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Examiners' Report
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GCE Biology SNAB 9BN0 01

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Introduction

This paper tested the knowledge and understanding of topics 1 to 6. The range of questions provided plenty of opportunity for candidates to demonstrate their grasp of these topics and their ability to process biological information in familiar and unfamiliar contexts.

On the whole, candidates coped well with this paper, finding most of the questions accessible; indeed, there were few examples of questions not being attempted at all, with all questions achieving the full spread of marks. Many candidates produced clear answers, set out in a logical style and using key biological terms appropriately.

Candidates generally demonstrated the ability to integrate and understand data provided to them. However, many struggled to bring in their biological knowledge to provide explanations. Many candidates struggled to describe or explain basic biological concepts, especially those from topics that might have been taught early in the course.

Some candidates let themselves down by not reading the questions carefully enough, or by providing a response without the detail required at this level. Lack of clarity of expression was also a problem for a number of candidates. Poor hand writing and language skills were evident in a significant minority of scripts and these can make assessment of biological understanding difficult.

Question 1 (b) (i)

Many candidates could provide a reasonable description of the role of LDL in the development of atherosclerosis.
Many candidates gained all three marks. Marking point three was the most frequently missed. Candidates frequently referred to endothelium without linking it to the artery and did not gain the mark. Some candidates did not link LDLs to cholesterol and if they did they made no mention of this being in the blood and therefore did not gain marking point 1.

(b) It has been suggested that magnesium ions are involved in regulating the ratio of HDL to LDL in the blood.

(i) Describe the role of LDLs in the development of atherosclerosis.

(3)

LDL's transport cholesterol from the liver to the blood where it circulates and binds to specific cell surface receptors. Accumulation of cholesterol at a damaged site in the endothelium layer of an artery leads to the formation of fatty streaks. Over time continuous accumulation forms a hard fibrous plaque (atheroma) that increases the risk of thrombosis and a heart attack or stroke.

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Examiner Comments

This response demonstrates good understanding of the biology and is clearly expressed. All three available marks awarded.

ResultsPlus
Examiner Tip

Don't take short cuts. To get a mark, candidates had refer to the endothelium layer of the artery. Just using the term 'endothelium' or 'endothelium of blood vessels' was not sufficiently clear.

(b) It has been suggested that magnesium ions are involved in regulating the ratio of HDL to LDL in the blood.

(i) Describe the role of LDLs in the development of atherosclerosis.

(3)

Low density lipids are more likely to stick to the walls (lumen) of the blood vessels. As this builds over time, it narrows the ~~low~~ lumen and so increases blood pressure as plaque forms, further trapping more LDL.

ResultsPlus
Examiner Comments

In this response the candidate has not provided the detail required to gain more than one mark. LDL has not been linked to cholesterol in the blood (MP1), 'walls of blood vessels' was not accepted for endothelial lining of arteries and the candidate was not describing cholesterol deposition (MP2). There was just enough of the idea of atheroma/plaques forming to award MP3.

ResultsPlus
Examiner Tip

Learn enough biology to ensure you can provide appropriate detail in your answers.

Question 1 (b) (ii)

This question was about atherosclerosis and damage to heart muscle. Candidates needed to answer in this context. Many candidates did not gain MP1 because they simply described arteries and not coronary arteries. Marking point 2 had to be in the context of heart muscle or cells. Candidates made simple statements such as 'less oxygen reached the heart' and did not gain this marking point.
On this occasion we accepted statements such as 'arteries narrow'. However, this is only because they are part of a more substatial answer. We would prefer responses that are clearly describing a smaller or narrower lumen. Candidates should be making it clear that it is the lumen of the arteries that is reduced.
For marking point 3 candidates needed to be clear about the effect on either aerobic or anaerobic respiration. Responses such as 'heart muscle cannot respire' did not gain this mark.

(ii) Explain how atherosclerosis can result in damage to heart muscle.

(3)

- In atherosclerosis build up of atheroma and plaque leads to narrowing of lumen. (and this further raises blood pressure)
- Narrow lumen increases the risk of the artery becoming blocked.
- If this happens in the coronary arteries which provide blood to the heart muscle: Blood flow will stop so oxygen supply to heart muscle stops which will lead to death of heart muscle cells as they cannot aerobically respire.

ResultsPlus
Examiner Comments

Lines 1 to 4 lacked sufficient detail and gained no credit.

Lines 5 to 8 allow all three available marks to be awarded.

ResultsPlus
Examiner Tip

Save yourself time by thinking carefully about your answer before you start writing.

(ii) Explain how atherosclerosis can result in damage to heart muscle.

(3)

Atheromas decrease the area of the lumen and reduces the elasticity of the artery wall. This therefore reduces the volume of blood that returns to the heart, and ~~reduces~~ causes the heart muscle tissue to be starved of oxygen, causing cells to die.

ResultsPlus
Examiner Comments

In this response the candidate gained one mark. The first sentence describes a decrease in the lumen of the artery. However, it does not make it clear this is the coronary artery so MP1 was not awarded. Line three 'reduces the volume of blood that arrives to the heart' would not gain MP2. However, the candidate then states 'and causes heart muscle tissue to be starved of oxygen'; having now mentioned heart muscle, MP2 can be awarded.

ResultsPlus
Examiner Tip

When describing processes make sure your description is not ambiguous. Terms such as 'heart', 'heart muscle' and 'heart cells' are not always interchangeable.

Question 2 (a) (i)

Most candidates could interpret the graph and provide the correct answer.

Question 2 (a) (ii)

Two marks were available. Both marks were given if the candidate completed the calculation correctly. If the final answer was incorrect then a working mark was available for taking the correct measurements from the graph. This mark was for either two correct measurements from the graph or use of the correct calculation using incorrect measurements.
Unfortunately, most candidates do not lay out calculations clearly. This can make it difficult to award a working mark.

(ii) Determine the fastest rate of growth of a blowfly maggot at a temperature of 19 °C.

Give your answer to 2 significant figures.

(2)

60 hrs → 6.9 or 7
90 hrs → 12

$\frac{5}{30} = \frac{1}{6}$ mm hour^{-1}

0.16 mm hour^{-1}

ResultsPlus
Examiner Comments

Giving a final answer as 0.16 recurring is not giving the answer to 2 significant figures.
One mark was awarded for correct working.

(ii) Determine the fastest rate of growth of a blowfly maggot at a temperature of 19 °C.

Give your answer to 2 significant figures.

(2)

90 - 60 = 30 hrs

12 − 6.8 = 5.2 m

$\frac{30}{5.2}$ $\frac{5.2}{30} = 0.17$

0.2

0.2 mm hour^{-1}

ResultsPlus
Examiner Comments

The candidate has not rounded to two significant figures so cannot be awarded both marks. However, they did obtain the correct values to use from the graph. These could be seen by the examiner and one mark was awarded.

ResultsPlus
Examiner Tip

Show clearly laid-out working for all calculations.

Make sure you read questions carefully and learn to use your mathematics skills appropriately.

Question 2 (a) (iii)

Many candidates ignored the fact that the question required an explanation and gave a detailed description of the results, often then adding on at the end an attempt at an explanation.

Candidate responses often lacked the detail required. Increased energy - rather than increased kinetic energy (MP2) and more collisions rather than more frequent collisions between the enzymes and substrate molecules (MP3).

