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Examiners' Report
January 2012

GCSE Biology 6BI04 01

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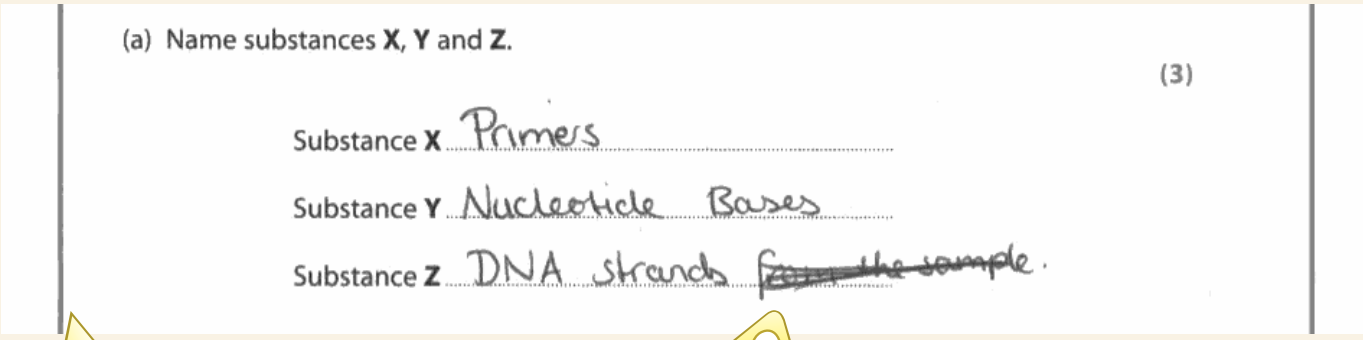
Introduction

This was the 4th 6BIO4 paper and it was very obvious that teachers are using the mark schemes to past papers to prepare their candidates for this exam. This was particularly evident in question 2c where the structure of cellulose was described very well, question 4b where there were some good accounts of speciation given and question 7biii where candidates clearly knew the events that take place following T helper cell infection by HIV. Predictably, the data handling questions caused candidates problems, especially in questions 3, 5 and 6, where candidates were asked to use several sets of data.

Question 1 (a)

For question 1, parts a and b gave candidates a positive start to the paper. Although there was some confusion between substance X and Y, the three multiple choice questions caused few problems with most candidates giving the right answer.

There were essentially three reasons for candidates not scoring well in this question: (1) confusion between substance X and Y, (2) reference to nucleotide *bases*, as seen in this response and (3) vague references to DNA for substance Z.



(a) Name substances **X**, **Y** and **Z**.

(3)

Substance **X** Primers

Substance **Y** Nucleotide Bases

Substance **Z** DNA strands ~~from the sample~~.

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Examiner Comments

This question does highlight the need to learn the core practicals in detail and to use terminology carefully.

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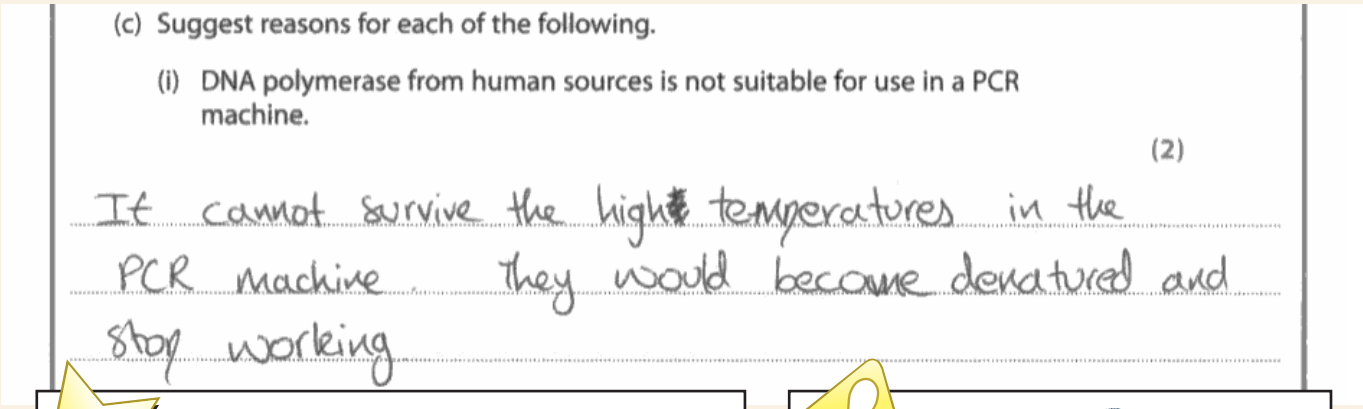
Examiner Tip

Be very careful with your terminology associated with DNA. There is a difference between DNA molecules and strands, nucleotides and nucleotide bases.

Question 1 (c) (i)

Some candidates completely mis-understood this question and wrote about the ethics of using human DNA. Candidates need to recognise questions about core practicals and apply their knowledge of these to answer such questions.



(c) Suggest reasons for each of the following.

(i) DNA polymerase from human sources is not suitable for use in a PCR machine.

(2)

It cannot survive the high temperatures in the PCR machine they would become denatured and stop working

ResultsPlus
Examiner Comments

Although the reference to enzymes not surviving at high temperature is not seen that often, it is a common mistake on 6BIO1. The main reason for candidates not scoring both marks on this question (approx half of them) was that they did not develop their argument sufficiently.

ResultsPlus
Examiner Tip

If there are two marks, you must give two facts that relate to the question. Simply stating that enzymes will be denatured will not score two marks, as it is only one fact.

Question 1 (c) (ii)

Candidates that considered that 6BIO4 is synoptic with the two AS units were able to approach this question successfully.

(ii) Species of plants cannot be identified from woody (xylem) material using PCR and DNA profiling.

(2)

Xylem may not contain any DNA. DNA polymerase may not work with plant DNA. The DNA in xylem may not be unique to that species. The heat treatment may not be sufficient to separate strands of DNA from xylem.

ResultsPlus
Examiner Comments

It appears that the mp 2 is on the first line, but when you read on to the 3rd line it has clearly been contradicted by this next idea, so cannot be awarded.

