ResultsPlus

edexcel

Examiners' Report
June 2014

GCE Biology 6BI04 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 2014

Publications Code UA038129

Introduction

We saw some really good responses by candidates on this paper this year; centres have clearly been using past paper mark schemes to prepare their candidates for this paper. There were relatively few blank responses and all our mark points were seen. The multiple choice questions caused few problems with the exception of those in question 8b. Even the stronger candidates struggled with these.

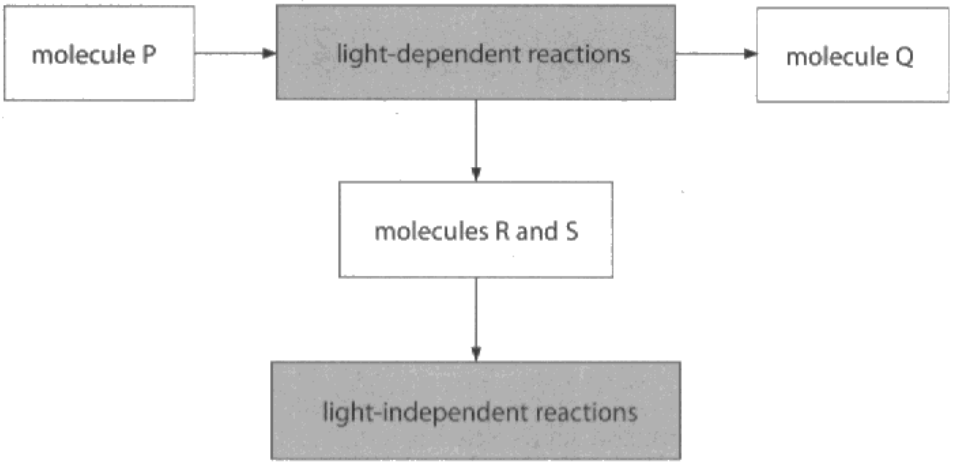
Question 1 (a) (i)

Many candidates could interpret the diagram and identify molecules P and Q as water and oxygen respectively.

Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 (a) The diagram below shows some of the steps in the process of photosynthesis.



(i) Name molecules **P** and **Q** in the diagram.

(1)

molecule P ADP, Pi, NADP, H_2O - water.

molecule Q ~~ATP, NADPH,~~ electrons

ResultsPlus
Examiner Comments

Formulae as alternatives to the name of molecules can be accepted provided that they are correct; this includes any numbers written subscript and the positive / negative charge(s) on ions.

However, in this response a selection of answers were given.

ResultsPlus
Examiner Tip

Do not write a list of possible answers when you are asked to name something, as the correct answer will not be selected for you. By writing a list you are guaranteed to score zero for the item, whereas if you commit yourself to just one answer, you may gain the mark.

Question 1 (a) (iii)

Candidates have clearly used past paper mark schemes to prepare for this exam. There were some excellent responses to this question with many candidates scoring full marks.

(iii) Describe the role of RUBISCO in the production of GALP in the light-independent reaction.

(4)

RUBISCO is a ~~catalsy~~ catalyst. It catalyses the reaction of RuBP and CO_2 to go to the 3 carbon molecule, GP. This then uses hydrogen from NADPH and energy from ATP to convert ~~GALP~~ GP to GALP, another 3 carbon molecule. (GALP goes on to make glucose (1 out of 6) or repeat the calvin cycle ~~to~~ and is converted to ~~makes~~ RuBP)

ResultsPlus
Examiner Comments

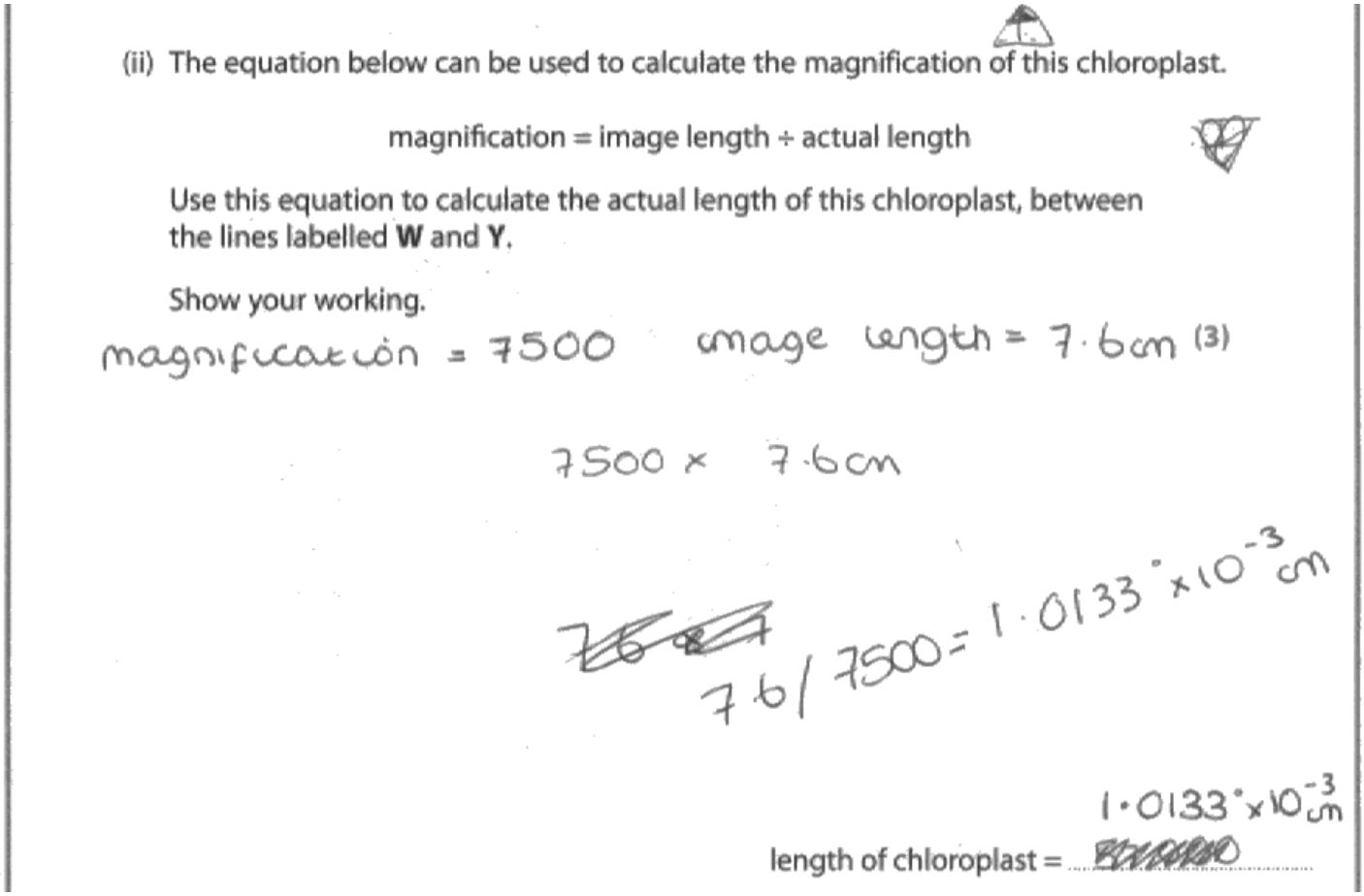
This response is an example of some of the excellent responses that were seen to this question. All of our mark points are illustrated within it.

