ResultsPlus

edexcel

Examiners' Report
June 2013

GCSE Biology 5BI3H 01

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications come from Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk.

Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus.

ResultsPlus

Giving you insight to inform next steps

ResultsPlus is Pearson's free online service giving instant and detailed analysis of your students' exam results.

- See students' scores for every exam question.
- Understand how your students' performance compares with class and national averages.
- Identify potential topics, skills and types of question where students may need to develop their learning further.

For more information on ResultsPlus, or to log in, visit www.edexcel.com/resultsplus.
Your exams officer will be able to set up your ResultsPlus account in minutes via Edexcel Online.

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk.

June 2013

Publications Code UG036861

All the material in this publication is copyright
© Pearson Education Ltd 2013

Introduction

This paper is the first B3 examination for the Science 2011 specification. The paper consists of 60 marks assessed by a variety of questions, relating to six different areas of the specification. Questions include six multiple choice, short answer and two extended prose questions worth 6 marks each. The extended 6 mark extended answer questions also marked on their quality of written communication (QWC) so candidates should ensure that their responses include good use of spelling and grammar and that their answers should be written with clarity. Candidates seemed to complete the paper within the set one hour time period.

The paper covers the topic areas of Survival, Human reproduction, Immunisation, Animal behaviour, Healthy foods and genetic modification of crops. This covers all three topics in the specification questioning the full range of topic areas.

As the paper is primarily sat by triple science students the questions were answered well on the whole with some excellent detailed answers seen. Candidates accessed all three calculation questions well although they should be encouraged to show their working and quote data to ensure that they maximise their marks. The multiple choice questions were answered well by the candidates as were the 6 mark extended answer questions, where a high degree of detail was seen. Candidates accessed all questions well with some excellent answers seen, showing detailed understanding of the underlying science to the questions.

Survival was answered well, although a significant number of candidates did not score because the answers were vague and did not use enough scientific terminology.

Hormonal control of reproduction was well understood by many candidates with some excellent detail seen, although too many candidates knew the names of the hormones involved but had not learnt the fine details of the role of each one.

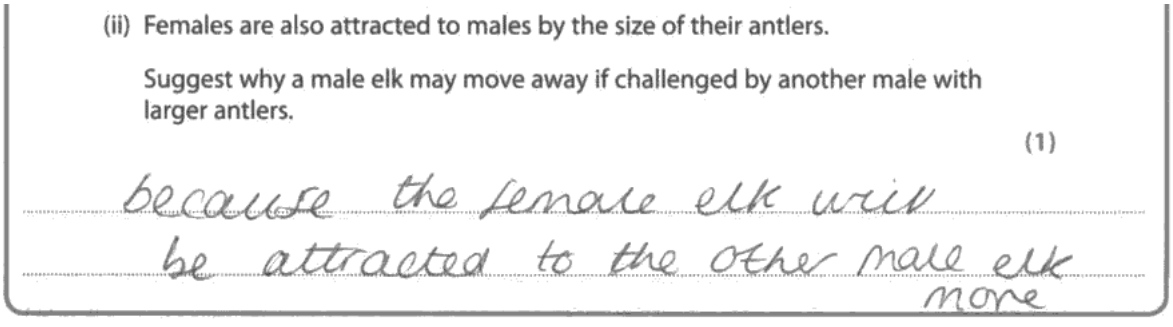
Monoclonal antibody production had been clearly taught well with many candidates answering the questions in a clear and logical fashion. Candidates were aware of the areas controlled in a fermenter to ensure optimum condition, although some lacked the detail to access Level 2 and 3.

Genetic modification had been learnt well by candidates who often gave extensive details of how organisms are genetically manipulated although there was less confidence shown when applying their knowledge with regard to how this relates to applications of genetic engineering. There was still evidence of candidates misreading questions and we reinforce our advice that candidates need practice in interpreting command words.

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

Question 1 (a) (ii)

The best response to this question was 'to avoid a fight / injury' although other answers were credited, for example, 'the larger male showed dominance'. Most candidates scored the mark here with candidates who did not score often writing that there was no point in fighting as even if they won, the females would still choose the male with larger antlers.



(ii) Females are also attracted to males by the size of their antlers.

Suggest why a male elk may move away if challenged by another male with larger antlers.

(1)

because the female elk will be attracted to the other male elk more

ResultsPlus
Examiner Comments

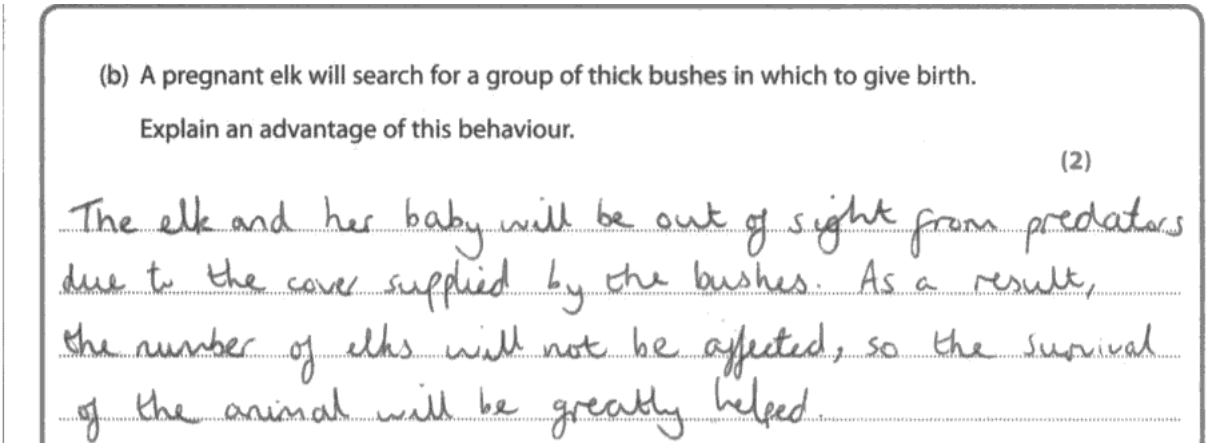
This example shows a common error from candidate answering this item. The answer does not score for two reasons. First it rephrases the stem that states that females are attracted to males by the size of their antlers and secondly, stags do not walk away from a fight because they will not be chosen, if they win in a fight.

ResultsPlus
Examiner Tip

Review any question and ask yourself, "Have I answered the question?"

Question 1 (b)

This question was accessed well by most candidates with many candidates scoring both marks. Some full answers were seen covering both points needed, namely that the pregnant elk gained protection and then this was qualified with an example of what the elks were being protected from. Where candidates fell down was omitting this qualification point thus only scoring one mark. A few candidates stated that the bushes supplied food to the newly born elk or that it gave the elks a soft place to sleep thereby gaining no marks.