ResultsPlus
Examiner Tip

Read through all your answers very carefully, to ensure that your response is clear and cannot be interpreted in a way other than the way you intended.

Marks are lost by candidates who write vague responses that do not give the specific details that they are expected to know at this level.

(ii) Species of plants cannot be identified from woody (xylem) material using PCR and DNA profiling.

(2)

Xylem do not have genetic material as they go through autolysis which is the removal of cell contents due to the break down of the tonoplast. Therefore there would be no genetic material to extract and use to produce a profile.

(Total for Question 1 = 10 marks)

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Examiner Comments

The reference to *genetic material* is too vague for this response to be awarded mp 2.

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Examiner Tip

Always read through your answer and consider whether or not you could be more specific in your answer. This is a typical example of where this would help. Yes, it is genetic material, but in the context of this question it is DNA that is needed and not any other genetic material such as RNA.

Question 2 (b)

A wide range of responses were seen for this question. In part (a) substance W and reaction T were identified correctly by almost all students, but only under half of candidates could identify reaction S.

Most candidates picked up at least two marks in (b).

Part (c) was more variable, depending on whether or not candidates had learnt previous mark schemes for 6BIO2.

(b) Reaction **T** occurs in a chloroplast.
Describe the structures in a chloroplast that are involved in this reaction.

(3)

The thylakiod ~~has~~ has a thylakiod membrane (light dependent) where this reaction takes place. The Stroma contains the enzymes needed for this reaction to take place. The electron carrier system which happens along the thylakiod releases energy which makes ATP. This energy provides the energy for the reaction.

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Examiner Comments

An incorrect reference to *stroma* would have negated either mp 1 or 2, if they had been awarded. Mp 2 was not awarded as we felt that for A2, a more detailed description of the thylakoids was necessary.

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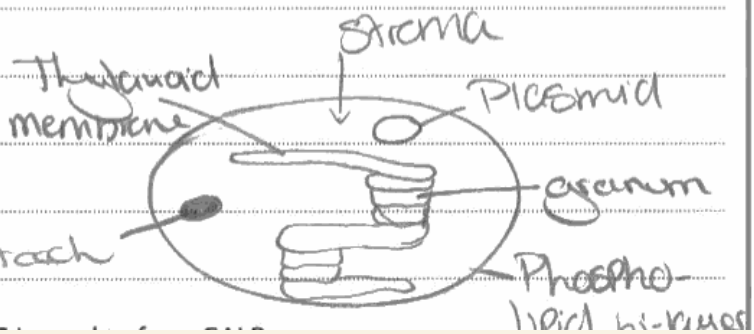
Examiner Tip

6BIO2 expects you to know the structure of a number of cell organelles in some detail. 6BI04 can build on this, especially in relation to photosynthesis in the chloroplast.

(b) Reaction **T** occurs in a chloroplast.
Describe the structures in a chloroplast that are involved in this reaction.

(3)

Takes Place in the Thylakoid membrane & a chloroplast.



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Examiner Comments

There are occasions when marks can be awarded from accurately labelled diagrams. This question was one of these. However, this particular response illustrates the need for accurate labelling. The label line pointing from the word *granum* is actually pointing to a thylakoid (sac).

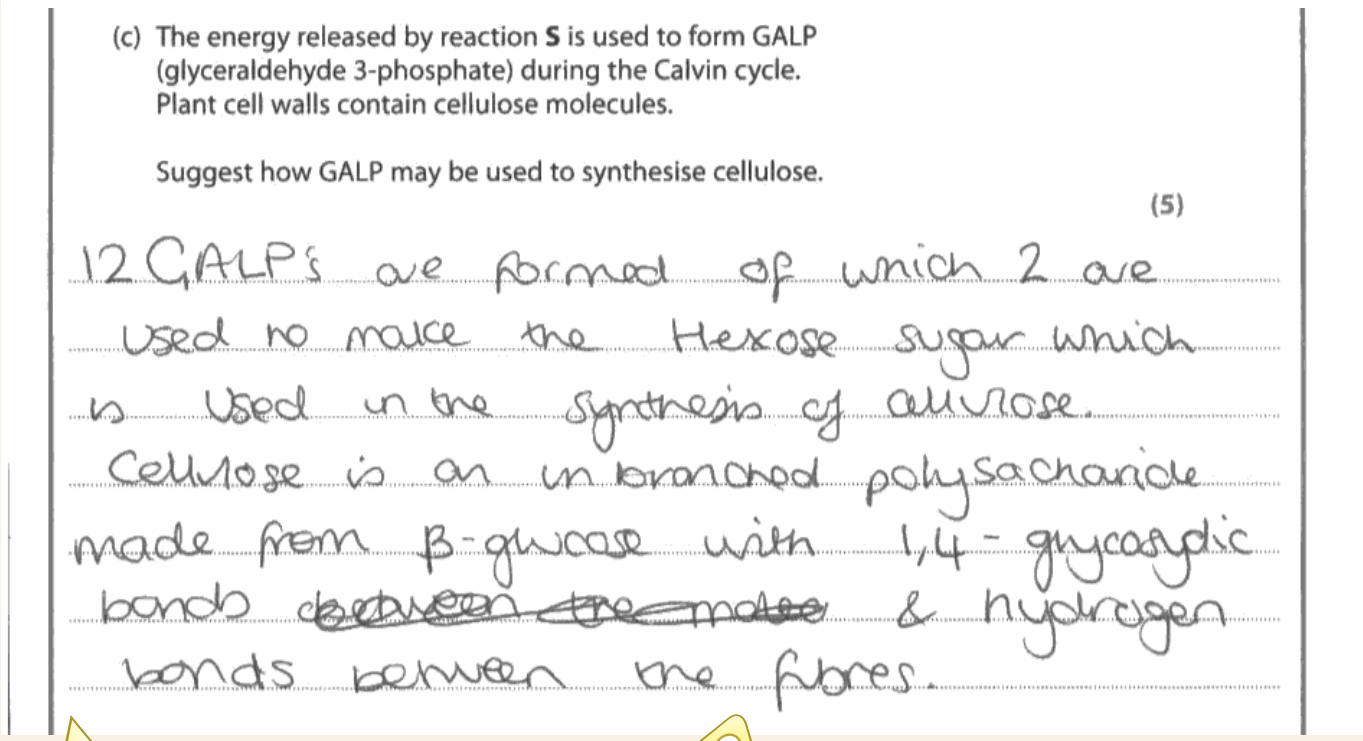
ResultsPlus
Examiner Tip

You will generally get awarded more marks from a written description than a diagram. It may be tempting to draw a diagram and save writing and possibly time, but diagrams have to be very accurately drawn and labelled to be awarded marks.