ResultsPlus
Examiner Tip

Using past paper mark schemes to prepare for the exam will show you what is expected from you in your answer.

Question 1 (b) (ii)

We were pleased to see that candidates were not phased by this type of maths question. Many could accurately measure the length of the chloroplast and then rearrange the formula to derive the correct answer. We did apply a consequential error to the marking so that candidates did not lose all three marks if they made an error in either the measuring or the formula rearrangement.



(ii) The equation below can be used to calculate the magnification of this chloroplast.

magnification = image length ÷ actual length

Use this equation to calculate the actual length of this chloroplast, between the lines labelled **W** and **Y**.

Show your working.

magnification = 7500 image length = 7.6cm (3)

7500 × 7.6cm

~~7687~~ 76/7500 = 1.0133 × 10^{-3} cm

1.0133 × 10^{-3} cm

length of chloroplast = ...

ResultsPlus
Examiner Comments

This candidate scored all three marks. The calculation was clearly laid out and the units were appropriate to their answer.

ResultsPlus
Examiner Tip

Always show your working. In some instances you may have got the final answer wrong but by showing your working you may well pick up method marks. For example, even if you could not rearrange the formula, you could still gain a mark for measuring the length of the chloroplast accurately.

(ii) The equation below can be used to calculate the magnification of this chloroplast.

magnification = image length ÷ actual length

Use this equation to calculate the actual length of this chloroplast, between the lines labelled **W** and **Y**.

Show your working.

(3)

$\frac{\text{Image length}}{\text{magnification}} = \text{actual length}$

$\frac{0.076\text{m}}{7500} = 1.01 \times 10^{-5}\text{m}$

length of chloroplast = 1.0×10^{-5} m

ResultsPlus
Examiner Comments

We did not specify the units in this question, so accepted the answer in um, mm, cm or m. We would have preferred the answer to have been given in um or mm however.

ResultsPlus
Examiner Tip

The answer has not been written very clearly on the answer line and we had to look at the working to confirm that the answer had been given to the correct power value. Always check that numbers in particular are legible.

(ii) The equation below can be used to calculate the magnification of this chloroplast.

magnification = image length ÷ actual length

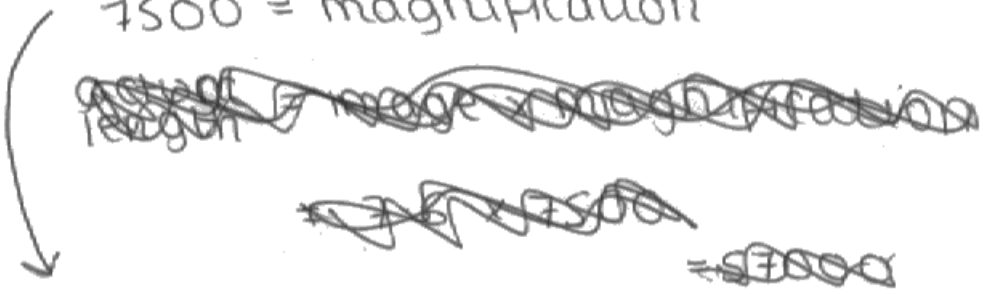
* Use this equation to calculate the actual length of this chloroplast, between the lines labelled **W** and **Y**.

Show your working.

(3)

7·6 = image

7500 = magnification



$\frac{7.6}{7500} = 0.001013$

length of chloroplast = 0.001013

ResultsPlus
Examiner Comments

If the question does not specify the units, then there is probably a mark for stating appropriate ones.

ResultsPlus
Examiner Tip

Whenever you are giving a value, units should be given. This is the case in a calculation such as this but also when you are giving a qualitative response in a describe or compare question on data.

