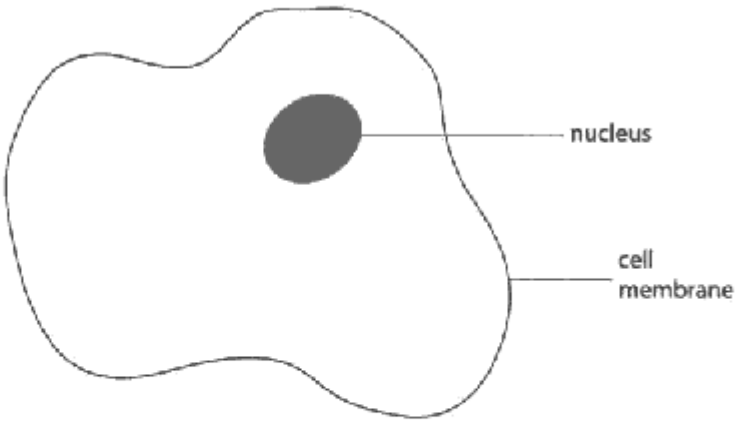
A very clearly laid out calculation that, on its own without an answer, would be worth 1 mark. However, as the correct answer is also given, this response is very worthy of 2 marks.

ResultsPlus
examiner tip

Make sure that calculations to mathematical questions are laid out clearly and ensure that the correct figures are used in calculations.

Few candidates used the correct calculation in their response but then input an incorrect answer into the space provided. This was unfortunate and just a case of uncertainty on the candidate's behalf.

(ii) The diagram shows an animal cell as seen using a light microscope.



not to scale

The length of this cell before it is magnified is 0.005 mm.

Calculate the length of the image after it has been magnified x400.

0.005 x 400 = 2

(2)

answer = 0.200 mm

ResultsPlus
examiner comment

This response shows a correct calculation using the numbers from the question. It also shows the correct answer following the calculation although unfortunately the candidate has manipulated the answer to place a decimal point before it. Rather than leaving the answer as 2 mm, as correctly calculated earlier, the answer, written in the space provided for the answer, has now become 0.200 mm. This lost the candidate 1 mark.

ResultsPlus
examiner tip

Use a calculator to carry out calculations and double check working. Remember that if a calculator is used, the working should still be written on the examination paper.

Question 2 (b)

There was a fair variety of answers to this question, many of them including a correct response, but others implying a lack of understanding of the role of the mitochondria. Very few of the correct responses stated 'aerobic respiration' and preferred to give just 'respiration' on its own, although this did gain them 1 mark. Incorrect answers included descriptions of where the mitochondria were found, a use in photosynthesis or defence against disease and a role in cell movement, among others.

Candidates gaining 1 mark for their response to this question were generally clear in their wording, either giving the link with (aerobic) respiration or stating that it was the site of energy release in the cell.

(b) An electron microscope can be used to see mitochondria inside cells.

State the function of mitochondria in a cell.

(1)

It is where respiration occurs.

ResultsPlus
examiner comment

This response was awarded 1 mark for correctly stating that the mitochondria are the sites where respiration occurs.

ResultsPlus
examiner tip

Candidates should be made aware that the mitochondria are the sites where *aerobic* respiration occurs, not *anaerobic* respiration which some candidates incorrectly stated.

A fair number of candidates were unsure of the role of mitochondria in the cell and attempted to answer the question with information that was irrelevant. However, candidates should never be discouraged from answering a question to leave it blank and, in the case of this candidate, at least they had a go at giving a response that did hint at some biological understanding, albeit incorrect in this instance.

(b) An electron microscope can be used to see mitochondria inside cells.

State the function of mitochondria in a cell.

(1)

The function of mitochondria in a cell is to keep the shape of the cell

ResultsPlus
examiner comment

This response gains no credit for giving an incorrect statement about the role of mitochondria in cells.

ResultsPlus
examiner tip

Candidates should be aware of the function of all components of plant, animal and bacterial cells. Wall displays or flip cards are a good way of remembering these.

Question 2 (c)(ii)

Many candidates scored well on this item, with many responses covering at least 3 points on the mark scheme. Candidates scoring 2 marks generally did so for stating that chloroplast contain chlorophyll with a mention of their role of photosynthesis or for their role in absorbing sunlight. The last marking point, production of glucose, was rarely seen although the vast majority of candidates that did include this in their answer had already scored full marks before covering this point. Only the least able candidates were unable to score in this question, giving vague responses that clearly did not reflect the function of the chloroplasts in a leaf cell.

Less able candidates were unsure of the role of chloroplasts in a leaf cell and although they made an attempt at describing their role, the information given was irrelevant and not worthy of credit.

(ii) Describe the function of the chloroplasts in a leaf cell.

(2)

To protect the nucleus from bacteria.

(Total for Question 2 = 7 marks)

ResultsPlus
examiner comment

This response gained no marks for stating that the role of the chloroplast was to protect the nucleus from bacteria.

examiner tip

Build up a bank of 'match-cards' that match cell components to their function and revisit periodically to reinforce the role of the different cell components. These cards can be used in games of 'snap' or in group competitions as a starter or plenary activity in lessons.

Many candidates scored 2 marks for their response to this question, with most gaining at least 1 of these marks from stating that chloroplasts were the sites of photosynthesis. The second mark usually came from stating that the chloroplasts contained chlorophyll or that they absorbed sunlight.

(ii) Describe the function of the chloroplasts in a leaf cell.

(2)

chloroplasts are the parts of the cell which absorb the sunlight in order to for photosynthesis to occur.

(Total for Question 2 = 7 marks)

ResultsPlus
examiner comment

This response is clearly awarded 2 marks for stating that the chloroplasts absorb sunlight for photosynthesis.

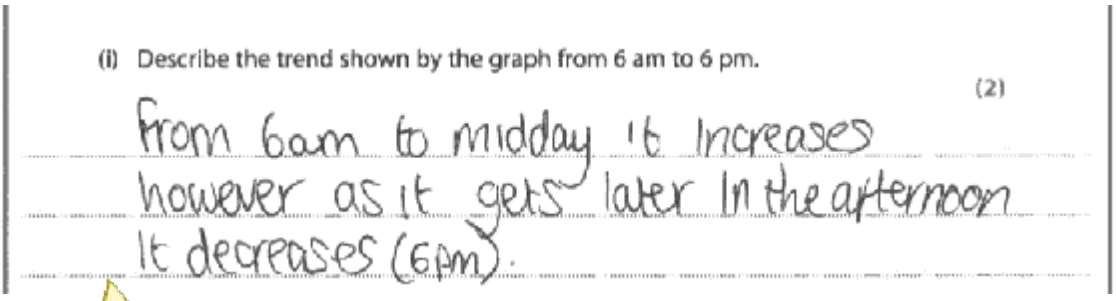
ResultsPlus
examiner tip

Avoid vague statements such as 'chloroplasts contain chlorophyll that makes the plant green'. This is not a function of the chloroplasts. Although there would be 1 mark for stating that they contain chlorophyll, the biological function of chlorophyll is in photosynthesis, not giving the plant a green colour.