This question was about explaining the effect of temperature on growth of an organism. Many candidates ignored the instruction to explain and gave a detailed description. Unfortunately, this resulted in no mark being awarded. Many candidates started with a detailed description and then provided an explanation at the end - wasting time and often running out of space.

Candidates who understood the question generally gained all three marks.

(iii) Explain the effect of temperature on the rate of growth of blowfly maggots.

(3)

An increase in temperature, increases the rate of growth of blowfly maggots.
An increase in temperature increases the rate of enzyme controlled reactions (eg. respiration).
If the maggots have a higher rate of respiration, they can obtain energy* at a higher rate which can be used in growth of the maggots.

* (in the form of ATP)

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Examiner Comments

In this response, the candidate has recognised the general idea that temperature affects enzyme controlled processes. (MP1). However, they have not attempted to explain why this is the case (MP2 and 3), so only one mark was awarded.

(iii) Explain the effect of temperature on the rate of growth of blowfly maggots.

(3)

As temperature increases so does the rate of blowfly maggot growth. This is because at higher temperatures enzymes and substrates have more kinetic energy so more likely to ~~edit~~ collide forming enzyme substrate complexes increasing rate of metabolism so more energy is available for growth so they grow faster.

ResultsPlus
Examiner Comments

A good response in which the candidate clearly explains the effect of temperature on growth of maggots. All the marks awarded.

(iii) Explain the effect of temperature on the rate of growth of blowfly maggots.

(3)

As the temperature increases so does the rate of growth of blowfly maggots. Blowfly maggots grow quickest at 23°c. according to the graph whereas at 4°c they grow the slowest. For example at 30 mins, the mean length at 4°c was at 2 mm whereas at 23°c the mean length was 6·4 mm an increase of 4·4 mm

ResultsPlus
Examiner Comments

In this response the candidate has ignored the command word in the question. Instead of explain the candidate has described the effect of temperature. Unfortunately, this gains no marks.

ResultsPlus
Examiner Tip

Read questions carefully - pay particular attention to command words.

Question 2 (b)

Many candidates found this question straightforward and could describe the role of decomposers in the carbon cycle.
For the first marking point candidates had to convey the idea of organic material being broken down. Use of phrases such as ingest or feed on organic matter were ignored.
For marking point 2 respiration did not need to be qualified as aerobic or anaerobic. However, for marking point 3 release of methane was only accepted in the context of the anaerobic respiration.

(b) Microorganisms are also found on a dead body.

Describe the role of decomposers, such as microorganisms, in the carbon cycle.

(2)

Decomposers, such as microorganisms, break down tissue in the dead body, and these microorganisms respire aerobically, releasing CO_2 gas in the atmosphere. These microorganisms therefore return the carbon stored in the tissues of the dead body back to the atmosphere as CO_2.

ResultsPlus
Examiner Comments

This response gained two of the available marks. Clear reference to respiration and the release of carbon dioxide into the atmosphere gains MP2 and 3. The start of the response was not sufficiently clear for MP1. To gain MP1 candidates need to make it clear that organic material was being broken down. Breaking down tissues does not necessarily mean that organic molecules are being broken down.

(b) Microorganisms are also found on a dead body.

Describe the role of decomposers, such as microorganisms, in the carbon cycle.

(2)

Decomposers (such as microorganisms) will contribute to the carbon cycle as when they decompose they release ~~xxxxxx~~ carbon dioxide (CO_2) which can therefore be used for respiration in the carbon cycle.

ResultsPlus
Examiner Comments

This response gained marking point 3 for the idea of release of carbon dioxide. Marking point 2 was not awarded as carbon dioxide is produced by, and not used in, respiration.

ResultsPlus
Examiner Tip

Read your answers and check they express your understanding accurately.

Question 3 (b)

Generally, well answered. Many candidates giving a complete explanation. Lack of sufficient detail often resulted in one or more marks not being awarded. For MP2 it had to be clear that it was arterioles that were being dilated not arteries, capillaries or blood vessels in general. Similarly, for MP4 it needed to be increased permeability of capillaries and in MP5 it had to be plasma and not cells leaving the capillaries.

(b) Inflammation is a non-specific response to an infection.

Explain how changes in the blood vessels result in the redness and swelling seen at the site of inflammation.

(4)

Once a clot has formed, dead white blood cells and mast cells secrete histamines which cause arterioles to dilate allowing more blood to flow through to capillaries. Histamine also makes capillary walls more permeable so when they swell they leak antibodies, plasma fluid and white blood cells into the tissue fluid and this causes a swelling called oedema. The redness is the dilated capillary.

ResultsPlus
Examiner Comments

A clear response that gained a maximum of 4 marks - all five marking points were seen.

(b) Inflammation is a non-specific response to an infection.

Explain how changes in the blood vessels result in the redness and swelling seen at the site of inflammation.

(4)

Blood vessels dialate and expand, allowing more blood to flow within area of infection. The redness is due to more redblood cells in the area carried by ~~plasma~~ blood flow, there will also be greater numbers of white blood cells to kill pathogens in infected area. Swelling is also known as edema, where there will be ~~greater~~ lymphocytes from lymphatic nodes, through fluid lymphatic capillaries and diffuse into blood vesseles to target and kill pathogen, causing swelling at site.

ResultsPlus
Examiner Comments

Marking point 2 was not awarded as the candidate has not identified the arterioles as the vessel dilating. Marking point 3 was awarded. The candidate has provided much irrelevant detail about white blood cell migration and then towards the end of the response mentions oedema. However, it not clear that capillaries are becoming more permeable or that blood plasma is leaving the capillaries. This means MP4 and 5 could not be awarded.

ResultsPlus
Examiner Tip

Make sure you use terms appropriate to the context of your answer. Instead of 'blood vessels dilate' in the context of this question use 'arterioles dilate'.

Question 3 (c) (i)

Many candidates gained the first mark for correctly identifying the correlation between interferon dose and survival time. Many then went on to link this to the ability of interferon to inhibit viral replication or to infect cells. Few candidates then went on to the bigger picture to link the effects of interferon to fewer viral particles and therefore reduced spread of the virus. Many descriptions were seen of 'viral cells', 'toxin production by viruses' and 'interferon binding to viruses'. It is difficult to judge if they are misconceptions but many candidates did seem to be unsure of the difference between viruses and bacteria and of the way in which interferons work.

Explain these results.

(3)

- The greater the dose of interferon received, the longer the median survival time
- Initially the dose of interferon is only enough to stop a few viruses from replicating, so the number of influenza viruses still increases as new cells are rapidly infected (minimal effect on median survival time).
- At higher doses, the median survival time is much longer as interferon inhibits influenza virus replicating by stopping protein synthesis, so the body cells of the mice are infected at a much slower rate and the number of influenza viruses increases much more slowly.

ResultsPlus
Examiner Comments

In this response the candidate has clearly expressed all three marking points.

Explain these results.

(3)

The mice that recieved a longer dose of interferon survived for longer. Interferon binds to a pathogen preventing it from interacting with cells and producing harmful toxins. So more interferon leads to less toxins from the pathogen.

ResultsPlus
Examiner Comments

In this response the candidate gains the first mark for recognising the relationship between interferon dose and survival of the mice. However, the candidate then fails to explain this effect.