Question 2 (c)

This was well-answered by candidates that were aware that 6BIO4 is synoptic with the AS units and had learnt their mark schemes.

This question yielded some really good answers.



(c) The energy released by reaction **S** is used to form GALP (glyceraldehyde 3-phosphate) during the Calvin cycle. Plant cell walls contain cellulose molecules.

Suggest how GALP may be used to synthesise cellulose.

(5)

12 GALP's are formed of which 2 are used to make the Hexose sugar which is used in the synthesis of cellulose. Cellulose is an unbranched polysaccharide made from B-glucose with 1,4-glycosidic bonds ~~between the molecules~~ & hydrogen bonds between the fibres.

ResultsPlus
Examiner Comments

This is an example of a very good, high quality answer that was seen by a number of good candidates.

ResultsPlus
Examiner Tip

Learn previous mark schemes.

Read through your answer and make sure that you have included at least the number of facts that you did not know at GCSE, to equal the number of marks being awarded to the question.

(c) The energy released by reaction **S** is used to form GALP (glyceraldehyde 3-phosphate) during the Calvin cycle. Plant cell walls contain cellulose molecules.

Suggest how GALP may be used to synthesise cellulose.

(5)

GalP is reduced to sorm reduced GALP during the light dependant reaction by gaining a H2 srom water. The ~~GAP~~ reaced GALP is used during the calvin to provide H2 to reduce the GP to sorm GALP. This requires the use os ATP. 10 out os the 12 ~~gal~~ GALPs are used to regenerate RuBP whilst 2 out os the 12 GALPs are used to produce glucose and depending on the type os bonding (whether its an a or b glucose) cellulose can be produced. GP is ~~sor~~ sormed by the RuBP and a C srom CO_2 with aid os rubicose enzyme

ResultsPlus
Examiner Comments

A lot of irrelevant material is included in this response, which was not uncommon by candidates who had not read the question correctly.

ResultsPlus
Examiner Tip

Do not hedge your bets - your examiner will not choose the right answer. In this response, the candidate has not committed themselves to either α or β glucose forming cellulose and has therefore not been awarded mp 4.

Question 3b

Question 3a caused no problems, with the majority of candidates answering the question correctly.

However, the average number of marks then dropped as candidates worked their way through the question.

Candidates did struggle with 3b, not surprisingly as they had two graphs to look at and the difficult command word *compare.* Predictably there were a lot of descriptions, not comparisons, but we did decide to piece answers together as the data was quite complicated. THIS SHOULD NOT BE RELIED UPON IN THE FUTURE, HOWEVER.

(b) Compare the changes in mean environmental temperature between the pre-monsoon and the post-monsoon periods from 1600 to 2000.

(3)

The mean changes can be compared using the line of best fit on each graph. Overall the post-monsoon period had the greatest overall mean change in temperature, 1°, compared to 0-35° for the pre-monsoon period over the time of 1600 to 2000. Both pre-monsoon and post-monsoon had a large change in mean temperature during 1800's, the largest over the 1600 to 2000 period. Overall pre-monsoon period experienced a mean temperature decrease, whilst post-monsoon experienced an increa

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Examiner Comments

This particular answer illustrates the importance of making accurate calculations and stating units, as well as avoiding making vague references to values. What could have been a high-scoring answer, scored only mp 1.

ResultsPlus
Examiner Tip

(1) include units with any value that you quote or calculation that you make

(2) read exact values from a graph, do not make approximation references.

(b) Compare the changes in mean environmental temperature between the pre-monsoon and the post-monsoon periods from 1600 to 2000.

(3)

The estimated temperature at the pre monsoon period is ~~starts off higher than~~ higher than at the past monsoon period. For example at 1950 at the pre monsoon period the temperature is ~~to~~ 15.5°C where as at the ~~aft~~ post monsoon period it is only 11.7°C. The temperature change on the pre monsoon stays ~~yearly~~ constant as ~~to~~ between 1600-2000 the change was 0.35°C where as post monsoon the temperature between 1600-2000 ~~steadt~~ increased ~~by~~ a lot more by nearly 2°C.

ResultsPlus
Examiner Comments

The question must be read carefully and the answer written accordingly. A *change* must be given if asked for. This candidate has only quoted figures for the lowest values (which are not actually correct).

ResultsPlus
Examiner Tip

Read the question very carefully to identify the command words used.

Question 3 (c) (i)

This question was not answered very well, with the average mark being one out of a possible three. Candidates should be aware of the specification points: in this case it states clearly that candidates should know about *extrapolating* and *modelling* - this would have given them two marks immediately.

(c) (i) Suggest how scientists could use these data to predict future climate change.

(3)

As there is no straight line of best fit and the raw data experiences fluctuations, a computer model should be used. Current data ~~ex~~collected can be extrapolated to predict future change. ~~No~~ Extrapolation with other data would make these predictions more reliable The scientists could compare this data with other data on climate change obtained over the same period to make a prediction. Using the table the temperature can be predicted for the months each period corresponds to.

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Examiner Comments

This is an example of a very good response.

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Examiner Tip

When you are preparing yourself for the exam use your specification, as this will tell you exactly what you need to know and will quite often be some of the marks for the question. You can obtain a copy of the specifications from the Edexcel website, or from your teacher.

Question 3 (c) (ii)

This question caused problems as candidates did not read the question carefully enough, and as a result did not appreciate that they had to discuss the *data* given in the question. A significant number of candidates discussed the factors that *would* affect the temperature in the future. Another group of candidates suggested that equipment would not have been accurate enough in the past, failing to appreciate the use of tree growth rings.

