

Examiners' Report  
June 2013

GCSE Biology 5BI2F 01

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## Introduction

The vast majority of candidates performed particularly well on the questions involving calculations although expressing their conclusions in written form of any data given was less successful. Candidates at foundation tier were shown to be less able to translate graphical data into written analyses with very few using actual data given to support any form of written conclusion. This generally limited the number of marks allocated to responses that required interpretation of data with many candidates losing a mark for not including figures derived from manipulated graphical data in their answers.

Clear trends in candidates' lack of knowledge and understanding emerged from their responses to several items on this paper. The general lack of understanding, for example, of the structure of proteins and the role of stem cells and a lack of awareness of the structure and function of the circulatory system raised concern. Many responses to the first of the extended answer questions which demanded an understanding of the roles of the various components of the circulatory system focussed on blood flow through the heart only which obviously limited the mark awarded whereas other responses discussed only the movement of food through the digestive system. Students were also challenged by the questions in the last section of the paper clearly implying a lack of familiarity with the process of genetic modification as well as its benefits and its disadvantages. Only the more able candidates were able to gain considerable credit for their responses in this topic.

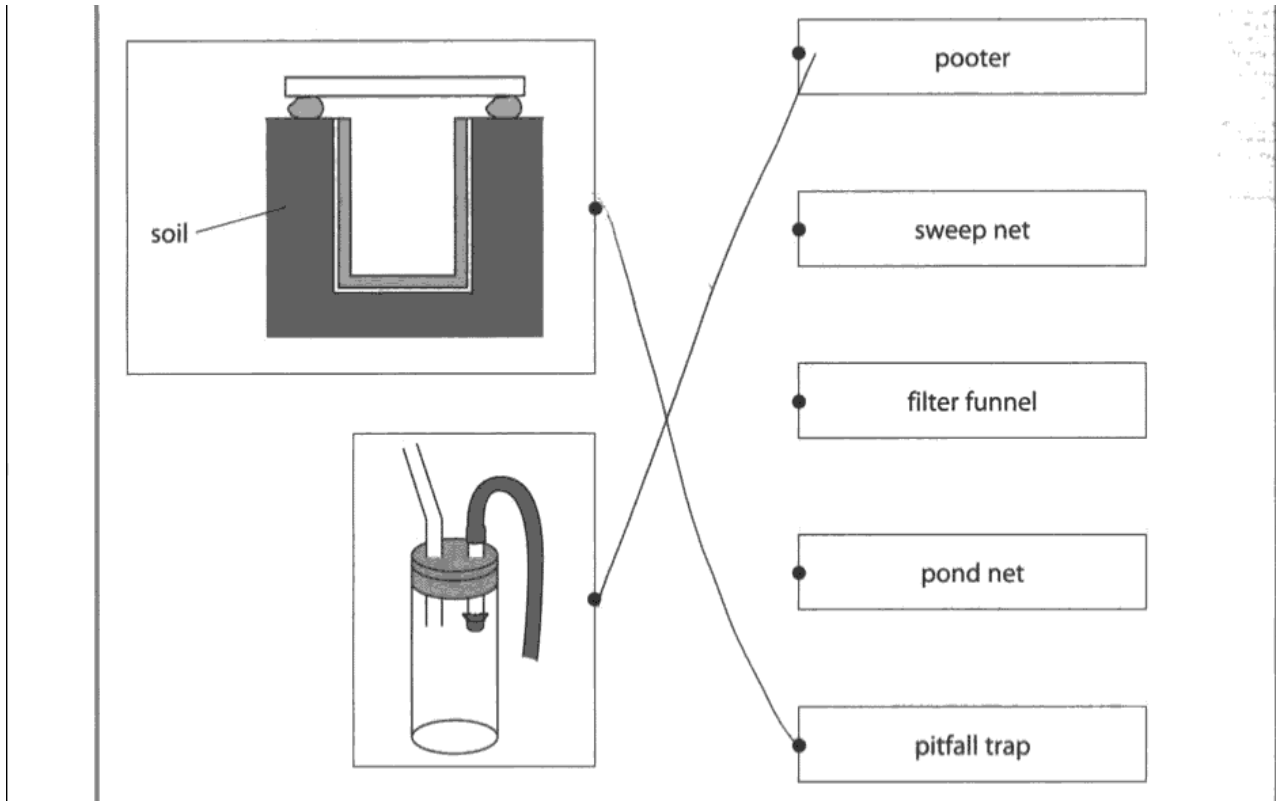
Candidate performance on the first section of the paper which tested understanding in environmental biology (Sampling) was generally good with all levels of ability accessing the expected number of marks. Less able candidates tended to lose marks on questions that were allocated more than one mark, for example questions 1(b) and 1(c) where only one creditable point was raised for each rather than the two needed for full marks. This was a pattern seen throughout the paper. For open questions requiring 3 marks, more able candidates were able to score at least 2 marks; for example question 5(b)(i) where many students gained marks for their understanding of a greater oxygen demand by muscles that were working harder during exercise. The 3 mark closed questions were less successful for all but the most able e.g. questions 3(c) and 4(a) where many students were unable to select the appropriate words to complete all of the sentences correctly.

Overall, the questions covering Assessment Objective 1, mainly recall, presented the most challenge to students on this paper and the areas where there is a deficit in knowledge and/or understanding are highlighted in this report.

## Question 1ai

It was surprising how many candidates did not recognise the pooter with the most common incorrect answer given being the filter funnel. This led to over one third of candidates scoring only one out of the two marks available for this question, with these students inevitably gaining credit for correctly identifying the pitfall trap. Very few candidates were unable to gain any marks for their response.

About half of candidates were successful in gaining full marks for this question. These candidates were able to correctly identify both pieces of equipment shown.



**ResultsPlus**  
Examiner Comments

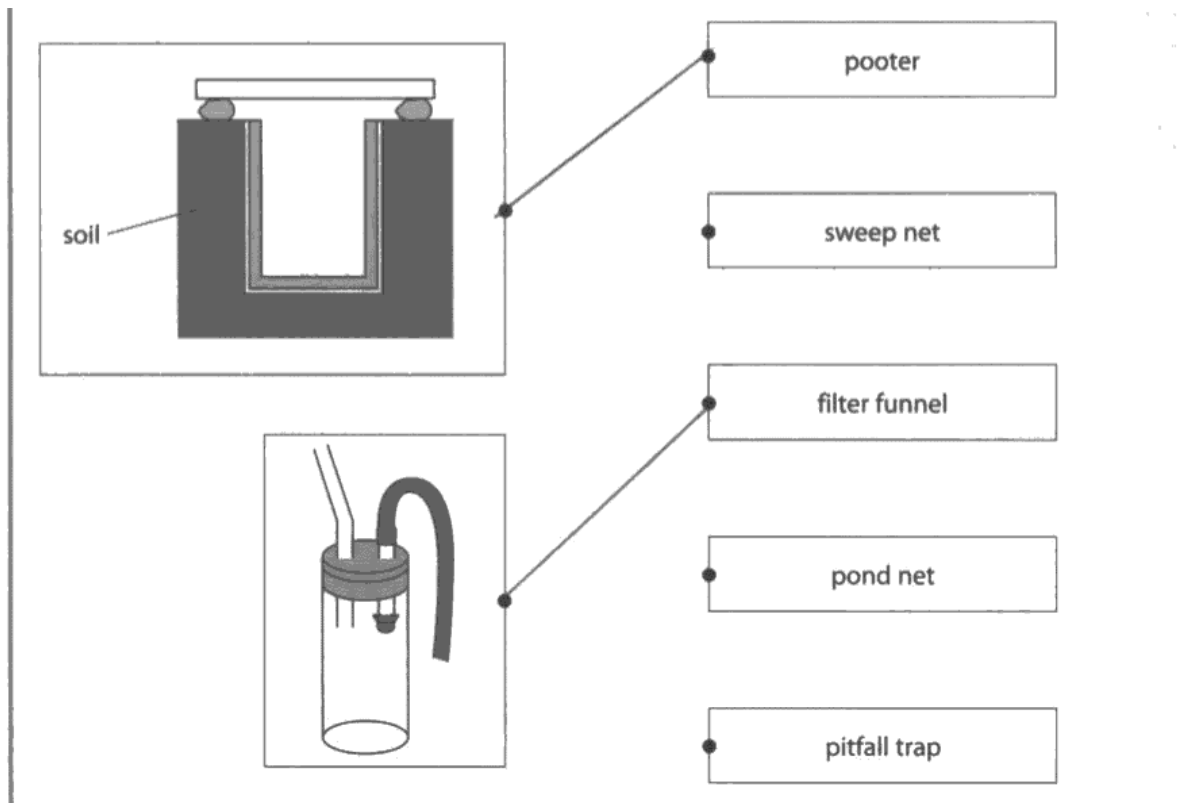
This response gains full credit for correctly identifying both pieces of equipment.



**ResultsPlus**  
Examiner Tip

Some responses to questions of this style lose marks for drawing more than the one line requested from each diagram. If the question asks for one line, or one fact then make sure that only one is given.

Few candidates were unaware of the names of the pieces of equipment shown although all of these candidates attempted to answer the question. This could be due to students not having used the equipment and therefore being unfamiliar with them or just simply being unable to recall their names.



**ResultsPlus**

**Examiner Comments**

Like most of the candidates that gained one mark for their response, this particular answer shows the pooter linked to the filter funnel. This was the most common mistake made for many candidates that gained one mark out of the two. Unfortunately in this case, the candidate has also labelled the pitfall trap incorrectly.



**ResultsPlus**

**Examiner Tip**

If it is inconvenient or difficult to offer students the opportunity to use equipment first hand, then short, card-sorting activities as lesson starters, similar to the style of this question, may help some candidates to identify with all types of sampling equipment. Although this is obviously not as effective as first-hand use of the equipment in a practical activity, it is important that candidates are fully aware of the various types of equipment that can be used to sample populations and how they are used.

## Question 1aii

Candidates demonstrated good skills in observation and mathematics here by identifying the correct figures to substitute into a calculation for 2 marks. Most of candidates gained full credit for their response to this question indicating understanding of how to estimate population sizes in a given area. Candidates that were less successful gave various answers ranging from incorrectly identifying the number of daisies in the field to carrying out a division calculation instead of a multiplication.

Many answers gaining two marks did not show a multiplication calculation using the correct extracted figures. In many cases the figures were just jotted down in the space provided. However, the final correct answer was given which gained full credit.