ResultsPlus
Examiner Tip

Read questions carefully. This question is about the effect of interferon on a viral infection, not a bacterial infection.

Question 3 (c) (ii)

Many candidates used the data provided to suggest the lack of activity was due to incorrect folding or lack of glycosylation. Some then went on to explain this was due to the absence of rER and Golgi apparatus.
Some candidates however, suggested different genetic code in bacteria compared to animal cells or bacteria not having glycosylated proteins. Many candidates appear to believe that the carbohydrates attached to proteins are glycogen.

Explain why the interferon made by genetically modified bacteria is different from the interferon made by animal cells.

(2)

In animal cells the protein is folded, processed and has a prosthetic group added in the endoplasmic reticulum. Bacteria cells do not contain membrane bound organelles and do not contain an endoplasmic reticulum. The protein cannot be folded and the prosthetic group cannot be added

ResultsPlus
Examiner Comments

In this response the role of rER is clearly identified and the candidate clearly describes the absence of rER in prokaryotic organisms. Both marks were awarded. The response could have been improved by reference to the Goli apparatus and separating out the folding and processing event.

Explain why the interferon made by genetically modified bacteria is different from the interferon made by animal cells.

protein

(2)

bacteria have a plasmid containing DNA which is only a single strand. there may also be mutations in the gene coding for the interferon.

ResultsPlus
Examiner Comments

In this response the candidate knows bacteria differ from eukaryotic cells but forgets about the role of rER and Goli apparatus. No marks.

ResultsPlus
Examiner Tip

Learn the basics well e.g. differences between bacteria and eukaryotes.

Question 4 (a) (i)

Many good responses were seen. However, many candidates demonstrated a poor grasp of basic ideas e.g. describing a gene as 'the sequence of amino acids in DNA'

4 Leptin is a protein hormone with a role in the control of appetite in humans.

(a) The leptin gene is located on chromosome 17.

(i) State what is meant by the term gene.

(2)

A gene is a sequence of bases on a DNA molecule that codes for a sequence of amino acids in a polypeptide.

ResultsPlus
Examiner Comments

A complete response that gained both marks.

4 Leptin is a protein hormone with a role in the control of appetite in humans.

(a) The leptin gene is located on chromosome 17.

(i) State what is meant by the term gene.

(2)

A gene is ~~made from~~ a characteristic expressed from amino acids in DNA.

ResultsPlus
Examiner Comments

It is not clear if this candidate understands what a gene is or if language skills have got in the way of providing a sensible answer. No marks were awarded.

ResultsPlus
Examiner Tip

Clarity of expression is essential if you want to succeed in biology. You have to think about what you write - does it provide the answer in a way that is not open to interpretation?

Question 4 (a) (ii)

Candidates generally understood the question and provided reasonably detailed descriptions of translation. Unfortunately, they often failed to focus on the attributes of tRNA. Marks were generally lost for lack of clarity in responses. In particular candidates often forgot that tRNA molecules with a particular anticodon will be carrying a particular amino acid - something that is key to the translation process. A number of candidates suggested, incorrectly, that tRNA was responsible for transferring mRNA from the nucleus to the ribosome.

(ii) Describe the role of tRNA in the production of leptin.

(3)

Once mRNA has been produced by the nucleus and has been bonded to a ribosome, tRNA will carry Specific Complementary amino acids to the ribosome to form the polypeptide, the correct tRNA will bind to the ribosome and mRNA because it has a Specific complementary anti codon for each codon of the mRNA.

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Examiner Comments

A clearly expressed response that gains all three marks.

(ii) Describe the role of tRNA in the production of leptin.

(3)

tRNA is needed in translation within protein synthesis. The tRNA has an amino acid attached to it which it will bring to the RNA strand on the ribosome and bond with the correct codon, releasing the amino acids in the correct order to produce leptin.

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Examiner Comments

The candidate has clearly described the role of tRNA in bringing amino acids to the ribosome (MP1). Unfortunately, the candidate has not quite described the idea that each tRNA carries a particular or specific amino acid so MP3 could not be awarded. Mention of binding to the correct codon is not linked to the idea of specific amino acids. Also, the candidate did not mention anticodon on the tRNA so MP2 could not be awarded.

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Examiner Tip

Make sure you provide complete answers. Ask yourself, have I put all the necessary information into my answer?

Question 4 (a) (iii)

Many candidates struggled to explain how the primary structure of a protein, in this case leptin, determines its solubility.
A number suggested leptin was a globular protein (MP2). Some also described the role of the primary structure in determining the folding of a protein and the importance of having hydrophilic groups on the outside of the protein.
Relatively few went on to describe the interaction of the hydrophilic groups with water.

(iii) Describe how the primary structure of leptin enables it to be soluble in water.

(3)

The primary structure is the sequence of base amino acids in the polypeptide chain. This primary structure dictates the folding of the secondary structure and the tertiary or even quaternary structure due to R-groups chemical and hydrophobic interactions. Leptin is a globular protein with polar R-groups arranged to face the water (hydrophilic) and non-polar R-groups arranged to not face the water (hydrophobic). This polar nature of the R-groups allow leptin to be soluble in water.

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Examiner Comments

In this respsonse the candidate explains the role of the primary structure in folding (MP1), the arrangement of hydrophobic and hydrophilic amino acids (MP3) and states that leptin will be a globular protein (MP2). There is not enough of an idea about the interaction between polar groups on the outside of leptin with similar groups on water, so MP4 could not be awarded.

(iii) Describe how the primary structure of leptin enables it to be soluble in water.

(3)

The R groups in the primary structure bond with each other in different ways such as disulfide bonds, hydrogen bonds and ionic bonds. These bonds mean the protein shapes as a globular protein. Globular proteins are soluble in water so leptin is soluble.

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Examiner Comments

In this response the candidate has recognised that globular proteins are soluble and suggests leptin is a globular protein (MP2). However, none of the detail about why a globular protein is soluble has been provided.

ResultsPlus
Examiner Tip

Make sure you answer questions in full.

Question 4 (b)

Many candidates recognised that the answer to this question revolved around the introduction of new stop codons, MP2. Many however, found it difficult to describe the effect of a frame shift mutation on the triplet code, MP1.
Relatively few candidates completed the answer effectively by describing the effect in terms of the amino acid sequence produced. Marking point 3 needed to be about a shorter amino acid sequence. Shorter primary structure was given in the stem of the question and was ignored.

(b) Several mutations of the leptin gene have been identified. All these mutations are frameshift mutations that result in shortened primary structures.

A frameshift mutation involves the insertion or removal of one or two nucleotides from a gene.

Describe how a frameshift mutation could result in the production of leptin with a variety of shorter primary structures.

(2)

If you insert or remove a nucleotide from a sequence, the whole sequence will suffer because the codon reads the sequence in triplets. The whole sequence will be shifted, as compared to the minor inconvenience of switching one base for another. The codon is reading multiple faulty triplets in the sequence, and this entails polypeptides being bonded that weren't meant to. The mutation could also mean the triplet now reads as a stop codon, so the polypeptide primary structure would stop prematurely

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Examiner Comments

This response shows that the candidate read and understood the question and was able to link the question to the idea of a triplet code. MP1 and 2 were awarded. For MP 3 candidates needed to make reference to the idea of a different number of amino acids - different lengths of primary structure was given in the question.