(ii) Suggest why some scientists may not be convinced that these data can be used to predict future climate change.

(3)

Some argue that current changes in temperature are merely fluctuations. Also, the equipment used to record temperatures in the past may not be accurate. Moreover, we have a limited knowledge of how climate change works and the data is only for one country over a 400 year period only and so may be unreliable. Also other factors such as fossil fuel use and greenhouse gas emissions need to be considered.

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Examiner Comments

This response was awarded mp 2 and 3, which were the most common marks. Mp 8 could not be awarded as it was not clear enough that these factors were relating to the growth of the trees because of the reference to greenhouse gases.

ResultsPlus
Examiner Tip

Read the question very carefully. Do not launch into your response without considering the context of the question.

Question 3 (d)

This question was answered well with three quarters of students scoring the mark.

Question 4 (b)

The multiple choice question caused few problems, with the majority of candidates selecting the correct answer.

Candidates generally wrote extensive answers for part (b), demonstrating an understanding of the process of speciation. It was evident that candidates had also used past mark schemes. Disappointingly, the average mark for this item was only 3 out of 5; primarily a result of poor Biological expression. Some candidates lost a mark through incorrect spelling; this item was our QWC question testing spelling of Biological terms.

This example illustrates a high-scoring answer, but also some of the poor wording that we saw.

*(b) In mountainous regions of mainland Europe, only *S. europaea* is found. Suggest how a distinct species of nuthatch, *S. whiteheadi*, has evolved in the mountainous regions of the island of Corsica.

(5)

They have been seperated by geographical isolation. From this the species of nuthatch living in the mountainous of Corsica regions have had to adapted due to different selection pressures. These selection pressures have caused mutations to happen causing some of the nuthatch to have better adapted alleles inorder to survive in these different environmental conditions. These successful and useful alleles are given to the offspring. Overtime more mutations have occured causing the better adapted nuthatch to survive, and causing them to become more unlike the nuthatch living in mainland Europe. They can no longer breed to produce fertile offspring.

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Examiner Comments

This was awarded mp 1 and 2, but could not be awarded mp 4 as the selection pressures do not cause mutations; a mistake frequently seen. *Better adapted alleles* is not acceptable for mp 5 but we reluctantly accepted *useful* alleles for mp 6. Mp 4 was given further down, where the context was more appropriate, but mp 5 still could not be awarded as we wanted some idea of what the adaption was to.

ResultsPlus
Examiner Tip

At A2 we are stricter about the phraseology of your answers. When you have finished revising a topic, either read about it in a textbook or look at past mark schemes more carefully, paying attention to the actual wording. Keep your sentences very short as well.

*(b) In mountainous regions of mainland Europe, only *S. europaea* is found. Suggest how a distinct species of nuthatch, *S. whiteheadi*, has evolved in the mountainous regions of the island of Corsica.

(5)

Speiation has occured which is the formation of a new species. This occurs when part of a population is seperated by a geographical isolating mechanism (mountains) from the rest of the population. They are exposed to different selection pressures. Mutations can also occur. As these selection preasures and mutations keep occuring they change the two species more and more as they are adapting to the new environments. If these two species met again they wouldn't be able to interbreed as their DNA would be different and they may breed at different times. Forming speciation.

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Examiner Comments

This was a typical answer. The candidate fell into the trap of referring to the nuthatches being separated by the mountains. They did get awarded mp 2, 4 and 5.

ResultsPlus
Examiner Tip

It is difficult under the pressure of exam conditions, but always read the question and your answer through very carefully to ensure that your answer is in the context of the question. A2 questions require a context-based answer, by their very nature.

Question 4 (c) (i)

This question did cause problems, with very few candidates scoring all three marks.

(c) (i) Suggest how environmental changes, such as those caused by global warming, are more likely to cause extinction of *S. whiteheadi* than *S.europaea*.

(3)

- Smaller number of the species
- which means they have a smaller gene pool
- so they are less likely to adapt to any changes

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Examiner Comments

This response has been included in this report to demonstrate the clarity of candidate's answers that are short, straightforward responses.

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Examiner Tip

Although you will not get any marks for simply writing keywords down, you can write very short, simple sentences underneath each other. Not only will this make your answers easier to mark (more of an advantage to us!) but it will help you express yourself more clearly and help you to write enough relevant points to get full marks for the question. Always aim to write one or two more points than there are marks available.

Question 4 (d)

Candidates clearly know a lot about the role of zoos in the conservation of organisms and some very detailed accounts were given. However, candidates only scored one mark on average for reference to the breeding programmes. Many talked about their role in education which was not really relevant to the context of this question.

This was a very typical response. It only scored mp 1.

(d) Explain how the work of zoos could be important to the survival of *S. whiteheadi*.

(2)

zoos can controll temperatures and climate and breed specific individuals to deal with the new conditions which can then be ~~real~~ released back into the wild

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Examiner Comments

Simply putting the birds *back into the wild* would not be sufficient; they need to be returned to habitats appropriate to their survival.

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Examiner Tip

When you think you know the answer to a question, particularly if it is one that you have seen on a past paper, check that you have tailored your response to fit the context of the question. You need to be quite specific in your answers at A2.

Question 5 (a) (i)

This table caused relatively few problems, with the majority of candidates completing each row correctly.

Question 5 (b) (i)

Sometimes the most straightforward of questions cause the most problems, as candidates do not always state the obvious. Most candidates scored between 1-2.

Candidates either did not tell us that bacteria caused SCAG or else the answers made vague references to antibiotics *affecting* or *fighting* bacteria.

(i) Suggest why patients with SCAG may be given antibiotics as part of their treatment.

(2)

As the development of SCAG is associated with the bacterium helicobacter pylori, antibiotics would be able to treat SCAG, as the antibiotics are able to fight bacterium.

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Examiner Comments

This is a typical response, illustrating the point.

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Examiner Tip

Try and be as specific as you can in your answers and choose your words carefully.

Question 5 (b) (ii)

There were problems with this question as there were three columns of data and two command words in one question. The most common mark points awarded were 1, 2, 5 and 7. This was also a QWC question, so we were also looking at the clarity of the response.