(2)

5 daisies =  $1\text{m}^2$   
100 daisies =  $20\text{m}^2$

number of daisies = 100



**ResultsPlus**

**Examiner Comments**

This response gains full credit for the correct final answer of 100 daisies. Although no multiplication calculation is shown it is obvious that the student in this case has carried this out correctly.



**ResultsPlus**

**Examiner Tip**

Always show working out in questions that test mathematical skills. If the final answer is incorrect, then a mark could be awarded for showing a calculation.

Many candidates tackled this question by first showing their working out. Candidates that did this, using the correct figures from the graph (or in some cases as an error carried forward) gained one of the two marks for this with the other mark obtained from carrying out the calculation correctly.

$$5 \times 20 = 100$$

number of daisies = 100



**ResultsPlus**  
Examiner Comments

This candidate has provided a clearly written multiplication calculation using the correct figures. This calculation has been carried out correctly to obtain the answer of 100 for full marks.



**ResultsPlus**  
Examiner Tip

Show working out to calculations clearly, making sure that the type of calculation e.g. multiplication, division, etc. is presented in a way that it is clear this sum has been used to arrive at the final answer. Lots of numbers spread randomly throughout the space given is likely to confuse which figures and calculation has been used and is likely to disadvantage the student.

Few candidates gained one mark for their answer to this question and this mark would have been gained from an error carried forward. Some candidates miscalculated the number of daisies in the field although carried out the correct multiplication calculation. Their answer to this calculation was also correct which allowed one mark to be awarded.

$$1 \text{ m}^2 = 4 \text{ daisies}$$

$$4 \times 20 \text{ m}^2 = \underline{\underline{80 \text{ daisies}}}$$

(2)

number of daisies = 80



**ResultsPlus**  
Examiner Comments

This candidate obtained one mark for carrying out a multiplication calculation despite the number of daisies shown in their sum being incorrect. Their answer of 80 is correct for their calculation. This example illustrates the importance of showing all working out. If the candidate had not done this, then no mark would have been awarded for just giving the final answer of 80.



**ResultsPlus**  
Examiner Tip

In most cases, students can gain one mark for showing the working out to an answer for mathematical questions even if the figures given are incorrect. There are certain conditions that apply to questions involving an error carried forward but students infrequently lose both marks for a question of this nature (if working is shown) unless the numbers used and the calculation bears no resemblance to what is being tested.

A minority of candidates were unable to score on this question. The main reasons for this were either using incorrect figures in a calculation leading to the wrong answer for this calculation or just giving a final answer with no indication on how this answer was worked out.

number of daisies = 2000



**ResultsPlus**  
**Examiner Comments**

This response gained no marks. Although it is unlikely that the answer would have gained any marks as the final answer given is likely to have been calculated using figures out of the accepted range for an error carried forward. As no calculation is shown on how this figure was arrived at, no marks can be awarded.



**ResultsPlus**  
**Examiner Tip**

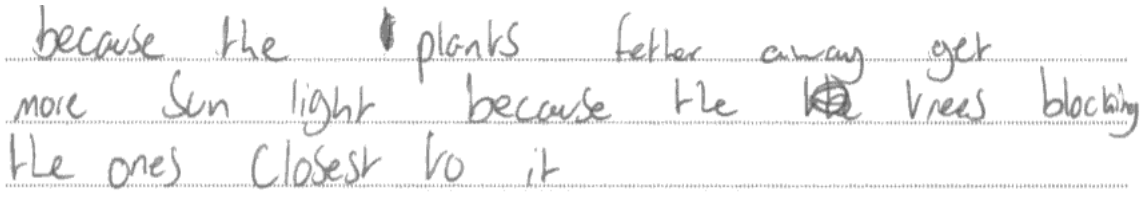
Always show the working out to questions that require a calculation to be done.



## Question 1b

Almost an equal number of candidates scored the full two marks for this question as scored one mark. Approximately half of the candidates were able to give two factors affecting the height of the plants further away from the tree although a large number of candidates gave a perfectly acceptable reverse answer and focussed their discussion on the shorter plants nearer to the wood. Of the students that gained one mark, responses varied although the most common correct answer was for recognising that the plants further away from the wood gained more sunlight. All points on the mark scheme were covered across 1 and 2 mark responses with very few candidates failing to score. In this case candidates tended to be vague in their suggestion with many stating that the plants did not have enough space. This detail was deemed to be too brief an alternative to less competition (for resources) and further justification was needed to gain a mark.

The most common response for students that gained one mark was that the plants furthest away from the trees obtained more sunlight. Failure to extend their answer to mention another factor that influenced the growth of the plants limited responses of this nature to one of the two marks allocated to the question. Other one mark responses included correct details about water, mineral ions or, less frequently, competition.



because the plants further away get more sun light because the trees blocking the ones closest to it



### ResultsPlus Examiner Comments

This answer was typical of the one mark responses where the vast majority of candidates recognised that the plants further away from the wood gained more sunlight. This response would have gained a further mark by giving another factor that helped the plants further from the trees to grow taller.



### ResultsPlus Examiner Tip

Be aware of the mark allocation for questions. The number of marks allocated is directly linked to the number of points that need to be raised in an answer.

Many two mark answers included details about sunlight, photosynthesis and water although the mention of minerals, faster growth and less competition were less frequently seen.

They can absorb more water as the tree is further away (taking a lot of water in) so there isn't much for the plants near it, as well as the fact that the tree could be blocking sunlight from the plants near it.



### ResultsPlus Examiner Comments

This candidate gained two marks for clearly stating that the plants further away from the trees obtained more sunlight and water.



### ResultsPlus Examiner Tip

Many candidates seem unaware that the mark allocation to a question represents the number of key points that need to be raised in a response. For this question and many of the other questions worth 2 marks, candidates lost a mark for only giving one piece of information related to a single point on the mark scheme. There is always the danger of giving more than the expected number of points required - two correct points raised with one incorrect response could negate a mark.

A minority of candidates failed to score a mark for this question. The answers given were too vague to award credit and generally based on suggestions involving lack of space or that implied that plants were closer to the Sun rather than the Sun providing more light for photosynthesis.

The roots have more space to grow in therefore the plants can grow taller



### ResultsPlus Examiner Comments

Of the candidates that did not gain any marks for this question the most common unacceptable answer was based on a more space (for plants). This example is typical of this type of response. More space (for root growth in this case) was too vague to award and this candidate would have gained credit if they had gone on to justify why more space was a reason for the increased height in the plants further from the trees i.e. by stating more access/uptake of minerals.



### ResultsPlus Examiner Tip

It is important that candidates are aware that no credit is given for repeating or rewording the content of the question in their response.

## Question 1c

A variety of responses were given for this 2 mark question although less students gained full marks than those that gained one mark. Many candidates are still confused on gas exchange in plants and this is supported by the fact that many 1 mark responses lost the second mark by including oxygen. Other candidates gaining one mark out of the two named one substance needed to produce glucose as sunlight, disallowed as it formed part of the question. Few candidates recognised that carbon dioxide was necessary although they failed to gain a mark as the incorrect formula was given. Candidates are not expected to recall chemical formulae at foundation tier and it would be best to steer away from using them if there is a danger that they will be written incorrectly.

Just over one third of candidates gained full marks for their response to this item with the most common correct answers including carbon dioxide and water. Candidates that included chlorophyll as one of their answers also tended to use chloroplasts as their answer for the second mark. These were not separate marking points on the mark scheme as they were deemed to be too similar to allow individual credit.

1. Carbon dioxide  
2. water.



**ResultsPlus**  
Examiner Comments

This is a typical 2 mark response and is reflective of the most common answers seen by candidates gaining full marks.



**ResultsPlus**  
Examiner Tip

Do not attempt to write more than what the question is asking for this type of question. The question asks for two substances to be named, so just state two. Any more than this then there is the danger that extra information could negate marks.

Nearly half of the candidates gained only one of the two marks allocated for this question. Although the most common correct mark given was either water or carbon dioxide, the incorrect details varied with oxygen and light being seen frequently.

1. water  
2. oxygen



**ResultsPlus**  
Examiner Comments

This response indicates confusion with gas exchange in photosynthesis, a misconception that was very common amongst the cohort. The inclusion of oxygen as a substance needed by plants to produce glucose lost this candidate one mark.



## ResultsPlus

**Examiner Tip**

Continued practice writing out the word equations for photosynthesis (and respiration which is also part of the B2 specification) will help to recall from memory.

Some candidates failed to gain marks due to confusion over which gas is needed for photosynthesis and which is produced. Other candidates did not read the question carefully enough and possibly could have gained a further mark if they had done so. These candidates included sunlight/light energy in their answer which was not credited as it formed part of the question.

1. Carbon dioxide  
2. light energy.



## ResultsPlus

**Examiner Comments**

This candidate scored one mark only for naming carbon dioxide as a substance needed by plants to produce glucose. As light energy was included in the question no credit was awarded for this.



## ResultsPlus

**Examiner Tip**

Candidates should be encouraged to read the question given carefully and to avoid using details in their response that have just been lifted from the question.

## Question 2a iii

Many answers to this question were structured well and although there was less use of scientific terminology than was hoped would be seen e.g. peristalsis, contraction a fair number of candidates proved to demonstrate some understanding of the role of the muscular wall of the oesophagus. A third of the cohort successfully gained 2 marks for their response. Of the candidates that were not successful, the way in which many answers were expressed lacked clarity. These candidates failed to put their understanding across in a more scientific way and used language that was too simplistic to award marks e.g. squeezing food. Other candidates clearly did not know the role of the muscular wall of the oesophagus although made a guess at its job including information such as protection and support of the oesophagus, digestion or breakdown of food or mentioned that the food 'went to' the intestines from here.

The vagueness of some responses lost candidates both marks in almost half of the responses seen. Although the details given for many of these responses hinted very subtly at some understanding of the role of the muscular wall of the oesophagus information given was below the minimum expected to gain marks.

The <sup>role of</sup> muscular wall of the oesophagus <sup>(4)</sup>  
helps to swallow the food and make  
it go down more easy.



### ResultsPlus Examiner Comments

This response did not contain adequate detail to award any marks although less able candidates tended to word their responses in a similar way. This candidate could have gained at least one mark by stating that food was 'pushed' down implying a more active role for the muscular wall rather than stating '.....and make it go down more easily'



### ResultsPlus Examiner Tip

Encourage candidates to express their understanding using scientific terminology where possible.