Question 3 (a)(i)

The majority of candidates used good interpretational skills to provide a response that gained full marks. Many recognised the peak at midday, where the rate of photosynthesis was the greatest and identified the trend either side of this peak. Some candidates were less thorough in their response and picked particular points in the graph to discuss rather than describing the trend shown. Of these candidates, many stated that photosynthesis was low at 6am and at 6pm and gained no mark, although fortunately many of these candidates gained credit for recognising that the rate at midday was the fastest. Other responses included a discussion on the availability of light at certain times of the day giving information about the celestial passage of the sun such as 'when the day gets lighter there is more photosynthesis and when the sun goes down it gets less' which contributes little towards a description of the 12-hour trend and also attempts to give an explanation rather than a description (which is what the question asks for).

The majority of candidates were successful in gaining full marks for this question and clearly described the trend in the rate of photosynthesis throughout the 12-hour period shown on the graph. Some candidates provided an explanation rather than a description and focused their response on why this trend was shown. This unfortunately gained candidates no marks.


(i) Describe the trend shown by the graph from 6 am to 6 pm.

(2)

From 6am to midday it increases however as it gets later in the afternoon it decreases (6pm).

ResultsPlus
examiner comment

This is a clear, 2-mark response that identifies the increase to midday and the decrease in the afternoon. Inherent in this answer is also the peak at midday.

ResultsPlus
examiner tip

Make sure that candidates are aware of the difference between describing and explaining. An explanation will involve an understanding of science, whereas a description will expect candidates only to provide information on what they actually see in the graph – describing the shape of the curve or line that the graph shows.

Some candidates picked particular points from the graph and gave a statement about the rate of photosynthesis at these points rather than describing the trend over the 12-hour period. However, many of these candidates did score 1 mark for identifying the peak at midday.

(i) Describe the trend shown by the graph from 6 am to 6 pm.

(2)

rate of photosynthesis is lower at morning and at night and is at the highest at midday.

ResultsPlus
examiner comment

This response does not combine the observations made by the candidate into a trend. The candidate has identified that the rate is lower 'at morning' and 'at night' which does not give the description required, although they have identified the peak at midday for 1 mark.

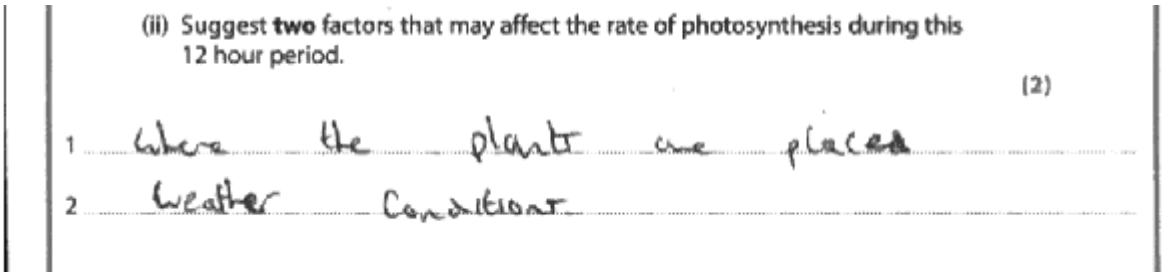
ResultsPlus
examiner tip

Describing a trend of a graph is describing the 'shape' of the graph using information from both the Y and X axes. The information given by the labels on the axes should always be used in a response rather than using vague statements such as 'it goes up and down'.

Question 3 (a)(ii)

Candidates of all abilities accessed this question well with only the very least able stating factors that were vague or that had no influence on the rate of photosynthesis. The most popular answers gave light and temperature as two factors although many candidates were also credited for giving 'cloudy' as an alternative to light.

Some candidates gave 'weather' as a factor affecting the rate of photosynthesis without going into further detail. This type of response was too vague to be given credit and needed further detail for a mark.


(ii) Suggest **two** factors that may affect the rate of photosynthesis during this 12 hour period.

(2)

1 Where the plants are placed

2 weather Conditions

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This response gains no marks. Its vagueness – ie where the plant is placed – could refer to shade where there is less sunlight or in an open field where sunlight is not limited. However, this cannot be assumed and further detail is required for the mark. Similarly, 'weather conditions' is also vague and no assumptions can be made about what type of weather conditions the candidate is referring to.

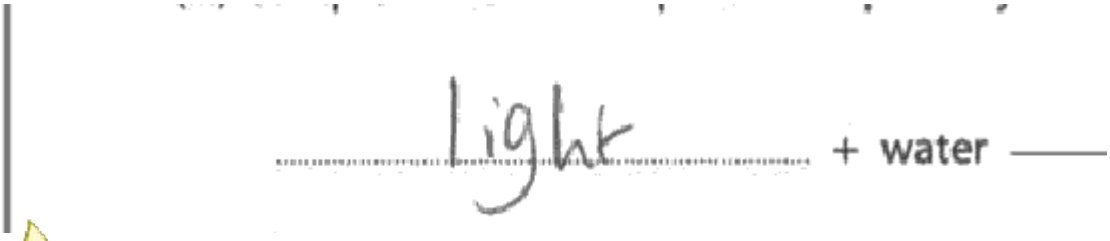
ResultsPlus
examiner tip

Candidates should be familiar with the factors affecting the rate of photosynthesis and should use the specific terminology in questions such as this, rather than give vague descriptions that make implications but are not enough to be awarded marks.

Question 3 (a)(iii)(1)

The number of correct responses to the first part of the word equation was very encouraging, with only the very occasional slip to reverse the products with the reactants. In few responses, oxygen was given as a reactant, as was light, although these were rare. Most candidates scored 1 mark for giving the correct reactant for photosynthesis.

Few responses implied that candidates were unsure of the correct reactant to include in the word equation for photosynthesis. Several incorrect responses stated 'light' which failed to gain a mark. Candidates that did use light in their response were clearly aware that this was needed for photosynthesis to take place, but they misunderstood the fact that the light only initiates the reaction, rather than acts as a reactant itself.



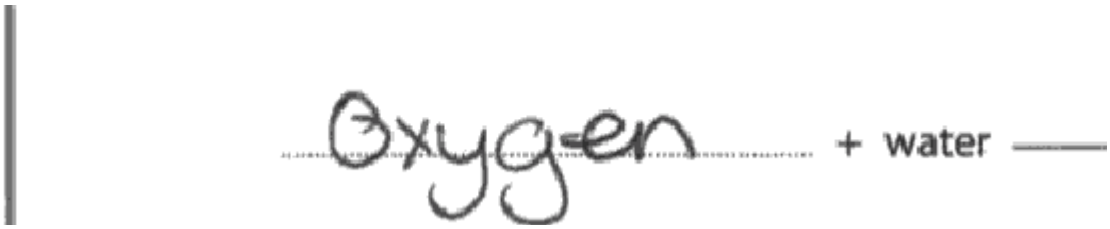
ResultsPlus
examiner comment

This response failed to gain a mark for giving light as a reactant for photosynthesis.

ResultsPlus
examiner tip

Light energy does not take part in any reaction in photosynthesis – it just provides the energy to start off the chemical reaction that is involved in photosynthesis. Candidates may benefit from undertaking practical activities that help to support their understanding of the role of light in photosynthesis and should be encouraged to write out the word equation with 'light' written above the arrow rather than in the place where a reactant should go.