Question 1 (b) (iii)

Some good responses were seen to this question, but there were a number of candidates who scored full marks by writing everything that they knew about photosynthesis.

(iii) Describe how the membranes inside the chloroplast are involved in photosynthesis.

(3)

The thylakoid membranes inside the chloroplast ~~are~~ is where the light-dependent reactions of photosynthesis take place, this includes non-cylic and cyclic photophosphorylation. The thylakoid membranes are fluid ~~flattened~~ filled and interconnect membranes which contain the photosynthetic pigments in the chlorophyll. PSI (700nm) and PSII (680nm) are used in non-cyclic photophosphorylation to produce ATP and reduce NADP. When a photon of light hits one of these photosystems, the electron inside the chlorophyll molecule is excited to a high enough energy level that it leaves the chlorophyll and is picked up by an electron acceptor, it is then passed down (electron transport chain) the ETC, from electron carriers to the next in a series of REDOX (reduced when gained, oxidised when lost) reactions to synthesise ATP and reduce NADP

(Total for Question 1 = 13 marks)

ResultsPlus
Examiner Comments

This candidate scored their three marks on the first five lines of the response. Far too much irrelevant detail has been put into this response.

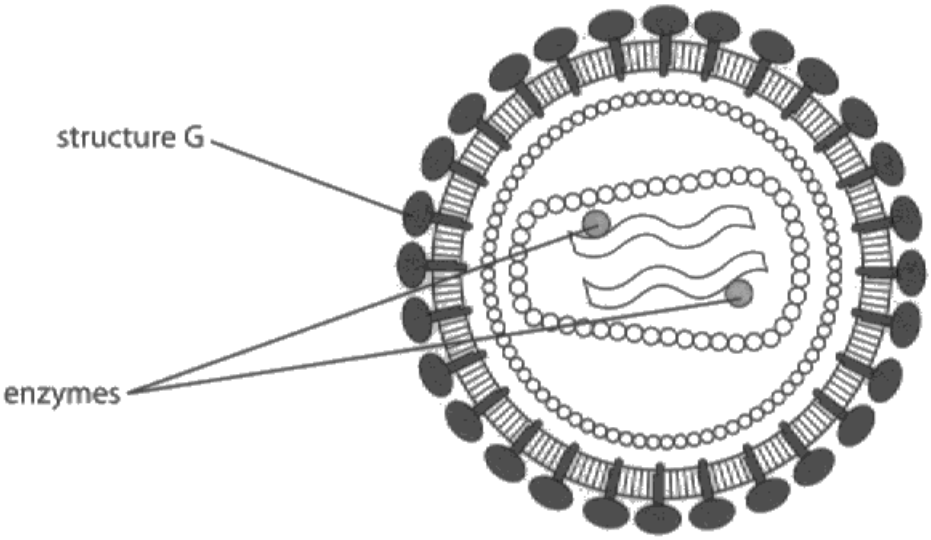
ResultsPlus
Examiner Tip

Read the question carefully and try to select the appropriate information for your answer. You should always try to write one or two more statements than the number of marks allocated to the question, but you can waste a lot of time by churning out everything that you know about a topic.

Question 2 (a)

Questions on HIV have been asked frequently in the past and candidates are familiar with our mark points. However, some candidates word spot and then write everything that they know without checking that they are actually answering the question.

The diagram below shows the structure of HIV.



(a) Explain how **structure G** enables HIV to infect human cells.

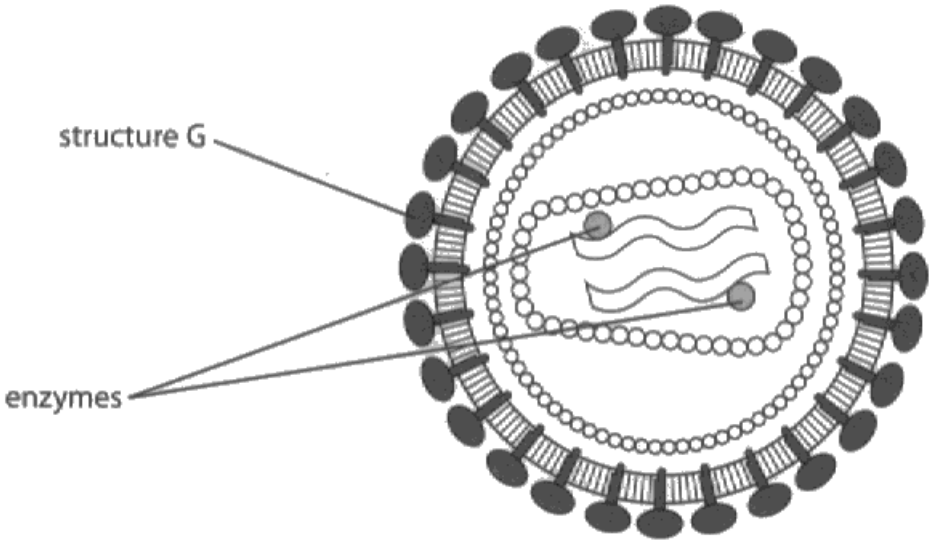
(3)

Structure G is a gp120 (glycoprotein) which binds to a CD4 receptor on a T helper cell. The HIV envelope fuses with the cell membrane on the T helper cell and the viral RNA enters the T helper cell.

ResultsPlus
Examiner Comments

This is an example of a clear response.

The diagram below shows the structure of HIV.



(a) Explain how **structure G** enables HIV to infect human cells.

