Examiners' Report
Principal Examiner Feedback

January 2017

Pearson Edexcel
International Advanced Subsidiary Level
in Biology (WBI04)
Paper 01 Natural Environment

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Paper Introduction

This paper saw a wide range of responses, many illustrating that candidates know the content of the specification very well and have been prepared thoroughly with the aid of past mark schemes. However, what was disappointing was that quite a large proportion of candidates are learning these mark schemes and writing them down *verbatim* without considering if they actually apply to the context of the question. As a result the responses are quite long, wasting candidates' time, and are low mark-yielding.

The multiple choice questions were answered well on the whole and the AS synoptic content did not cause any problems.

WBI04_01_Q01bi

Introduction

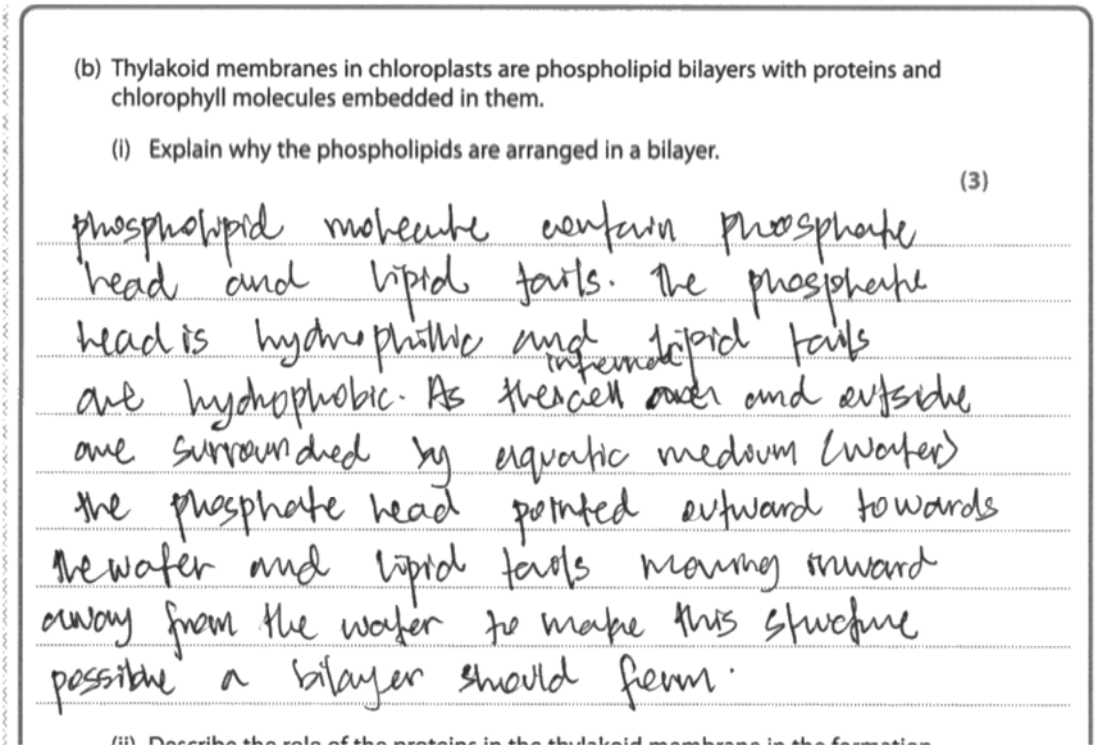
Candidates clearly know the arrangement of phospholipid molecules in the membrane and that the heads are hydrophilic and the tails hydrophobic.

Examiner Comment

This candidate has read the question clearly and picked out the command word 'explain'. Mark point 2 can therefore be awarded on line 7.

Examiner Tip

Read the question carefully and identify the command word.



(b) Thylakoid membranes in chloroplasts are phospholipid bilayers with proteins and chlorophyll molecules embedded in them.

(i) Explain why the phospholipids are arranged in a bilayer.

(3)

phospholipid molecule contain phosphate head and lipid tails. the phosphate head is hydrophilic and lipid tails are hydrophobic. As the cell outer and inner are surrounded by aquatic medium (water) the phosphate head pointed outward towards the water and lipid tails moving inward away from the water to make this structure possible a bilayer should form.

Examiner Comment

This candidate has written a response to a question that would have the command word 'describe'. Therefore mark point 2 cannot be awarded.

(b) Thylakoid membranes in chloroplasts are phospholipid bilayers with proteins and chlorophyll molecules embedded in them.

(i) Explain why the phospholipids are arranged in a bilayer.

(3)

Hydrocarbon tails are hydrophobic, they face away from water whereas the phosphate heads are hydrophilic and face towards water. These interactions with water form the bilayer of the thylakoid membranes.

WBI04_01_Q01bii

Introduction

Candidates who read the question carefully and picked out the fact that we wanted to know about the role of the proteins specifically, scored reasonably well in this question. We did see a lot of responses where candidates simply wrote down everything that they knew about the light-dependent reaction; these responses usually only picked up mark point 4 in the context of ATPase.

Examiner Comment

This response scored mark points 1, 3 and 4. There was not quite enough for mark point 2 as there was no indication of the role of the proteins in the movement of the hydrogen ions into the stroma.

Examiner Tip

Do not pick out key words and write down everything that you know about the topic. Read the question carefully to see if there is a particular emphasis required in your answer.

(ii) Describe the role of the proteins in the thylakoid membrane in the formation of ATP.

(3)

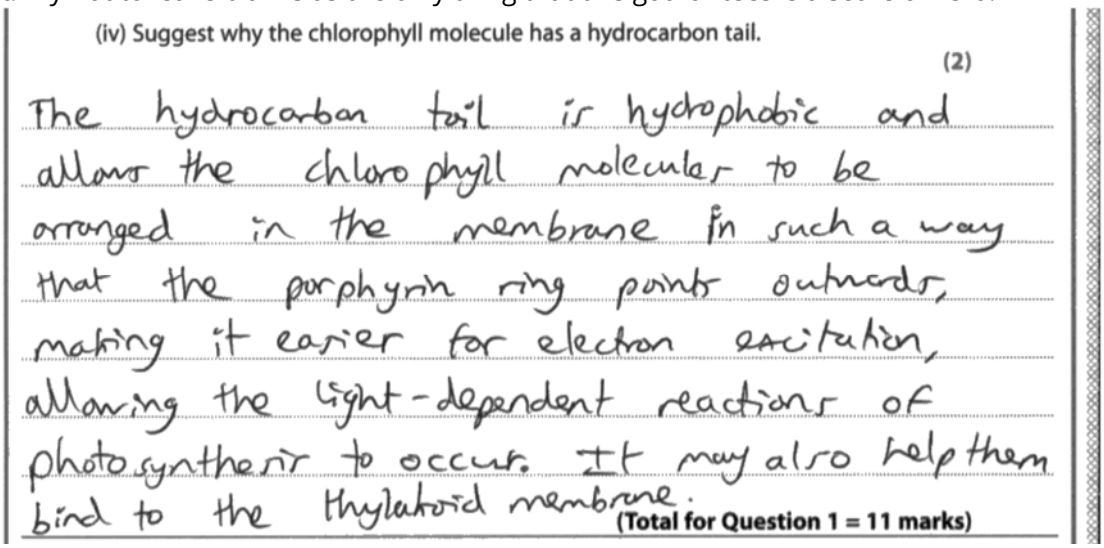
Proteins within the phospholipid bilayer in thylakoid membrane has a role of electron carriers in light-dependent stage of photosynthesis. As electrons, that are lost from chlorophyll, ~~A~~ pass along the electron carriers energy is released, resulting H^+ ions being moved and accumulated to thylakoid space. Then due to concentration gradient of H^+ ions, H^+ ions diffuse into the stroma. This movement of H^+ ions provides energy for photophosphorylation of ATP from ADP and inorganic phosphate