(b) A pregnant elk will search for a group of thick bushes in which to give birth.

Explain an advantage of this behaviour.

(2)

The elk and her baby will be out of sight from predators due to the cover supplied by the bushes. As a result, the number of elks will not be affected, so the survival of the animal will be greatly helped.

ResultsPlus
Examiner Comments

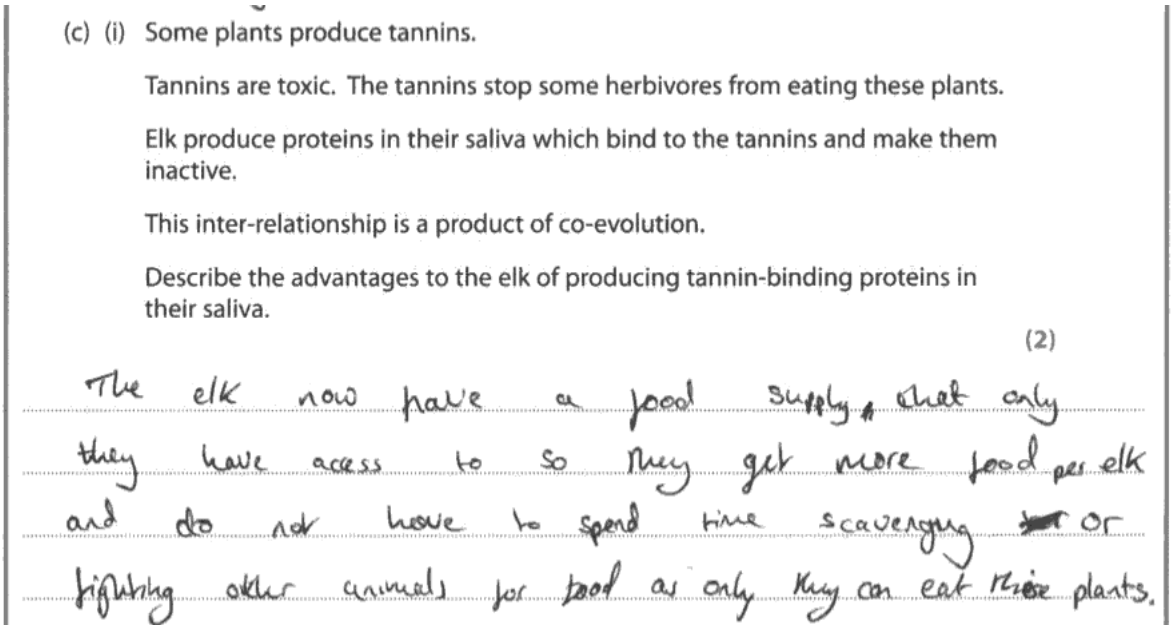
The candidate has rightly scored both available marks by not only stating that by entering the bushes the elk is hidden / protected, but have qualified this with 'from predators', thus gaining the second mark.

ResultsPlus
Examiner Tip

In a question where there are two or more marks, review your answer and see what you can add in to the response to ensure that the question is answered more fully.

Question 1 (c) (i)

This question asked candidates to describe the advantage to elks of producing proteins that bind to toxins in plants. About one third of candidates gained just one mark by explaining that the elk could therefore eat these plants without harm, with a further two thirds extending this idea to explain that the advantage was that the elks had less competition for this food / gained more food. Common errors included the idea that the elk was eating the tannins. This misunderstanding, however, did not disqualify the candidate from being awarded the second mark for the idea of 'more food'.



(c) (i) Some plants produce tannins.

Tannins are toxic. The tannins stop some herbivores from eating these plants.

Elk produce proteins in their saliva which bind to the tannins and make them inactive.

This inter-relationship is a product of co-evolution.

Describe the advantages to the elk of producing tannin-binding proteins in their saliva.

(2)

The elk now have a food supply that only they have access to so they get more food per elk and do not have to spend time scavenging or fighting other animals for food as only they can eat these plants.

ResultsPlus
Examiner Comments

This candidate clearly demonstrates an understanding of how the toxin neutralising protein has aided the elks' survival and has been selected for. They cover all three marking points; that they can eat the food, that only they can eat the food and that this gives the elks more food / less competition. 2 marks awarded.

ResultsPlus
Examiner Tip

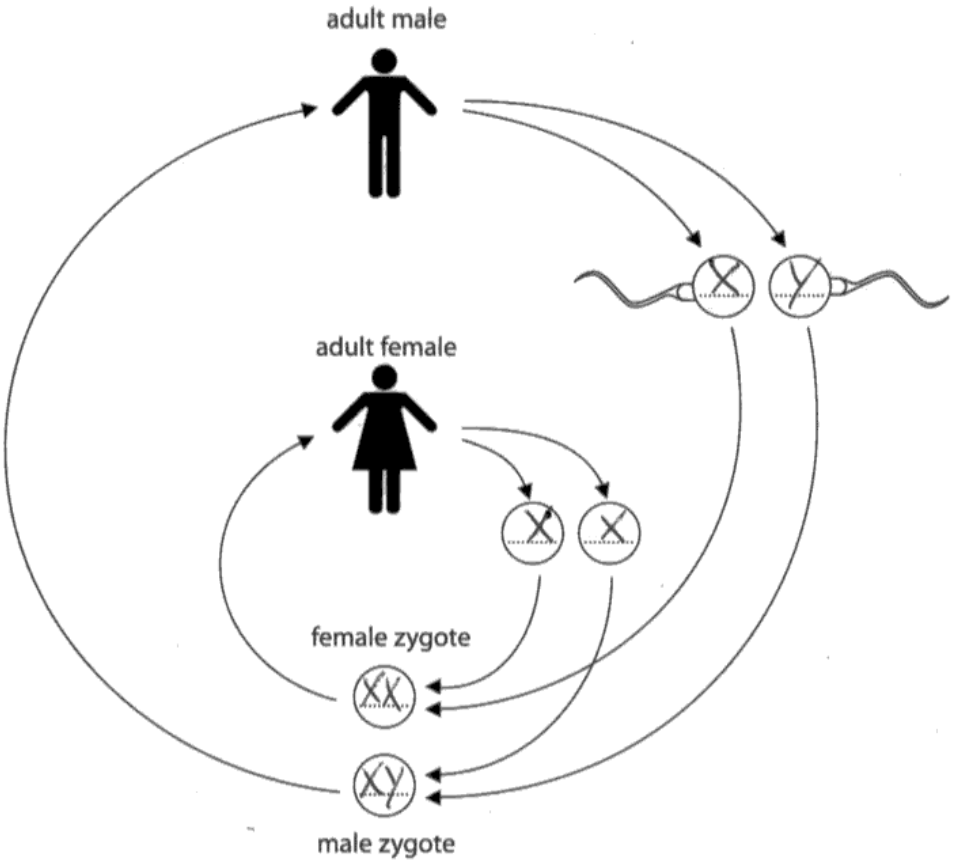
If a describe question has 2 marks available, make sure that you extend and develop your first point so that two clear linked points are made that answers the question.