Don't simply repeat terms from the question.

Question 5 (a)

In this question candidates were asked to analyse data to explain why exposure to cigarette smoke affects fertility. The phrase 'Analyse the data' is used to direct students to information they should use to help them answer the question.
Many candidates simply described the data and did not include an element of explanation. Better responses were produced when candidates looked at each bit of information and tried to explain why it would reduce fertility.

(a) Analyse the data to explain why exposing pregnant mice to cigarette smoke affects the fertility of their male offspring.

(3)

Exposing pregnant mice to cigarette smoke reduces the % of sperm that are motile by 28%, therefore sperm are less able to swim to reach the ovum and fertilise the egg.
It also reduces the % of stem cells producing sperm by 60% so the number of sperm cells is reduced - reduced chance that a sperm will reach the egg.
It also means that sperm are less able to pass the zona pellucida so the sperm cannot fuse with the egg membrane. Sperm nucleus and egg nucleus cannot fuse.

ResultsPlus
Examiner Comments

This candidate produced a well organised answer that gains three marks, for MP2, MP1 and MP3.

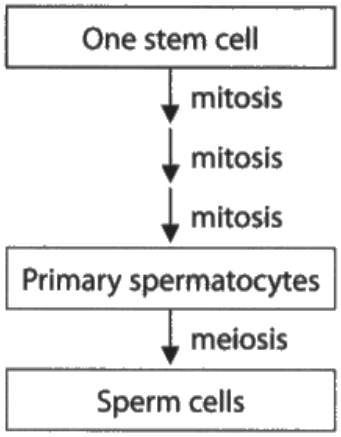
ResultsPlus
Examiner Tip

When asked to explain some results, first decide what the information tells you. Then write your answer providing an explanation for each key bit of information.

Question 5 (b) (i)

Most candidates had a good idea of what a stem cell is and provided good statements that gained both marks.

(b) Sperm are produced from stem cells in a process that involves several cycles of mitosis and a single cycle of meiosis, as shown in the diagram.



(i) State what is meant by the term stem cell.

(2)

Cells that are undifferentiated so can become differentiated into any cell and be specialised cells.

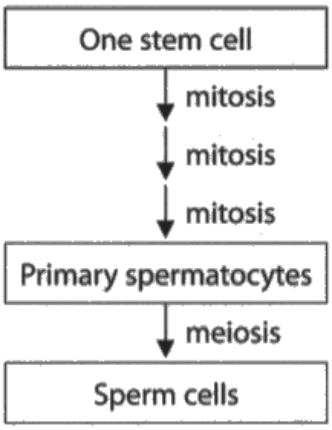
ResultsPlus
Examiner Comments

A concise answer that gains both marks.

ResultsPlus
Examiner Tip

As you learn your Biology make sure you understand and can use relevant biological terms.

(b) Sperm are produced from stem cells in a process that involves several cycles of mitosis and a single cycle of meiosis, as shown in the diagram.



(i) State what is meant by the term stem cell.

(2)

A stem cell is a cell that has the capability to turn into any other type of cell.

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Examiner Comments

This response did not gain any marks; 'the ability to turn into any other cell' was not sufficient for MP2.

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Examiner Tip

Think carefully about the way you express scientific ideas. It is very easy to write an answer that lacks sufficient clarity to gain marks.

Question 5 (b) (ii)

Candidates were asked to compare and contrast the results of meiosis and mitosis. Candidates generally gained marking point 2 recalling that mitosis produces diploid cells and meiosis produces haploid cells.
Although few candidates described the overall contribution of mitosis and meiosis to sperm cell numbers (MP4) a number gained the allowed alternative answer gaining MP4 for a correct description of the number of daughter cells.
Many candidates described mitosis as producing 'identical daughter cells' and 'meiosis producing non-identical daughter cells'; this was not sufficient for marking point 3. To gain MP3 it had to be clear that candidates were talking about genetically identical and genetically non-identical daughter cells.
Very few commented on the idea that both mitosis and meiosis increase the number of cells for MP1.

(ii) Compare and contrast the results of mitosis and meiosis in the production of sperm cells from stem cells.

(4)

Mitosis occurs several times to produce primary spermatocytes from one stem cell. It increases the number of cells and results in genetically identical cells. The diploid number of chromosomes is maintained with each cell division. Meiosis occurs only once to produce sperm cells from primary spermocytes. Meiosis produces sperm ~~sperms~~ cells that are genetically different (genetic variation). The number of chromosomes in the cell halves to produce sperm cells with haploid nuclei. Many sperm cells can be made from one sperm cell due to the number of times diploid mitosis takes place. Mitosis produce 2 identical cells, meiosis produces 4 haploid cells which are genetically different.

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Examiner Comments

This response gained all four marks, although each mark point had to be pieced together.

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Examiner Tip

When asked to compare and contrast try to include each comparison or contrast in the same sentence e.g. mitosis produces diploid cells whereas meiosis results in haploid cells'. Alternatively, consider using a table format.

(ii) **Compare and contrast the results of mitosis and meiosis in the production of sperm cells from stem cells.**

(4)

Mitosis produces two identical daughter cells. Mitosis of stem cells would ~~stop~~ produce diploid cells with all ~~the chromosomes~~ chromosomes that could then differentiate to make primary spermatocytes. Meiosis makes the actual sperm (gametes) as meiosis produces haploid cells with half the number of chromosomes in a full cell.

ResultsPlus
Examiner Comments

For this response the candidate gained one mark, MP2.

A full comparison was not made for MP3 and 4, and it was not clear that meiosis results in an increase in the number of cells, so MP1 could not be awarded.

Question 6 (b)

In this question candidates were required to analyse data to come to a conclusion about the effectiveness of a programme to reduce the impact of TB.
Many candidates gathered appropriate data from the information presented for MP1, 2 and 3. However, they often struggled to form an opinion of the effectiveness of the programme. Often candidates sat on the fence and said it was and it wasn't effective.
Some candidates did reach a sensible conclusion e.g. 'More new cases combined with relatively constant total number of cases suggests more are being successfully treated. Fewer deaths similarly suggests the programme was effective. The conclusion then is that the programme has reduced the impact of TB'.
A maximum of two marks were available for use of information and one mark was for the deduction.

Analyse the data to deduce the effectiveness of this programme.

(3)

The programme has very slightly impacted the total number of cases since 2000, causing a small decrease. The number of TB deaths has decreased by 0.3 million, which is small when compared to the scale of the first graph. The number of new cases since 2000 has increased by 2.5 million, which is a very large increase. The number of new cases far outweighs the reduced number of deaths and total cases, so the programme has been ineffective.

ResultsPlus
Examiner Comments

This candidate gained two marks for picking out relevant information from the graph. However, the candidate did not arrive at the correct conclusion for the final mark.



Read questions carefully. The programme is about reducing the burden of TB. The questions asks you to deduce the effectiveness of the programme. So has the programme reduced the burden associated with TB? Yes, it's reduced deaths and in spite of the increasing number of new cases, the total number of cases stays the same - so more people are being effectively treated.

Analyse the data to deduce the effectiveness of this programme

(3)

From looking the graph I can see that from 2005 there has been a fall in the number of Tb deaths. However there has been an increase in the number of New Cases. From 2005 to 2015 new cases increase by an increment of 0.2 and the number of TB deaths decrease by the same increment And the all cases stays ~~[illegible]~~ constant throught the whole time. Seeing this information the programme is not effective.