(3)

Structure G, (GP~~41~~) is a binding site that allows the HIV to attatch itself onto a human cell. The GP~~41~~ binds to the ~~cell membrane and allows the two~~ binding sites on the cell membrane and allow the hydrophobic GP120 to enter the cell, and begin to pull the HIV closer by folding, eventually the 2 membranes fuse and the HIV enters the human cell.

ResultsPlus
Examiner Comments

This was a very muddled response but had the candidate been more specific and named the host cell and the receptor, i.e.T helper cell and CD4 antigen, marks would have been gained.

If the candidate had mentioned 'glycoprotein' we could have awarded mp 1 as we are ignoring a reference to gp41.We cannot award the reference to gp 120 further on as they are still not saying that this is structure G and entering the cell is after the attachment and is not its role in infection.

ResultsPlus
Examiner Tip

Try and be as specific as you can. You are expected to be able to name the host cell of HIV and the name of the binding site on the cell membrane.

Question 2 (b) (i)

This paper is supposed to have approximately 10-20% of its marks on AS topics; any of the topics can be tested. It is obvious that some candidates are either not aware of this or else have spent insufficient time preparing themselves for this.

(b) Some anti-viral drugs used to treat patients infected with HIV are inhibitors of enzymes found within HIV.

(i) Describe the structure of an enzyme.

(3)

An enzyme is a globular protein with a specifically - shaped three - dimensional structure. An enzyme has a specific shaped active site where one particular substrate can fit. The three-dimensional structure is determined by bonds between R groups and both the secondary and primary structure of the protein. It is determined by the sequence of amino acids in a polypeptide chain. Hydrophilic R groups lie on the outside of the protein and hydrophobic groups lie on the inside.

ResultsPlus
Examiner Comments

This is an example of one of the stronger responses seen, illustrating all three of our mark points. We saw the third mark point very infrequently, which was disappointing as it is always included on the 6BIO1 mark scheme for this question.

ResultsPlus
Examiner Tip

You must thoroughly revise all the AS content when preparing for this paper.

Question 2 (b) (ii)

Candidates know the role of reverse transcriptase and integrase very well. However many launched into an explanation of what the enzymes do without actually relating it to the question. In many cases candidates wasted a lot of time by explaining what the enzymes do and then moved onto answering the question but having to repeat everything again.

*(ii) Suggest how these anti-viral drugs would work in the treatment of patients infected with HIV.

(5)

Anti-viral drugs prevent reverse transcriptase from producing viral DNA from viral RNA, and integrase is inhibited ~~in prevent integ~~ integrated into hosts DNA and therefore viral mRNA cannot be ~~transcript~~ a transcript by translation ^ Therefore no viral proteins are produced ^ at the hosts ribosomes. Therefore no new virus particles are formed, and are not leaving the hosts cell, & and killing it as it leaves. T helper cell cancer levels do not decrease, and therefore the immune system isn't weakened.

ResultsPlus
Examiner Comments

This is an example of a nice clear response that scored all our mark points except the last one, as they shot themselves in the foot by stating that RNA incorporated into the host cell genome.

ResultsPlus
Examiner Tip

Always read through your response to make sure that you have not made a silly mistake due to rushing or exam nerves.

*(ii) Suggest how these anti-viral drugs would work in the treatment of patients infected with HIV.

(5)

These drugs could inhibit the ~~integrase~~ reverse transcriptase enzyme which would mean none of the HIV RNA could be converted into viral DNA, meaning the genetic material couldn't ~~be~~ be incorporated ~~into~~ A and inject more host cells. Inhibiting the integrase in HIV would also work as a treatment as the ~~host~~ t-helper cells DNA would not be able to be replaced with viral DNA from the HIV. This means that no viral proteins would be made to inject the rest of the cells in patients suffering from HIV.

ResultsPlus
Examiner Comments

Not such a clear response but it does illustrate a very frequent error that we saw. At the end of line two the candidate has stated that the RNA is *converted* into DNA. As this is biologically wrong we could not accept this for mark point 4.

Question 3 (a) (i)

Candidates clearly know this particular part of the specification very well; very detailed responses were seen of both PCR and gel electrophoresis. Weaker candidates tended to write lengthy accounts of PCR without a mention of gel electrophoresis.

*(i) Describe how a DNA profile was produced from this small sample of DNA.

(6)

DNA can be amplified by PCR.

~~The DNA is put~~

Primers are added to the DNA which bond to specific parts of the DNA, allowing the amplification process to only replicate a specific section of DNA.

The DNA is then heated to around 70°C so that the Hydrogen bonds joining the Double helix break.

DNA is then cooled to around 40°C and amplified.

This process is repeated multiple times and each cycle doubles the number of new strands

A DNA profile is made by Gel Electrophoresis.

The DNA is put on a charged gel, and because the DNA is slightly negatively charged, it moves along the gel at different rates depending on its weight. The smaller the strand, the further it travels

~~This can then be~~

ResultsPlus
Examiner Comments

A very good response.

*(i) Describe how a DNA profile was produced from this small sample of DNA.

(6)

A sample of DNA was collected, restriction enzymes wer used to select the section of DNA required, the DNA was amplified using a PCR reaction, primers, nucleotides & DNA polymerase and DNA wer used in the reaction. A series of reactions took place at 95°C → 60°C → 75°C. At 90-95°C hydrogen bonds between the DNA strands wer broken, at 60°C primers bonded to DNA and began to anneal, 75°C free nucleotides lined up against template strand and DNA polymerase synthesised them forming phosphodiester bonds between. DNA was amplified using several PCR cycles, A fluorescent tag or probe was added to the DNA sample and gel electrophoresis was carried out. DNA fragment were placed in well and buffer solution was placed are top, DNA fragments moved towards positive electrode, this caused the fragments to seperate out relative to size, smaller fragments moved towards positive electrode faster as they were smaller in size, DNA fragments are negatively charged. Removed & placed into bag with probe & viewed under UV light, this showed DNA bands. which were the seperated fragments.