Question 1 (c) (ii)

This question extended the idea of co-evolution by asking candidates to explain how insects and flower evolution has been an advantage to the plant. Whilst some candidates' responses gave advantages to the insects, many excellent answers were seen. Although some scored both marks with a general description of the flower attracting the insect which then increased pollination, many gave specific examples. These included the relationship between bees and bee orchids, and moths with long probosci and flowers with deep nectaries which increased the likelihood of pollen being transferred to flowers of the plants of the same species. Most candidates scored at least one mark on this question. However, almost half of the candidates only scored one mark often simply saying that the insects pollinated the plants. Common errors include candidates just stating that insects collected the pollen, without developing this to say that it was then carried to another flower.

Question 2 (a)

Candidates were required to interpret a human life cycle diagram here and enter the X or Y chromosomes for gametes and zygotes. Whilst some candidates either gave the gametes two chromosomes, and/or the zygotes just one, and some wrote 23 and 46 in the spaces, most candidates gained both marks. Candidates who only scored one mark here usually did so by giving both gametes and zygotes two chromosomes (usually with eggs being XX and sperm YY) but then correctly gave the male zygote XY and the female zygote XX.



(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote..

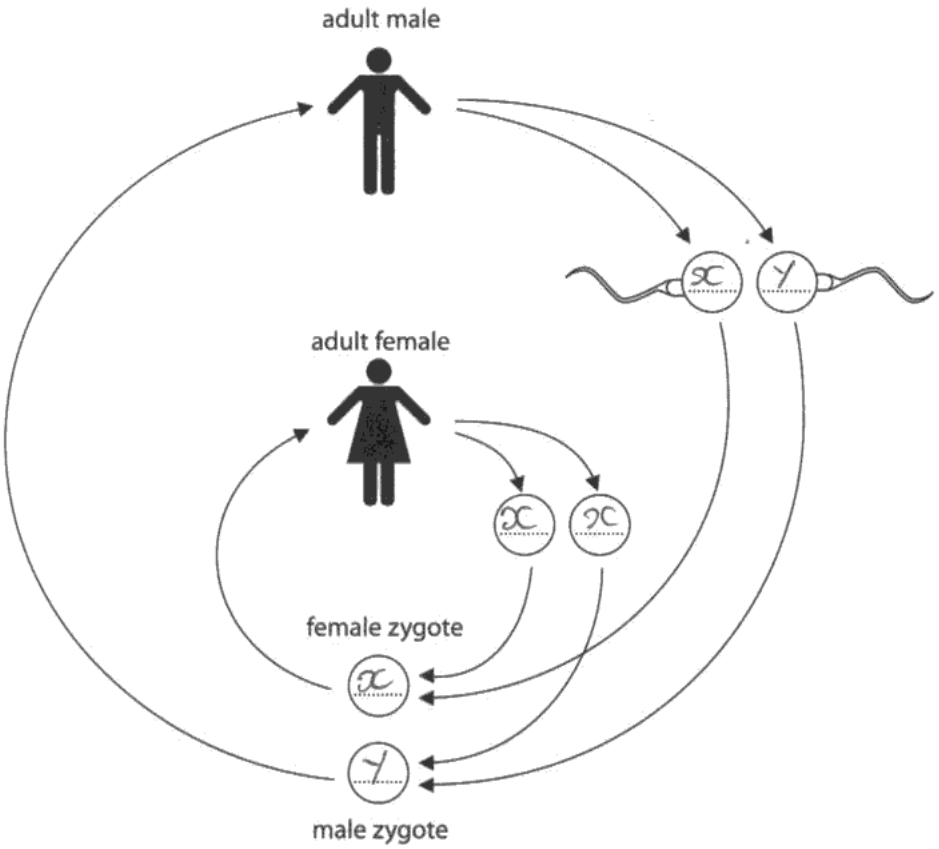
(2)

ResultsPlus
Examiner Comments

The candidate has written the correct letters in the diagrams and so gets the full 2 marks available.

ResultsPlus
Examiner Tip

Make sure that if you are going to write X and Y that you make them clear so that the marker is in no doubt as to which one you mean.



(a) Complete the diagram by writing the sex chromosomes in the egg cells, sperm cells, male zygote and female zygote.

(2)

ResultsPlus
Examiner Comments

One mark awarded here for the correct chromosomes in the gametes.

ResultsPlus
Examiner Tip

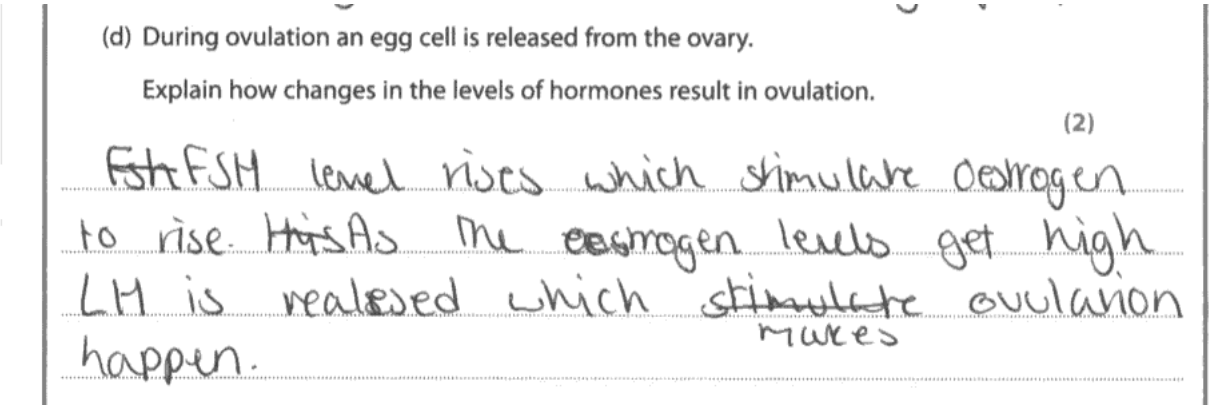
Use diagrams to help you answer the questions. Here, the diagram shows two letters going into the zygote which should suggest that each zygote contains two letters.

Question 2 (c)

Many candidates correctly stated that an egg cell has a large amount of cytoplasm so that it can supply the developing zygote / embryo with nutrients, although food was also credited. Of those candidates who did not score the mark here, some stated that the cytoplasm supplied mitochondria, which although true does not answer the question as to why the cytoplasm is large. Others disqualified their answer of more nutrients by stating that the nutrients give the sperm energy to swim to the egg.