ResultsPlus
Examiner Comments

Only marking point 3 was awarded.

ResultsPlus
Examiner Tip

When looking at graphs look carefully at the axis. Make sure you are interpreting the size of changes appropriately.

Question 6 (c)

This was a six-mark levels based question. Examiners read the response and decide on the level of response, they then decide if the response is at the upper mark for that level or the lower mark. The mark scheme provides guidance on relevant content and on how this might be used to determine a particular level of response.
For this question candidates were provided with information about a clinical trial using different combinations of antibiotics to treat TB patients. They were provided with information on the mode of action of the antibiotics.
Responses that contained only a description of the antibiotic trial results, were considered to be at level 1. Responses that attempted to explain the reasons for differences in the results, were considered to be at level 2, e.g. suggesting that antibiotics with different modes of action or targets work better as combinations. If candidates tried to use information about the mode of antibiotic action with their own understanding e.g. bring in ideas such as dormancy of TB, bacteriostatic and bactericidal antibiotics, if they comment on trial design e.g. missing combinations of antibiotics, then the response is probably at level 3.

only 2 months.

Analyse the data to comment on the effectiveness of these antibiotics for the treatment of TB.

(6)

As you can see, group 1 showed the best sign of recovery and group 4 (with only 1 antibiotic for 4 months) showed the least. Isoniazid (I), Rifampicin (R) and Streptomycin (S) are bacteriostatic antibiotics and they only inhibit bacterial growth and division. Pyrazinamide (P) has a different mechanism suggesting it is a bactericidal antibiotic and kills bacteria in its action. All 4 treatments manage to reduce TB by a minimum of 70% however the pair R and P are most effective when together. It is clear that TS(I) is least effective and by pairing it with R in group 2 and P in group 3 you can compare effectiveness of R and P. ~~Antibiotic~~ Antibiotic R is ~~most~~ quite effective, but with P it is only 2% more effective suggesting P doesn't have much of an effect. This can be supported by group 3 who had 32% of patients with active TB supporting that P isn't very effective. However, antibiotic S is not used with a pair so its effectiveness cannot be distinguished as when it was used, it was used with all the antibiotics so individual effectiveness is hard to determine. ~~Overall,~~ antibiotic

(Total for Question 6 = 10 marks)

R's effectiveness can be supported by its mechanism as it prevents protein synthesis and replication thus preventing an increase in TB levels. Overall, to deduce the effectiveness of each antibiotic, they should be compared individually, rather than mixed. In addition, there is no indication of sample size, gender, other control variables eg other illnesses that could effect the ~~the~~ chance of having TB after 3 years. Also, the experiment with antibiotics should be done for longer than two months.

ResultsPlus
Examiner Comments

This response considers in detail all the information provided. The candidate has used information about the results of the trial, about the antibiotics required for a good level 2 response. The candidate has also brought in their own biological knowledge and has commented on the design of the trial, extending the quality of response to level 3.

ResultsPlus
Examiner Tip

Remember to use all the information provided as well as your own biological knowledge and understanding .

Question 7 (b) (iii)

In this question candidates were presented with information in an unusual format. It was pleasing to see that most candidates were able to access the information provided.
Unfortunately, many candidates only used the information about Ash trees and ignored its pathogen H. fraxineus. Marking point 2 was most frequently seen. Many candidates also gained marking point 5 with respect to Ash trees and marking point 3 for reference to distribution of H. fraxineus. Very few candidates linked the presence of Ash trees to absence of H. fraxineus (MP 4) or made the general statement about carbon dioxide causing global warming (MP1).

(iii) Analyse the data to explain the predicted effect of climate change on the distribution of ash trees.

DBS

(5)

- as CO_2 concentration increases, the distribution of ash trees move northeastern
- this is because an increase in CO_2 increase global temperatures (by causing global warming through the greenhouse effect - it traps heat within our atmosphere)
- the ash therefore move to ~~one~~ cooler areas of a similar temperature to their original ~~distribution~~ habitats, as that is their optimum temperature for growth
- they could also be moving away from the H. fraxineus fungus, as it's distribution has moved more northward - the ash trees within their distribution will die if infected and so will only survive in areas the fungus is not - the east.

ResultsPlus
Examiner Comments

This candidate has clearly understood the information provided and has produced an excellent answer that gains all five marking points. In order, MP2, MP1, MP5, MP3 and MP4.

ResultsPlus
Examiner Tip

For questions worth several marks, take time to read the question, consider the information provided and plan your answer.

(iii) Analyse the data to explain the predicted effect of climate change on the distribution of ash trees.

(5)

An increase in CO_2 concentration results in more ash trees growing in the East, particularly the North East. This is because in these regions, there is no H. Fraxineus present so disease isn't present either. In some regions e.g. 30° E, it is predicted that there is a slight reduction in ash trees and this could be because not all ash trees have advantageous alleles which allow them to become resistant to the disease. These advantageous alleles are more likely to be passed on as these trees are more likely to survive and reproduce. Those trees that are unable to withstand and adapt to the fungi, which is the selection pressure, will migrate by methods such as seed dispersal.

ResultsPlus
Examiner Comments

This response gained two marks, MP2 and MP5.

ResultsPlus
Examiner Tip

It is common for candidates to make slips in their answers, so that the answer does not make sense or is ambiguous. The best way to avoid this is to read your answers carefully.

Question 8 (a)

Many correctly recognised this as a hydrolysis reaction.

Question 8 (b)

Many candidates did not appear to know how to answer this question. Candidates frequently suggested using the amino acid sequence to find a DNA sequence and then carryout all sorts of manipulation e.g. PCR, gel electrophoresis.
For marking point one candidates must express the idea of determining the amino acid sequence. Determining the primary structure was not sufficient. In addition, although candidates did not need to specify for trypsin, answers in a different context were ignored. An answer such as 'determine the amino acid sequence of all proteins' would not gain marking point one.

Explain how the primary structure of trypsin molecules can be used to produce a phylogenetic tree.

(3)

~~The numbers~~ The amino acid sequence for the different organisms ~~can be identified~~ for the primary structure of trypsin can be identified. A very similar sequence suggests 2 species are more related and shared a common ancestor more recently. However a very different sequence suggests many mutations have occured since they shared a common ancestor so are more distantly related. Number of differences in amino acid sequence between species counted.

ResultsPlus
Examiner Comments

In this response the candidate gains all three marks for MP1 , MP3 and then MP2 at the end.

Explain how the primary structure of trypsin molecules can be used to produce a phylogenetic tree.

(3)

- The amino acid sequence joined by peptide bonds in primary structure of trypsin of each species is compared
- The more similar the sequence, the more closely related the species and the closer they are on the phylogenetic tree
- proteonomics can also be used
- The less related the species, the more disimilar the primary structure

ResultsPlus
Examiner Comments

This response gained MP3 only. The candidate has stated what the primary structure is but has not expressed the idea that it needs to be determined, so did not gain MP1.