Some candidates confused the products of photosynthesis with the reactants and failed to gain the mark for this part of the equation.



ResultsPlus
examiner comment

This response failed to gain a mark for giving a product of photosynthesis rather than a reactant. It is likely that this candidate may also have the second part of the equation incorrect due to their misconception.

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Candidates could produce visual displays that focus on photosynthesis and that reinforce the reactants and products, as well as the limiting factors, of photosynthesis. They should remember that plants produce oxygen as a waste product of this chemical reaction but need carbon dioxide for photosynthesis to take place.

Question 3 (a)(iii)(2)

The responses given to the second part of the word equation for photosynthesis were very encouraging and indicated that the vast majority of candidates were aware of the products of photosynthesis. In few cases candidates gave a reactant rather than a product or stated 'energy' as their answer for no credit.

Less able candidates were unsure of the products of photosynthesis and gave a response that gained them no mark. However, regardless of the response given, answers did all relate to photosynthesis in some way. It appears that there is just some confusion on where these 'factors' are placed in the word equation.

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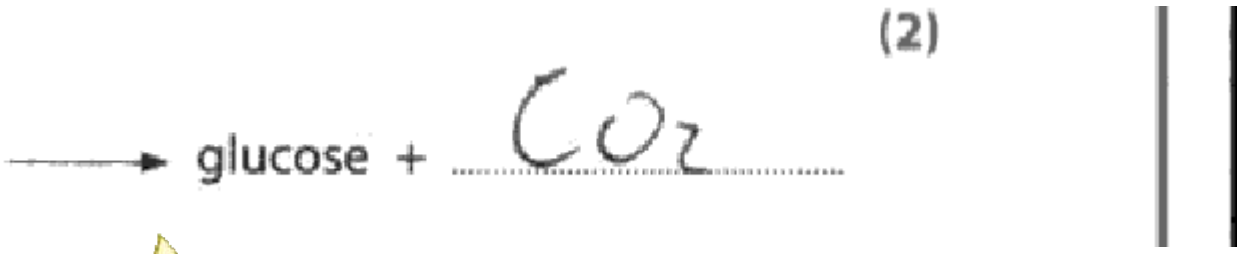
This response did not gain a mark for stating 'light' as a product of photosynthesis.

ResultsPlus
examiner tip

Candidates should be aware of the reactants and products of photosynthesis and why light itself is not part of the chemical reaction. They should be given plenty of opportunity to write out the correct word equation and this could be undertaken through activities built into starters or plenaries of lessons.

Some candidates used formulae in their response to this question and in most cases their answer was correct. In few cases, the formula that was given for an answer failed to gain a mark purely because they had not written it correctly e.g. O^2 rather than O_2. Some candidates, the minority, were confused over the reactants and products of photosynthesis and gave the name of a reactant in the space provided for a product.

(2)



ResultsPlus
examiner comment

This response gains no marks as it states a reactant rather than a product. If the answer given had been correct, the structure of the formula given may have been put under question as a result of the misuse of capital letters. Here the O could easily be mistaken as lowercase.

ResultsPlus
examiner tip

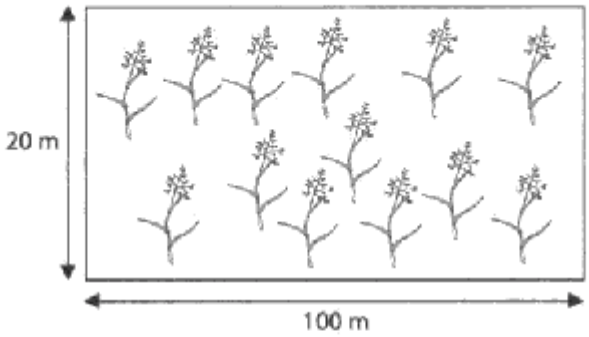
When a question asks for completion of a word equation, ensure that **words** are used to complete the equation rather than symbols or formulae. This will minimise the risk of incorrectly writing a formula that may have been awarded a mark if it had been written correct.

Question 3 (b)(i)

In most cases, this question was very well answered, with the majority of candidates calculating the area of the field correctly. Not all candidates showed their working, although this appeared to pose no problem as the correct final answer was given for 1 mark. Very few candidates calculated the perimeter by adding the length of each side of the field and gained no marks for their response.

Some candidates calculated the perimeter of the field rather than multiplying the length by the width to find the area. In some cases a calculation was given to show how the perimeter had been calculated but in an equal number of responses just the final answer (without any workings) was given.

(b) The diagram shows a field containing grass plants.



(i) Calculate the area of the field.

(2)

area of field = 240 m²

ResultsPlus
examiner comment

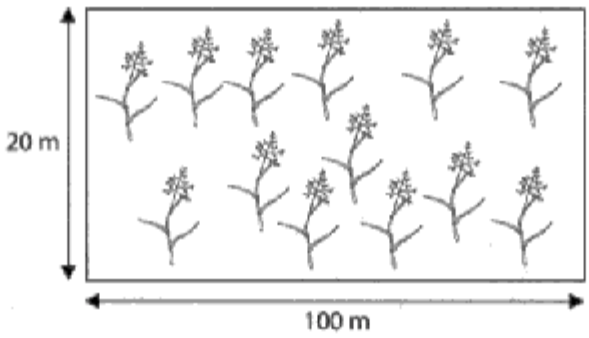
This response failed to gain a mark for giving 240 m^2 as the area of the field. There is no calculation to show how the answer was worked out but it is likely that this candidate has calculated the perimeter rather than the area.

ResultsPlus
examiner tip

Candidates should be given the opportunity to demonstrate various mathematical skills, particularly when undertaking practical activities. Calculating area is a skill that is expected of them and practice in this can be carried out in a number of ways, some of which may not even be related to the topic being studied. Candidates would benefit from activities that distinguish perimeter calculations from area calculations and knowing the difference in what the two are measuring.

Some candidates clearly demonstrated an understanding of how to calculate area and gave the correct calculation. Unfortunately, and despite providing the correct sum, their answer, in some cases, was incorrect.

(b) The diagram shows a field containing grass plants.



(i) Calculate the area of the field.

(2)

× 100
20
200

area of field = 200 m²

ResultsPlus
examiner comment

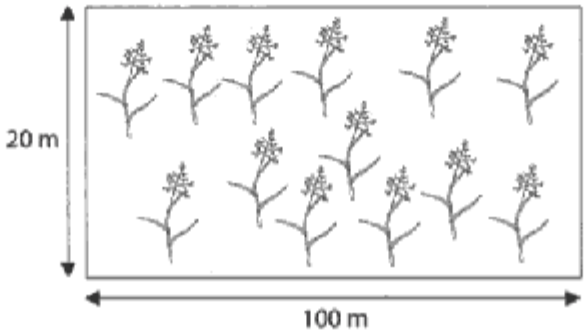
This response was awarded 1 mark for giving the correct calculation to work out the area. The second mark was not gained due to the incorrect answer being placed in the space allocated for the answer.