Question 2 (d)

This question required candidates to explain how LH peaking caused ovulation. Over half of the candidates scored both available marks, although one mark could be awarded by stating the role of oestrogen. The answer that was credited most for both marks was 'a surge in LH causes the egg to be released'. Some candidates gave a very full answer starting with FSH and ending with the role of progesterone. As long as this did not contradict any reference to the role of LH and oestrogen in ovulation, the candidate still scored both marks.



(d) During ovulation an egg cell is released from the ovary.

Explain how changes in the levels of hormones result in ovulation.

(2)

~~Fsh~~ FSH level rises which stimulate oestrogen to rise. ~~His~~ As the ~~oe~~ oestrogen levels get high LH is ~~realesed~~ released which ~~stimulate~~ makes ovulation happen.

ResultsPlus
Examiner Comments

The inclusion of FSH here is not incorrect and so is just extra information and therefore this candidate gets the full 2 marks available for oestrogen affecting LH to be released which causes ovulation.

ResultsPlus
Examiner Tip

Try to answer the question without extra information. If you need to write a sequence out to help you remember the order / details, do it as a short 'plan' and then just put down the relevant information that will answer the question.

Question 2 (e)

To gain marks here, the candidate needed to state that the uterus lining would be maintained if the progesterone levels remained high / were maintained, or that the uterus lining was maintained so that the egg could embed into it. Candidates lost marks with imprecise answers, for example just stating progesterone, rather than high levels of progesterone, referring to the uterus lining supplying nutrients to the baby, or jumping to the role of the placenta.

(e) Explain what happens to the uterus lining if the egg cell is fertilised.

(2)

It is maintained so the egg cell can inbed its self in it, and the embio can get nutrience from the blood supply.

(Total for Question 2 = 8 marks)

ResultsPlus
Examiner Comments

The candidate here is awarded both marks available as they have linked a valid reason to explain why the uterus lining is maintained.

ResultsPlus
Examiner Tip

Ensure that you link the points made in answers so that the question is answered.

Question 3 (a) (i)

This calculation question was well answered with most candidates gaining both marks. The few who only scored one mark tended to only use the data for meningitis B or C and then scored an error carried forward mark by correctly calculating the reduction in cases, with some incorrectly subtracting the 2004 data from the 1999 data. Teachers need to ensure that candidates can read data correctly from graphs and ensure that they read the question carefully so that the question can be answered accurately.

(a) (i) Use the graph to calculate the change in the total number of cases of meningitis in 1999 compared with 2004.

(2)

~~1600~~

2600 –
1600 = 100.

answer = 100 cases

ResultsPlus
Examiner Comments

This candidate has gained one mark for selecting the correct data from the table, 2600 and 1600. Unfortunately they have then incorrectly subtracted the latter from the former and arrived at 100 instead of 1000 meaning that only one of the two marks available was awarded.

ResultsPlus
Examiner Tip

Make sure that you take a calculator into the examination.

(a) (i) Use the graph to calculate the change in the total number of cases of meningitis in 1999 compared with 2004.

(2)

1999 = 1000 cases of meningitis

2004 = - 200 cases of meningitis

= 800

answer = 800

ResultsPlus
Examiner Comments

This candidate has selected the wrong data, but as it is from the graph, it is acceptable to award an error carried forward mark as the calculation of the difference is carried out correctly.

ResultsPlus
Examiner Tip

Read the question carefully and ensure that you include all the data requested to carry out the calculation.

Question 3 (a) (ii)

Candidates often try to answer a question like this by treating all data together. Here candidates had to explain the effect of the immunisation on meningitis B and meningitis C. Some candidates' responses stated that they both went down. This would only score one mark for the reduction in cases of meningitis C. Less than one third of the candidates scored just 1 mark. Candidates that scored both available marks split their answer and talked about the two forms of meningitis separately. Teachers need to train candidates to answer questions like this individually. The question required the candidate to say that Meningitis B fluctuated and may have decreased a little, or that you cannot tell if the immunisation had an effect or that the immunisation did not have an effect on meningitis B.

(ii) Immunisation against meningitis C was introduced in 1999.

Describe the effects the immunisation had on the number of cases of both types of meningitis.

(2)

The number of cases of meningitis C went down by 550 in a year and continued to go down. Meningitis B went up by 100 in the first year then continued to yoyo up and down.

ResultsPlus
Examiner Comments

Here both marks are awarded as the candidate correctly describes the effect of immunisation on each variant of meningitis.

ResultsPlus
Examiner Tip

In questions like this where you are asked to comment on two separate areas, ensure that you write about each one in turn, even if you are sure that both show the same trend.

(ii) Immunisation against meningitis C was introduced in 1999.

Describe the effects the immunisation had on the number of cases of both types of meningitis.

(2)

Immunisation meant that the number of cases in ~~meningit~~ meningitis C dropped from 1000 to 200 where as the number of cases in meningitis B dropped from 1600 to 1400. Immunisation worked better in meningitis C

ResultsPlus
Examiner Comments

This candidate also only scores one mark. This was awarded for stating that the number of cases of meningitis C dropped. The candidate has quoted figures, e.g. dropping from 1000 to 200 cases. There are no marks for simply quoting figures from the graph. There was a mark available for correct manipulation of data.

ResultsPlus
Examiner Tip

There are usually no marks for quoting figures. Quoting them is fine, although the mark will be awarded for doing a calculation on these figures. here 1000 - 200 equates to a drop of 800 cases. This would have gained the second mark available.

Question 3 (c) (i)

This question required candidates to explain how to make monoclonal antibodies. It was well answered by many with some excellent answers seen covering the whole range of marking points. Most candidates who scored 3 marks and addressed at least three of the first four marking points: injecting with antigens, extracting B lymphocytes, fusing these with a cancer cell, which makes a hybridoma. Few candidates continued their response to include the extraction of the antibodies. Some candidates lost a mark by significantly misspelling hybridoma. A common error was for candidates to confuse antibodies antigens and B lymphocytes. Some, for example, wrote that antibodies were extracted from lymphocytes and that these were fused with cancer cells. Another common error was to state that the B Lymphocytes were engulfed by the cancer cell or hybridomas.

(c) (i) Monoclonal antibodies can be produced in large quantities.

Describe the steps in producing monoclonal antibodies.

(3)

monoclonal antibodres are ~~als~~ exactly the same as ~~the~~ each other they are mass produced by the hybidomas. You can bind a B lymphocyte and a cancer cell to get hybridomas cell as cancer cells divide but dont produce antibody, but b lymphocytes produce antibodies but dont divide.

ResultsPlus
Examiner Comments

This answer gets three marks. Although the candidate has not written the answers in the expected logical order, the three creditable points are correct and match the mark scheme and so 3 marks are awarded.