This response illustrates the QWC principal.

*(ii) Using the information about SCAG and the data, describe and suggest explanations for the trends shown in the table.

(5)

The table shows that the ~~not~~ number of new cases of stomach cancer increases with age. 633 new cases of stomach cancer have been found in people between the ages of 66 and 70, whereas there have been no new stomach cancer cases in people up to the age of 30. This could be, that as you get older, your immune system gets weaker, and is not as effective at fighting off pathogenic bacteria, and so there is ~~a~~ more chance for opportunistic infections to thrive. This could also be linked to the amount of stomach acid you secrete per hour. In the older age groups, this is far less, as with children between the ages of 11 and 15, the mean acid ~~secretion~~ secretion is 170mg hour^{-1}, however with people between 66 and 70, the secretion is 20mg hour^{-1}. Stomach acid is a major asset to the immune system, as its acidic conditions kill off most bacteria. Due to the secretion of ~~the~~ stomach acid being a lot less as you get older, it is a lot easier for bacteria to infect your body.

(Total for Question 5 = 10 marks)

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Examiner Comments

This candidate was awarded mp 2 at the top, mp 7 on line 7 and then mp 5 and 1 at the end. In the middle of the response, the candidate is trying to link age with infections thriving with the amount of stomach acid. We did not award mp 1 as this was not clear enough to award mp 1, although we knew what the candidate was trying to say. Nor did we like the reference to *infections* thriving.

ResultsPlus
Examiner Tip

Keep your sentences very short and straightforward.

If there are two command words in the question, you must write appropriate information for both to be awarded full marks.

*(ii) Using the information about SCAG and the data, describe and suggest explanations for the trends shown in the table.

(5)

SCAG is the first step that can lead to stomach cancer, and SCAG is caused by a bacterium. Hence, because stomach acid destroys bacteria (it is hydrochloric acid with a pH of 2.00 which destroys the bacteria), the less secretion of acid that takes place, the more likely it is that the bacteria causing SCAG will enter the body and thus the more likely it is that stomach cancer will occur. The older people are the less stomach acid secretion takes place and the greater the prevalence of stomach cancer is as a result. For example, comparing 11-15 year olds with 66-70 year olds, the mean acid secretion has decreased by $(\frac{130}{170})100 = 76.5\%$ and stomach acid numbers have increased by 633%. This is because less of the bacteria causing SCAG are destroyed in the lower amount of hydrochloric acid, thus they will enter the blood stream and thymph, cause SCAG which ultimately leads to stomach cancer.

ResultsPlus
Examiner Comments

This response was awarded mp 5 at the top, then mp 1 and 2 in the middle. Unfortunately, the candidate could not be awarded mp 3 as they refer to the *likeliness* of stomach cancer occurring whereas the data is about actual cases of the cancer.

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Examiner Tip

Read the question very very carefully. We spend a long time selecting the information we put in a question so that you do not have more to read than necessary. Therefore, what is written is important and should be read carefully.

Question 6 (a) (i)

This question asked for a definition of NPP, which has been asked for before. The responses that we saw indicate that candidates really do not understand this term and have many misconceptions. For a relatively straightforward two mark question, very few candidates received this.

(a) (i) Explain what is meant by the term **net primary productivity**.

(2)

The amount of energy which is turned into biomass.

NPP = GPP - R.

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Examiner Comments

A lot of responses would make Physicist's cringe! We saw many expressions relating to energy *changing into, being converted into , turning into* something.

The equation gained a mark.

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Examiner Tip

Learn all terms used in the specification accurately.

(a) (i) Explain what is meant by the term **net primary productivity**.

(2)

The amount Energy available to an organism which can be turned into biomass

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Examiner Comments

Very few candidates appreciated that NPP relates to biomass of plants. This answer was vague in its reference to organisms, but a significant number of candidates referred to animals.

(a) (i) Explain what is meant by the term **net primary productivity**.

(2)

NPP IS THE OVERALL ENERGY ~~REEU~~ RECIEVED FROM PHOTOSYNTHESIS MINUS PROCESS LIKE RESPIRATION THAT USE ENERGY.

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Examiner Comments

The reference to *like respiration* suggests other processes may be involved.

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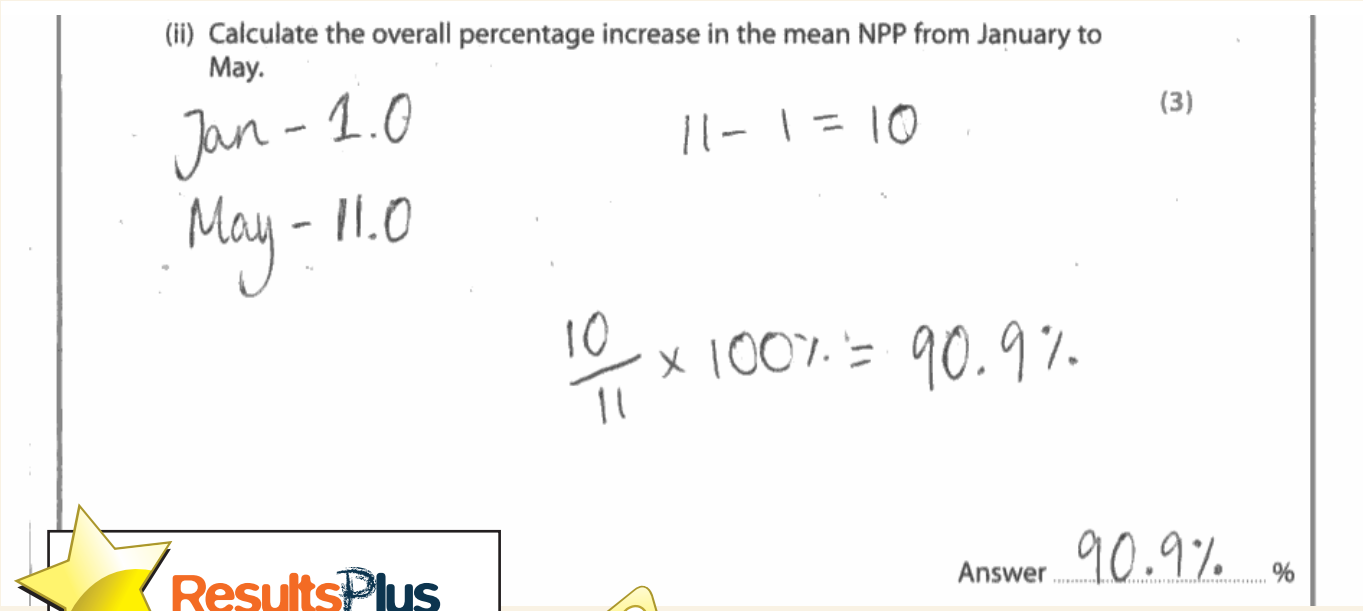
Examiner Tip

Read through your answers very carefully to make sure you have written exactly what you mean.