Many confused the oesophagus with the throat and this could have negated marks. Most 1 mark answers gained the transit or location mark i.e. 'push' and 'to the stomach' and most of these candidates failed to use more scientific terms in their descriptions.

The Oesophagus pushes the food down  
the ~~throat~~ throat which has been  
chewed up by the teeth into smaller  
molecules there for it will be easier

easier for the food to be transported.  
The oesophagus uses its muscles to  
push the food down.



### ResultsPlus Examiner Comments

This candidate gained one mark for understanding that the muscle in the wall of the oesophagus 'pushes' food. This candidate has confused the oesophagus with the throat although in this particular case the inaccuracy was ignored to award the third marking point.



### ResultsPlus Examiner Tip

Be aware of including incorrect details that could negate marks. In this case, the use of the term 'throat' instead of oesophagus is just acceptable as the remainder of the response includes details that imply an acceptable understanding of this topic.

Less able candidates failed to score on this question but most at least made an attempt at describing the role of the muscular wall of the oesophagus. Their failure, however, to use more scientific terminology in their descriptions or general lack of understanding or vagueness of expression unfortunately failed to gain them credit. Many incorrect answers focussed a 'protective' role for the muscular wall but an equally large number of candidates also stated that it 'digested', 'broke down' or 'crushed' food.

The muscular wall helps to break  
down food throughout the digestion ~~system~~  
~~by~~ ~~stomach~~ system and protects the oesophagus



### ResultsPlus Examiner Comments

This candidate failed to gain marks for the details given in its response. The candidate is misunderstood in thinking that the breakdown of food occurs in the oesophagus. This could be confused with chemical breakdown by enzymes and although food may be broken into smaller pieces as a result of muscle contraction this is not the biological role of the oesophagus wall.



### ResultsPlus Examiner Tip

The inadvertent use of the phrase 'break down' is seen often in student answers. In digestion, it needs to be made clear whether this break down is chemical or mechanical.

Most 2 mark responses included details about the action of the muscles of the oesophagus and the location to which food travelled. It was disappointing that use of the term 'peristalsis' was infrequently seen and, in some cases where it was seen, expression of language was generally weak.

The muscular wall of the oesophagus pushes food & down the oesophagus by contracting, & which therefore pushes it down towards the other parts of the digestive system.



**ResultsPlus**  
Examiner Comments

This is a typical 2 mark response where the candidate has included details such as 'pushes food' and 'muscle contraction'.



**ResultsPlus**  
Examiner Tip

Try to use scientific terminology where possible although make sure that it is used in the right context and that it can be written in a sentence that makes sense.

## Question 2bi

Three quarters of candidates scored full marks for extracting the correct information from the graph and using in a calculation leading to the correct answer. The use of negative values in the graph posed no problem for the majority of students although the weaker candidates lost marks for carrying out an addition rather than a subtraction. Candidates that failed to score generally misunderstood what was required of them and random answers were given in this case, usually an incorrect final mark with no working out shown.

One of the marks allocated to this question was for the correct extraction of data from the graph. The majority of candidates that scored one mark on this question wrote down these two figures (-10 and -15) and were, therefore, awarded credit. For much of the time, these responses failed to gain a second mark as an incorrect calculation was carried out using this data, more often an addition rather than a subtraction.

(2)

$$\begin{array}{r} -10 \quad -15 \\ 10 + 15 = 25\% \end{array}$$

answer = 25%



### ResultsPlus Examiner Comments

This candidate has clearly extracted the correct data from the graph to use in a calculation. This response gained one mark for doing this. Unfortunately, the figures extracted have not been used in a subtraction calculation and therefore a second mark could not be awarded.



### ResultsPlus Examiner Tip

Ensure that all working out to calculations are shown. Failure to include this detail could lose marks.

The most frequent error made was not showing working out to the calculation for this question and writing in an incorrect final answer. Many candidates could have gained a mark by extracting data within tolerance from the graph and writing this down but failed to do so.

answer = 13.4



### ResultsPlus Examiner Comments

This candidate has not shown any working out but has included a final incorrect answer. No marks can be awarded for this.



### ResultsPlus Examiner Tip

When showing the workings to a calculation, make sure they are laid out in the space provided in an ordered fashion and make it clear which figures have been used to arrive at the final answer. Random numbers thrown onto a piece of paper and leaving the examiner to choose which have used will not gain marks. A 'list' rule will apply here.



Candidates gaining the full marks for their answer either just gave the final answer without showing any working or provided full details that included showing the correct data in a calculation.

answer = 5



**ResultsPlus**

**Examiner Comments**

This answer gained 2 marks for the correct final answer. Although a calculation is not shown it must have been carried out to arrive at this answer.



**ResultsPlus**

**Examiner Tip**

Show all working out to questions with a mathematical focus.

## Question 2bii

Some candidates failed to consider the minus values shown on the graph when describing how the levels of cholesterol were affected by the different masses of plant stanol esters consumed. These candidates clearly just looked at the Y axis values and noticed the increase in the figures given without reading the label for the axis. This unfortunately led to many candidates not gaining the full 2 marks for their response. Similarly, many candidates failed to use data to support their descriptions and simple information, such as identifying no change in cholesterol levels between 8g and 10g of plant stanol esters consumed was commonly omitted. The majority of candidates scoring one mark out of the two recognised the decrease in the percentage of blood cholesterol as the mass of plant stanol esters increased and backing this up with data extracted from the graph would have gained these candidates the second mark. Very few candidates were awarded 2 marks for their response, mainly for describing the decrease in the percentage of cholesterol and for recognising the plateau in cholesterol levels between 8g and 10g of plant stanol esters eaten. Others gaining 2 marks supported their correct description of the trend with data extracted from the graph.

Many of the less able candidates struggled with interpreting the data shown on the graph although most attempted to answer the question. However, responses from these candidates were vague and did not provide the detail required to award any marks.

The level of cholesterol in the blood changes as the mass of plant stanol esters eaten increases because of all the fat that is involved in the food.

(Total for Question 2 = 8 marks)



**ResultsPlus**  
Examiner Comments

Some candidates were unable to express their ideas clearly about the trends in cholesterol levels in enough detail to be awarded one mark. Many students repeated the question by stating that the percentage of cholesterol 'changes' without specifying how. This response gives an example of this.

Almost half of the candidates scoring one mark identified the decrease in the percentage of cholesterol in the blood when more plant stanol esters were eaten.

the level of cholesterol in the blood drops rapidly as the more plant stanol esters is eaten.



**ResultsPlus**  
Examiner Comments

This response gained one mark for recognising the general trend in the percentage of cholesterol. A further mark could have been gained by including either data extracted from the graph to support the description or for identifying no further decrease in cholesterol levels after 8g of plant stanol esters were consumed.



**ResultsPlus**  
Examiner Tip

When describing graphical trends try to include relevant data to support written descriptions when appropriate. This numerical information often needs to be included as a comparison e.g. starting value vs final value or a manipulation of data rather than just numbers lifted from the graph.

Some candidates managed to gain the full 2 marks for their response. In this case their written description of a decrease in the level of blood cholesterol was supported by data from the graph or alternatively the trend shown in the level of cholesterol between 8g and 10g of plant stanol esters consumed was identified.

the mass of plant stanol esters eaten per day decreases the percentage in level of cholesterol in the blood to -10 then steadily drops to -15 the stays consistent until the mass is 10.



**ResultsPlus**  
Examiner Comments

This response covers three marking points with the detail given. The candidate has correctly identified that the percentage level of blood cholesterol decreases with an increase in the consumption of plant stanol esters and it has backed this up with data. A further marking point is also covered where the candidate has recognised that the levels of blood cholesterol remains constant (from -15% to 10g of plant stanol ester).



**ResultsPlus**  
Examiner Tip

It is always best to extract as much information from graphs as possible when describing trends, regardless of how many marks are awarded to the question. As long as the information is relevant and links directly to the information shown it is unlikely marks will be negated for extra information provided by the student.

### Question 3a ii

Two marks were rarely awarded for this question, and the detail given for the vast majority of responses gaining 1 mark or no credit clearly indicated a lack of subject knowledge in this area. Candidates struggled to describe the role of stem cells in forming new tissue and although most attempted the question, many answers were more or less a repeat of the question. Most candidates scored one mark - over half of the students gained credit mainly for their understanding that stem cells divide with use of the term 'mitosis' seen fairly often although these response failed to then provide further detail to gain the second mark. Some candidates focussed their answers on linking stem cells with platelets and blood clotting to seal wounds or prevent infection and there were several references to white blood cells. Other candidates were under the impression that the stem cells produced new skin cells not that they themselves turn into new skin cells whereas others gave information such as 'stem cells are unspecialised' without taking this further to state that they then specialise or differentiate.

The majority of one mark answers correctly identified that stem cells divide to form new tissue with few responses using the word 'mitosis' as an alternative to divide. Fewer candidates scoring one mark obtained this for including the second marking point on the mark scheme - many students seem unaware that stem cells differentiate.

Stem cells produce new tissue by dividing and doubling to make tissues.



#### ResultsPlus Examiner Comments

This response gained one mark for stating that stem cells divide. If this response had gone on to mention that these cells then differentiate or used phrasing to suggest this then a further mark could have been awarded.



#### ResultsPlus Examiner Tip

Regardless of the context of the question the underlying information required will always be the same. This particular question may have caused some confusion being in the context of producing new skin tissue but all that was required was the basic stem cell division and differentiation for the full 2 marks.

The few candidates that did manage to score full marks for their response to this question rarely used the terms differentiation or specialisation. Instead these candidates tended to choose more simple ways to describe this process by stating, for example, that the stem cells 'change into skin cells'.

they start ~~off~~ as blank cell then when they are called what to do they start dividing and form a group of tissue ~~that~~ then they will change into new skin cells.



**ResultsPlus**

**Examiner Comments**

This response scored 2 marks for demonstrating an understanding that stem cells divide and then differentiate although a description of the differentiation process has been given rather than actually stating the name of the process.



**ResultsPlus**

**Examiner Tip**

Providing descriptions of key terms such as differentiation is perfectly acceptable in most cases although the wording does need to contain particular detail to be awarded credit. For example, if a response such as 'skins cells form new cells' is too vague as it does imply that the stem cells are producing new cells rather than changing into new cells themselves.