Question 8 (c)

This question asks candidates to explain how a trypsin with a calcium ion binding site could have evolved. Many candidates seemed to think that the calcium ion binding site was an entity in its own right and ignored the context of the trypsin molecule. The first marking point requires candidates to link the process of mutations to the trypsin gene. The remaining three marking points could be achieved for generic statements about evolution of a trait. However, it is possible to see how some of them could be specifically linked to the trypsin molecule e.g. the additional guidance for MP3. Candidates should look to answer in the context of the question to ensure that they gain access to all the available marks.

Some organisms in an environment could have a mutation which gives them the calcium binding site.
This would make them ~~have~~ have an advantage against selection pressures and therefore be more successful at breeding and producing offspring.
The offspring may inherit this advantageous allele and overtime the allele frequency will increase.
There will be a genetic shift and the species will evolve to all have the calcium ion binding site.

ResultsPlus
Examiner Comments

This response gained three marks. MP2 for the idea of calcium ion binding site arising from mutations, MP3 for the idea of selective advantage and MP4 for increased allele frequency in population over time.

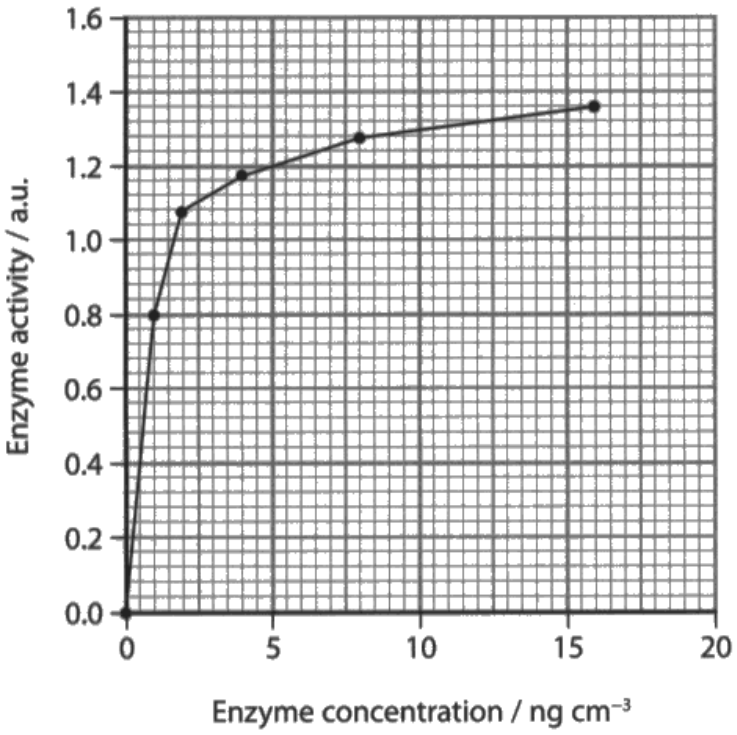
MP1 would not be awarded for 'Some organisms .. have a mutation' - it needed to be clear that mutations were in the trypsin gene.

Question 8 (d)

The idea behind this question was the core practical investigation of enzyme activity and the idea of initial rates of reactions. Some leniency was allowed and answers suggesting a value or range of values between 0 and 2 ng cm^{-3} was accepted for the first marking point. Marking point 2 was for the recognition that to compare enzymes you need to use the initial rates of reaction.

(d) In an experiment, the effect of enzyme concentration on the activity of human trypsin was measured.

The results are shown in the graph.



Explain which range of enzyme concentrations should be used to compare the activity of trypsin from different species.

(2)

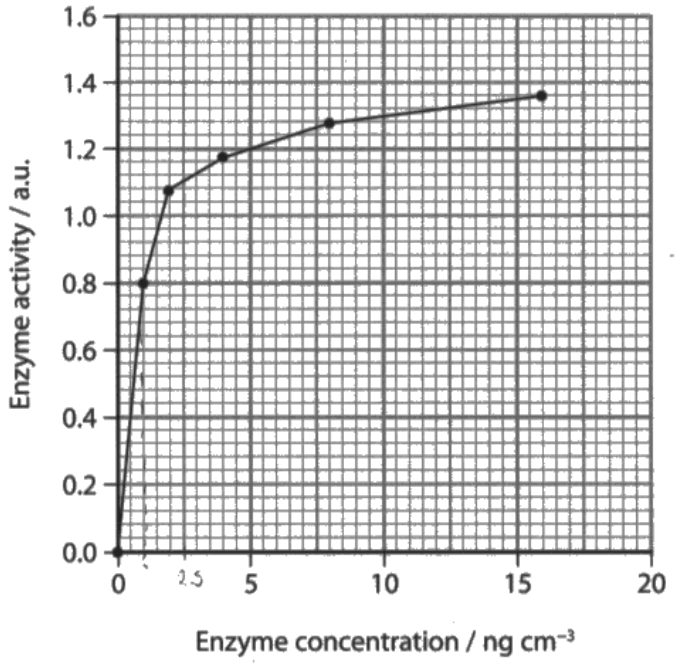
0 - 15 ng cm^3 to see how the initial rate compares and where they level off

ResultsPlus
Examiner Comments

This candidate understood the need to compare initial rates but was not able to select the relevant concentration range from the graph. Only MP2 was awarded.

(d) In an experiment, the effect of enzyme concentration on the activity of human trypsin was measured.

The results are shown in the graph.



Explain which range of enzyme concentrations should be used to compare the activity of trypsin from different species.

(2)

Q: 1ngcm^{-3} so the initial rate of the enzyme activity can be compared.

ResultsPlus
Examiner Comments

A concise but complete response that gained both marks.

ResultsPlus
Examiner Tip

You do not need to write to fill the space. Plan your answers and the space provided on the exam paper should be ample.

Question 9 (a) (ii)

This calculation was straightforward for most candidates. The correct answer gained both marks. One mark was achieved for a partial answer in which the candidates had identified the correct percentage transferred as 35%.

(ii) The gross primary productivity (GPP) for one mature tropical rainforest was found to be 24 800 kJ m^{-2} $year^{-1}$. It was estimated that 65% of GPP was used in respiration.

Calculate the energy transferred to the next trophic level.

(2)

$\frac{24,800}{100} \times 35 = 8630$

8630 kJ m^{-2} $year^{-1}$

ResultsPlus
Examiner Comments

Although the calculation was completed incorrectly the candidate's working allowed the award of one mark.

ResultsPlus
Examiner Tip

Always show working for a calculation. The more clearly it is laid out, the better your chance of getting working marks if your final answer is incorrect.

Question 9 (b)

This question proved to be straightforward for most candidates. Frequently, the idea of net uptake of carbon dioxide was not clearly expressed with candidates simply stating carbon dioxide is taken up during photosynthesis and not gaining the mark.

(b) Explain how reforestation of tropical rainforests can be used to minimise climate change.
(3)

- reforestation involves replanting more trees
- therefore an increase in photosynthesis, which removes CO_2 from atmosphere because trees are carbon sinks.
- removing CO_2 takes away a greenhouse gas, meaning less infrared ~~ration~~ radiation is absorbed, thus less rise in global warming.

ResultsPlus
Examiner Comments

All three marking points were awarded. The last three lines were accepted as a description of reduced greenhouse effect and therefore being equivalent to simply stating 'reducing greenhouse effect'.

(b) Explain how reforestation of tropical rainforests can be used to minimise climate change.