WBI04_01_Q01biv

Introduction
This was quite a discriminating question. Quite a few blank responses were seen.

Examiner Comment
This is a good example of the type of response that we were hoping for.

Examiner Tip
When you see the command word 'suggest' you must think about everything that you have been taught and try to figure out the answer. The answer will not be something that you have been specifically taught. Try not to leave blanks as the only thing that this guarantees is a score of zero.



(iv) Suggest why the chlorophyll molecule has a hydrocarbon tail.

(2)

The hydrocarbon tail is hydrophobic and allows the chlorophyll molecules to be arranged in the membrane in such a way that the porphyrin ring points outwards, making it easier for electron excitation, allowing the light-dependent reactions of photosynthesis to occur. It may also help them bind to the thylakoid membrane.

(Total for Question 1 = 11 marks)

WBI04_01_Q02b

Introduction

Candidates have a good idea of the symptoms associated with TB but not all of them are clear on the actual sequence in which they occur.

Examiner Comment

This response illustrates the type of response that we were hoping to see.

Examiner Tip

TB weakens the immune system - it is not a disease that only occurs if the immune system is already weakened.

(b) Describe the sequence of symptoms that result in the death of a person infected with *Mycobacterium tuberculosis* (TB).

(3)

~~Firstly,~~ ~~the~~ the respiratory ~~track~~ tract and cell is targetted, so the person infected will have more respiratory issues and breathing problems. ~~Also, the person may begin~~ However, before this occurs, the person experiences headaches, nausea and other common bacterial infections. ~~After that~~ After some time, the person will start coughing blood and will lose weight drastically. Since T cells are targetted, the immune system is weakened, making the person susceptible to other diseases. Finally a combination of all of this will lead to death if untreated.

WBI04_01_Q02c

Introduction

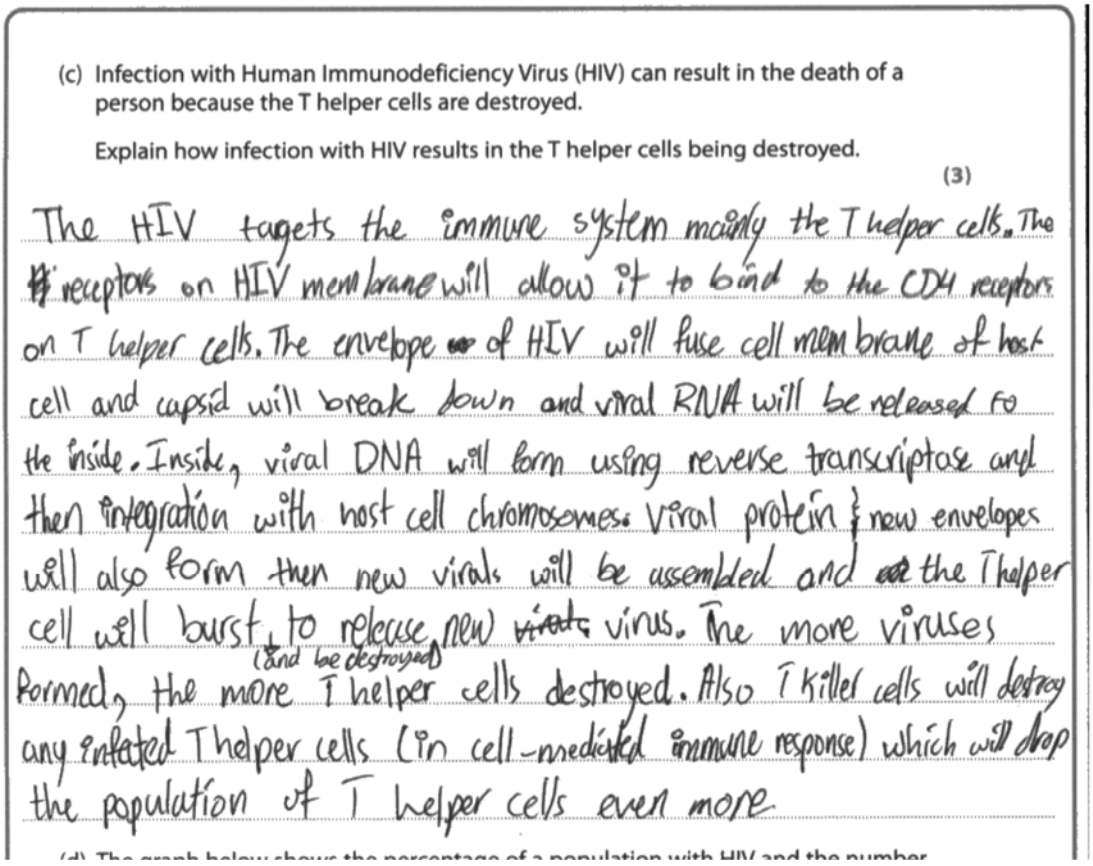
Candidates know the HIV story very well. Many candidates did not select the part of the story that they needed to answer the question and simply wrote everything that they knew about the disease. Although this did not prevent them from scoring full marks, it would have used up some time that they may have needed at the end of the question paper.

Examiner Comment

This candidate started their response far too early and did not score marks until half way down.

Examiner Tip

The T helper cells are destroyed when lots of virus particles burst out of the cell at once. T helper cells are needed for the activation of the T killer cells, so if the T helper cells are destroyed the T killer cells will not be activated.



(c) Infection with Human Immunodeficiency Virus (HIV) can result in the death of a person because the T helper cells are destroyed.

Explain how infection with HIV results in the T helper cells being destroyed.