It was unfortunate that some students failed to gain a mark for their response due to the spelling of key words. In some cases, accuracy in spelling is crucial where one word spelt incorrectly may have an alternative meaning or where a misspelt word could be mistaken for another no mark will be awarded.

They use ~~Meiosis~~ Meitoesis, ~~the~~ Becau  
Sometimes the body will need more cells because  
the others die.



**ResultsPlus**

**Examiner Comments**

This candidate has misspelt mitosis so that it appears to be cross between this and meiosis. No mark has been awarded for this.



**ResultsPlus**

**Examiner Tip**

Learn the correct spelling of key scientific terminology.

### Question 3bi

Three quarters of the candidates scored the full 2 marks for their response to this question by extracting the correct data from the table of information and using these figures in a subtraction calculation. The remaining candidates that were less successful in their response proceeded to calculate the average mass gain of baby X although this is not what the question asked for. Despite these average calculations being correct for most of the responses seen, no mark for an error carried forward was awardable in this case. Very few candidates scored one mark although those that did were able to correctly extract 2.5 and 10.8 from the graph but proceeded to use these numbers in an incorrect calculation.

The majority of candidates scoring two marks clearly wrote their working out to the calculation in the space provided and this was pleasing to see. Other candidates chose to just write in the final answer without showing any working.

$$\text{Baby Y} = 12.2 - 3.4 = 8.8$$

(2)

$$\text{Baby X} = 10.8 - 2.5 = 8.3$$

mass gained = ~~ANS~~ 8.3 kg



**ResultsPlus**

**Examiner Comments**

This candidate has worked logically through this simple calculation and used the information from baby Y to check their answer. The working out is clearly shown for 1 mark with a correct final answer given for the second mark.



**ResultsPlus**

**Examiner Tip**

Help is sometimes given in the form of examples for questions that require candidates to carry out calculations. Students should be encouraged to use all of the information given to help them with their answer. In this case, the mass of baby Y was given in the table. Candidates should have been able to deduce how this mass was obtained and then used the same steps to work out their own answer for baby X.

Some candidates chose just to give a final answer without showing any working out. This was unfortunate in a minority of cases where no mark could be awarded due to the number given being incorrect.

mass gained = 4.5 .....kg



**ResultsPlus**  
Examiner Comments

This candidate gained no mark for just writing the incorrect final answer. However, if their working had been shown and it included figures within tolerance (any of those given for baby X) in a subtraction calculation then they could have been awarded one mark.



**ResultsPlus**  
Examiner Tip

Always show working out to a calculation. This could be awarded a mark for an error carried forward even if the values given are incorrect.

Nearly one third of candidates failed to score any marks for their response to this question and the main reason for was because many proceeded to calculate the average mass gain rather than just mass gain. The question clearly did not ask for the average to be calculated.

$$2.5 + 6.4 + 7.8 + 9 + 10.8 \div 5 \\ = 7.3 \text{ kg}$$

mass gained = 7.3 .....kg



**ResultsPlus**  
Examiner Comments

Although this candidate has calculated the average mass gain correctly and shown its working out clearly, this was not what the question asked. No marks were awarded to this response.



**ResultsPlus**  
Examiner Tip

Read the question carefully and carry out exactly what is it asking you to do.

### Question 3bii

The majority of candidates managed to score one mark for stating an acceptable way in which the growth of babies can be measured. Over three quarters of the cohort gained one mark here with the most common response being height followed closely by length. Of the candidates that failed to score, many gave weight as the most common incorrect answer. Some gave a random answer such as 'how much food they eat' or an ambiguous response, such as 'size', which were not credited. It was unfortunate in some cases where the poor quality of handwriting lost some candidates marks, e.g. height could often be read as weight and was therefore not awarded.

The majority of candidates scoring one mark gave height as their answer with length following as a close second. Some candidates wrote down both whereas others wrote height along with width. In the case of the latter, width was ignored as it was deemed insignificant in the awarding of marks. Other responses that gave two ways in which growth could be measure, with one of the ways given being clearly incorrect, the mark gained was negated. This was seen fairly infrequently for students, for example, who wrote height along with weight.

Height gained



#### ResultsPlus Examiner Comments

This candidate has read the question carefully to write down one correct way in which the growth of babies can be measured. This response gained one mark.



#### ResultsPlus Examiner Tip

Do not give more information than is requested and do not give information that you have been asked not to. This question asked for one suggestion other than mass gained but despite this the majority of candidates that failed to score wrote down weight.

Nearly a quarter of candidates failed to score a mark for this question with most of these giving weight as their answer. This was a case of either not reading the question carefully or some misunderstanding between mass and weight.

The weight



#### ResultsPlus Examiner Comments

This candidate failed to score a mark as they incorrectly gave weight as their answer.



#### ResultsPlus Examiner Tip

Candidates should be aware of similarities between mass and weight and that weight cannot be considered as an alternative to mass.



There were few candidates that failed to score due to the randomness in the suggestions that they made, although such responses ranged from measuring the length of their hand to the type or quantity of food that they ate. Nearly a quarter of candidates were unable to give an acceptable response to this question.

Growth in babies hands. (mm<sup>2</sup>)



**ResultsPlus**

**Examiner Comments**

Although this candidate made an attempt at answering the question, the answer given did not detail an appropriate way in which the growth of babies could be measured. No mark was awarded for this answer.



**ResultsPlus**

**Examiner Tip**

It is always worth attempting an answer even if you are unsure. Having a go could gain marks, particularly for the multiple choice and closed questions.

### Question 3c

Many candidates in this cohort seemed to lack the subject to gain the full 3 marks for their responses to this question. Although it appeared that no student left this question blank, many lacked recall skills to complete the sentences using the correct words from the box. Incorrect answers varied although many candidates were under the impression that glucose is absorbed by villi in the large intestine or that carbohydrates are broken down into simple proteins. The most common correct answer seen for one mark was amylase which a fair number of students included their responses as the enzyme breaking down the carbohydrates. For this cohort, the majority obtained one mark. Three mark answers were much less frequently seen. Under one third of candidates gained 2 marks and again the responses varied. Which correct answers were given was random although most gave amylase for one of their two marks.

A minority of candidates scored 2 marks for this question which required them to choose the correct words from those given to complete the sentences. Of these candidates, many gave amylase as the correct response for the first part of the first sentence although the words chosen to complete the remainder of the passage was random. There is a clear lack of knowledge amongst many students on this specific area of the topic and despite the structure of the question being simplified to enable access by weaker candidates the result was not as expected.

Carbohydrates are broken down by Amylase into  
simple Sugars.  
Glucose is absorbed into the blood through villi found in the  
large intestine.



#### ResultsPlus Examiner Comments

This candidate scored two marks for correctly slotting in amylase and sugars in their correct places in the first sentence. The final answer given - the large intestine, was a common area seen amongst students that did not gain a third mark.



#### ResultsPlus Examiner Tip

Read through all information given carefully and refrain from using the first option that you come across. In this case, the large intestine is likely to be read before the small intestine due to its placing in the box and the word 'intestine' may have prompted many candidates to use this option rather than small intestine.

Fewer candidates than expected scored the full three marks for this question with one of the many errors for candidates scoring 2 marks being the last word insertion - many gave large intestine instead of small intestine. Students gaining one mark more often inserted amylase correctly into the first sentence for their mark whereas candidates that failed to score placed words from the box randomly into the sentences.

Carbohydrates are broken down by ~~starch~~<sup>amylase</sup> into  
simple sugars .  
Glucose is absorbed into the blood through villi found in the  
small intestine .



### ResultsPlus Examiner Comments

This is a 3 mark response. The candidate has correctly chosen the words from the box to complete the sentences.



### ResultsPlus Examiner Tip

Before choosing options to complete sentences in questions structured in this way, read through all of the options given and then write in the answers.

Most candidates scoring 1 mark gained this for the correct placing of amylase. Other candidates nearly always inserted the wrong word into the last sentence and gave large intestine instead of small intestine. This was a trend also seen in responses gaining 2 marks.

Carbohydrates are broken down by amino acids into  
simple sugars .  
Glucose is absorbed into the blood through villi found in the  
large intestine .



### ResultsPlus Examiner Comments

This candidate scored one mark for correctly placing sugars to finish off the first sentence. Like many other candidates, the large intestine was chosen incorrectly to complete the final sentence. No mark was awarded for the placement of 'amino acids'. This candidate appears confused about the role of carbohydrases in digestion, despite the similarity between its name and its substrate.



### ResultsPlus Examiner Tip

The names of the digestive enzymes can be linked easily to their substrates just by looking at how many letters in each match! If the first three letters of an enzyme and a substrate are the same then they work together.

*Carbohydrases-carbohydrates,  
proteases-proteins,  
lipases-lipids.*

## Question 4a

This question, focussing on the structure of DNA, raised similar issues to the previous question which was structured in the same way. Many candidates were unable to choose the correct words from the box to complete all the sentences successfully although the percentage of candidates scoring 3 marks was significantly better than question 3c. Nearly half of candidates correctly chose all three words to complete the sentences. Most candidates identified DNA as a double helix and for those who scored one mark, this was the most common correct answer. Like the candidates gaining one mark students gaining two marks generally opted for **double** helix and in addition to this also understood that the two strands were held together by **hydrogen** bonds. The most common incorrect answer was placed in the final sentence. A vast number of candidates were unaware that a **gene** is a section of DNA and many preferred to choose chromosome to complete this final sentence. A tiny percentage of candidates were unable to score at all on this question.

A small number of candidates scored one mark for this question and of these the vast majority chose the correct word, double, to complete the first sentence. Many of these one mark answers placed chromosome into the last sentence, a trend seen across responses that failed to gain any marks to responses gaining 2 marks.

A DNA molecule consists of two coiled strands that form a double helix.

The strands are held together by gene bonds between the bases.

A chromosome is a section of a DNA molecule that codes for a specific protein.



### ResultsPlus Examiner Comments

This candidate scored one mark for correctly placing double into the first sentence. The other incorrect answers shown were commonly chosen by candidates with this score.



### ResultsPlus Examiner Tip

This can be a tricky topic and it sometimes helps to draw a diagram of a chromosome, break it down into its constituent parts and label it with the following: DNA, chromosome, gene.

The majority of candidates scoring two marks gained these for the correct placement of words into the first and second sentences. Inaccuracies in choosing the type of bond holding the DNA strands together was rarely seen in the 2 mark responses although obviously were seen far more frequently in the 1 mark responses. This suggests that better candidates, those scoring 2 and above, are unsure what constitutes a chromosome and a gene.