ResultsPlus
Examiner Tip

Try to write your answers in a logical order. You are less likely to make mistakes or write contradictory statements.

Question 3 (c) (ii)

The question required candidates to explain how monoclonal antibodies can be used to treat cancer. A significant number of candidates confused the question and their responses discussed treating cancer. These candidates often matched the first marking point of joining the monoclonal antibody to radioactive isotopes, but then went on to explain how this could be used to determine the position of a cancer. Candidates who scored both marks clearly showed an understanding of complimentary structures and how this ensured specificity, often referring to tumour markers. These candidates then continued to explain how this caused less damage to other cells when compared to other forms of cancer treatment.

(ii) Explain the advantage of using monoclonal antibodies to treat cancer.

(2)

The first advantage is that less of the drug is used in chemotherapy so it is more economical (cheaper). It also affects less surrounding normal cells. The cancer is treated by attaching the drug to treat cancer to a specific monoclonal antibody which binds to cancer cells. Therefore, the drug is taken to the cancer cell which it consequently kills.

(Total for Question 3 = 10 marks)

ResultsPlus
Examiner Comments

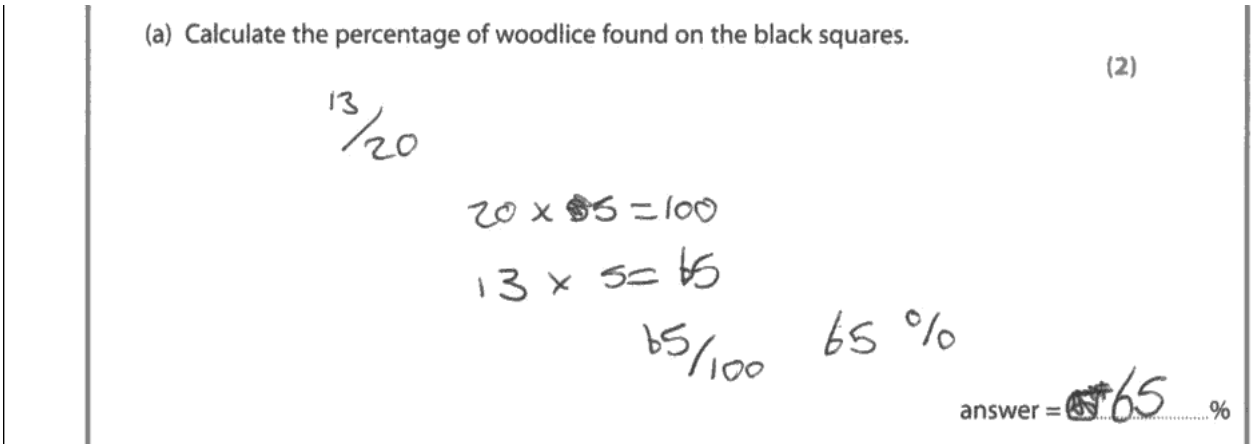
This detailed answer is awarded both marks available and covers all three marking points, namely, only attach to cancer cells, attaching a drug to treat cancer to the antibody, and less harm is caused to other cells.

ResultsPlus
Examiner Tip

Put as much detail into an answer as possible as long as you are certain that it is correct.

Question 4 (a)

It was pleasing to see that the calculation was correctly completed by most candidates who gained both marks available. Some who scored only one mark counted the number of woodlice correctly, but then failed to calculate the percentage correctly. Some candidates counted the number of woodlice incorrectly. Others divided by 30, the number of minutes that the woodlice were left before counting, or by 12, the number of black and grey squares.


(a) Calculate the percentage of woodlice found on the black squares.

(2)

13/20

20 x 5 = 100

13 x 5 = 65

65/100 65 %

answer = 65 %

ResultsPlus
Examiner Comments

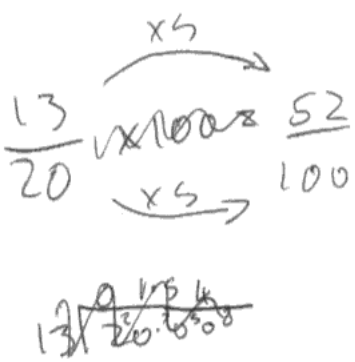
This answer is clearly set out and shows that the correct data, 13 and 20, has been extracted from the diagram which has then been used to correctly calculate the percentage of woodlice on the black squares 65%.

ResultsPlus
Examiner Tip

Always state the data used from the source and then show your working clearly as well as state the answer.

(a) Calculate the percentage of woodlice found on the black squares.

(2)



answer = 52 %

ResultsPlus
Examiner Comments

The candidate scores one mark here for extracting and stating the correct data from the diagram. However, although they show that they know a correct way to calculate the percentage, their arithmetic lets them down and they incorrectly multiply 13 by 5 to come to 52.

ResultsPlus
Examiner Tip

Ensure that you have a calculator in the examination.

Question 4 (b)

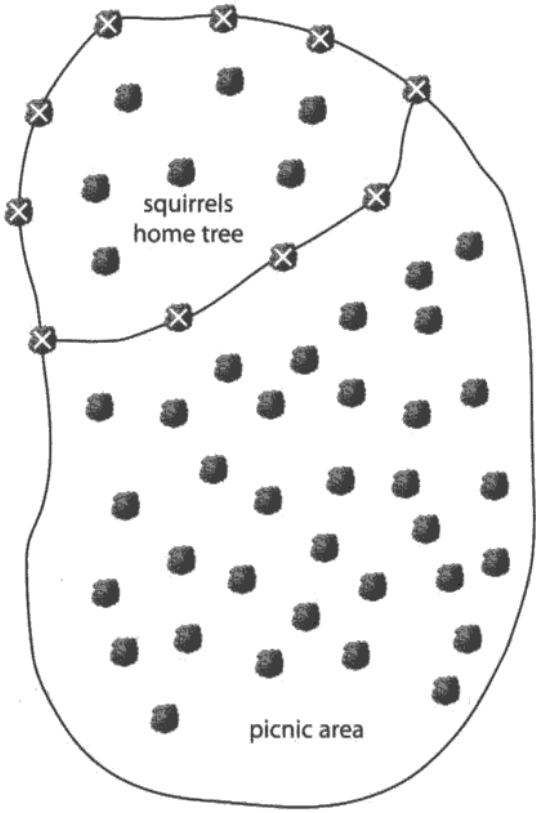
Over two thirds of the candidates correctly stated that the behaviour shown by the woodlice was innate or inherited. Some candidates correctly answered the question more technically stating that the woodlice showed a kinesis. A few candidates stated that the woodlice showed ataxis and a significant number gave the most common incorrect answer seen, that the woodlice had learned the behaviour.