ResultsPlus
Examiner Comments

This response scored 6 marks despite the QWC penalty for spelling. A spelling mistake only prevents the candidate from scoring one of the mark points (in this case mark point 5) so they can still achieve full marks.

ResultsPlus
Examiner Tip

In a QWC question, indicated by an * at the beginning of the question, always try to write at least one more point than there are marks.

Question 3 (a) (ii)

In this question many candidates simply stated that the bands should be compared, without specifying the actual comparisons that could be made; three marks are not going to be awarded for one point. The weaker candidates did not actually state what was being compared i.e. the bands.

(ii) Suggest how these DNA profiles were compared.

(3)

you would compare the positions of the bands of each profile. The Bands in the same position indicate the same DNA, and the bands in Different positions indicates different DNA. Southern blotting using DNA probes and X ray light allows you to visualise them.

ResultsPlus
Examiner Comments

This is a typical response.

ResultsPlus
Examiner Tip

Use the mark allocation to help you decide how much you need to write. A suggest question like this with three marks needs three suggestions.

Question 3 (b)

This question caused very little problem to candidates except the weaker ones, who clearly thought that a reference to peer review was actually a method of sharing data as opposed to being a reliability check.

(b) Scientists in different parts of the USA are investigating the possibility that the difference in cell size is responsible for the different mating calls. This is contributing to an understanding of the evolution of grey tree frogs.

Suggest **two** ways in which the results of their investigations can be shared.

(2)

by publishing their investigation in journal or magazine articles

Or even making documentaries for television

ResultsPlus
Examiner Comments

This lack of clarity was not uncommon. A journal is not the same as a scientific journal, and is therefore not sufficiently different enough from a magazine to be credited two marks.

Question 4 (a)

We were pleased that the majority of candidates tried to answer both parts of this question, writing about both phagocytosis and lysozyme action. The weaker candidates tended to refer to phagocytosis without extending their answer to describe the process. A number of candidates confused lysozyme with lysosomes. Many candidates wrote about where lysozyme could be found which does not answer the question, again illustrating how some just churn out everything that they know on a topic without considering the question asked.

(a) Explain how phagocytosis and lysozyme action lead to antigen presentation by macrophages.
(4)

During phagocytosis the bacteria or pathogen, with surface antigens is first engulfed by macrophages. The macrophages then expose protein fragments of the bacteria on its cell surface membrane; it is an antigen presenting cell (APC).

Lysozyme works by destroying the cell walls of pathogens and bacteria, hence the bacteria is killed and destroyed. The cell contents is released during cell lysis ~~and the ones~~.

Pathogens with surface antigens can be ~~engulfed~~ engulfed by macrophages and enclosed in a vacuole. Digestive enzyme sacs containing lysozyme can fuse with the vacuole and release the lysozyme into the vacuole. The bacteria is destroyed and antigens are presented on the surface of cells as APC.

ResultsPlus
Examiner Comments

This response managed to just score four marks for their answer. Just a reference to *engulf* was a sufficient description of phagocytosis for mark point 1. For mark point 3 it was needed a bit more than "the bacteria was destroyed", but this candidate has demonstrated some knowledge of lysozyme action on the cell wall. Mark point 2 is also there.

ResultsPlus
Examiner Tip

If there are two parts to a question, then you must write about both parts if you want to access full marks. In this response you had to write about both phagocytosis and lysozyme action.

Question 4 (b)

The most common of our three possible mark points were 1 and 3, with only a few candidates knowing that the MHC on the macrophage is involved. The weaker candidates tended not to specifically name the receptor on the T helper cell.

(b) Explain how macrophages present antigens to T helper cells.

(2)

The macrophage holds the antigen on its surface and a CD4 receptor on a T helper cell binds to it.

ResultsPlus
Examiner Comments

This was a typical response, giving mark points 1 and 3.

(b) Explain how macrophages present antigens to T helper cells.

(2)

The macrophage becomes an APC, T helper cells with the complementary receptor bind the to the APC.
APC/MHC complex formed.
T helper cells activate T-killer cells, and B cells.
B cells produces plasma cells.

ResultsPlus
Examiner Comments

This candidate has tried to make a reference to MHC but unfortunately what they have written is not actually correct, so mark point 2 cannot be awarded. Answers have to be in the correct context to gain marks.

Question 4 (c)

This part of the spec has not really been tested before but there were plenty of mark points available for this three mark question. It was clear that candidates had either been taught / learnt it or knew nothing about it.

Suggest how this could affect antigen presentation to T helper cells.
Give an explanation for your answer.

(3)

If TB becomes adapted against the enzymes* in phagocytes it will not be destroyed meaning the antigens then can't be presented on the outside of the macrophage. The bacteria could also evolve against the phagocytes so they are unable to engulf the bacteria, which would also prevent antigen presentation

*if a mutation occured the lysozymes may no longer be substrate specific and therefore cannot bind in order to destroy the bacteria.

ResultsPlus
Examiner Comments

This is an example of one of the stronger responses that we saw.

Suggest how this could affect antigen presentation to T helper cells.
Give an explanation for your answer.

(3)

TB may undergo a beneficial mutation that alters its antigens. This would mean the T-helper cells would no longer recognise the antigens in order to bind to them. Additionally they could develop slime coats, making it harder for the macrophages to engulf them in order to become antigen presenting cells so the T-helper cells would have nothing to bind to.