(3)

The HIV targets the immune system mainly the T helper cells. The ~~#~~ receptors on HIV membrane will allow it to bind to the CD4 receptors on T helper cells. The envelope ~~on~~ of HIV will fuse cell membrane of host cell and capsid will break down and viral RNA will be released to the inside. Inside, viral DNA will form using reverse transcriptase and then integration with host cell chromosomes. Viral protein & new envelopes will also form then new virals will be assembled and ~~on~~ the Thelper cell well burst, to release new ~~virals~~ virus. The more viruses (and be destroyed)
formed, the more T helper cells destroyed. Also T killer cells will destroy any infected Thelper cells (in cell-mediated immune response) which will drop the population of T helper cells even more.

(d) The graph below shows the percentage of a population with HIV and the number

WBI04_01_Q02d

Introduction

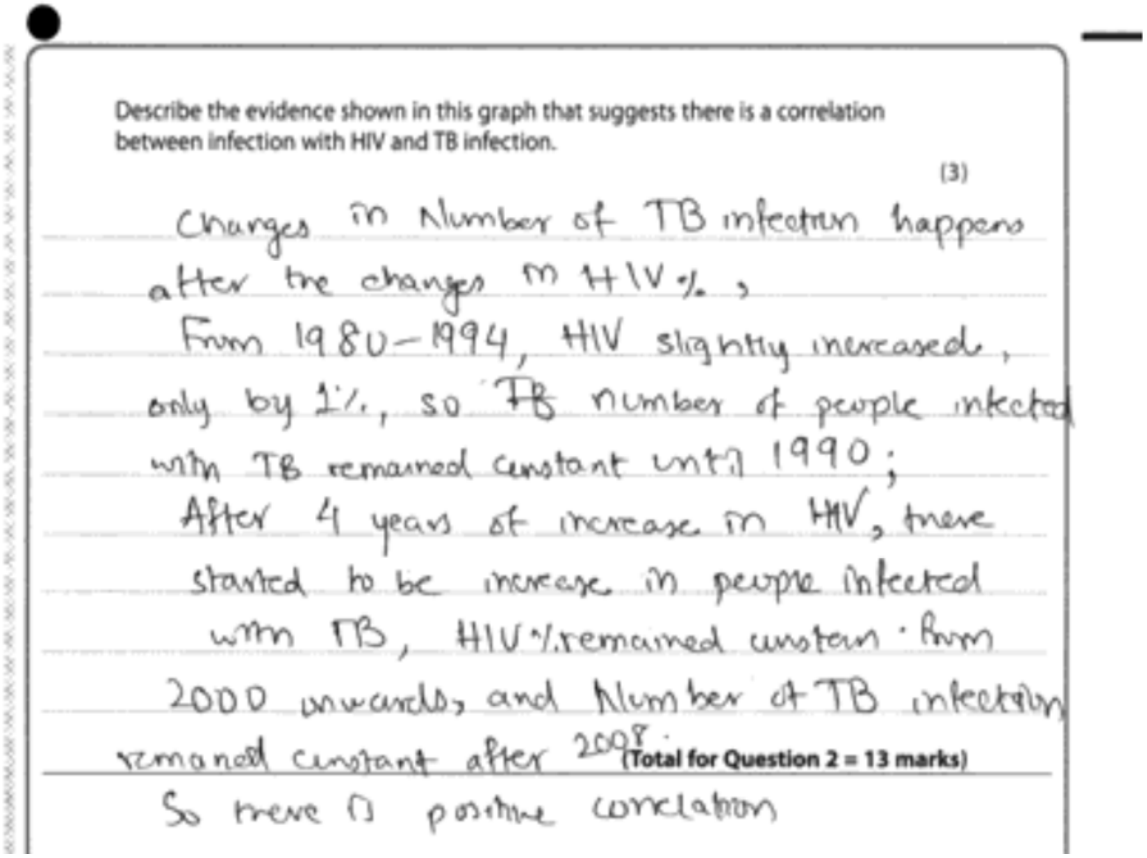
It was pleasing to see that candidates knew a change in one variable reflected by a change in another variable indicated a correlation. Very few candidates looked at the data critically enough and realised that a correlation could not be detected in the earlier years.

Examiner Comment

This response illustrates mark point 2 and 3. Mark point 3 was only seen in the better responses.

Examiner Tip

If you are asked to describe evidence, you cannot simply describe the data. Read the question carefully.



Describe the evidence shown in this graph that suggests there is a correlation between infection with HIV and TB infection.

(3)

Changes in Number of TB infection happens after the changes in HIV%,
From 1980–1994, HIV slightly increased, only by 1%, so TB number of people infected with TB remained constant until 1990;
After 4 years of increase in HIV, there started to be increase in people infected with TB, HIV% remained constant from 2000 onwards, and Number of TB infection remained constant after 2008.
So there is positive correlation

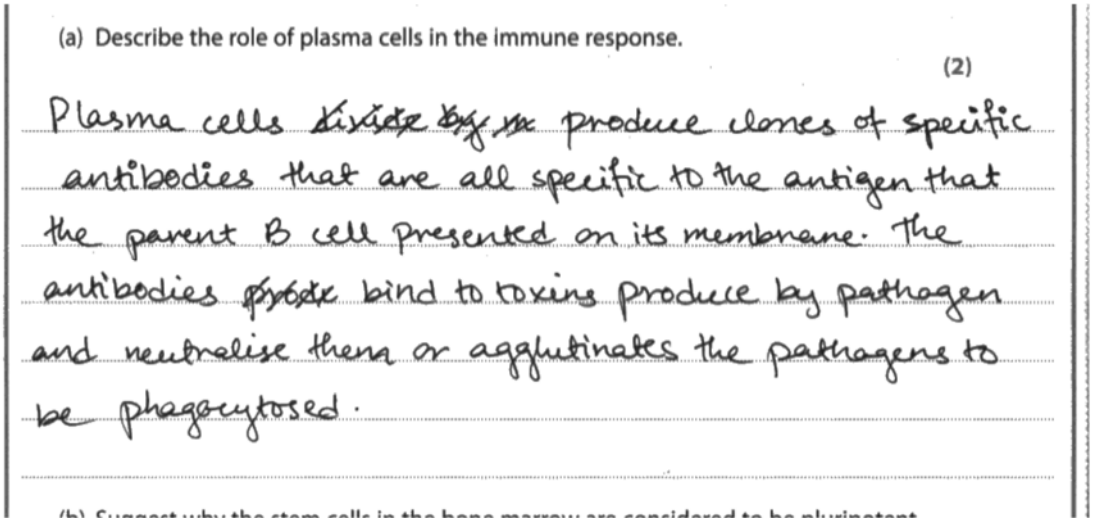
(Total for Question 2 = 13 marks)

WBI04_01_Q03a

Introduction
Candidates are now very confident in describing the role of plasma cells and the antibodies that they produce. Some very good responses were seen.

Examiner Comment
This candidate clearly had a good understanding of the importance of antibodies.