(3)

reforestation can be used to minimalise climate change, because by planting more trees, there are more trees able to intake carbon dioxide and oxidise it to be released as oxygen and increase the net biomass, as there are more organic molecules in the atmosphere. Furthermore, it subtracts from the deforestation, as by planting more / newer trees it cancels out those that have been cut down.

ResultsPlus
Examiner Comments

This response gained marking point 1, for 'planting more trees'.

From line 3 down the response is unclear and does not address the relevant point to gain any marks.

ResultsPlus
Examiner Tip

Answer the question that is asked. Practise reading questions so that you understand what you are being asked to do.

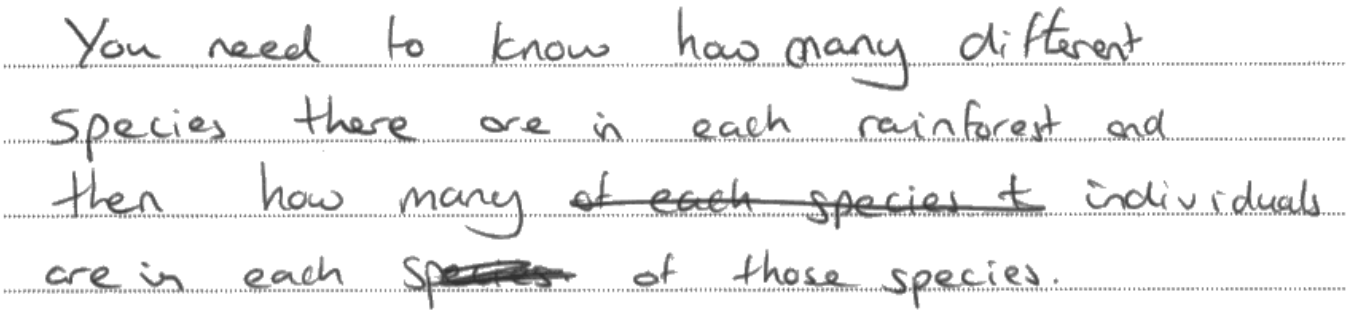
Question 9 (c) (i)

Many candidates found this question straightforward. However, some did not think about the context of measuring biodiversity of a rain forest and suggested measuring allele frequencies etc. This is an example of a question where poor language skills affected student attainment. Many candidates struggled to express the two marking points in a clear and unambiguous way. Some used terms such as species richness and species evenness. While we accepted species richness as an alternative for marking point 1 we did not accept species evenness as being the same as counting the number of individuals in each species. Many candidates used the term 'abundance' in a way that made their response ambiguous. If a candidate writes 'number of species and abundance of species' they can be given MP1 for number of species but abundance of species is not the same as number of individuals of each species.

(c) Information on biodiversity has been collected from various rainforest habitats in Madagascar.

(i) Describe what needs to be measured in order to compare the biodiversity of two rainforests.

(2)



ResultsPlus
Examiner Comments

Both marks were awarded for a concise but complete response.

(c) Information on biodiversity has been collected from various rainforest habitats in Madagascar.

(i) Describe what needs to be measured in order to compare the biodiversity of two rainforests.

(2)

The size of the area of the rainforests where biodiversity is being measured

The number of species, range of taxa, genetic variety within the species and variety of ecosystems in each rainforest.

ResultsPlus
Examiner Comments

In this response the candidate has gained marking point one. The candidate has then produced a list of additional factors that it was possible to ignore. However, candidates need to be careful with questions like this one. If they provide a list of alternatives the majority of which are incorrect, they are unlikely to be awarded marks.

ResultsPlus
Examiner Tip

When answering questions take care not to produce lists of alternatives in the hope that some of them might be correct.

Question 9 (c) (ii)

Many candidates engaged well with this question and many complete responses were seen. The command word 'determine' requires an element of calculation and most candidates recognised this. Some candidates did not make clear comparisons between Madagascar and the world and struggled to express marking points 2 and 3 clearly.

Analyse the data to determine the importance of the rainforests of Madagascar in maintaining biodiversity on Earth.

(3)

The species richness of madagascer is much higher then in general with a new species of plant present in every 0.202km² of land. where as in general the new species of plant are found 0.00201km² of land. Also madagascar has a large ~~no~~ number of endemic species with over 3 quarters of its plants and animals being endemic to madagascar. This means without the presence of madagascer these species wouldn't exist at all.

ResultsPlus
Examiner Comments

In this example the candidate gains all three available marks. Marking point 1 is for the calculation of species density. The candidate used these calculated values to express the idea of higher species density in Madagascar, gaining marking point 2. In the last four lines the idea of many species being endemic to Madagascar gains marking point 3.

Analyse the data to determine the importance of the rainforests of Madagascar in maintaining biodiversity on Earth.

(3)

The land area in madagascar makes up ~~quite~~ a bit of the land area on earth. The importance of the rainforests in madagascar is that it provides quite a lot of biodiversity of plants and species that make up quite a large percentage of the biodiversity on land area of earth. e.g. 4% of known species of plants is in the land area of earth.

ResultsPlus
Examiner Comments

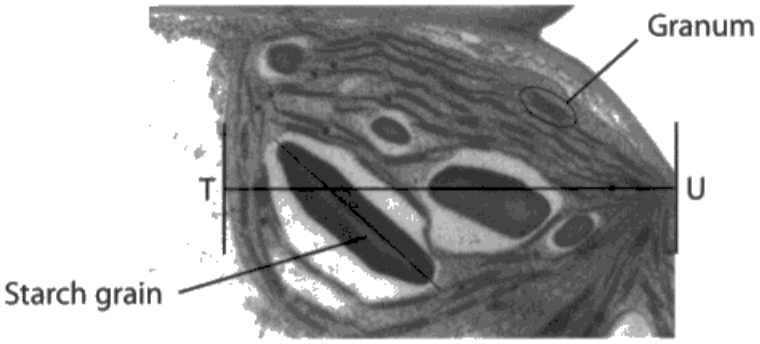
In this response the candidate has carried out a relevant calculation to get 4% of the world's plants in Madagascar, so gains marking point 1. The rest of the response is too vague to gain any additional marks.

Question 10 (a) (i)

This calculation proved difficult for many candidates. Those that recognised it was a simple proportionality calculation gained both marks for little work. Others worked out a magnification and then the width of the chloroplast and gained both marks. Many did not attempt the calculation. One mark was available for correct measurements taken from the image. Alternatively if a correct the method of calculating could be followed using incorrect measurements then one mark was awarded.
Unfortunately, candidates generally do not lay out calculations clearly, making it difficult to award a mark for a correct calculation method with incorrect values from the image.

10 Photosynthesis is a process that occurs in all green plants.

The electron micrograph shows part of a chloroplast in a plant cell.



(a) (i) The labelled starch grain in the chloroplast is 2.2 µm long.

Calculate the width of this chloroplast between T and U.

(2)

2.7cm : 2.2µm

1cm : $\frac{2.2}{2.7}$ µm

T – U = 6cm

= $\frac{2.2}{2.7} \times 6$ µm = 4.88µm

4.9 µm

ResultsPlus
Examiner Comments

A clearly laid out calculation with the correct answer gains both marks.

ResultsPlus
Examiner Tip

There are at least two ways to approach this question. One involves calculating the magnification and then using the magnification to calculate the width of the chloroplast - two calculations. The second is to use ratios - one calculation : 2.2 ÷ 27 = width ÷ 60. So, the answer is (2.2 ÷ 27) x 60.