ResultsPlus
Examiner Comments

This response illustrates some of our other mark points. Unfortunately there is no reference to *memory* cells for mark point 3.

Question 5 (a) (ii)

Although we did see some very good answers, many candidates just word-spotted *global warming* and launched into very detailed description, straight from previous mark scheme accounts of how global warming is caused. These responses could score some of mark points but could not access full marks.

(ii) Suggest why using first generation biofuels instead of petrol and diesel could reduce global warming.

(3)

Biofuels are carbon neutral, meaning there is no net release of ~~greer~~ CO_2, a greenhouse gas which contributes to the greenhouse effect and global warming by trapping infra red light as it reflects from the Earth's surface. As crops for biofuels grow, they fix carbon during photosynthesis. Only this carbon is released on burning the biofuels, no extra, so no extra CO_2 in our atmosphere. Remove CO_2 as they grow.

ResultsPlus
Examiner Comments

This is an example of one of the excellent responses seen.

ResultsPlus
Examiner Tip

Read the whole question very carefully - do not spot one scientific word and launch into your response.

Question 5 (b) (i)

This caused few problems except to those candidates who thought that a *cell* or a *cell wall* is part of a plant stem.

Question 5 (b) (ii)

This question was disappointingly not very mark yielding. Many responses lacked specific 6BIO1 knowledge, reinforcing our impression that candidates are insufficiently prepared for the synoptic element of this paper. There were a number of candidates that think bacteria cannot produce cellulase.

(ii) Suggest why cellulose has to be treated with enzymes before the bacteria can use it as an energy source.

(2)

Cellulose is a long chain, non-soluble, unreactive polymer. It can only be used by bacteria for respiration when it is broken down into its monomers of B-Glucose by enzymes which would hydrolyse the 1-4 glycosidic bonds holding the monomers together.

ResultsPlus
Examiner Comments

This is one of the better responses seen.

ResultsPlus
Examiner Tip

Learn the AS topics thoroughly and put very specific detail into your answers, especially naming particular monomers and bonds present in the polymers.

(ii) Suggest why cellulose has to be treated with enzymes before the bacteria can use it as an energy source.

(2)

This is because bacteria ~~do~~ cannot breaks down the polymer, own its own due to lack of enzymes that can break down polymers. Therefore after breaks the polymers by enzyme, the bacteria can use it as an energy source.

ResultsPlus
Examiner Comments

This response illustrates how some responses can lack specific detail, drawing from the AS topics.

Question 5 (c)

This question really separated the good students from the weak ones. The weaker students described the two sets of data only whereas the more able candidates offered (good) reasons for the changes. The advantages of using second generation biofuels are clearly known.

Using the information in the graph, describe the expected changes in the production of first generation and second generation biofuels. Suggest reasons for these changes.

(4)

The production of second generation biofuels will increase from 10 - 29 in 3 years, whereas 1st generation will increase as is until 2016 and then the production will plateau.

This is because second generation biofuels use non-food parts of plants, therefore, are production is more sustainable as it doesn't affect food supply.

~~and the~~

ResultsPlus
Examiner Comments

A good response where both a description and some reasons have been given.

Using the information in the graph, describe the expected changes in the production of first generation and second generation biofuels. Suggest reasons for these changes.

(4)

Both first and second generation biofuels are expected to increase in production between 2014 and 2016, however second generation will increase further. A reason for the increase in first generation could be that people have been educated on ~~green~~ global warming and second generation; food is in short supply in some parts of the world- will be less expensive. After 2016, 1st generation remains steady and second generation increases continually.

~~Second generation~~ ~~[illegible]~~ ~~further~~ **(Total for Question 5 = 11 marks)**

ResultsPlus
Examiner Comments

Another example of where both parts of the question have been addressed.

ResultsPlus
Examiner Tip

If there are two parts to a question you must address both parts if you want to access full marks. In this case, just a description is not enough as the question asks you to give reasons as well.

Question 6 (a)

Examining succession in the context of a retreating glacier did not throw candidates; we saw some very good descriptions and explanations of the changes in distribution of organisms. It was also good to see candidates giving their answers in the context of the question, which has not always been the case in the past.

(a) Using the information in the diagram, describe and explain the changes in the distribution of organisms with distance from the front edge of this glacier.

(3)

Close to the glacier front there are few organisms, if any. As you move further from the glacier there are more complex/higher organisms & by the last section there is high biodiversity. The reasons for this are due to primary succession. As the rock is first exposed it is inhabitable to many organisms apart from a few pioneer species. The algae & lichens are pioneer species that have managed to colonise the rock. As they live & die they break up the rock & deposit organic matter, which allows more species to colonise such as the mosses, & later grasses. Each stage can be described as a 'sere'. Each sere changes the abiotic conditions, which allows more organisms to establish - eventually reaching larger plants such as shrubs & trees & animals, a climax community that is stable enough to support many organisms. The earlier species are outcompeted, however.

ResultsPlus
Examiner Comments

This is an example of a really good response, illustrating all our mark points.

ResultsPlus
Examiner Tip

Always write your answer in the context of the question.

Question 6 (b) (i)

Again, it was encouraging to see answers being given in the context of the question. One or two odd statements were seen about the role of the *Epilobium* as a predator! Some candidates do not appreciate that the term *prey* refers to an animal and not a plant.

(i) Explain what is meant by the term **niche**, using the plant *Epilobium latifolium* as an example.