ResultsPlus
examiner tip

Candidates should be encouraged to use a calculator to carry out mathematical calculations where possible but make sure that the calculation is written on the examination paper, as well as the answer.

The majority of candidates gave a clear calculation to show how they worked out the area of the field and arrived at the correct answer for 2 marks. Very few candidates misread the information given to them in the diagram and carried out calculations such as 20×10, which gained no marks.

(b) The diagram shows a field containing grass plants.



(i) Calculate the area of the field.

(2)

100m x 20m = 2000m²

area of field = 2000 m²

ResultsPlus
examiner comment

This response clearly shows a correct calculation and answer for full marks.

ResultsPlus
examiner tip

Make sure that information from diagrams is read carefully. This information is provided for a purpose – use the information given to include in calculations.

Question 3 (b)(ii)

There were a good many answers to this question, with candidates being familiar with the design and use of quadrates to estimate population size. Some comments on how to make a final calculation to estimate the total population size were a little confused, but candidates had often scored full marks by this point. Candidates that had not had the opportunity to use quadrats still described accurately how small samples could be measured e.g. 'count the number of plants in a small area or in 1 m^2 and then scale up' whereas others gave an adequate description of a quadrat for 1 mark. The responses that did not gain full marks still portrayed a good understanding of this sampling process but failed to add specific details in their answer. Fewer candidates mentioned the use of repeats or that averages should be calculated, although these candidates were still able to obtain at least two marks for good detail elsewhere.

The detail that some candidates provided in their answers lacked detail which restricted the overall mark that they gained for this question. In most cases, candidates obtained at least 2 marks, although some candidates just stated 'Use a quadrat' without giving further information on how the quadrat could be used to make an estimation.

(ii) Describe a method that could be used to estimate the total number of grass plants in this field.

(3)

A Quadrat could be placed on the field, then you would count the number of grass plants inside the Quadrat and compare the numbers per quadrat to get a idea of the volumes in the field

(Total for Question 3 = 11 marks)

ResultsPlus
examiner comment

This response starts off very well and gains 2 marks, firstly for recognising that a quadrat should be used and secondly for counting the number of plants within the quadrat. This, however, does not give an estimation of the total population of grass plants in the field and, for the final mark, the response needed to continue with details on how this estimation could be made using the sample in the quadrat.

ResultsPlus
examiner tip

It is important that candidates recognise the number of marks available for their response. In this case, their response has the potential of earning them 3 marks. The number of marks indicates the number of points that need to be mentioned.

Candidates that were not familiar with quadrat sampling did make an attempt at answering this question by using information from the previous question. Although these attempts were admirable, few were successful and candidates failed to gain marks. Some candidates did give alternative methods, some including the use of transects and these were awarded appropriately.

(ii) Describe a method that could be used to estimate the total number of grass plants in this field.

(3)

~~For every~~ If there is 6 trees in a row then for every 6 add 1 because there is an extra tree in the middle of each row. So for every 6 add 1 except the last row of them because it only has an extra tree in the middle

(Total for Question 3 = 11 marks)

ResultsPlus
examiner comment

This response failed to gain any marks. Although the candidate has made an attempt at describing how the total population size can be estimated, there is no detail here that would allow such an estimation to be made accurately.

ResultsPlus
examiner tip

When estimating population size in a larger area, quadrat sampling is very likely to be the best sampling method. If quadrats are not available, candidates could be given straws to make their own and then carry out an estimation of a 'pretend' population in the classroom to give them an idea of the size of this population in the area of the classroom. The use of this sampling process and its inherent calculations can be reinforced through written activities and paired work that enable good practice to be shared between candidates and provide a good opportunity for Assessment for Learning (AfL).

Question 4 (a)(i)

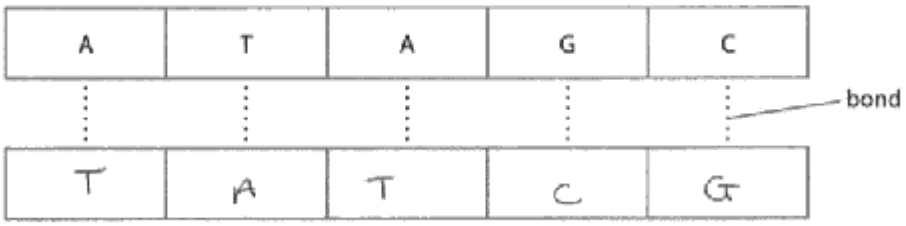
Very few candidates failed to gain a mark for this question. Those that did just simply paired the bases given in the diagram to incorrect bases. There was no pattern in the incorrect responses given; what candidates included in their answer was completely random.

Most answers to this question were very encouraging and implied a good general understanding of complementary base pairing.

4 (a) The diagram shows part of a DNA molecule.

(i) Complete the diagram by writing the letters of the missing bases in the empty boxes.

(2)



ResultsPlus
examiner comment

This response gains 1 mark for correctly identifying the bases to pair with those given in the diagram.

ResultsPlus
examiner tip

Pneumonics can sometimes help candidates to remember base pairing. Making up a sentence with the beginning of each letter being a letter that represents a base may be more memorable to some, particularly less able candidates than trying to remember which base pairs with another.

Question 4 (a)(ii)

Most candidates were able to score the mark allocated to this question by stating the correct answer of 'hydrogen bond'. Less able candidates gave a wide variety of responses including 'chemical bond', which was the most popular incorrect answer, although these were infrequent.

Less able candidates made a guess at the type of bond holding the bases together and, although most were based on the topic area, these answers unfortunately did not gain credit.

(ii) Name the type of bond that joins the base pairs together.

(1)

Double H elix

ResultsPlus
examiner comment

This response is clearly incorrect and was not awarded a mark.

Many candidates correctly recognised that a weak hydrogen bond held complimentary bases together.

(ii) Name the type of bond that joins the base pairs together.

(1)

weak hydrogen bond

ResultsPlus
examiner comment

This answer gained 1 mark for stating the type of bond found between complimentary bases.

Question 4 (b)(i)

Better candidates were able to gain full marks for stating 'plasmids' and 'chromosomal DNA'. Few candidates gave 'chromosomes' or 'chromosome DNA' which was not awarded credit due to lack of clarity and the implication that bacteria have distinct chromosomes. Candidates working at lower levels usually gained 1 mark of the 2 for stating either 'plasmid' or 'chromosomal', but not both. Their attempt at the second type was a guess and sometimes stated another cell component, such as cytoplasm or cell membrane.

More able candidates correctly identified and clearly stated the two types of DNA found in bacterial cells.

(i) Name the **two** types of DNA found in a bacterial cell.

(2)

1 Plasmids

2 Chromosomal DNA

ResultsPlus
examiner comment

This is a clear 2-mark response that gives the two types of DNA found in bacterial cells.

ResultsPlus
examiner tip

Beware of stating just 'chromosomes' as this confuses with the distinct chromosomes found in animal and plant cells.

Less able candidates generally gave other cell components rather than the types of DNA that the question asked for. The components given were not always restricted to those found in bacterial cells.

(i) Name the **two** types of DNA found in a bacterial cell.