Question 4 (c) (i)

Candidates were required to include the ideas of marking territories with pheromones, and then extend their answer to explain how this benefitted the squirrels, e.g. by reducing conflict or competition for food / habitat. Candidates often dropped the marks for pheromones, where chemical messengers would gain the mark, but just chemicals would not. Another incorrect answer was stating that the urine would scare predators away.

(c) A pair of squirrels in a forest were studied for four months.

The map shows part of the forest including the area where the squirrels lived.



(i) The squirrels were observed to urinate regularly on particular trees.

The trees on which they urinated are marked on the map with an X.

Explain how this behaviour benefits the squirrels.

(3)

The behaviour is used to mark out the ~~space~~ squirrels territory to warn of other animals. The pheromones in the urine are then smelt by the other animals which then warn them.

ResultsPlus
Examiner Comments

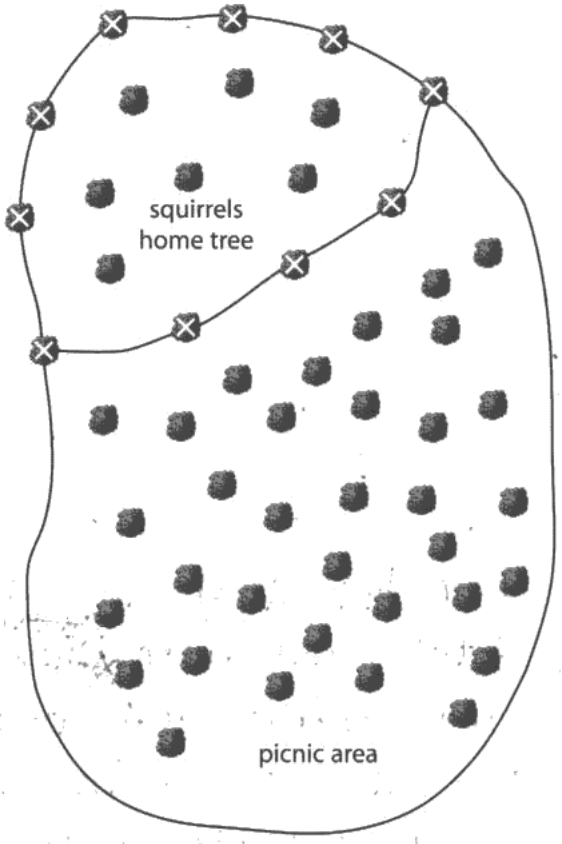
This answer receives just two marks, for marking the territory and correct use of the term pheromone. It is a pity that after using a technical term 'pheromone' to gain a mark, the candidate has then referred to animals rather than qualify this with squirrels which would have gained the third available mark.

ResultsPlus
Examiner Tip

Try to be as specific as possible when answering questions.

(c) A pair of squirrels in a forest were studied for four months.

The map shows part of the forest including the area where the squirrels lived.



(i) The squirrels were observed to urinate regularly on particular trees.

The trees on which they urinated are marked on the map with an X.

Explain how this behaviour benefits the squirrels.

(3)

This benefits the squirrels, because they are marking their territory. Therefore animals will no not to enter their territory so this prevents unessary fights. This means they get all the food in this area.

ResultsPlus
Examiner Comments

Although this candidate again does not get the mark for other 'squirrels' keeping away because of using the less precise term of animals they still get three marks. These are for: marking territory, reducing conflict, and the idea of an overall benefit, getting more food.

ResultsPlus
Examiner Tip

In a question where 'explain' is the command word, always try to extend your answer so that you cover the consequences of your first point.

Question 4 (c) (iii)

Candidates found this question quite challenging and merely rewrote what they had learnt about B F Skinner's behaviour experiments with rats. Other candidates confused operant and classical conditioning which was a common error seen. To gain the marks candidates had to explain operant conditioning in terms of random behaviour being rewarded, reinforced with the animal associating the reward with the behaviour eventually increasing the frequency of that behaviour with infrequent or no reward. This question asked the candidates to describe what operant conditioning meant and many could not do so with enough detail and accuracy. The majority of candidates who scored three marks did so by hitting three of the first four marking points.

(iii) Another scientist suggested that the squirrels that lived near the picnic area were showing operant conditioning.

Describe what is meant by the term operant conditioning.

(3)

Operant conditioning is when an animals does a chance behaviour and is rewarded for doing it. If they did this chance behaviour and again were rewarded for it, they would associate the behaviour with the reward. This would mean that the animal would do the behaviour more often. However, sometimes operant conditioning can be used to prevent a behaviour if the animal is hurt or mistreated.

(Total for Question 4 = 10 marks)

ResultsPlus
Examiner Comments

This excellent answer is clear, logical and detailed, using the correct terminology. It gains all three marks available.

ResultsPlus
Examiner Tip

Where describe questions have 2 or more marks available, try to put your points as logically as possible. If it helps, use bullet points.

Question 5 (a) (ii)

This question required candidates to extract data from a table and then calculate the difference in the mass of protein in 200g of mycoprotein mince and beef mince. Candidates had to select the correct data, find the difference and then double it. Most candidates correctly calculated the correct difference. Those candidates scoring one mark, tended to double the difference between the amounts shown in the table. Some candidates selected the wrong data and although some of these gained an error carried forward mark by then correctly calculating the difference and doubling their answer, it is of concern that so many candidates could not extract the correct data from the table. Teachers should spend time training candidates with regard to the accurate reading and extraction of data from tables of information.

(ii) The table shows the mass of different nutrients in 100 g of mycoprotein mince and 100 g of minced beef.

nutrient	mass of nutrient in 100 g of mycoprotein mince / g	mass of nutrient in 100 g of minced beef / g
protein	13.5	20.0
carbohydrates	12.0	1.0
fat	7.0	16.0
fibre	3.5	0.0
salt	1.0	0.7

Calculate the difference in the mass of protein contained in 200 g of minced beef compared with 200 g of mycoprotein mince.

(2)

13·5 x 2 = 27
20 x 2 = 40
= difference of 13

answer = 13 g

ResultsPlus
Examiner Comments

This excellent answer shows clearly that the candidate has selected the correct data and then gone on to show their working to calculate the correct answer of 13g for both marks.

(ii) The table shows the mass of different nutrients in 100 g of mycoprotein mince and 100 g of minced beef.

nutrient	mass of nutrient in 100 g of mycoprotein mince / g	mass of nutrient in 100 g of minced beef / g
protein	13.5	20.0
carbohydrates	12.0	1.0
fat	7.0	16.0
fibre	3.5	0.0
salt	1.0	0.7

Calculate the difference in the mass of protein contained in 200 g of minced beef compared with 200 g of mycoprotein mince.

(2)

answer = 6.5 g

ResultsPlus
Examiner Comments

This candidate probably has selected the correct data and found the difference of 6.5 g which is correct for 100g of each type of mince. However, they have not doubled the answer to give the difference in 200g and as they have not shown their working, no credit can be given.