Question 6 (a) (ii)

What is it with percentages that candidates hate so much?



(ii) Calculate the overall percentage increase in the mean NPP from January to May.

(3)

Jan - 1.0

May - 11.0

11 − 1 = 10

$\frac{10}{11} \times 100\% = 90.9\%$

Answer 90.9% %

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Examiner Comments

This was one of the common calculation mistakes.

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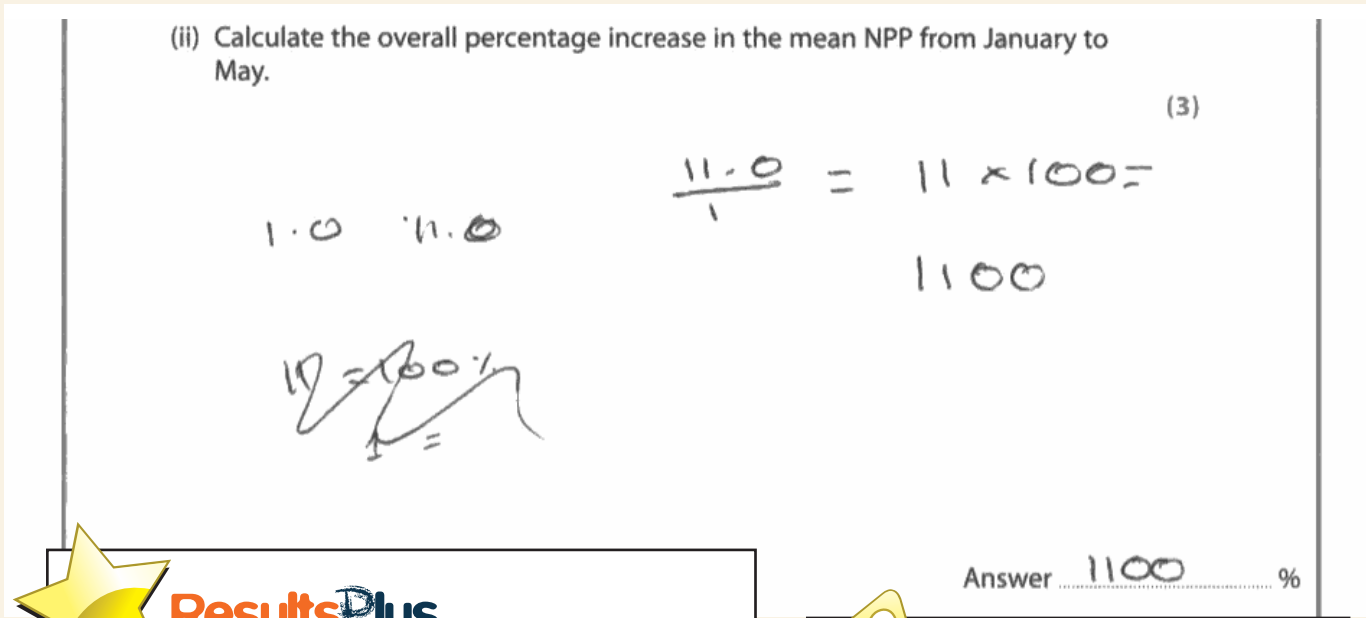
Examiner Tip

And then practice more .....



(ii) Calculate the overall percentage increase in the mean NPP from January to May.

(3)

1.0 11.0

$\frac{11.0}{1} = 11 \times 100 =$

1100

1 = 100%

Answer 1100 %

ResultsPlus
Examiner Comments

This calculation was very common. As we apply the consequential error rule to calculations, this candidate was awarded mp 1 for the correct readings from the graph and mp 3.

ResultsPlus
Examiner Tip

Practice every percentage calculation question that you can find!

Question 6 (b)

This was a relatively straightforward synoptic question, that did not score very highly.

(b) Suggest why an increase in temperature may cause an increase in NPP.

(2)

An increase in temperature would mean that the molecules involved in metabolic reactions have more kinetic energy and so there are more successful collisions in a shorter space of time so the reactions are more efficient and the rate of growth increases. Resulting in more energy being passed down the food chain.

ResultsPlus
Examiner Comments

This answer is too vague and only scored mp 2, however this candidate identified the involvement of enzymes.

ResultsPlus
Examiner Tip

If you are asked to explain an effect due to temperature, nine times out of ten you should write about the kinetic energy of enzymes and their collisions with their substrate.

Similarly, if the variable is pH then you should refer to the change in shape of an enzyme's active site.

Question 6 (c)

Four sets of data on three graphs is quite difficult, however the difficulty of this question was taken into account when the mark scheme was finalised. Candidates had a really good attempt at this question.

(c) Using information from the graphs, describe and explain the relative effects of temperature and hours of sunlight on NPP in this grassland.

(4)

As temperature and sunlight increased, so did the NPP in the grassland. However, the increase in NPP was delayed following an ^increase in temperature an hours of sunlight. The highest peak for sunlight was ~~March~~ April whereas the NPP peak was in May. A peak in October for mean daily temperature also caused a peak in NPP in october. The overall NPP trend seems to follow the mean daily sunlight graph more than daily temperature suggesting sunlight has more of an effect on NPP in this grassland. Overall as temperature and sunlight increase or decrease so does NPP.