Make sure you practice applying your maths skills to calculations in Biological contexts.

Question 10 (a) (ii)

Many candidates struggled with this question. Detailed descriptions of the structure of thylakoids or of photosynthesis were frequently seen. However, few candidates tried to link structure to function. For marking point 1, many described stacks of membrane but made no reference to increased surface area. Some candidates that did attempt to describe the increased surface area used the term surface to volume ratio - which is not correct in this context.
Many candidates described the presence of chlorophyll but then did not give its function. Marking point 3 was most frequently awarded at the end of an extended description of photosynthesis.

(ii) Explain the relationship between the structure and functions of a granum in photosynthesis.

(3)

The granum are stacks of thylakoid membranes. Their flattened, long structures give them a large surface area. They contain photosystems and ATP synthase, so the large S.A allows them to absorb a lot of light for light-dependent reaction in photosynthesis and ATP synthase to produce ATP in the light-dependent reaction

ResultsPlus
Examiner Comments

This is an example were the candidate has related structure to function and has gained all three marking points.

(ii) Explain the relationship between the structure and functions of a granum in photosynthesis.

(3)

A granum is a small disk like object that is used in photosynthesis to absorb the light energy that is required for reactions to occur. They are often ~~stack~~ stacked on top of each other to be more efficient

ResultsPlus
Examiner Comments

In this response the candidate has attempted to describe the structure of granum. However, they have made no attempt to relate structure to function.

ResultsPlus
Examiner Tip

A few questions will require you to simply provide a description of a structure or a process. However, these will be a minority of questions. If you find you are simply writing out a description stop and read the question again.

Question 10 (b)

Many candidates ignored the reference to 'products of the ...' in the question. As a result, many produced a complete description of photosynthesis or the Krebs cycle before then answering the question. Even so many candidates scored well on this question.

(b) **Describe how starch is formed from the products of the light-independent reactions of photosynthesis.**

(4)

When CO_2 enters the Calvin cycle, it is combined with RuBP (a reaction catalysed by RUBISCO) This produces 3P and then breaks down into 3 GALP. 2 out of 12 GALP form glucose. Starch is a polymer of glucose. Starch consists of amylose and amylopectin. Amylose is formed due to 1,4 glycosidic bonds forming between glucose molecules in a condensation reaction which releases water. Amylopectin is formed by glucose molecules forming 1,4 and 1,6 glycosidic bonds in a condensation reactions which release water. Starch consists of 70-80% amylopectin and 20-30% amylose.

ResultsPlus
Examiner Comments

A clear response that addresses the question directly and gains all four marks.

(b) Describe how starch is formed from the products of the light-independent reactions of photosynthesis.

(4)

* Starch = chains of β-glucose units.
* Light independent photosynthesis produces glucose molecules from the calvin cycle
* Glucose units can be joined by a condensation reaction, to form a 1,4 glycosidic bond between units, which becomes no a polysaccharide, starch

ResultsPlus
Examiner Comments

The candidate has not described the formation of glucose from two GALP so did not get marking point one. The response did gain marking point 3 and 4. Although not relevant to the marks awarded, it is worth noting that if they had suggested two GALP form **beta** glucose, then since starch is formed from alpha glucose they would not have been awarded MP1.

ResultsPlus
Examiner Tip

Much of the biochemistry needed for A level biology may be taught early in the course. Make sure you learn this biochemistry well. Poor recall of the basic biochemistry (e.g. confusing alpha and beta glucose, or bases and amino acids, or the types of bonds involved in forming biological molecules) is a common reason for candidates to lose marks.

Question 10 (c)

This was the second level based question and was based on a core practical, using chloroplasts to investigate the Hill reaction
Candidates were asked to devise an investigation. Many candidates missed or ignored the idea that the investigation was on the effect of herbicides on the light dependent reaction. These candidates described a range of studies with intact plants and usually suggested measuring the size of the plant or starch produced.
Those candidates that remembered the Hill reaction often gave great detail about how to isolate chloroplasts which was not required.

Few candidates used the previous information provided to select concentrations of herbicide to use.
If candidates described using controls (biotic and abiotic), using different concentrations of herbicide then they were probably around a level 1 response
Those that went on to describe the use of chloroplasts, DCPIP and methods of controlling some variables were probably at level 2. If they included information about how to compare the effect of the different herbicides, described a suitable statistical test, some more sophisticated controls (e.g. some reactions in the dark) then they are probably approaching a level 3.
It is import though to recognise that the level based mark scheme is all about the quality of the response and descriptors are used to determine this. The indicative content is there to help identify appropriate points that candidates might make.

Devise an investigation that would produce quantitative data on the effectiveness of the herbicides on the light-dependent reactions of photosynthesis.

(6)

Get a sample of barnyard grass and crush it so that you get a fine mould, or blend to make it into a liquid consistency. Then pour the mixture in the test tube with some cold isolation medium and a buffer to slow down the enzyme activity ~~from~~ of the chloroplasts present in the sample. Centrifuge the sample so that the chloroplast ~~pellets~~ can separate from the rest of the cell components. Carefully, with a pipette, remove the chloroplast pellet so that the cell debris remains in the test tube. Place the chloroplast pellet in another test tube. In another test tube pour a ~~around~~ 5cm³ of DCPIP. With set up the different concentrations of herbicides, ensuring there is a control. Separate the pellets into different test tubes so that around 2cm³ ~~5cm³~~ of each herbicide conc is placed in a seperate (can be later) test tube. ~~As soon as the herbicide~~ ~~Connect using a gas syringe~~ Pour the DCPIP into the chloroplast pellet in the test tube, pour in the herbicide solution

and start the stop clock immediately. Observe and measure the time it takes for the DCPIP to decolourise. Record ~~on the results~~ the results in the results table. Complete the same steps above for the control and each of the concentrations of the herbicides in order to make a comparison. Ensure the experiment has been repeated at least 5 times to be able to compare and come up with valid results.

ResultsPlus
Examiner Comments

This candidate realised that the way to carry out this investigation involved using the Hill reaction. The description included all elements required for a good level two response and was given 4 marks. Additional information on selection of appropriate concentrations of herbicide (from the table in the question), how the effect on DCPIP could be quantified (use of colorimeter or time to get to a particular colour) and method of comparing results (e.g. use of an appropriate named statistical test) would have made this a level 3 response.

Paper Summary

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

- Make sure you are familiar with the command words used to ask questions.
- Take a little time to scan the paper and plan the order in which to answer questions.
- Make sure you can correctly use and explain relevant biological terms.
- Read the whole of each question carefully, including the introduction, to help relate your answer to the context used in the question.
- Read your answers back carefully – do they answer the question, are your answers clear and unambiguous, have you made at least as many clear points as marks are available?
- Think carefully about the data provided in questions to help you answer – you should not be spending time simply describing in words the individual data points of a table or graph, rather you should be processing the information – look for trends, similarities or differences in the data, etc.
- Include clear workings with any calculation; these may start with a suitable equation or values measured from a figure followed by the values determined at different steps in the calculation.
- Don't be afraid to include a sketch diagram or graph if it will help add clarity to your answer.

Grade Boundaries

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

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

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