A DNA molecule consists of two coiled strands that form a double helix.

The strands are held together by carbon bonds between the bases.

A gene is a section of a DNA molecule that codes for a specific protein.



### ResultsPlus Examiner Comments

This candidate scored 2 marks for correctly completing the first and third sentence although carbon has been chosen incorrectly to complete the second sentence.



### ResultsPlus Examiner Tip

Carbon appears first in the list of words shown in the box. Hydrogen happens to be the last word in the box. Read through all options before writing in any answers - don't use the first word that seems to fit in questions like this.

Candidates at C/D grade easily accessed this question showing a good understanding of the structure of DNA by completing each of the sentences correctly.

A DNA molecule consists of two coiled strands that form a double helix.

The strands are held together by hydrogen bonds between the bases.

A gene is a section of a DNA molecule that codes for a specific protein.



### ResultsPlus Examiner Comments

This candidate correctly chose all three correct words to complete the sentences.



### ResultsPlus Examiner Tip

Learn the structure of DNA in a hierarchical order: bases, genes, chromosomes.

## Question 4ci

The first section of this part of the paper proved a real challenge to the majority of candidates, many of whom failed to score at all for 4(c)(i). It is clearly an area where students lack knowledge and understanding, and although the majority made an attempt at providing a response, most failed to make the link between proteins and amino acids and instead gave responses that focussed on the lock and key hypothesis, incorrect base-pairing or that proteins were made up of different bases, denaturing of enzymes or just gave information about how proteins have different jobs which was the given reason why they had different shapes.

Very few candidates managed to score full marks on this question although those that did provided clear descriptions on how two different proteins are different shapes. Most answers included details about amino acids but some took a step back from this to describe how different base sequences determine protein structure although this was rare. Other two mark responses focussed only on the amino acid type and sequence in a protein chain. Very few responses included information about the number of amino acids in a protein.

As different genes ~~have~~<sup>code</sup> for a specific protein, the amino acids may be arranged in a different order. Two proteins have different jobs so they both have different features.



**ResultsPlus**

**Examiner Comments**

This candidate scored 2 marks for a good response covering two separate marking points. Here the candidate has recognised that the blue print for each different protein is different - different genes code for different proteins and also that that amino acids making up the protein are in different orders.



**ResultsPlus**

**Examiner Tip**

It is always worthwhile with more tricky topics to use diagrammatical representation to aid understanding. This particular topic is well suited to this where students can learn from hierarchical diagrams starting with the DNA and then culminating in a protein to reinforce understanding.

Although many candidates knew that different proteins had a different role to play this did not provide an adequate answer to the question. Many candidates gave the proteins function as a reason why their shapes varied without adding further detail to describe how their shapes came to be different.

They can be different shaped molecules because they need to be a certain shape to do a certain job.



### ResultsPlus Examiner Comments

This response is typical of those that failed to score any marks. There is no detail here on how two proteins can be different shapes and the mention of protein function does not provide a direct answer to the question that was asked.



### ResultsPlus Examiner Tip

Although the candidate here is quite right in stating that different proteins have different shapes as they carry out different functions, this does not answer the question. Read the question carefully to understand fully what information it is asking you to provide.

Some candidates gaining one mark recognised that proteins were made up of different amino acids and others, albeit less frequently, described how the base order in the DNA coding for the protein was different. Of the candidates that were successful in scoring on this question, most gained one rather than two marks.

Two proteins can be different shaped molecules because of the different combination of bases in DNA and the different shapes of enzymes to break them down.



### ResultsPlus Examiner Comments

Although this candidate has given some unclear detail at the end of its response it has clearly recognised that the structure of proteins is determined by the DNA base sequence. This response gained one mark for the detail provided.



### ResultsPlus Examiner Tip

Always link protein structure with amino acids. When including amino acids in an answer to a question like this there are three main details to remember; the number of amino acids, the order of amino acids and the type of amino acids.

## Question 4cii

Candidates were marginally more successful in their responses to this question than they were for question 4(c)(i). Most responses gaining one mark out of the two recognised that a DNA mutation was the cause of an abnormal protein structure although many candidates failed to score by repeating incorrect information that had already been given for 4(c)(i). This included details such as incorrect base-pairing or hydrogen-bonding, information about genetic disorders, temperature and pH and their denaturing effects. A fair number of responses assumed that proteins were directly made up of bases and many vague references were made to 'damaged DNA'. Candidates gaining one mark generally scored this for their understanding of how DNA mutations can cause a protein to have the wrong shape although this was often accompanied by incorrect information that discussed the base-pairing rule rather than the base sequence being altered in some way. Few candidates were able to make suggestions on the cause of DNA mutation without actually mentioning that the DNA was mutated. Radiation was an example seen most frequently.

Candidates scoring 2 marks for their response inevitably mentioned DNA mutation for one of their marks. Some of these responses then went on to state how the DNA was mutated providing details such as 'base change' or alternatively gave a cause of the mutation. A minority were able to obtain the full marks for their response to this question, with one mark seen far more often from students gaining some credit.

Mutation could have occurred in the base pairing causing a base to change into another.



### ResultsPlus Examiner Comments

This is a good response from a foundation tier candidate who has demonstrated a clear understanding of the cause of malformed proteins. One mark was gained for initially recognising that the DNA had mutated with the second mark awarded for giving a description of how the base sequence of the DNA had been altered. In this case, the candidate has described a mutation involving a substitution.



### ResultsPlus Examiner Tip

At foundation tier it is not necessary to know the different ways in which DNA mutation occurs although information that describes a specific mutation relays understanding of what DNA mutation actually means and this is worthy of credit.



Many candidates failed to score any marks on this question. Responses were unable to communicate an understanding that DNA mutation was the cause of a wrongly shaped protein despite the question itself specifically asking for responses to be linked to the DNA.

the proteins that are not  
the correct shape most have been  
mutated



### ResultsPlus Examiner Comments

This response mentions the protein being mutated as a reason why it was misshaped. In this case the candidate may have been thinking along the lines of denaturation although the question specifically asked about what may have happened to the DNA rather than the protein itself.



### ResultsPlus Examiner Tip

Read the question carefully. In this case the question asks about how DNA affects the structure of the protein and therefore any response should include details about DNA in its answer.

Of the candidates scoring one mark for their response, this was more often gained for recognising that a DNA mutation was the cause of a malformed protein. Candidates close to one mark failed to gain this for giving responses that failed to provide adequate detail. For example, damaged or malformed DNA was a common answer that with better use of terminology i.e. mutation, could have gained these candidates one mark.

Mutation happens to some DNA  
when the DNA changes this causes  
proteins to make differen shapes because  
it got the wrong instructions



### ResultsPlus Examiner Comments

This candidate gained one mark for demonstrating some understanding of the reasons why a protein may not have the correct shape. In this case DNA mutation was awarded credit although to gain a further mark the candidate should have included details that linked a DNA mutation with a base change or made an attempt at stating how a mutation could occur.



### ResultsPlus Examiner Tip

For questions of this nature try not to limit answers to one fact e.g. DNA mutation. Extend your answer to describe what a DNA mutation is and this will always be linked to the bases that make up a DNA molecule.

## Question 4d

Just over a third of candidates were successful in their response to this question. These candidates were able to succinctly state that 'clones', the preferred answer, was the name given to describe individuals with identical DNA. Although this was the most common answer, identical twins was seen frequently and, unfortunately, so was twins. Candidates who failed to score any marks for this question gave random answers such as haploid or diploid or genetically identical.

Most candidates scoring one mark chose to give 'clones' as their answer although others gave identical twins.

~~Twins~~ clones



### ResultsPlus Examiner Comments

This response gained one mark for giving the preferred answer of 'clones'.



### ResultsPlus Examiner Tip

Answers that are crossed out will be accepted as the given answer only if there is no alternative information given. In this case the candidate has given the correct answer of 'clone' and therefore the information that has been crossed out is ignored.

The answer of 'identical twins' was less frequently seen although a perfectly acceptable alternative to clones.

IDENTICAL TWINS



### ResultsPlus Examiner Comments

This candidate gained one mark for 'identical twins' which was an acceptable alternative to 'clones'.

Candidates failing to score any marks on this question gave a variety of answers which included, most commonly, twins.

haploid.



### ResultsPlus Examiner Comments

This response failed to score a mark for 'haploid'. This candidate has been unable to recall the correct term for individuals with identical DNA or lacks understanding in this topic area.

## Question 5ai

This is another area where many candidates lack knowledge and despite the use of a diagram to help with recall, the majority of students failed to score any marks for this question. Only the most able candidates were able to correctly state 'xylem' as the vessel transporting water and mineral ions whereas the unsuccessful candidates most often gave 'phloem' as their answer.

Few candidates were able to identify the vessel transporting water and mineral ions as the xylem. Only the more able candidates scored the one mark allocated to this question.

xylem



### ResultsPlus Examiner Comments

This response was one of the minority that correctly stated xylem as the transport vessel for water and mineral ions.



### ResultsPlus Examiner Tip

Use all available information to help answer questions. Where a diagram has been given with a question, it is there for a reason and in this case the one way flow of water and mineral ions was aimed to help with recall.

Incorrect answers to this question more often named a structure found in plants or plant cells. Answers that failed to score ranged from phloem to cell wall although most commonly included stem.

Vacuole



### ResultsPlus Examiner Comments

This candidate gained no marks for giving vacuole as their response. There is evidently confusion here on the role of different plant structures.



### ResultsPlus Examiner Tip

Use diagrams to aid learning of the various structures of plants.

Very few candidates lost marks for their spelling of key words for this question and although this is the case generally, words spelt to look similar to another or which have an alternative meaning are discredited.

Xylem in the shoot or shoot.



### ResultsPlus Examiner Comments

This candidate's response was a combination of xylem and phloem which could not be credited.