(2)

1 Nucleus

2 Mitochondria

ResultsPlus
examiner comment

This answer gained no marks. The candidate has not identified either type of DNA found in bacterial cells.

Question 4 (b)(ii)

Few candidates linked the role of DNA to protein synthesis and preferred to state that it 'controlled the activities of the cell' or 'gave the cell its identity/characteristics' for 1 mark. Other responses referred to the organism as a whole, rather than limiting details to the cell itself, eg 'gives instructions for eye colour' or 'gives an organism its characteristics' and failed to gain a mark. Other responses that were unsuccessful gave the role of DNA as 'storing genes' or 'stores genetic information' which were too vague to award marks.

Many candidates gave a vague description of the influence of DNA on the whole organism rather than at a cellular level. Some stated specific characteristics that were obtained from DNA, such as eye or hair colour, whereas others were even further from the mark by giving a description of where DNA was located or that it was 'made up of genes/chromosomes'.

(ii) State the function of DNA in cells.

(1)

DNA is what holds the genes and makes us who we are, (feature wise).

ResultsPlus
examiner comment

This response links loosely to the topic of the question, although the information given is not credit-worthy. The role of DNA in 'holding genes' and 'makes us who we are' does not give any indication at all of the actual role of DNA and also refers to the whole organism rather than the cell, as stated in the question.

ResultsPlus
examiner tip

Candidates should read all questions carefully in order not to make the mistake of responding with information that falls out of the remit. If the question asks for the function of DNA in cells, then the answer should be limited to cells.

Many candidates were vaguely aware of the function of DNA at a cellular level. Most of these responses included information on DNA controlling the activities of the cell or giving the cell its characteristics.

(ii) State the function of DNA in cells.

(1)

DNA controls the way cells work, how they grow and how they react to things. making everyone different.

ResultsPlus
examiner comment

This response gained 1 mark for correctly stating that DNA controls the way that cells work. The remainder of the information given is irrelevant and even though they have referred to a 'whole' organism later in the response, they clearly implied earlier that DNA works at a cellular level.

ResultsPlus
examiner tip

Candidates need to try to express answers succinctly using scientific terminology. Although 'controls the activities of the cell' is worthy of a mark in this case, it would be much better to state that 'DNA controls the production of proteins'.

Question 4 (c)

Few candidates were able to score 1 or 2 marks for their response to this question, with most responses commenting on changes in the shape and/or function of the proteins. More able candidates recognised a change in the sequence of amino acids or a change in the type of amino acid, and some then went on to describe the implications that this would have on a protein, eg a change in function. Of these better answers, there were none that included details on both a change in the sequence *and* a change in the type of amino acid as a result of a gene mutation. A second mark was more often gained, as mentioned, for indicating a change in shape or function. There were few references to active sites and substrates no longer being able to fit, although many of these responses lacked clarity and consequently failed to gain a mark. A large number of responses made simple statements such as 'mutations can have beneficial or harmful effects' and, although this is correct, it did not answer the question.

Most responses that gained 2 marks commented on how a mutation might change the shape and function of a protein.

(c) Explain how a gene mutation can affect the structure of a protein.

(3)

If a protein is mutated then it may not carry out its function. ~~and protein can change its shape. This will make it harder for the protein to work~~ If the structure of the protein is changed then it may not work correctly

(Total for Question 4 = 9 marks)

ResultsPlus
examiner comment

This response gained 2 marks for clearly stating that a mutation could affect the shape and function of a protein.

ResultsPlus
examiner tip

Two points have been covered in this response although there are potentially 3 marks available. Candidates should be aware of how the number of marks made available relates to the number of points mentioned in a response.

Few candidates touched on the effect that a mutation may have on the amino acids in the protein chain. Those that did include such details in their answer were, more often than not, correct and gained a mark for their answer.

(c) Explain how a gene mutation can affect the structure of a protein.

(3)

* a gene mutation can affect the structure of a protein because the substrate does not fit into the enzyme correctly. so ~~there~~ the amino acids change order and the amino acid chain ~~fold correctly~~ does not fold correctly.

(Total for Question 4 = 9 marks)

examiner comment

This response has identified an effect that a mutation would have on not only the sequence of amino acids but on the final shape of the protein formed. In this case, they have implied strongly that an enzyme has changed shape so that its substrate can no longer fit. This response has gained 2 marks overall.

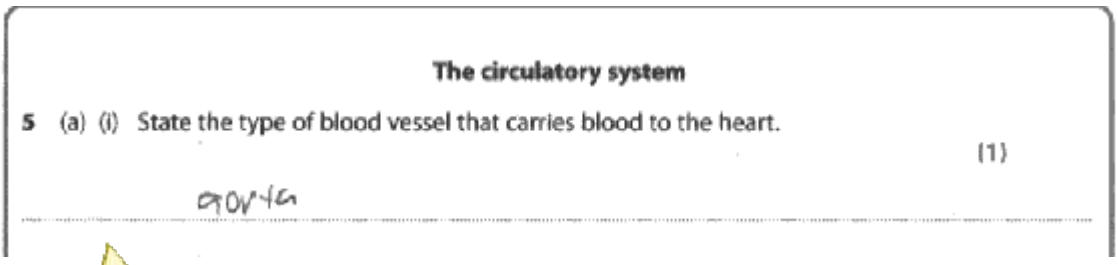
examiner tip

Candidates should be made aware that there is only one place on an enzyme that binds to its substrate and it would be much better to incorporate details of the active site in questions such as this. If the active site changes shape (rather than the enzyme as a whole) then its substrate may no longer be able to bind.

Question 5 (a)(i)

A large majority of candidates were able to successfully state that veins were the vessel that brought blood into the heart. Although 'veins' was the most popular answer, numerous responses alternatively gave the name of specific veins such as the pulmonary vein or vena cava. Few responses gave alternative vessels, although 'arteries' was the most common incorrect answer and less frequently seen 'aorta' or 'pulmonary artery' or 'capillaries'. Very few responses were seen that did not relate to the heart at all, which was encouraging.

Some candidates preferred to state the name of a specific vessel rather than a *type* of vessel transporting blood into the heart. This opened up responses to errors where candidates had a greater range of named vessels to choose from. In some cases their choice was, unfortunately, incorrect.



The circulatory system

5 (a) (i) State the type of blood vessel that carries blood to the heart.

(1)

aorta

examiner comment

This response failed to gain a mark for giving an incorrect named vessel transporting blood *into* the heart.