ResultsPlus
Examiner Tip

1. Always show your working
2. Read the question at the end to ensure that you have included all that is required to gain the available marks.

Question 5 (a) (iii)

Misreading the question caused some candidates problems here. The question clearly says 'state one nutritional advantage of mycoprotein'. There was enough data in the table to answer this and candidates could gain the available mark by either stating that there was less fat, or more fibre in mycoprotein. Correct reasons not included in the table were also credited. Some candidates just chose any data from the table and quoted it as an advantage of using mycoprotein. Common errors included 'more salt which is good for you', and less protein occasionally qualified with 'because your body doesn't need protein'. References to carbohydrates were insufficient for credit, but thereby did not disqualify a correct response, unlike references to mycoprotein having more salt or less protein.

Question 5 (b)

This item asked candidates to explain an advantage, other than a nutritional one, of using microorganisms to produce food. This was a relatively well understood, with candidates mainly addressing the first two marking points. Candidates had to link the advantage with a relevant reason. This is where some candidates fell down with many candidates giving two advantages or not explaining the reason clearly enough to be credited. Although all marking points were seen (larger yield due to short reproductive cycle, produced anywhere in the world due to fermenters being independent of climate, reduced cost due to using waste products / low costs for extra demands e.g. vets, and suitable for vegetarians as no animals are hurt / killed in production), the majority of candidates gained their marks by addressing the first two marking points.

(b) Explain **one** advantage, other than a nutritional benefit, of using microorganisms to produce food.

(2)

they are quicker and easier to grow in any conditions, all that is needed is a fermenter

ResultsPlus
Examiner Comments

Here, one mark can be awarded for growing quickly. The second available point needed to link growing quickly with faster food production.

ResultsPlus
Examiner Tip

Questions that use the command word 'explain' usually ask you to link a point with a consequence of that point.

(b) Explain **one** advantage, other than a nutritional benefit, of using microorganisms to produce food.

(2)

They contain less fat which means that if you are on a diet you might still be able to eat mycoprotein instead of minced meat.

ResultsPlus
Examiner Comments

There are no points awarded here as the stem of the question clearly states 'other than a nutritional benefit', and this answer is clearly nutritional.

ResultsPlus
Examiner Tip

Watch out for these questions that state 'other than...' Check the answer at the end to make sure that your answer is not in conflict with this type of instruction.

Question 5 (c)

This is the first of the two six mark extended prose questions on this paper. The correct response to access level 3 was to explain how at least four different features control the conditions inside a fermenter with a reasonable degree of detail.

Most candidates were able to cover how temperature, oxygen and aseptic conditions were used, with many extending these areas to cover the detail required to access level 3. For those candidates that did achieve level 3, stirring was the main fourth area explained and it was rewarding to see some candidates' clear understanding of this area which is probably the key area in fermenter design to maintain optimum conditions.

Many referred to ensuring an equal distribution of oxygen and nutrients so that all microorganisms received the maximum amount, with some talking about dead pockets. A significant number also mentioned the extra problems with *Fusarium sp* as agitation broke up the fronds, with some including information on gas uplift fermenters. Some of these candidates then fell down on their fourth area for although they could describe how temperature tended to increase due to microbial respiration and how probes fed back to reduce the temperature using the cold water jacket, they often could say no more than pH is controlled by a pH probe, for example. Many excellent answers were seen covering six areas in detail.

Overall the QWC was awarded to the vast majority of candidates with only a few being practically unreadable in terms of the English used. In these instances candidates lost a mark. Common errors seen included 'oxygen is let in for anaerobic respiration', and the misunderstanding of what probes do (for example, that probes add pH to the contents). Overall the candidates that only accessed level one did not have the breadth, or depth required to proceed to the higher levels.

*(c) Fermenters are used to grow microorganisms.

Explain how optimum conditions for the growth of microorganisms are controlled in a fermenter.

(6)

when the fermenter is growing the microorganisms, it has a cooling jacket around it. Which is usually attached to two probes, and then connected to a computer. This means that the temperature levels can be controlled automatically, without the need of manual adjustment. The computer senses if the temperature for the enzymes to work are too high or too low, and will adjust them accordingly for the optimum growth rate for the microorganisms. This is usually for if the fermenter is left unobserved or left over night, it doesn't have to been kept an eye on because the temperature will adjust itself if needs be.

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

Although this candidate has described how the temperature is controlled in a fermenter in reasonable detail, they have not described any other factor that is controlled, so this response only accesses level one.

ResultsPlus
Examiner Tip

If the question states more than one (as in this question where it says 'conditions), make sure that you talk about more than one in your response.

*(c) Fermenters are used to grow microorganisms.

Explain how optimum conditions for the growth of microorganisms are controlled in a fermenter.

(6)

Temperature is monitored by a temperature probe. This is used to change the temperature of the water in the water jacket. The pH is measured with a pH probe. Microorganisms are fed with glucose so that they have the energy to grow. In some fermenters there is a stirrer in the middle. In others, gases are used to push the microorganisms around in a circle. The oxygen levels are measured and controlled the level of oxygen going into the fermenter

(Total for Question 5 = 12 marks)

ResultsPlus
Examiner Comments

Here, temperature, nutrients, and stirring are included, to reach level 2, although not in enough detail to be of level 3 standard. The references to pH and oxygen are limited and therefore not enough to raise the allocation to level 3.

ResultsPlus
Examiner Tip

To access level 3 a reasonably detailed account of several areas relating to the question are usually required.

Question 6 (a) (i)

Less than half of the candidates could correctly name the health substance in purple tomatoes as a Flavanoid / bioflavinoid or one of the alternative acceptable answers, namely antioxidants or anthocyanin. Common errors included chlorophyll and named hormones, e.g. insulin, sometimes with 'purple' in front of them. Although wrong, it was pleasing to see that these candidates were making an educated guess using their biological knowledge and relating it to clues in the stem of the question, e.g. health with their answer.

Question 6 (b)

This item was the second six mark question in the paper and again, QWC was taken into account when awarding marks. The question required candidates to describe how *Agrobacterium tumefaciens* can be used to create transgenic plants. To access level three, candidates had to describe the three areas outlined in the indicative content; genetic modification, use of *Agrobacterium,* and plant production.

Some excellent answers were seen that covered all three areas in detail. They included the basis of using *Agrobacterium* and details including the incorporation of *Agrobacterium* DNA into the plant genome. Details on genetic modification were above the level expected at GCSE. These included naming restriction endonucleases; stating the bases sequence of the sticky ends made by them; detailed information on the production of plants including either the leaf disc method; the crown gall tissue culture method.