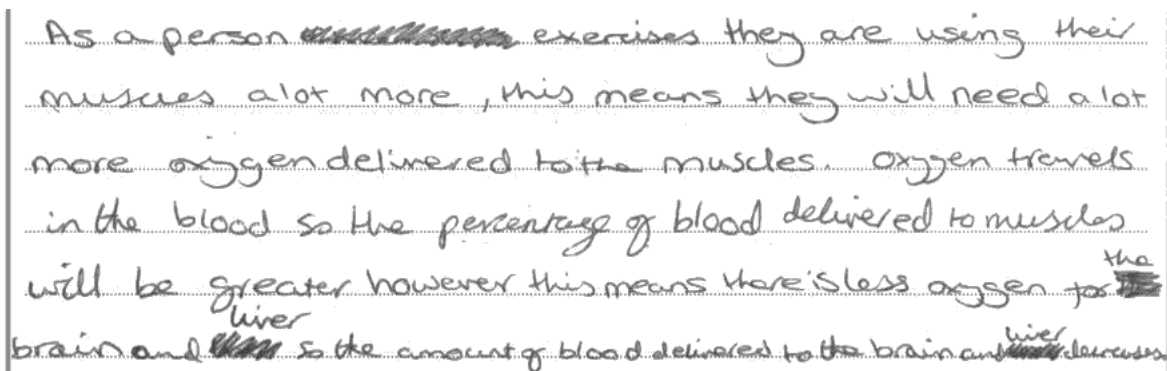
### ResultsPlus Examiner Tip

Ensure that spelling of key words is accurate or at least spelt so that there is no doubt about its meaning.

## Question 5bi

Most candidates made a fair attempt at answering this question with many scoring at least one mark for recognising that the muscles required more oxygen to continue working. Of the candidates that did mention this, the majority failed to include the reasons why more oxygen was needed and thus details of respiration and energy demand were very rarely seen. Candidates gaining two marks tended to include information about oxygen demand but also recognised that there was less blood flowing to the liver and brain than to muscles. Marks were lost by some candidates who referred to 'body parts' or 'body organs' rather than specifically stating less blood flow to the liver and brain and other candidates failed to score by preferring to state that muscles were 'working' or 'moving' during exercise rather than being more precise in their answer and stating that muscles were working *harder*. There were a large number of vague responses that, for example, gave details about the heart pumping more blood or that oxygen was needed in the body, the latter not being linked to muscles failed to draw any credit. Other responses focussed detail on what happened 'at rest' rather than describing the changes during exercise and many of the marking points given on the mark scheme were very infrequently mentioned; removal of carbon dioxide, references to oxygen debt and an increased need for glucose delivery to muscles were all points that were overlooked in the majority of responses.

Very few candidates were able to score the full 3 marks for their response to this question although those that did generally covered the same three marking points on the mark scheme; more oxygen to muscles, less blood to the brain and liver and muscles work harder. These candidates were clear in their understanding of what the data in the table was showing and used this in addition to applying their scientific knowledge to gain full credit.



As a person ~~exercises~~ exercises they are using their muscles a lot more, this means they will need a lot more oxygen delivered to the muscles. oxygen travels in the blood so the percentage of blood delivered to muscles will be greater however this means there's less oxygen for ~~the~~ <sup>the</sup> liver brain and ~~the~~ so the amount of blood delivered to the brain and ~~the~~ <sup>liver</sup> decreases.



**ResultsPlus**

**Examiner Comments**

This response gains three clear marks; using muscles more was considered an acceptable alternative to muscles working harder, more oxygen is delivered to muscles and less blood flow to the liver and brain (compared to muscle) during exercise.



**ResultsPlus**

**Examiner Tip**

For questions that demand information related to blood flow and exercise it is worth noting that use of the word 'more' generally determines whether a mark or marks will be awarded. Candidates should, for example, be stating a 'greater blood flow' or 'more oxygen' is needed or 'a faster rate of respiration' during physical activity to distinguish demand from that needed at rest.

Some candidates did not express their ideas clearly enough to warrant a greater score than what was obtained. Details such as 'more oxygen is needed' without linking this to the muscles meant that some candidates failed to score the oxygen mark. This vagueness in expression was common across the cohort.

because your body is working harder. using up more energy in your muscles. This means you respire quicker to get more ~~the~~ oxygen for your heart to pump round your body to get to your muscles, as they need the energy.



### ResultsPlus Examiner Comments

This candidate illustrates some understanding of the details required and gained 2 marks out of the three allocated to this question. One mark was lost by stating that the *body* works harder rather than the muscles and again by failing to imply that *more* energy was needed by muscles and this was unfortunate. However, credit was awarded for the recognition that muscles require more oxygen and that the rate of respiration increased during exercise.



### ResultsPlus Examiner Tip

Questions that require application of knowledge expect responses to include information linked clearly to the context. In this case information was given in a table and more use could have been made of this to improve the score awarded.

Candidates that scored one mark generally gained this for stating that more oxygen was needed by muscles although an almost equal number of students also recognised that less blood flowed to the liver and brain than to the muscles during exercise. Many of these responses were clear in their descriptions although marks were lost mainly due to lack of detail.

when exercising the muscles are being worked harder than the brain or liver, as they are constantly being used, so more blood needs to go to the muscles to keep them moving.



### ResultsPlus Examiner Comments

This response gained one mark for recognising that the muscles work harder during exercise. Further marks could easily have been gained if the candidate had added slightly more detail to parts of the response. For example, in addition to stating that 'more blood needs to go to muscles' the candidate could have questioned the reason why this was necessary and included details about oxygen demand and respiration for a further 2 marks.



### ResultsPlus Examiner Tip

For questions that focus on exercise and blood flow, think about why it is necessary that more blood needs to flow through muscles rather than just stating that the muscles need more blood. Question why they need this and the answer should provide the detail to include in an examination response to this type of question.

## Question 5bii

This question was answered well by nearly half of the cohort showing fair understanding of the disadvantages of anaerobic respiration. The most common correct answer was the recognition that anaerobic respiration generates a build-up of lactic acid and many candidates that did state this went on to describe how lactic acid affects muscles. Other one mark answers included details about muscles tiring more easily or that anaerobic respiration can result in cramp. Less often seen was that anaerobic respiration releases less energy although still a fair few candidates were awarded a mark for this. There is a common misconception amongst the majority of students that muscles do not receive oxygen during anaerobic respiration. Many candidates seem unaware that the energy demand by muscles exceeds the rate at which aerobic respiration can release energy for sustained activity and therefore the excess energy needed is released anaerobically. Candidates did not gain marks for stating that muscles did not receive or require oxygen and similarly that anaerobic respiration does not require oxygen. Neither of these details met the requirements of the question. Some students failed to gain a mark for stating that *muscles* tire stating instead that 'you get tired easily' or that the *body* gets tired. Again, these were too vague to award.

Many candidates scored one mark for including details about the build up of lactic acid in their response. Other one mark answers mentioned how muscles tire more easily or that they cramp. Few one mark answers included information on how anaerobic respiration provides less energy (than aerobic respiration).

less oxygen is supplied to the muscles  
so lactic acid is produced



### ResultsPlus Examiner Comments

This candidate has incorrectly stated that less oxygen is delivered to muscles although this is a common misconception amongst most candidates. However, the response given gains one mark for including details about the production of lactic acid.



### ResultsPlus Examiner Tip

Candidates should understand that anaerobic respiration provides the 'extra' amount of energy needed (above that supplied by aerobic respiration) to sustain activity. They should not misconceive that less oxygen is delivered to muscles as this is not the case.

Over half of candidates failed to score for this question with many of these making incorrect references to oxygen. For example, details seen frequently included 'anaerobic respiration does not require oxygen' or that 'less oxygen is delivered to muscles'. Other responses that did not gain any credit mentioned that 'the body gets tired' or more simply 'you get tired more quickly' which did not provide the detail expected.

The person may find it hard to breath as they are not getting oxugen



**ResultsPlus**

**Examiner Comments**

This response is typical of many responses that failed to gain credit. There is a mention of oxygen although the detail given is incorrect and the reference to breathing is irrelevant.

A large number of candidates scoring one mark for giving details about lactic acid went on to explain the consequences of this on muscles providing information about muscle cramp or muscles tiring more quickly. Very few one mark answers mentioned that anaerobic respiration provides less energy.

A build up of lactic acid means pain and Cramp on behalf of the person doing the physical exercise.



**ResultsPlus**

**Examiner Comments**

This candidate has covered more than one marking point in their answer. One mark was awarded for lactic acid although this could also have been given for recognising that this causes cramp.



**ResultsPlus**

**Examiner Tip**

Be wary of providing more information than is required. In this case, the details given are correct but incorrect detail can negate marks. If the question asks for a specific number of points to be included in the answer then try to limit your answer to this number. This question asks for 'a disadvantage' which implies only one should be given.

## Question 5c

More able candidates were able to score 4 marks or above for their response to the first of the extended answer questions. It was unfortunate that candidates scoring lower than this lacked a clear understanding of what the circulatory system actually is and discussed a range of bodily functions, mostly digestion and how food is moved through this system. Other answers focussed purely on blood flow through the heart, giving details of the heart structures which gained minimal marks. Few candidates made it known that they understood the oxygen carrying role of the red blood cells, or that exchange of materials took place between cells and capillaries with only the best candidates gaining recognition for this detail in their responses. Likewise, very few candidates mentioned the role of the blood plasma in the transport of dissolved substances such as hormones and carbon dioxide - this knowledge seems to be very thinly spread across the cohort, even amongst the best candidates. Most 2 mark responses were credited for showing some understanding that the heart was the hub of the circulatory system, and that it 'pumped blood' or that blood was transported through vessels which were usually named as either arteries or veins. There is a clear lack of knowledge of this topic amongst students working at E grade and below and for many a lack of scientific literacy skills and clarity of expression restricted the number of marks that could be awarded.

On the whole, candidates scoring 6 marks gave clear, detailed responses that included relevant information from the indicative content of the mark scheme. Most often, this information included details on heart structure, the role of arteries and veins and the oxygen-carrying role of red blood cells. Some candidates went a step further to include more detailed but relevant information which implied a very sound understanding of the circulatory system as a whole.

Arteries are used to carry blood away from the heart. They have strong, thick walls as the blood is pumped around the body at high pressure. Capillaries are smaller than arteries and they have thin permeable walls so that substances such as oxygen can be diffused in and out. Veins aren't as thick as arteries as they carry blood to the heart at a lower pressure. Plasma is a yellow fluid that carries most other substances around the body including hormones, nutrients and waste products such as carbon dioxide. Red blood cells contain haemoglobin which carries oxygen around the body. White blood cells contain antibodies and antitoxins to help fight disease. Platelets create scabs to prevent bacteria getting into wounds.