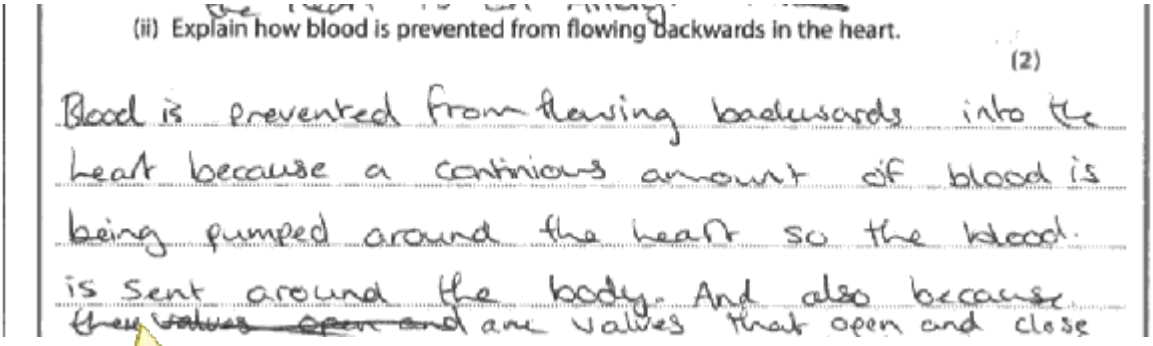
examiner tip

The question asks for a *type* of blood vessel rather than a *named* blood vessel. There are only two *types* of vessel but several *named* vessels. Unless a candidate is absolutely sure, it would be safer to provide a type rather than the name of a vessel.

Question 5 (a)(ii)

The majority of candidates were aware that valves were the structures preventing the backflow of blood in the heart although very few mentioned the location of these valves. Full marks were gained by more able candidates who included details on the action of the valves, ie close to prevent backflow, although many 1-mark answers simply identified valves without further detail or with detail that was not credit-worthy. This question proved to be a good discriminator to distinguish between C/D grade candidates and those working at lower levels; less able candidates gave vague responses with many of these repeating the information given to them in the question.

Some candidates provided lengthy detail on how the blood flow is maintained in one direction, much of which was irrelevant. In most of these cases, there was information that could be credited; some described the action of valves as 'one way doors' which opened and closed when blood moved backwards which was enough to gain them 1 mark without actually stating 'valves'.



(ii) Explain how blood is prevented from flowing backwards in the heart.

(2)

Blood is prevented from flowing backwards into the heart because a continious amount of blood is being pumped around the heart so the blood is sent around the body. And also because ~~they valves open and~~ are valves that open and close

ResultsPlus
examiner comment

Much of the detail in this response is irrelevant but there is no detail that is detrimental to the correct part of the response written later on. Here the candidate has gained full marks for stating that valves open and close.

ResultsPlus
examiner tip

Be careful about writing lengthy responses that may contradict another part of an answer or provide information that is so incorrect that it negates a mark that could have been awarded. Irrelevant detail should be avoided to leave answers that are succinct and straight to the point.

Many 1-mark answers failed to add detail on *how* blood was prevented from flowing backwards. The mark was usually gained for identifying valves as the structure that prevented backflow but more often than not the remainder of the response repeated the stem of the question.

(ii) Explain how blood is prevented from flowing backwards in the heart.

(2)

the heart has valves, to prevent any of the blood going back into the heart.

ResultsPlus
examiner comment

This response gained 1 mark for stating 'valves' as the structure preventing backflow but it failed to provide details on how the valves worked to prevent blood flowing in the wrong direction.

ResultsPlus
examiner tip

A question allocated 2 marks requires a response covering two key points. In this case the question asks candidates to 'Explain how...' and candidates should be aware that a response that 'explains' includes more than the mention of one key point.

Question 5 (b)

The action of the heart as a whole was frequently described without reference to what one side or the other achieved, eg 'the heart pumps oxygenated and deoxygenated blood to the body and to the lungs'. Such responses, although correct in their science, did not answer the question and more intricate detail was necessary before credit could be considered. However, many candidates were able to identify the two sides to the heart and imparted good scientific understanding in their response by giving further correct information on the location to which blood was pumped and/or the type of blood being pumped. Consequently, a large number of candidates scored full marks for their response. Few responses failed to score at all and those that did either described the passage of blood through the heart, some of which drew information from the previous question about the valves, or as mentioned previously, described the action of the heart as a whole, making no reference to a 'double-pump'. Several responses gave details that implied the heart only pumped twice or that blood went through the heart twice. In these cases, candidates had clearly associated 'double pump' with twice in whatever context and made an attempt to respond based on this.

Many candidates that failed to score for their response to this question gave a vague overview of the heart as a whole rather than discussing the discrete action of each side. Although the information provided in most cases did imply an understanding of the role of the heart, the detail given was inadequate in answering the question.

(b) Suggest why the heart can be referred to as a 'double-pump'.

(2)

Because it pumps blood too and from the body as well as too and from the lungs.

ResultsPlus
examiner comment

This response failed to gain any marks. It gives a vague description of the role of the heart as a whole, with no information about the role of each side.

ResultsPlus
examiner tip

Candidates should be aware of the division of the heart and the role of each side. Diagrams of the circulatory system as a whole are useful in putting this information across. Candidates can be made more aware of the direction of blood flow from each side by drawing arrows onto such diagrams.

Question 5 (c)

There were many satisfactory answers to this question that scored 4 marks as well as some very impressive ones that often covered more than a page of extra paper and extended into considerations of anaerobic respiration and oxygen debt. In some cases, references to aerobic respiration and energy demand were weak which restricted the level obtained by candidates to level 2, although more able candidates were able to clearly state the link between heart rate and breathing rate to an increase in energy demand or a faster rate of aerobic respiration. Many level 1 answers failed to give detail on heart rate **and** breathing rate or gave vague responses that implied some understanding but were not clear in their reasons for an increase in these body functions. Very few candidates lost the Quality of Written Communication (QWC) mark, which is particularly encouraging, with the vast majority of responses relayed in a coherent way with few major spelling and grammatical errors.

Candidates gaining 2 marks for their response generally failed to give clear details on both heart rate **and** breathing rate. Although the information these candidates provided was fair in its biological context, the lack of information limited the number of marks that could be allocated.

*(c) Explain why heart rate and breathing rate increase during exercise.

(6)

the heart rate and breathing increase because as the person is moving alot faster the blood needs to be pumped around the body to all of the organs alot quicker. This makes breathing increase because the veins and heart have to work alot harder. ~~th~~heart rate also increases because it is pumping faster and faster to get the blood to where it needs to be.

ResultsPlus
examiner comment

This response gained 2 marks for stating that an increase in heart rate increases blood flow. There is no relevant detail given on why the breathing rate increases during exercise, with no mention at all in the response of oxygen.

ResultsPlus
examiner tip

Candidates should be encouraged to read the question carefully prior to attempting their answer. Candidates could construct mind-maps or complete a mini brainstorm, referring to the question frequently, to ensure that the information that they include covers all necessary points.

More able candidates were able to express details clearly and included good scientific information and terminology worthy of a level 3.

*(c) Explain why heart rate and breathing rate increase during exercise.

(6)

Heart rate and breathing rate increases during exercise as we need more oxygen flowing through our body. Oxygen is needed so that we can make the energy to continue exercising. We breath faster so that we can get more oxygen in our body for a process called aerobic respiration in which energy is made. our heart rate increases because it needs to work harder to get blood travelling faster around our body so that it can give oxygen to cells. If we no longer have enough energy we go into ~~anaer~~ anaerobic respiration ~~where~~ were ~~there~~ oxygen is used to make lactic acid. It gives us a burst of energy but can cause cramps

ResultsPlus

examiner comment

This response clearly gives reasons for an increase in both heart rate and breathing rate. It comments on how the speed of blood is increased with an increase in heart rate and on how an increase in breathing rate results in more oxygen being transferred into the blood. A correct link is also made to aerobic respiration and energy demand and a description is provided of how an increase in blood flow and oxygen uptake relates to aerobic respiration.