It was frustrating to see many candidates give very detailed accounts of genetic modification. They often covered all of the indicative content for this area. Many were then not being able to say any more than a simple statement about *Agrobacterium* infecting a plant which makes it a transgenic plant with occasionally, this is now increasing yields. Common omissions included suggesting a feature that would be beneficial to be added to modify plants and any of the indicative content on plant production.

*(b) Describe how *Agrobacterium tumefaciens* can be used to create transgenic plants.

(6)

To create transgenic plants the scientists identify the gene responsible for the action on a plant and remove it with a restriction enzyme that cuts accurately the same enzyme is used to cut at the ring of DNA open and the ligases insert it. The produced is allowed to grow.

ResultsPlus
Examiner Comments

Here level one is awarded as only one area, genetic modification, is covered in limited detail.

ResultsPlus
Examiner Tip

You often need to cover a wide range of information to access level three when the question has a broad base as in this case.

*(b) Describe how *Agrobacterium tumefaciens* can be used to create transgenic plants.

(6)

Agrobacterium tumefaciens can be used to create transgenic plants because it is used as a vector meaning it carries other genes. In addition when it injects a plant it passes on that gene so the plant now produces this protein. First stage is to isolate the desired gene from a plant and cut it out using restriction enzymes. Then take out the loop of DNA from the Agrobacterium tumefaciens and cut it using the same restriction enzymes because it recognises specific DNA sequences meaning it leaves 'sticky ends' on the loop of DNA and the desired gene. Next add ligase which join together the desired gene and loop of DNA to form recombinant DNA and place back into bacteria. Infect the target plant with the ~~bacteria~~ Agrobacterium tumefaciens which causes the desired gene to be passed on to the target plant. The cells injected will grow in the crown gall. Then place the cells from the crown gall onto a dish with the substance you want it to be resistant against and the cells which survive contain the desired gene

ResultsPlus
Examiner Comments

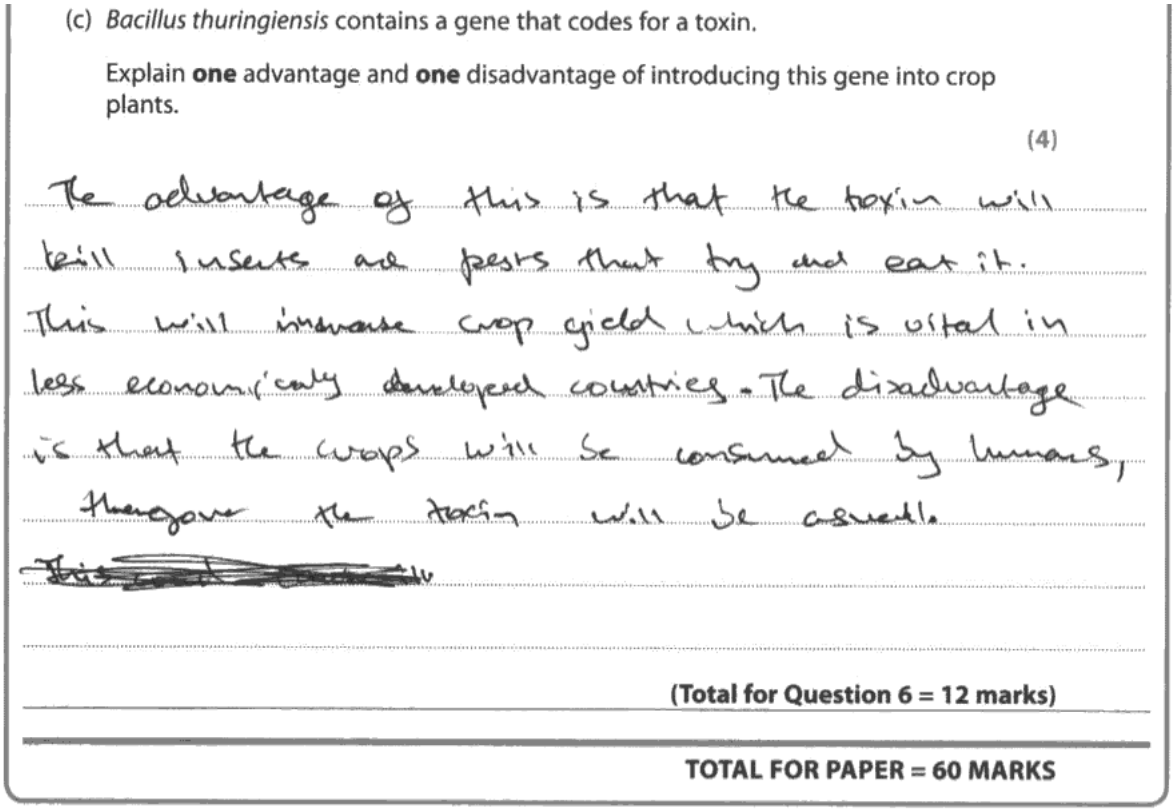
This answer just gets into level three as it covers all three areas required, namely, use of agrobacterium, genetic modification and the production of plants.

ResultsPlus
Examiner Tip

Ensure that your response covers all areas required to fully answer the question.

Question 6 (c)

This question required candiidates to explain one advantage and one disadvantage of introducing the toxin gene from *Bacillus thuringiensis* to crop plants.



(c) *Bacillus thuringiensis* contains a gene that codes for a toxin.

Explain **one** advantage and **one** disadvantage of introducing this gene into crop plants.

(4)

The advantage of this is that the toxin will kill insects and pests that try and eat it. This will increase crop yield which is vital in less economically developed countries. The disadvantage is that the crops will be consumed by humans, therefore the toxin will be ingested.

(Total for Question 6 = 12 marks)

TOTAL FOR PAPER = 60 MARKS

ResultsPlus
Examiner Comments

Here the advantage is covered well stating that the toxin will kill insects that eat it and that this will increase drop yield. Unfortunately it does not continue to cover any of the points outlined in the disadvantages section of the mark scheme.

ResultsPlus
Examiner Tip

Ensure that both parts of a question are answered in detail.

Paper Summary

Based on their performance on this paper, candidates should:

- always show the working when doing calculations as a mark can be awarded for errors carried forward in this case
- ensure that they read the questions carefully and ensure that their answer does not include areas that are in the stem, as in the nutritional benefit in the question 5(b))
- practice extracting data from graphs and tables.
- practice analysing questions to see if a broad or highly specific answer if required.
- be as specific as possible when answering questions. Ensure that numbers are manipulated rather than simply quoting them from a graph or table.
- when tackling extended answers, think about the structure, by writing a plan before starting to ensure that the answer shows clarity of writing and flows. Remember that the quality of written qualification (QWC) is assessed on the 6 mark questions and therefore check that accurate spelling and grammar are incorporated into the response.

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

Pearson Education Limited. Registered company number 872828
with its registered office at Edinburgh Gate, Harlow, Essex CM20 2JE