(Total for Question 5 = 12 marks)





## ResultsPlus

Examiner Comments

This is an excellent Level 3 response from a candidate who has demonstrated a clear understanding of the various components of the circulatory system. Although not all components have been mentioned and some detail that has been included is not creditworthy this does not distract from the knowledge that this candidate clearly has. The mention of plasma and its role in transporting various substances was rarely seen, even in the responses gaining 6 marks although this candidate has included this along with other infrequently seen detail linked to the role of capillaries. The response has communicated the details of the circulatory system very clearly and has, therefore, also gained the QWC mark. A model answer!



## ResultsPlus

Examiner Tip

Responses to extended answer questions should be structured in an ordered, logical manner where, in this case, one piece of information is described followed by another and so on. Good communication is key to gaining the QWC mark - poorly structured sentences, poor spelling and grammar are likely to lose this mark.

Very few candidates failed to attempt this question and some students provided a fair amount of information which, unfortunately, was off the point and did not answer the question. Despite many candidates demonstrating some knowledge that was linked in some way to the circulatory system, the details provided did not focus on the transport of substances.

In the circulatory system there are ~~white~~ red blood cells which contain haemoglobin which allows them to ~~transfer~~ absorb oxygen into the cell. They have no nucleus so there is more room for more haemoglobin. They transport oxygen to muscles around the body. Plasma is a liquid form that keeps the blood liquid and carry many things, such as hormones, white and red blood cells. White blood cells gobble up microorganisms that enter the body using antibodies. They then use antibodies to remove toxins left by the microorganisms. (Total for Question 5 = 12 marks)

Platelets prevent wounds from pouring blood

act by allowing the wound to clot. this preventing microorganisms getting in and stop lots of blood getting out.



### ResultsPlus

Examiner Comments

This candidate has shown some good detail in their response although much of it does not link closely enough to what the question requires. Here, the candidate has given a level 1 response, gaining 2 marks for implying that red blood cells carry oxygen. Unfortunately for this candidate, they have confused plasma with plasmids - incorrect science cannot be credited and this error has cost the student another 2 marks. The details provided on white blood cells and platelets are irrelevant as it side tracks from the subject of the question.



### ResultsPlus

Examiner Tip

A response should focus entirely on the subject of the question. Although the details given in this response focus on the components of the circulatory system, it has given the role of each rather than discuss how the circulatory system *transports* substances around the body. It may help to focus a response by underlining the key words in the question - in this case *how*, *circulatory system*, *transports* would be underlined.

Many of the Level 2, 4 mark responses implied a fair understanding amongst candidates of the role of the circulatory system in transporting substances around the body. Unfortunately, of these good responses, many just missed out on moving to the next level by omitting just one key point which would have provided more depth to the information already given. Level 3 responses needed to include particular details which would have acknowledged a more comprehensive understanding of the discrete roles of the components of the circulatory system although significantly fewer candidates were able to reach this level.

The circulatory system transports substances around the body in the blood. For example, the blood will carry oxygen around the body when it is being pumped around by the heart. The blood will then get sent to different cells by the veins, along with the oxygen and the blood <sup>the vein</sup> will then supply the cells with will the oxygenated blood and provide the cells with energy to continue working. Once the blood reach ~~reaches~~ and the oxygen reaches the cell the process will happen again.



### ResultsPlus Examiner Comments

This is a good level 2 response that gained 4 marks for including details covering the role of the blood in carrying oxygen, the heart as a pump and the role of veins in transporting blood. Had this candidate stated that the red blood cells transport oxygen then it would have been possible to move this response to a level 3 at foundation tier.



### ResultsPlus Examiner Tip

It could help to produce a mind-map prior to completing extended answer questions. List all of the components of the circulatory system and then discuss the role of each in turn.

## Question 6a

It is evident from the responses provided by the foundation tier cohort that there is a significant lack of understanding of genetic modification in general. This includes the finer details on how genetic modification i.e. the transfer of genes from one organism to another, the reasons why genetic modification is carried out to its advantages and disadvantages which students were expected to demonstrate an understanding of later in the paper. Nearly two thirds of candidates were unable to score any marks for this question, with many showing no clear understanding of what was required to gain any credit. Many students confused genetic modification with cloning - this was common but had the question been about cloning then marks would have been awarded as, despite this being a higher tier topic, candidates knowledge of this process was significantly better than their knowledge of genetic modification. Very few candidates used scientific terminology in their answers and there appeared to be a general misconception that genetic modification occurred via the spraying of chemicals on plants. Of the candidates that did gain marks, these were generally gained for naming a GM characteristic rather than providing details of the procedures itself.

Very few candidates were able to score the full 2 marks for their response to this question although those that did gave clear, succinct answers that translated good understanding. Most of the two mark responses included a reason why genetic modification was carried out but occasionally a response focussed entirely on the GM procedure which included the preferred detail.

Maize has been genetically modified through a process called genetic engineering the gene is taken from an organism with a specific worthy characteristic using restriction enzymes. It is then put into the plasmid dna of the organism to be modified.



### ResultsPlus Examiner Comments

This candidate has demonstrated a good understanding of genetic modification gaining the full 2 marks for stating that the process involves genetic engineering and for recognising that a gene is transferred from one organism to another. In addition to this the candidate has included details on the use of plasmids although the information given here lacks some clarity. A very good response with good use made of scientific terminology.



### ResultsPlus Examiner Tip

Make sure that candidates are able to distinguish between key words in a question - many candidates mistook the question to read *why* instead of *how* and therefore focussed their answer on the reasons why organisms are genetically modified.

Over a third of candidates were able to score one mark for their answer although this was not necessarily for the preferred detail. Many of these candidates included information on the reasons why organisms are genetically modified rather than how they were modified. The most common response included information on resistance of some kind - resistance to herbicides or pesticides was seen often. However, these details were acceptable and students were credited with one mark.

It is genetically modified to be resistant to ~~herbicides~~  
herbicides.



**ResultsPlus**

**Examiner Comments**

This candidate shows some understanding of genetic modification and has given a reason why GM is carried out for one mark. This was deemed an acceptable answer.



**ResultsPlus**

**Examiner Tip**

Make sure that you fully understand what the question is asking before attempting a response. In this case, the question asks *how* rather than *why* organisms are genetically modified.

Many candidates failed to score on this item and the detail given in the responses made it quite clear that there is a significant lack of understanding of the basic procedures involved in genetic modification. Very few candidates showed any knowledge of genetic engineering being the process involved and failed to give discrete details linked to this.

Maize is genetically modified by using a quadrat to estimate  
the number of the maize.



**ResultsPlus**

**Examiner Comments**

This response failed to gain any marks. There is no detail here that demonstrates any understanding of genetic modification.

## Question 6bi

Throughout the paper candidates in general have demonstrated excellent mathematical skills and this question was no exception. Many candidates were able to analyse the graph and extract the correct information to use in a simple calculation that awarded many with full marks. Most marks were lost when students failed to show the working out to their final (incorrect) answer. Had this been shown then many more candidates could have gained one mark rather than failing to score at all. Other errors were made in misreading the graph although many of these were credited with an error carried forward and therefore obtained one mark for their response.

Many candidates scoring 2 marks gave just the final answer without showing any working out although a significant number provided all details, including the working out, to minimise the risk of losing out completely on marks. This was pleasing to see as in some cases, the working out obtained a mark but the final answer didn't.

$$\begin{array}{r} 58.2 \\ - 11.5 \\ \hline 47 \end{array}$$

answer = 47% (2)



### ResultsPlus Examiner Comments

This candidate has extracted the correct values from the graph and used these in a clearly displayed calculation. The correct final answer along with the correct units has also been given in the space provided.



### ResultsPlus Examiner Tip

If the units are not given in the space provided for an answer, make sure that you include them.

Many candidates failed to score marks simply because they did not show their working out. Candidates that did not obtain the correct final value and that did show their working out were, more often than not, awarded a mark for an error carried forward.

$$62.1 - 12.1 = 50.1$$

answer = 50.1



### ResultsPlus Examiner Comments

This candidate has not extracted all of the correct data from the graph. However, they have carried out a subtraction using this extracted data and their final value for this calculation is correct. This can be credited with one mark for an error carried forward.



### ResultsPlus Examiner Tip

Always show working out to a question with a mathematical focus.

Candidates that gave a final incorrect value and failed to show how they arrived at this value were given no marks. In many cases, it is likely that one mark could have been obtained if the working out had been shown.

answer = ...4.3.5.....



**ResultsPlus**  
**Examiner Comments**

This candidate scored no marks for giving a final incorrect value. It is likely that they could have gained one mark from showing their working out as the final value given appears to be derived from a calculation that would have been within the tolerance allowed for an error carried forward.



**ResultsPlus**  
**Examiner Tip**

Never just give a final answer to a calculation.  
Always show your working out.

## Question 6bii

This was a successful question for candidates with over half scoring full marks for their analysis and interpretation of the data shown by the graph. Most candidates were able to identify the overall increase in the amount of land used to grow genetically modified maize for one mark with many of these then breaking down the graph into smaller chunks to describe the more discrete patterns shown. Candidates scoring the full 2 marks generally went on to support their written details with data extracted from the graph with a large number recognising an overall increase of 62%. However, a large number of responses included far more detail, accurately describing the changes between 1996 and 2004 with very few missing out on the decrease in the amount of land used to grow GM maize between 1998 and 2000. Although the vast majority of candidates gained at least one mark for this question, students failing to score provided responses that were too vague to credit or tried to explain why the amount of land used to grow GM maize changed. Some candidates included details on ethics or on the benefits or popularity of GM crops neither of which came close to answering the question.

Candidates scoring one of the two marks available for this question generally recognised the overall trend in the amount of land used to grow GM maize over the 12 year period. These responses failed to describe the discrete patterns in the graph for a further mark.

The percentage of farmland used to grow GM maize has increased exceedingly, this could be because it is in higher demand.



### ResultsPlus Examiner Comments

This response gained one mark for describing the overall trend shown by the graph. A further mark could have been gained if this description was supported by extracted data or if the details included a description of the patterns shown between 1996 and 2008.



### ResultsPlus Examiner Tip

Always look at the number of marks allocated to a question. In this case, two marks are awarded and therefore two points needed to be made about the percentage of farmland used to grow GM maize. One mark for describing the overall trend and the other mark for either supporting this with data or for describing the discrete patterns in the data shown.