ResultsPlus

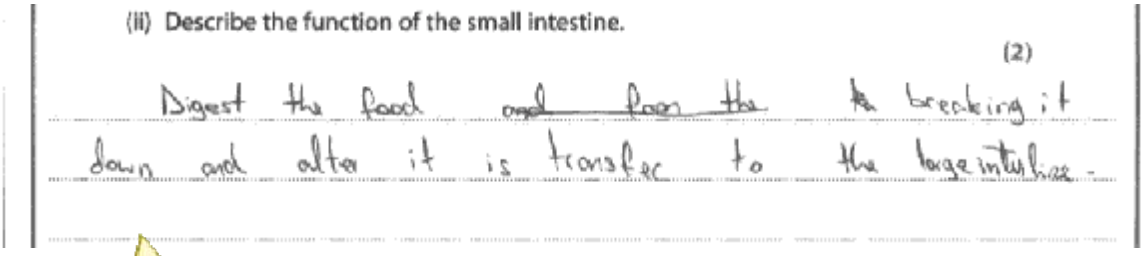
examiner tip

Success in extended answer questions is based on good scientific understanding and communicating this understanding in a coherent and structured manner. It is important that candidates use key terminology correctly and structure their answer in short sentences that provide, where appropriate, some sort of ordered sequence to events.

Question 6 (a)(ii)

Many candidates scored at least 1 mark for their response to this question, although many details provided were slightly confused, indicating a lack of understanding of the role of the small intestine. 1-mark responses generally included details of the 'breakdown of food' with others gaining credit for their reference to transporting food to the large intestine. Few responses implied an understanding of the role of the small intestine in the secretion of enzymes and answers that made an attempt to describe the process of absorption often lacked clarity and detail. However, more able candidates were aware that 'food' passed from the small intestine into the blood although these generally failed to state 'absorption' or 'diffusion' **from** the small intestine. More frequently, responses implied that the small intestine itself absorbed nutrients/food. Other candidates recognised, in so many words, that absorption did take place here but then failed to gain credit for stating that food was absorbed into 'the body'. It is evident that many candidates may have gained a mark or a further mark by giving more thought to the question and looking at the mark allocation available.

Candidates gaining 2 marks were awarded credit most frequently for recognising that food was broken down in the small intestine and for referring to its role in the movement of food. Peristalsis was a term infrequently seen which implies that candidates are unaware that this muscular action takes place here, as well as in other parts of the digestive system.


(ii) Describe the function of the small intestine.

(2)

Digest the food and then the breaking it down and after it is transfer to the large intestine.

ResultsPlus
examiner comment

This response gains 2 marks. Although it is very simply worded, it is clear that this candidate understands that the small intestine has a role in the breakdown of food as well as in the movement of food to the large intestine.

ResultsPlus
examiner tip

There is evidence to suggest that candidates are not aware of all functions of the small intestine. Frequent revision of this topic, with the use of learning aids such as mind-maps and match cards may help to develop their awareness of the roles of the small intestine. Candidates should be encouraged to express their ideas more scientifically using key words and terminology where possible. This could be achieved by incorporating key information into any learning aids that may be constructed.

More able candidates were able to express their ideas clearly and used good scientific terminology in their response to gain credit.

(ii) Describe the function of the small intestine.

(2)

The small intestine absorbs the nutrients from the food into the bloodstream.

ResultsPlus
examiner comment

This response gains full marks and makes use of scientific terminology to clearly explain one of the roles of the small intestine.

ResultsPlus
examiner tip

The use of key words adds clarity to a response. Candidates should be encouraged to use key scientific terminology where possible and with the help of glossaries and wall displays will be far more likely to understand how to structure their response to include such information.

Question 6 (b)

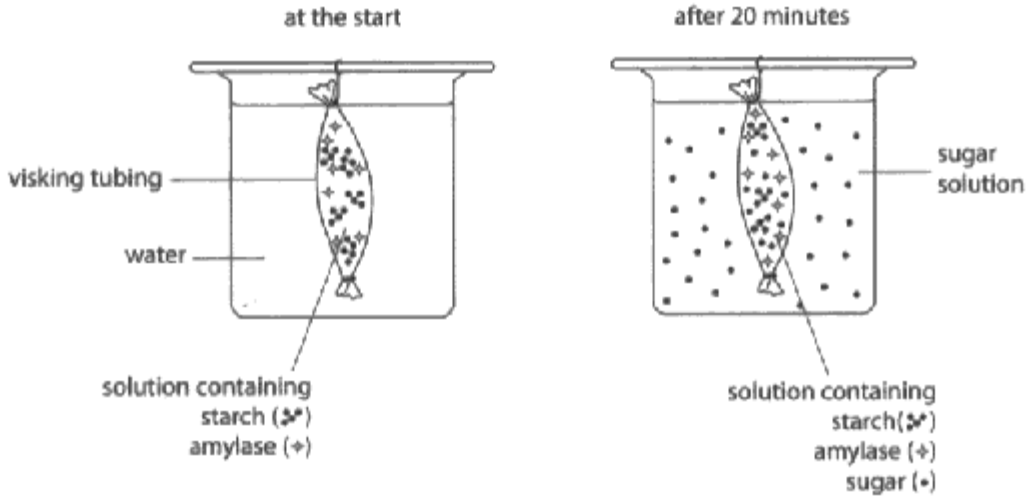
A fair number of candidates were able to score full marks for their response to this question and this implied that they were familiar with the practical set-up shown in the diagram and its underlying scientific principles. Other candidates had clearly studied the diagram very carefully and consequently also scored good marks for their answer. Of the candidates that did obtain full marks, many were aware that the starch was broken down to sugar and that sugar then 'moved' into the water to form a solution. Few were able to use the word 'diffusion' for the latter mark and preferred to give an inference to this process which, if clearly expressed, awarded them the mark. Although some impressive and detailed descriptions were seen, some candidates did fail to express their ideas clearly because of imprecise terminology, eg 'starch breaks up', and loosely grasped concepts. For example, there were frequent references to starch and amylase 'mixing' to 'make sugar' and 'starch *and* amylase' being '*broken down to sugar'.* Other common weaknesses included simply recording observations from the diagram with no attempt to explain the reasons for the observations made. Some candidates referred to what might happen in the small intestine without reference to what had occurred in the experiment illustrated.

There were many responses that gained full marks for this question, which indicated that candidates had made a careful and thorough observation of the diagram illustrated. The 3-mark responses generally covered the breakdown of starch to sugar and the movement of sugar from the visking tubing into the water. Very few responses stated that sugar was 'soluble' and there were no responses that gave maltose as the sugar formed from the digestion of starch by amylase.

(b) An experiment was set up to find out what happens to food molecules in the small intestine.

Visking tubing was used as a model for the small intestine.

The diagrams show the experiment at the start and the results after 20 minutes.



Explain the results of this experiment.