ResultsPlus
Examiner Comments

This candidate did a good job of describing the data, scoring three marks, but unfortunately did not go on to explain any of the trends.

ResultsPlus
Examiner Tip

If the stem of the question asks you to *describe* and *explain* then you must do both to access full marks.

Whenever you see temperature, mention enzymes. If you see light and plants, mention photosynthesis.

(c) Using information from the graphs, describe and explain the relative effects of temperature and hours of sunlight on NPP in this grassland.

(4)

The hours of sunlight match the trend of the NPP graph and have a positive relationship with it, the largest value on hours graph is April while on NPP graph is May suggesting temperature has a large effect. The temperature relates directly, as the minimum temperature has a small range as the maximum temperature increases so does the NPP. However in October the temperature and hours were highe at 4 hours however the NPP was low suggesting other abiotic factors may also have an influence.

ResultsPlus
Examiner Comments

This candidate lost marks as they referred to the graph and not the Biology.

ResultsPlus
Examiner Tip

Always describe the effect of the dependent variable on the dependent variable and not what the graph or line shows - this is a Biology exam, not a Maths exam.

(c) Using information from the graphs, describe and explain the relative effects of temperature and hours of sunlight on NPP in this grassland.

(4)

Generally as mean temperature and daily sunlight hars increases, NPP increases. However the highest mean temperature is in June and highest rate of NPP occurs in May. This may be ~~that~~ because during June other abiotic factors such as carbon dioxide or light are limiting factors. Or the temperature may be too high ~~don't affect the temperature~~ denaturing enzymes. ~~to cool~~ The ~~highest~~ greatest amount of ~~sun~~ sunlight hars occurs in April however as greatest NPP is in May. This may be due to Carbon dioxide being a limiting factor. Photosynthesis cannot occur without CO_2, if one factor is not abundant enough the process cannot continue.

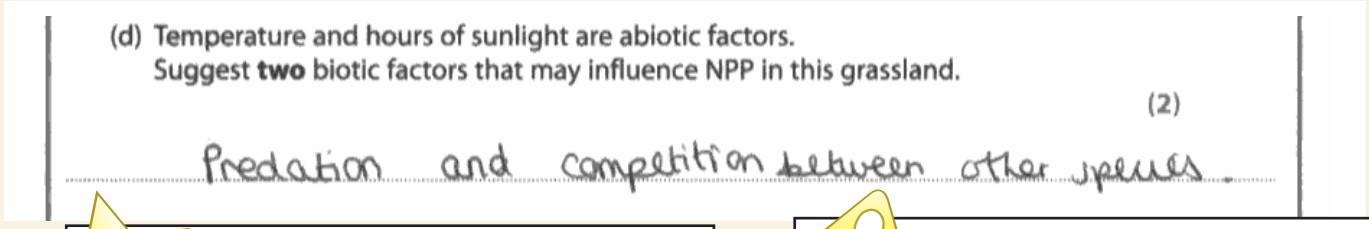
ResultsPlus
Examiner Comments

Candidates should be encouraged to start their responses to describe questions by an *overall* comment, but they must be accurate. This mistake was typical of a number of responses seen.

Question 6 (d)

This was a simple question, but the majority of candidates gave a range of suggestions which was not relevant to the context of the question.

This was a typical response, which gained no marks.



(d) Temperature and hours of sunlight are abiotic factors.
Suggest **two** biotic factors that may influence NPP in this grassland.

(2)

Predation and competition between other species.

ResultsPlus
Examiner Comments

Candidates must read the question carefully, as well as appreciate that *predator* is not an appropriate term to apply to a herbivore.

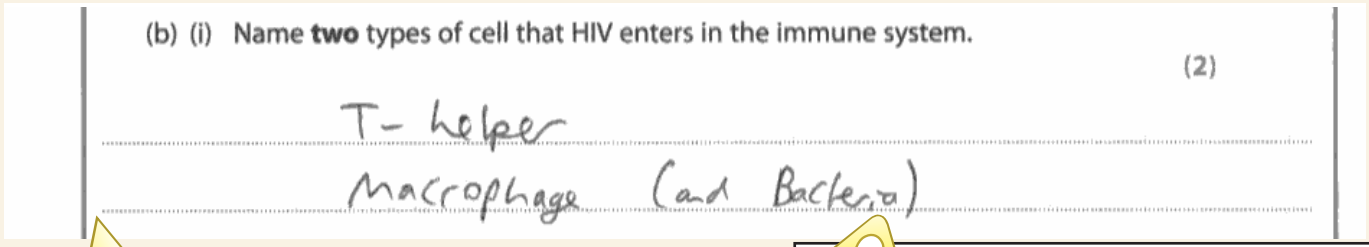
ResultsPlus
Examiner Tip

Your responses must apply to the context of the question. Also, check that you have been as specific as possible.

Question 7 (b) (i)

The multiple choice question caused few problems.

Provided candidates were specific enough, this was well answered, but unfortunately not all were.



(b) (i) Name **two** types of cell that HIV enters in the immune system.

(2)

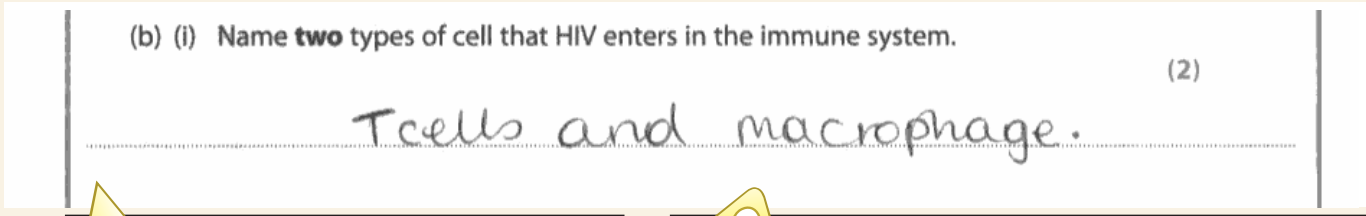
T- helper
Macrophage (and Bacteria)

ResultsPlus
Examiner Comments

Two right answers and one wrong answer that is totally wrong. This means that the response will only be awarded one mark.