Examiner Tip
Antibodies enhance phagocytosis; they do not actually destroy the pathogen themselves.



(a) Describe the role of plasma cells in the immune response.

(2)

Plasma cells ~~divide by~~ produce clones of specific antibodies that are all specific to the antigen that the parent B cell presented on its membrane. The antibodies ~~produce~~ bind to toxins produce by pathogen and neutralise them or agglutinates the pathogens to be phagocytosed.

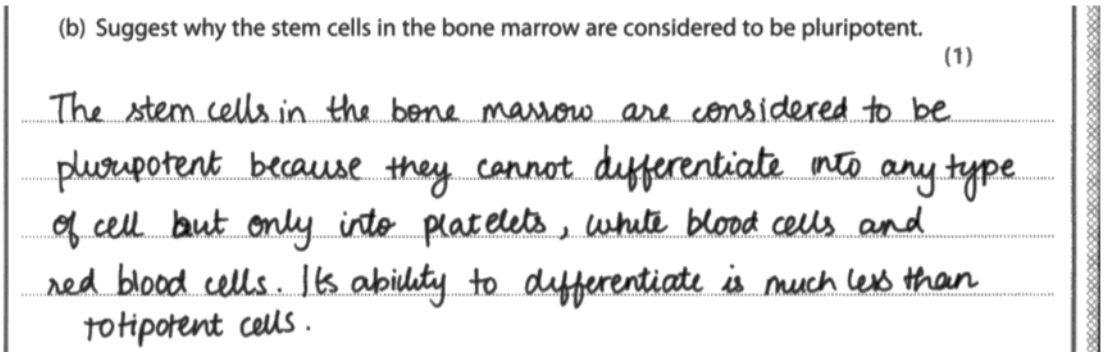
WBI04_01_Q03b

Introduction

Candidates have clearly been taught a definition of pluripotency in the context of the blastocyst but clearly do not realise there are pluripotent cells anywhere other than in the blastocyst.

Examiner Comment

This candidate applied their knowledge to the context of the question.



(b) Suggest why the stem cells in the bone marrow are considered to be pluripotent.

(1)

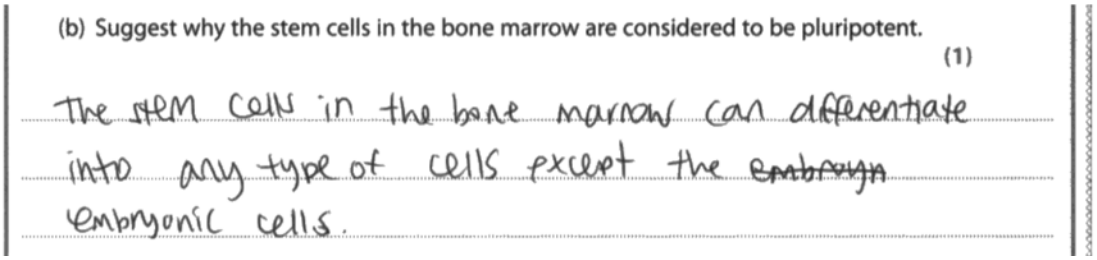
The stem cells in the bone marrow are considered to be pluripotent because they cannot differentiate into any type of cell but only into platelets, white blood cells and red blood cells. Its ability to differentiate is much less than totipotent cells.

Examiner Comment

This response was seen on many occasions.

Examiner Tip

When you see the command word 'suggest' you must apply your knowledge to the context of the question and not just recall what you have been taught.



(b) Suggest why the stem cells in the bone marrow are considered to be pluripotent.

(1)

The stem cells in the bone marrow can differentiate into any type of cells except the ~~embryon~~ embryonic cells.

WBI04_01_Q03c

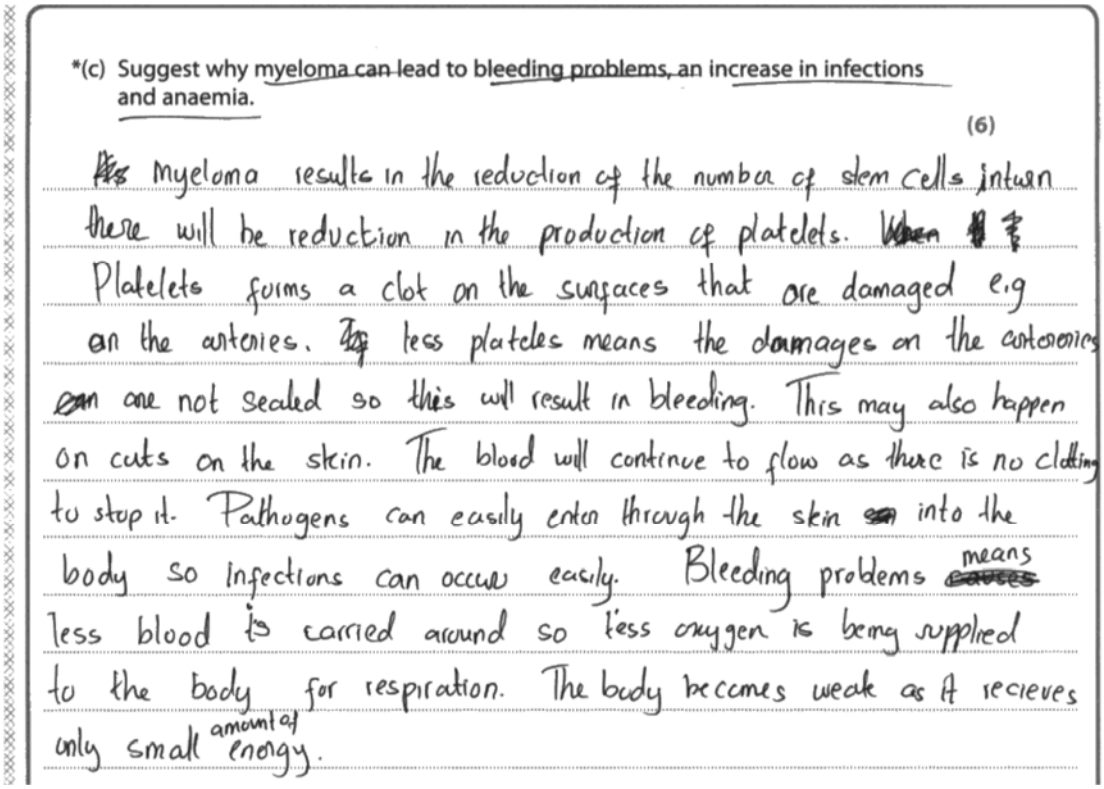
Introduction

This question discriminated very well. The better responses gave detailed responses that contained specific A2 knowledge. The weaker candidates gave vague responses that did not demonstrate any of A2 course content.