(3)

Niche is the role a species plays within it's habitat. For the Epilobium latifolium this is likely to be as a producer to ~~them~~ any other ~~speccy~~ species that as plants are ~~beep~~ autotrophic and can give energy to the next trophic level. It could also form as a mini habitat for smaller insects within the larger ~~e~~ habitat.

ResultsPlus
Examiner Comments

An example of a good response, illustrating four of our five mark points.

(i) Explain what is meant by the term **niche**, using the plant *Epilobium latifolium* as an example.

(3)

niche is a role of an organism within its environment, the plant Epilobium latifoliums ~~s~~ role is to be a producer and synthesise its own food, it is also the prey/ ~~of many~~ food of many consumers, its role is also ~~is als~~ to make the environment less hostile ~~s~~ for other species to survive in.

ResultsPlus
Examiner Comments

The first two mark points are given, but poor use of terminology has prevented anything else from being awarded.

ResultsPlus
Examiner Tip

Always check that any scientific terms that you have used are appropriate. In this example *prey* is not a suitable term to be using to describe a plant.

Question 6 (b) (ii)

Again, having a different context to assess a spec point did not phase candidates and all responses seen were in the context of the glacier. There were a few candidates who phrased their descriptions poorly and did their sampling on the glacier itself and there was some confusion between transects and quadrats and whether the sampling should be random or systematic. Few candidates scored the fifth mark point as they did not make it clear enough that another transect would have to be used to repeat the investigation.

(ii) Describe how to carry out a study of the distribution of *Epilobium latifolium* from the front edge of this glacier.

(4)

A belt transect could be used with point quadrats perpendicular to the line every 2m. Pins are dropped through the wooden frame. Every time a pin touches epilobium latifolium, it is counted. Percentage cover at each 2m interval is calculated as number of pins touching the species divided by number of pins dropped times by 100.

ResultsPlus
Examiner Comments

A clear response achieving mark points 1, 2, 3 and 4.

(ii) Describe how to carry out a study of the distribution of *Epilobium latifolium* from the front edge of this glacier.

(4)

A transect could be used, where a line or measuring tape is set up from the glacier and about 40 metres onto the rock. At intervals of 1 metre (systematic sampling), a 50cm × 50cm quadrat will be placed down, and the percentage cover of E. latifolium can be estimated. This is carried out along the whole transect, and can be repeated several times.

ResultsPlus
Examiner Comments

A clear response for the first four marks. This does illustrate how a lack of clarity can cost marks, in this case mark point 5.

ResultsPlus
Examiner Tip

In questions where you are asked to describe a practical procedure there is usually a mark for repeating something. However you do need to state clearly what is being repeated.

Question 6 (b) (iii)

The majority of candidates could name a relevant abiotic factor and the piece of equipment used to measure it. Relatively few read the question and used the mark allocation to describe how to measure it and those candidates who did attempt to do this were usually too vague.

(iii) Suggest **one** abiotic factor that might affect the abundance of *Epilobium latifolium* and describe how this factor could be measured.

(3)

[illegible] pH of the soil/ground. [illegible] Take a sample of the soil and mix it with water to create a solution, then check the pH using a pH probe. pH could affect the growth of the plant. You could take several measurements to create an average and repeat at different points along the glacier.

ResultsPlus
Examiner Comments

This candidate did address all parts of the question and used the mark allocation to gain the three marks.

ResultsPlus
Examiner Tip

Read the question carefully to ensure that you answer all component parts. Also use the mark allocation to help you write as many relevant statements as there are marks available.

Question 7 (a) (i)

This question did not cause problems to the few candidates that read the question carefully and wrote two relevant points. Too many candidates either described the changes over the whole of the 100 day period or else compared the antibody level for A with that for B over the whole period.

(a) (i) For antibody A, compare the increase in mean level after the vaccination with the increase in mean level after infection with *Bordetella pertussis*.

(2)

The mean level of antibody A increases both after vaccination and after injection with Bordetella pertussis. However, the increase is quicker and greater after injection with B. pertussis than after vaccination. The increase after injection is 1.83 (35.5) times as great as the increase after vaccination (almost double).

ResultsPlus
Examiner Comments

A good example where the candidate has written two qualitative comparisons and then quantified one of them.

ResultsPlus
Examiner Tip

When either describing data or making a comparison between two sets of data, always quantify one of your statements with a calculation. The calculation does not have to be complicated, just accurate and with units.

(a) (i) For antibody A, compare the increase in mean level after the vaccination with the increase in mean level after infection with *Bordetella pertussis*.

(2)

- After vaccinating there was a small increase, by 12 units which started after 2 days and peaked (3 days later. The increase in the number of antibodies after infection was greater (10 units), as was the rate of antibody production in antibody A
- The increase also began without delay after infection but there was a 2 day delay after vaccination before the increase.

ResultsPlus
Examiner Comments

Another example where two comparisons are made backed up with a calculation.

(a) (i) For antibody A, compare the increase in mean level after the vaccination with the increase in mean level after infection with *Bordetella pertussis*.

(2)

After vaccination, there was delay of approx 5 days before an increase in antibody A from 0 - 12 au. ~~After~~ 14 days after vaccination, the levels dropped to around 3 au and remained constant until the injection. Then levels of antibody A immediately increased to 25 au. At day 72, levels decreased again but remained at 5 au, a higher level than after vaccination.

ResultsPlus
Examiner Comments

A weaker response that really answers the question: describe the changes in levels of antibody ..... We do not piece together the comparisons from two descriptions at this level.

ResultsPlus
Examiner Tip

If the command word is *compare* then do not write two descriptions. Write each sentence with two parts, one part about one of the things you are comparing and the other part about the other thing you are comparing.