(3)

Starch is a large particle and amylase is an enzyme. Diffusion has taken place so the sugar molecules are allowed to move randomly. The large particle starch has been broken down with the help of the enzyme. The sugar has moved from a high concentration to a low concentration.

ResultsPlus
examiner comment

This response gains full marks for clearly covering three marking points. The candidate has recognised that amylase is 'an enzyme' and this enzyme 'breaks down starch'. The use of the word 'diffusion' linked to sugar and in the correct context and also a description of this process gains the candidate the third mark.

ResultsPlus
examiner tip

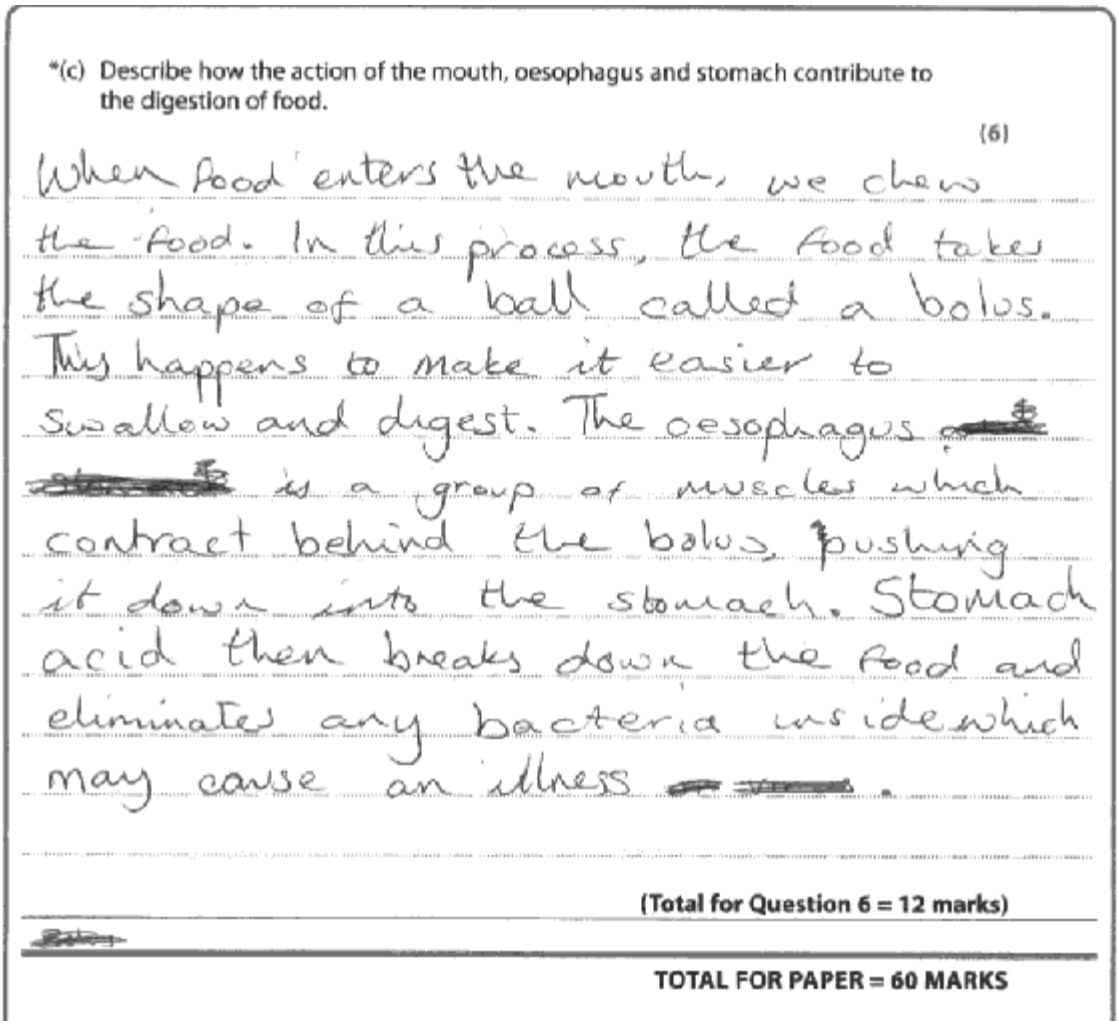
Questions that require an explanation necessitate answers that contain scientific information. In this case, the candidate has used scientific information to explain the results of the experiment. Candidates should be

aware of the difference between questions asking for an explanation and questions asking for a description.

Question 6 (c)

There were some extremely good descriptions by some candidates who scored 6 marks for their response. Details included the action of enzymes in the mouth and small intestine as well as the role of the oesophagus where 'peristalsis' was a term used correctly and frequently. These candidates also gave good descriptions of the role of the teeth and stomach acid in the digestion of food and were aware of the role of the tongue although this was less often mentioned. Candidates scoring 4 marks often mentioned the fact that enzymes were present in the mouth and small intestine but then failed to describe their role in digestion. Some comments on the stomach lacked sufficient relevance to the indicative content to be fully valid and simply stated that the stomach helped to 'break down food'. Other responses followed the journey of food past the stomach and into the small and large intestines, providing irrelevant information that was not credited. Several weaker answers just described the passage of food through the three structures mentioned in the question and failed to score for this, although the majority of candidates were credited with at least 2 marks for their response.

Answers awarded 4 marks were varied in their content with candidates either describing the role of two structures well or three structures in slightly less detail. These answers rarely included correct details on enzymes and, most commonly, intricate details of the role of the oesophagus was overlooked with many candidates vaguely stating that 'food travels to the stomach through the oesophagus'. Better 4-mark answers described the action of the teeth and tongue, and sometimes included the role of saliva as well as stomach acid.



*(c) Describe how the action of the mouth, oesophagus and stomach contribute to the digestion of food.

(6)

When food enters the mouth, we chew the food. In this process, the food takes the shape of a ball called a bolus. This happens to make it easier to swallow and digest. The oesophagus [redacted] is a group of muscles which contract behind the bolus, pushing it down into the stomach. Stomach acid then breaks down the food and eliminates any bacteria inside which may cause an illness [redacted].

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
examiner comment

This response gives good detail on the role of the mouth in digestion, covering information about chewing and how the formation of a bolus aids swallowing. There is excellent detail on the action of the oesophagus with use of good scientific terminology to clearly describe how the contract of muscles pushes food towards the stomach. Although the information provided for the stomach is relatively brief, the information provided earlier in the response and the clarity in which the information is communicated awards 4 marks to this response.

ResultsPlus
examiner tip

Extended answers should be structured carefully and written in short sentences that provide sequential information, particularly in the case of questions such as this, where the order of events is important in providing clarity.

Paper Summary

Based on their performance in this paper, candidates should:

- be encouraged to use key scientific terminology where possible
- show all steps taken in carrying out calculations, rather than just providing a final answer, as methodology could gain candidates credit
- be careful not deviate from the topic of the question in extended answer questions
- write in short, clear sentences, as these were nearly always more successful in gaining good marks than candidates whose ability to communicate in appropriately detailed and grammatically correct language was limited
- be aware of the distinctions between the different command words used in questions, for example, 'explain' and 'describe'.

Grade boundaries

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