Many candidates used up valuable time repeating the stem of the question before actually writing their answer.

Examiner Comment

This response illustrates our first three mark points.



*(c) Suggest why myeloma can lead to bleeding problems, an increase in infections and anaemia.

(6)

Myeloma results in the reduction of the number of stem cells, in turn there will be reduction in the production of platelets. Platelets forms a clot on the surfaces that are damaged e.g on the arteries. less platelets means the damages on the arteries are not sealed so this will result in bleeding. This may also happen on cuts on the skin. The blood will continue to flow as there is no clotting to stop it. Pathogens can easily enter through the skin into the body so infections can occur easily. Bleeding problems means less blood is carried around so less oxygen is being supplied to the body for respiration. The body becomes weak as it recieves only small amount of energy.

Examiner Comment

A good response given here, illustrating mark points 5, 7, 8, 1 and 2.

*(c) Suggest why myeloma can lead to bleeding problems, an increase in infections and anaemia.

(6)

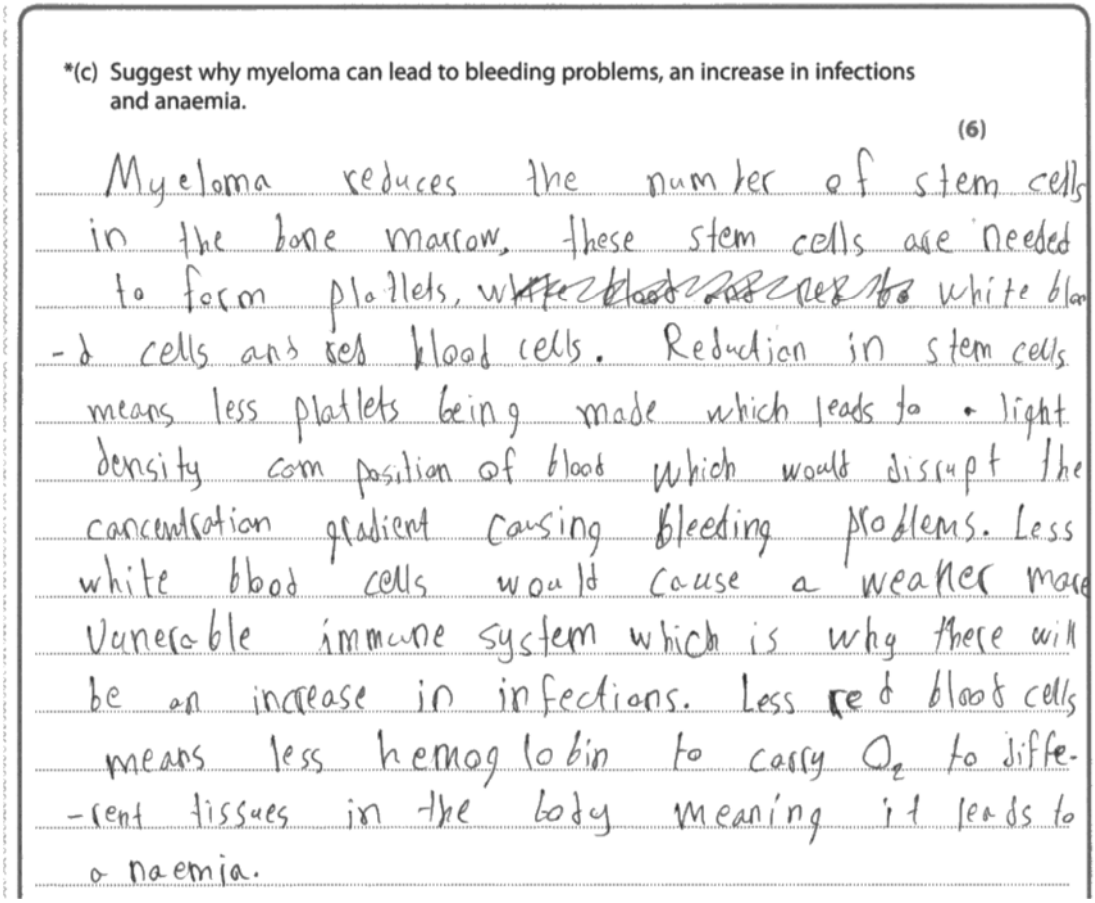
Myeloma affects bone marrow where B lymphocytes and T lymphocytes are produced. If the bone marrow is affected, the production of B-cells and T-cells will be reduced. T-helper cells won't be able to release cytokines to activate B-cells and even T-killer cells. B-cells won't clone into B-effector cells that differniate into plasma cells for antibody production. Bone marrow is also responsible for the production of red blood cells that carry oxygen to all cells of the body. If bone marrow is affected, there will be a decrease in the count of red blood cells and thus anemia will occur. Infections will not be fought by the immune system as there is a reduction in B-cells and T-cells and thus no/less (even white blood cells) antibodies. Also, Bone Marrow produces platelets that help in clumping the blood and to stop bleeding. A decrease in platelets will lead to bleeding problems.

Examiner Comment

A large proportion of candidate repeated the stem of the question before writing their answer.

Examiner Tip

Do not waste time repeating the stem of the question. Just give enough information so that we know what you are referring to.



*(c) Suggest why myeloma can lead to bleeding problems, an increase in infections and anaemia.

(6)

Myeloma reduces the number of stem cells in the bone marrow, these stem cells are needed to form platlets, white blood cells and red blood cells. Reduction in stem cells means less platlets being made which leads to a light density composition of blood which would disrupt the concentration gradient causing bleeding problems. Less white blood cells would cause a weaker more vunerable immune system which is why there will be an increase in infections. Less red blood cells means less hemoglobin to carry O_2 to different tissues in the body meaning it leads to anaemia.

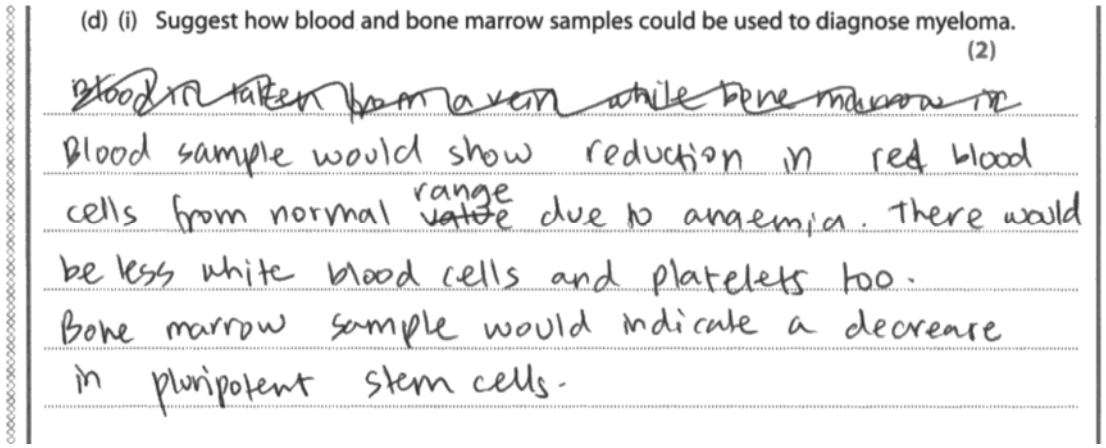
WBI04_01_Q03di

Introduction

Responses to this question were disappointing; we saw a lot of vague responses that simply stated that the samples would be looked at and compared to the patient's cells

Examiner Comment

This is an example of the quality of response that we were hoping for.