Candidates scoring 2 marks for their response generally recognised the overall increase in the amount of land used to grow GM crops for one mark. The other mark came from adding further detail to this, either by supporting a description of the trend with data (most commonly identifying the percentage it had increased by over the 12 year period) or by describing the patterns shown by the graph between 1996 and 2008.

over the years it has increased by 62%.  
From 1998 it dropped slightly for 2 years but from  
2000 it has increased a lot up until 2008.



### ResultsPlus Examiner Comments

This is a good 2 mark response that covers several marking points. The candidate has recognised the overall increase, for one mark, and also that it has increased by 62% for a second mark. Other marking points are also covered; the decrease in the amount of land used to grow GM maize from 1998 is identified as is the significant rise from 2004.



### ResultsPlus Examiner Tip

Divide a graph up into sections and analyse each separately. Extract data from the graph that is relevant to each section and use this to support your description.

Some one mark responses touched on detail that almost gave them the second mark although the details given were not quite enough to award.

The percentage has had a steady  
increase except one anomaly between  
1998 - 2000.



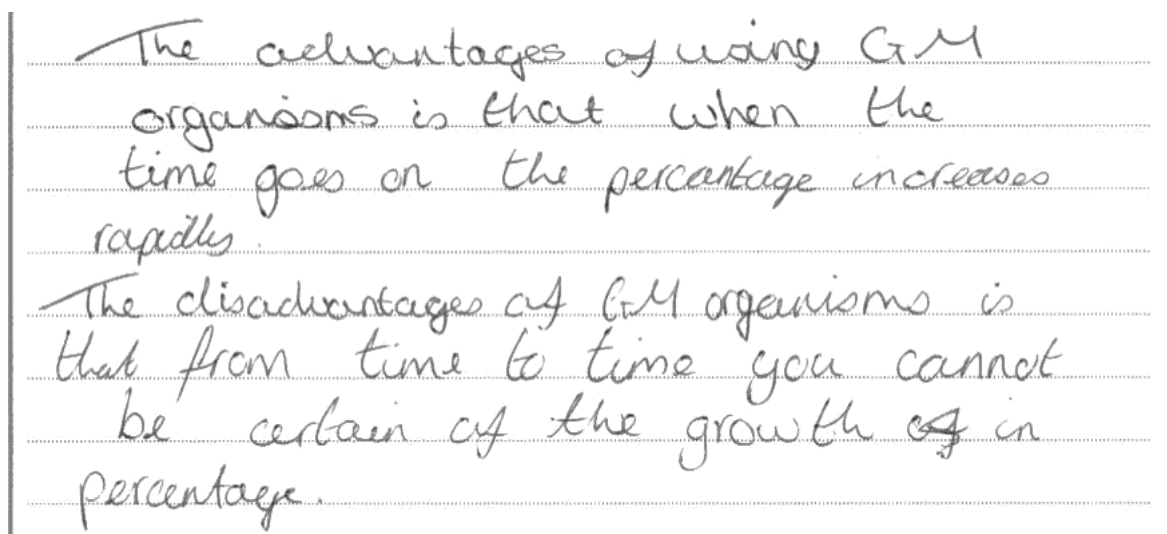
### ResultsPlus Examiner Comments

This candidate, who gained one mark, has recognised the pattern shown from 1998 to 2000 although has failed to mention that it decreased between these years. This prevented the second mark from being obtained.

## Question 6c

There is a significant lack of sound understanding of genetic modification amongst the majority of candidates who sat this paper. The majority struggled with this concept with very few being able to provide a level 3 answer. Many responses were entirely non-specific, lacking structure and use of scientific terminology and phrases relating to this part of the specification. Most commonly, candidates confused genetic modification with cloning and proceeded to include details that highlighted the risks associated with the latter. Some candidates muddled elements of GM with cloning, particularly when it came to describing disadvantages; details included, for example, that 'animals were harmed' or that 'they don't live very long' and other information that was irrelevant to genetically modified organisms. Just under a third of candidates were able to obtain a level 2 for their answer. The content of these responses were credited mainly for the advantages that they described, with the disadvantages given being more vague and clearly less well known than the benefits. Most advantages included a resistance of some kind e.g. herbicide or pesticide although it was pleasing to see some candidates describe the benefits of producing crops containing beta-carotene to reduce vitamin A deficiency. Many of the responses gave information on genetically modified crops, although the question did not specify this, perhaps as a result of the preceding questions focussing on maize. Very few candidates gave details about genetically modified bacteria although those that were seen were generally good and even less students chose to discuss modification of animals to produce useful substances such as hormones and proteins. There were a number of references to stories highlighted in the press or from television such as glow in the dark fish or dogs and, similarly, to the content of the previous questions where some candidates incorrectly interpreted details by making statements such as 'GM crops take up too much land'. Some of the most valid disadvantages included risks to human health or the environment although many candidates also discussed the cost of producing GM organisms and the buying power of poorer communities.

The majority of candidates failed to score on this question. Responses were vague, lacked structure and implied a serious lack of knowledge and understanding of the advantages and disadvantages of the use of GM organisms. Some of these responses gave details of cloning, highlighting the disadvantages of this process and the cloned organisms despite this topic being restricted to higher tier. Other candidates gave incorrect interpretations of the data given in the previous questions or the details given were too simplified to award e.g. 'grow better' rather than faster growth or higher yield.



The advantages of using GM organisms is that when the time goes on the percentage increases rapidly.

The disadvantages of GM organisms is that from time to time you cannot be certain of the growth of in percentage.



## ResultsPlus

Examiner Comments

This candidate failed to score any marks on this question. The details given are based on interpretations from the previous question. Although this question follows the same theme as the preceding questions, it is a stand-alone question that does not draw on any previous information given.



## ResultsPlus

Examiner Tip

The question asks for advantages and disadvantages - plural. This indicates that more than one advantage and more than one disadvantage needs to be given in the response.

Most candidates scored marks for the advantages of GM organisms rather than the disadvantages which were less well documented in responses. The advantages given were fairly diverse although generally good suggestions covering most of the points for GM crops shown in the indicative content. Very few of the advantages focussed on GM bacteria or animals.

the advantages of Genetically modified organism is that it could help cure a disease that someone might have. Also it could help the crops grow faster. <sup>also</sup> the disadvantage of Genetically modified organism is that it could damage the cells in the body. Also it might not help the crops grow again it could damage their cells as well as the humans.



## ResultsPlus

Examiner Comments

This candidate gave a level 1 response and gained 2 marks for stating that GM crops grow faster. The details given about curing disease are non-substantial and the information on the disadvantages vague and irrelevant.



## ResultsPlus

Examiner Tip

One approach to tackling 6 mark questions is to carry out a mind-map which may help to structure a response. Alternatively a clearly drawn table may help to organise ideas.

Very few candidates were able to achieve 6 marks for their response but those that did provided good details that demonstrated a sound understanding of the advantages and disadvantages of the use of GM organisms. These responses varied in the content that they provided but most included advantages that were based on either herbicide or pesticide resistance with the disadvantages mentioning the generation of 'superweeds' or the risks to health and the environment.

Advantage is that two genes can be inserted into a rice plant so it becomes golden one produces higher levels of beta carotene. This is high in vitamin A which helps benefit vitamin A deficiency. A Disadvantage some people are worried that they will develop new allergies from eating GM food (although this is just as likely with normal foods). An Advantage is that bacteria can be inserted with human insulin gene to produce <sup>a Bacteria producing</sup> insulin. A disadvantage is that that the insulin is produced slightly differently each time so may not suit everyone. Adv: However it's ~~soon~~ quicker and cheaper to <sup>treat</sup> produce <sup>for</sup> ~~one~~ <sup>diabetics</sup> so is more ~~at~~ <sup>convenient</sup> to treat.

Plant can be inserted with (Total for Question 6 = 12 marks)  
 Herbicide resistant gene so don't die when weeds are sprayed with herbicides

Beta Carotene - Vitamin A  
 Bacteria Insulin

People are worried <sup>so</sup> ~~the~~ herbicide resistance gene will be picked up by weed creating new super weed

TOTAL FOR PAPER = 60 MARKS



**ResultsPlus**  
Examiner Comments

This is a good example of a level 3 response that covers several aspects of the indicative content shown on the mark scheme. This candidate has given a more than adequate number of valid advantages; beta-carotene to reduce vitamin A deficiency, insulin production by bacteria and herbicide resistance. The disadvantages are also very clear; development of allergies and the creation of superweeds.



**ResultsPlus**  
Examiner Tip

When revising topics such as this it is a good idea to draw up a table showing the advantages and disadvantages of the use of GM organisms. This summarises information that may help some candidates learn more effectively.

## Paper Summary

The paper was attempted well by the majority of candidates although it is clear that there are several areas of the biology covered in the B2 topics in which candidates of all abilities lack understanding and/or knowledge. Many candidates were unable to recall simple information in areas such as genetic modification, the circulatory system and stem cells and also had difficulty in recalling the roles of the digestive enzymes in the body. Mathematical skills were demonstrated well by candidates at all levels and selecting the correct data from graphical information to incorporate into calculations is an area of strength. However, using this data to make sound, written conclusions was less successful with only the more able candidates gaining full marks for their responses. Candidates should be encouraged to incorporate data into their written answers to support the conclusions that they write and ensure that questions requiring a *description* of trends do not incite a response that includes an *explanation*. Candidates should also be made aware of the mark allocation for each question and understand that this relates directly to the number of points that need to be mentioned in a response. A large number of candidates failed to obtain full marks for longer responses as a result of omitting key points in their answers. This was particularly the case for questions such as 5(b)(i), 6(a) and the 2 mark questions that proceeded most calculations.

Students should be commended for their knowledge in some topic areas - many were awarded full marks for their understanding of the factors affecting the height of plants and also for their understanding of anaerobic respiration. Some candidates wrote excellent responses to the first of the six mark questions demonstrating sound awareness of the various components of the circulatory system. Although higher marks for this question were generally restricted to the more able candidates, many lower ability students were able to access marks here for stating valid points in their answer although many lost marks for restricting their response to the direction of blood flow through the heart.

In general, mathematical skills and graph interpretation are good although more focus might be spent on written analysis. There is clearly work to be done in some topic areas where knowledge and understanding is severely lacking and also in encouraging the use of scientific terminology in non-contextualised and contextualised situations.

On the basis of their performance on this paper candidates are offered the following advice. Make sure you:

- can use data to make conclusions
- understand the difference between a description and an explanation in a trend
- include data in your answers where appropriate
- can analyse data from graphs
- understand and then use scientific terminology in your answers

## **Grade Boundaries**

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

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



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