ResultsPlus
Examiner Tip

The examiner will not choose the right answer from a selection of possibilities. You must make a decision.



(b) (i) Name **two** types of cell that HIV enters in the immune system.

(2)

Tcells and macrophage.

ResultsPlus
Examiner Comments

This illustrates a typical vague answer.

ResultsPlus
Examiner Tip

You must be specific and demonstrate your knowledge.

Question 7 (b) (ii)

Candidates have good knowledge of HIV.

(ii) Explain how HIV is able to enter these cells.

(3)

- Thick protein coat around RNA.
- ~~Antigen~~
- The gp120 glycoproteins on the surface of viruses attach to 2 CD4 receptors on host cells.
- This allows membranes to fuse and for the nucleic acid of viruses to enter the cell.
- New protein coats are then formed for these viruses after transcription in the nucleus.

ResultsPlus
Examiner Comments

An example of a very clear response.

ResultsPlus
Examiner Tip

Short snappy sentences will help you to express yourself clearly and accurately.

(ii) Explain how HIV is able to enter these cells.

(3)

HIV has glycoproteins (antigens) on on its cell surface membrane and this attaches to CD4 receptors only T helper cells and allows the HIV cell surface membrane to fuse and nucleic acid to enter. In macrophages, the HIV virus glycoprotein antigens combine with the antibody receptor and allows it to fuse with the surface membrane and deposit its RNA.

ResultsPlus
Examiner Comments

A much more verbose response.

ResultsPlus
Examiner Tip

Viruses are NOT cells. Try using the term *particle* when you are trying to describe them

Question 7 (b) (iii)

Some candidates are clearly using the previous mark schemes to prepare for this part of the specification. There were many responses that scored maximum marks, yet the average mark was low.

(iii) Describe the sequence of events following infection of these cells by HIV, that may lead to the death of the patient.

(6)

In T helper cells, the viral RNA uses viral reverse transcriptase to make viral DNA which uses the viral enzyme integrase to insert the viral DNA into the hosts T helper cell DNA. This causes T helper cells to produce viral proteins by transcription and translation which assembles themselves to form new viruses which bud off the cell surface membrane taking some of that helper cell membrane with it, causing lysis (death) of the cell. ~~Th~~ This causes the reduction of T helper cells – which regulate the immune system, so less differentiation of B cells occurs as T helper cytokine levels are low. So B cells cannot differentiate into plasma cells to release antibodies to bind onto antigens of viruses (so there is less phagocytic activity (less recognition by macrophages)). Also T helper cells activate T killer cell differentiation (using cytokines) into active T killer cells that ~~also~~ kill pathogens by cell lysis, so the immune ~~response~~ system gets weaker. This results in opportunistic infections such as tuberculosis or pneumonia to affect the body and ~~these~~ as the immune system is so weak, symptoms of opportunistic ~~in~~ infections causes AIDS. T helper cell lysis also release chemicals that damage other cells. Person dies from opportunistic infections that thrive – called the Disease phase.

(Total for Question 7 = 12 marks)

The numbers of viruses replicating is kept in check in the first, acute phase but the virus takes the advantage due to its high replication and mutation rate of the protein coat so evades the immune system in the chronic phase where the patient may experience symptoms and find simple illnesses take more time to go away. The number of T helper cells is depleted so much by the last, disease, phase.

ResultsPlus
Examiner Comments

Mp 1, 3, 2, 5, 4, 6 and 8 in the first few lines. Then we awarded mp 10 as our minimum requirement for this mp. The candidate was also awarded mp 9 and 11. 6 max.

(iii) Describe the sequence of events following infection of these cells by HIV, that may lead to the death of the patient.

(6)

Once the viral RNA & enzymes are in the cell, reverse transcriptase is used to create DNA ~~from~~ complimentary to the viral RNA. integrase then inserts the viral DNA into the hijacked cell's DNA so the ~~HIV~~ cell now makes copies of viral DNA and new HIV cells are produced. The new cells then leave the host cell taking part of the cell surface membrane to use as an envelope. HIV antigens sometimes bind with host cells so t-killer ~~C~~ells recognise them as foreign and the body attacks it's own immune system. As the immune system is weakened, opportunistic ~~p~~pathogens then invade the body eg TB can become active again so the patient may die of an opportunistic disease

(Total for Question 7 = 12 marks)

ResultsPlus
Examiner Comments

Another good response. Mp 1, 3, 2, 5 and 4 on the first few lines. Mp 9 and 11 at the very bottom. NB We do not credit a mp if HIV are referred to as cells (but we would only penalise once)

ResultsPlus
Examiner Tip

Viruses are not cells.

(iii) Describe the sequence of events following infection of these cells by HIV, that may lead to the death of the patient.

(6)

Once inside the T helper cells, the HIV virus reverses the transcription of the cell's DNA using the enzyme reverse transcriptase. This allows viral DNA strands to be produced from the virus' RNA. Once new viral DNA has been synthesised, the DNA is integrated into the host's DNA using the enzyme integrase. This means that new viral proteins can be produced and used to create new viral proteins, which go on to attack more T helper cells. The reduced activity of T helper cells means that B cells and T killer cells are not able to function effectively to fight the disease. Once infected, the T helper cells also display the antigen for HIV. This causes T killer cells to attack the helper cells, and therefore damaging the host's immune system further. The immune system can become ineffective

ResultsPlus
Examiner Comments

When the mark scheme says *correct reference to ...* then the context or the Biology must be correct. Here, the context for the role of reverse transcriptase is wrong and therefore mp 3 cannot be awarded - reverse transcriptase does NOT use the host cell's DNA.

Mp 2 cannot be awarded as DNA is not produced *from* the RNA.

ResultsPlus
Examiner Tip

Your wording has to be very precise - use every second that you have at the end of an exam to read and re-read through your answers.

Question 8 (a) (i)

A whole range of responses were seen for this question, with no discernable pattern being evident.

Paper Summary

In order to improve their performance, the candidates should:

- Continue to use past papers and their corresponding mark schemes to prepare for the exam
- Focus on the command word(s) used in the question during the exam
- Be specific with their response
- Attempt to answer all questions
- Practice on data handling questions.

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