(d) (i) Suggest how blood and bone marrow samples could be used to diagnose myeloma.
(2)

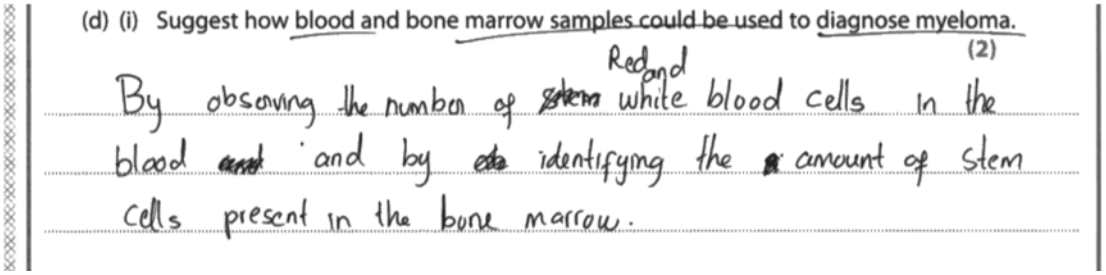
~~Blood is taken from a vein while bone marrow is~~
Blood sample would show reduction in red blood cells from normal ~~value~~ range due to anaemia. There would be less white blood cells and platelets too.
Bone marrow sample would indicate a decrease in pluripotent stem cells.

Examiner Comment

This is a more typical example of the responses that we saw.

Examiner Tip

If we are asking you for two things and there are two marks then you need to specifically address both aspects separately to gain full marks.



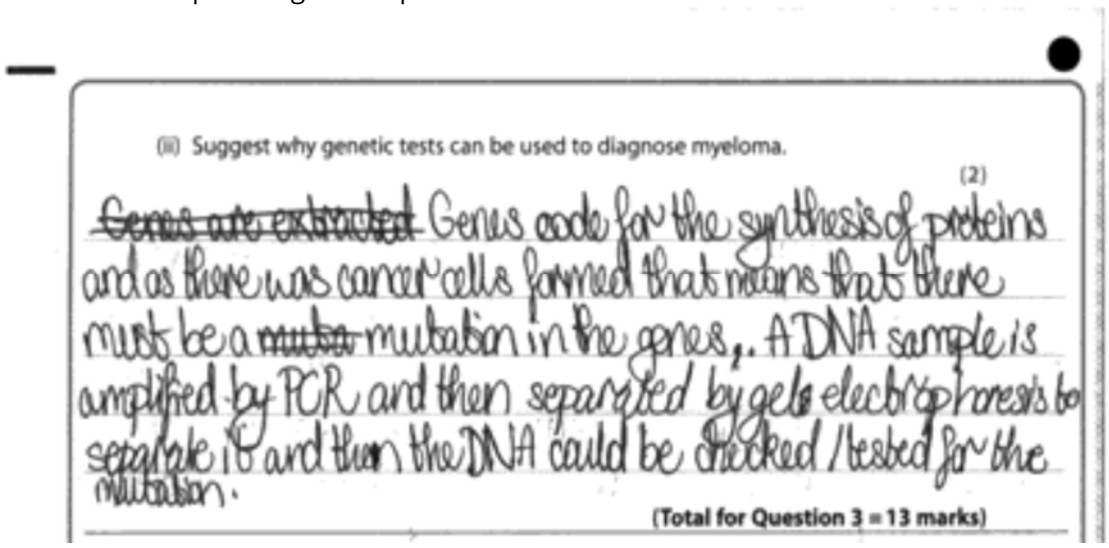
(d) (i) Suggest how blood and bone marrow samples could be used to diagnose myeloma.
(2)

By observing the number of ~~stem~~ Red and white blood cells in the blood ~~and~~ and by ~~identifying~~ identifying the ~~amount~~ amount of stem cells present in the bone marrow.

WBI04_01_Q03dii

Examiner Comment

This is an example of a good response.



(iii) Suggest why genetic tests can be used to diagnose myeloma.

(2)

~~Genes are extracted~~ Genes code for the synthesis of proteins and as there was cancer cells formed that means that there must be a ~~muta~~ mutation in the genes, a DNA sample is amplified by PCR and then separated by gels electrophoresis to separate it and then the DNA could be checked / tested for the mutation.

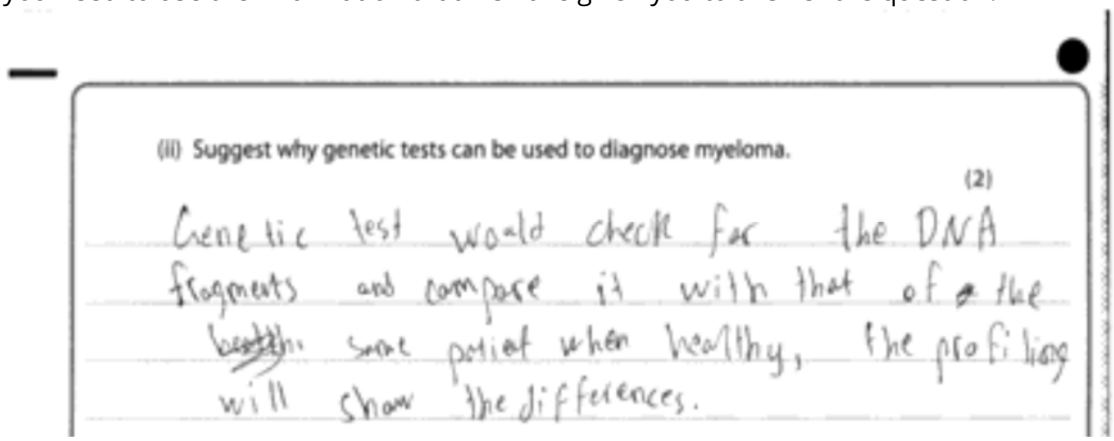
(Total for Question 3 = 13 marks)

Examiner Comment

This is an example of a response that is far too vague.

Examiner Tip

If you see the command word 'suggest', your answer needs to be given in the context of the question; you need to use the information that we have given you to answer the question.