Question 7 (a) (ii)

This question did cause difficulties to many of the candidates. Most identified that memory cells were missing but could not go on to say much more. Few appreciated what memory cells actually do in the secondary response.

(ii) Explain the changes in mean level of antibody A after infection with *Bordetella pertussis*.

(3)

The immune System recognises the antigen on bacterium Bordetella as foreign. ~~B cells present these antigens on it's surface~~, B memory Cells produced by the primary infection, will differentiate into plasma cells. These plasma cells Secrete antibodies with a Complementary receptor to Bordetella pertussis Specific antigen. The reason why the antigen production is greater and quicker is because it is secondary immune response.

ResultsPlus
Examiner Comments

This response illustrates our mark scheme nicely

ResultsPlus
Examiner Tip

Only plasma cells produce antibody.

Question 7 (b) (i)

This was another question that caused problems. Many candidates thought that the virus had mutated but then did not point out that the antigens would have been missing from the vaccine.

Question 7 (c)

There were a lot of mark points available for this question, but few scored all three marks. Many candidates did not use the mark allocation to help them work out how much to write. Lots of candidates wrote that the investigation was performed on rats and therefore not applicable to humans.

(c) Comment on the reliability of the data shown in the graph.

(3)

The data is not very reliable as no information about the sample size is given. ~~No~~ no repeats are carried out. Also, no other factors that can affect the level of ~~antibiotic~~ antibodies is considered.

ResultsPlus
Examiner Comments

An illustration of mark points 2 and 6

(c) Comment on the reliability of the data shown in the graph.

(3)

The dependent variable is a mean indicating several readings were taken and averaged, increasing reliability. Control variables are not mentioned, and the subjects are rats so this info cannot be applied to humans. Data is reliable. 2 different antibodies tested at regular intervals.

ResultsPlus
Examiner Comments

Mark points 7 and 6

ResultsPlus
Examiner Tip

If there are three marks available, three points have to be made.

Question 8 (b) (iii)

The responses to this question were disappointing. Although this is a slightly different context for testing the spec point relating to decomposition, the stem of the question makes a clear reference to decomposition.

(iii) Explain why there is a decrease in mass of the leaves.

(4)

Because the leaves (cellulose) are broked down (cellulase) by enzymes releasing by bacteria. leaves are broken down to cellulose, protein and lipids, which then broken down to glucose molecules and amino acids. These organic molecules are absobed by bacteia. Bacteia use this organic molecules to respire, producing carbon dioxide if Aerobic Conditia, producing methane if anaerobic conditia. Some of the organic molecules are lost to the surrounding area.

ResultsPlus
Examiner Comments

This is the quality of response that we had been hoping for; a nice clear account with specific scientific terms and names of molecules correctly given.

(iii) Explain why there is a decrease in mass of the leaves.

(4)

there is a decrease due to microorganisms such as bacteria & fungi that decompose dead organic matter (leaves). As the microorganisms ingest the leaves, the mass of the leaves decrease. It may also have decomposed into the soil & recycled carbon back into the environment through respiration by microorganisms.

ResultsPlus
Examiner Comments

This is more typical of the responses that we got from candidates who identified that they should be writing about decomposition but could not do so in sufficient detail. They nearly hit a number of our mark points but just not quite.

ResultsPlus
Examiner Tip

Always look carefully at the stem of the question to get clues as to which topics the question is testing. Where relevant, use scientific terminology and give the names of molecules.

Question 8 (b) (iv)

This last question left many candidates finishing on a high; they know how temperature affects enzyme activity and can write very detailed accounts using 6BIO1 knowledge.

(iv) Suggest what effect an increase in temperature would have on the rate of decomposition of these leaves. Give an explanation for your answer.

(4)

- When you increase the temperature the rate of ~~photosynthesis~~ decomposition increases
- Because enzyme activity in the micro-organisms and metabolic processes in the ~~pathogen~~ micro-organisms ~~increases~~ increases.
- The enzymes and substrates gain kinetic energy and ~~start~~ / the frequency of successful collisions increases
- The number of enzyme-substrate complexes ~~form~~ forming increases
- But this only happens ~~to~~ till the optimum temperature is reached.
- Above the ~~optimum~~ optimum temperature, the bonds in 3-D structure of the enzyme breaks, the enzyme is denatured
- The enzyme and substrate are no longer complimentary
- The rate of decomposition ~~starts~~ starts to decrease

ResultsPlus
Examiner Comments

One of the excellent responses that we saw to this question.

ResultsPlus
Examiner Tip

This is a very clear response. The use of bullet points has helped make the response clear for the marker and has also helped the candidate judge the number of relevant points made.

Bullet points are fine provided there is enough information to give context to the answer. Single words are not sufficient.

Paper Summary

Candidates have a good knowledge of photosynthesis (question 1), PCR (question3, part a), role of macrophages in the non-specific response and the immune response (question 4), succession and niche (question 6, parts a and bi). As expected, the question on immunology caused candidates the most problem but the majority of candidates made attempts to answer all question parts.

Based on their performance on this paper, candidates are offered the following advice:

- the stem of the question should be read through carefully to (i) identify which topics are being tested and (ii) to acquire the information needed to answer the question in its context
- the mark allocation for each question should be noted to work out how many points are needed to access full marks
- the number of command words / component parts in a question should be identified so that responses answer the whole question to access full marks
- how science works terms need to be learnt thoroughly and used in the correct context
- the AS content needs to be just as familiar as the 6BIO4 content
- immunology spec points need focussing on more.

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