(iii) Suggest why genetic tests can be used to diagnose myeloma.

(2)

Genetic test would check for the DNA fragments and compare it with that of the ~~health~~ same patient when healthy, the profiling will show the differences.

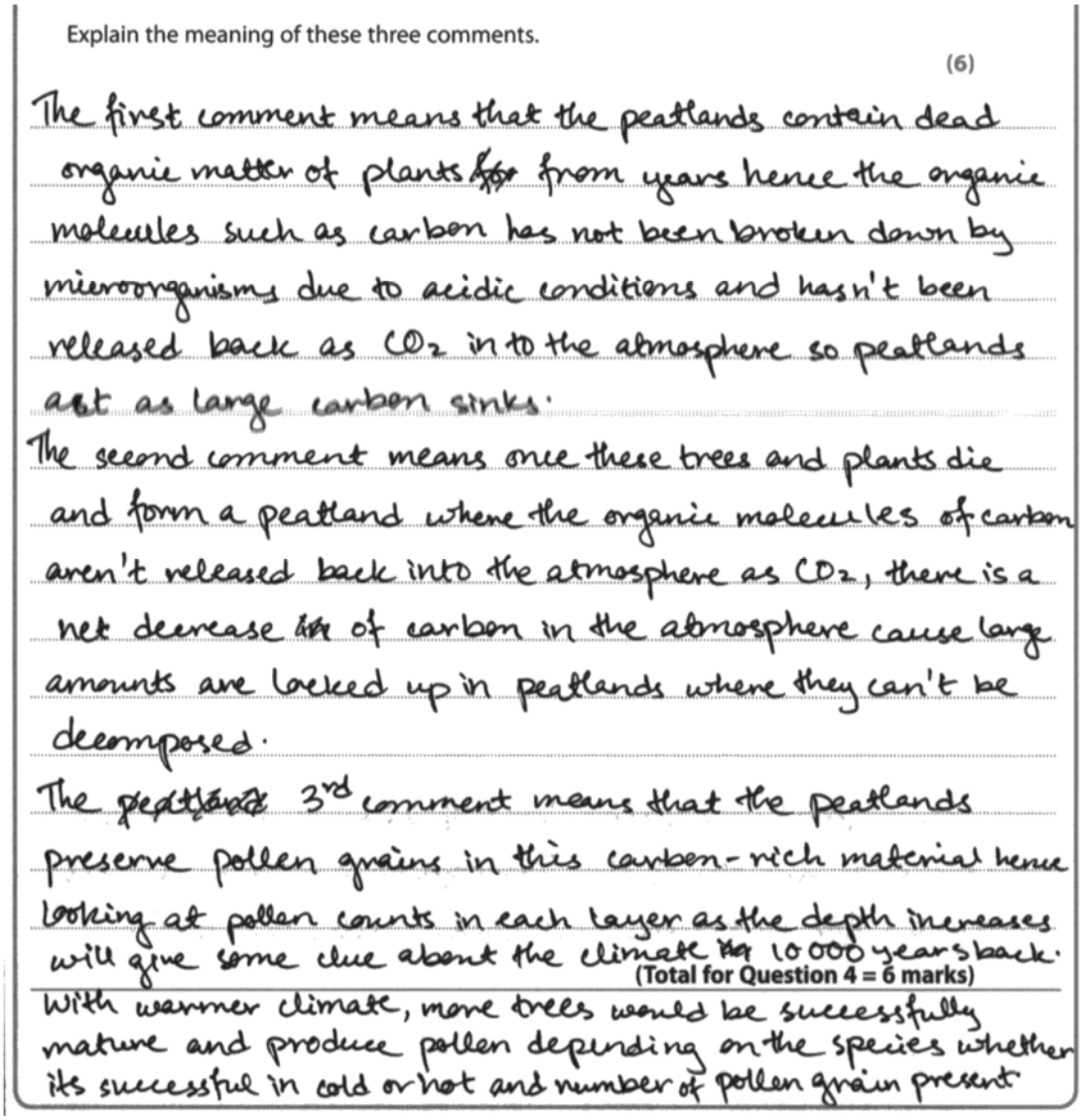
WBI04_01_Q04

Introduction

We were really impressed by the number of candidates that made very good attempts at answering this question, especially as there has not been a similar style question on previous papers.

Examiner Comment

This response was awarded mark points 1, 3, 5, 10 and 9.



Explain the meaning of these three comments.

(6)

The first comment means that the peatlands contain dead organic matter of plants ~~for~~ from years hence the organic molecules such as carbon has not been broken down by microorganisms due to acidic conditions and hasn't been released back as CO_2 in to the atmosphere so peatlands act as large carbon sinks.

The second comment means once these trees and plants die and form a peatland where the organic molecules of carbon aren't released back into the atmosphere as CO_2, there is a net decrease ~~in~~ of carbon in the atmosphere cause large amounts are locked up in peatlands where they can't be decomposed.

The ~~peatlands~~ 3rd comment means that the peatlands preserve pollen grains in this carbon-rich material hence looking at pollen counts in each layer as the depth increases will give some clue about the climate ~~in~~ 10 000 years back.

(Total for Question 4 = 6 marks)

With warmer climate, more trees would be successfully mature and produce pollen depending on the species whether its successful in cold or hot and number of pollen grain present.

Examiner Comment

Another good response, illustrating mark points 2, 7, 4, 10 and 9.

Examiner Tip

Use the scaffolding in the question to help you structure your answer. There were three statements in this question, so you needed to divide your answer into three parts to address all three statements to gain full marks.

Explain the meaning of these three comments.

(6)

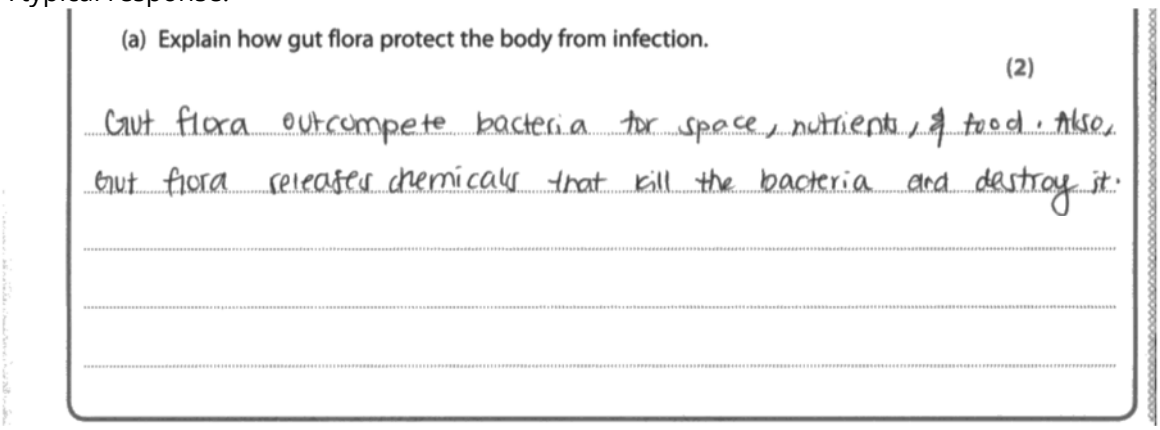
- The first comment describes how the CO_2 from the atmosphere which becomes glucose in plants through photosynthesis, remains present in the ground as dead plants and animals and their excretory products and isn't converted back into CO_2 and released into the atmosphere
- The second comment is referring to the carbon cycle, usually ~~CO_2 from the~~ carbon ~~atmosphere is organic~~ in organic matter is returned to the atmosphere by the respiration of decomposers, however in this case it is trapped in the peatland.
- The third comment ~~refers~~ means that pollen trapped in the peatland at different depths can tell us which species were present and what the climate was like (due to the abundance ~~and distribution~~ of seeds at each ~~de~~ depth)

(Total for Question 4 = 6 marks)

WBI04_01_Q05a

Introduction
Candidates are now very familiar with this part of the spec and this question caused very few problems, even to the weaker candidates.

Examiner Comment
A typical response.



(a) Explain how gut flora protect the body from infection.

(2)

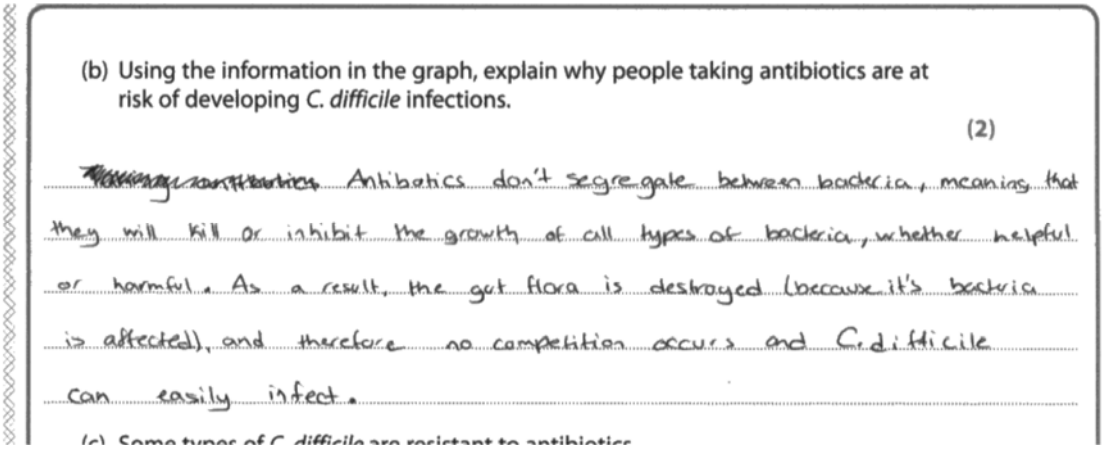
Gut flora outcompete bacteria for space, nutrients, & food. Also, gut flora releases chemicals that kill the bacteria and destroy it.

WBI04_01_Q05b

Introduction
This question did not cause too many problems to candidates.

Examiner Comment
A typical response.

Examiner Tip
Quite often the questions at the start give clues to the answers expected in later parts of the question – look out for them.



(b) Using the information in the graph, explain why people taking antibiotics are at risk of developing *C. difficile* infections.

(2)

~~Taking antibiotics~~ Antibiotics don't segregate between bacteria, meaning that they will kill or inhibit the growth of all types of bacteria, whether helpful or harmful. As a result, the gut flora is destroyed (because it's bacteria is affected), and therefore no competition occurs and C. difficile can easily infect.

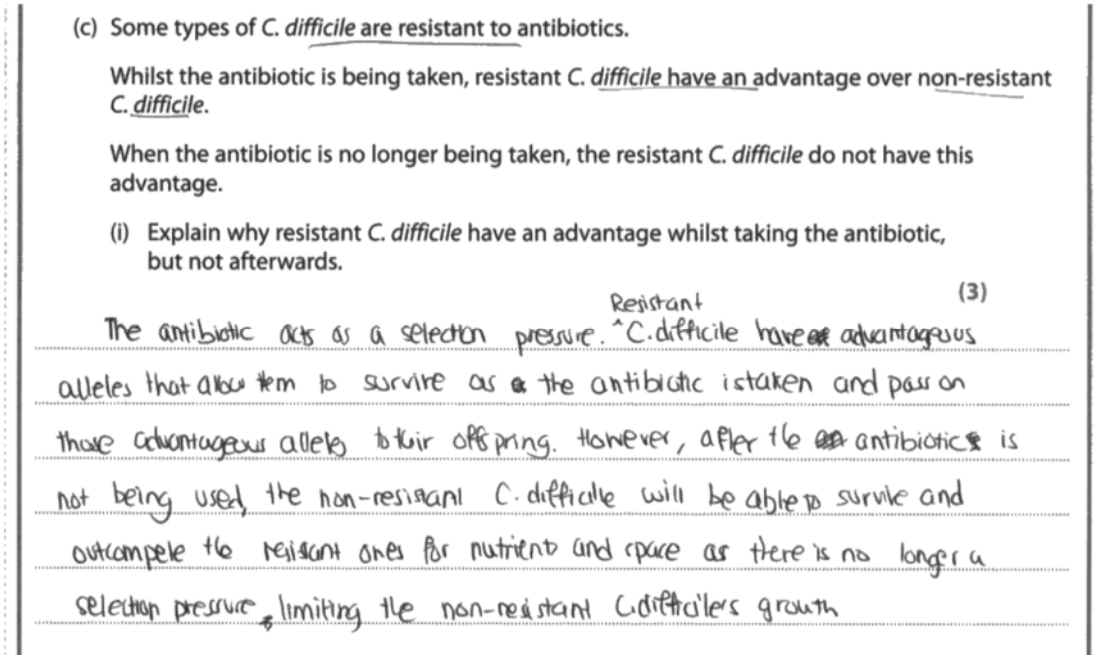
(c) Some types of *C. difficile* are resistant to antibiotics

WBI04_01_Q05ci

Introduction
Candidates who realised that there were two halves to this question scored well.

Examiner Comment
This was a reasonable answer, typical of many responses that we saw.

Examiner Tip
If there are two parts to a question e.g. 'before and after' then both parts have to be commented on in your answer.



(c) Some types of *C. difficile* are resistant to antibiotics.

Whilst the antibiotic is being taken, resistant *C. difficile* have an advantage over non-resistant *C. difficile*.

When the antibiotic is no longer being taken, the resistant *C. difficile* do not have this advantage.

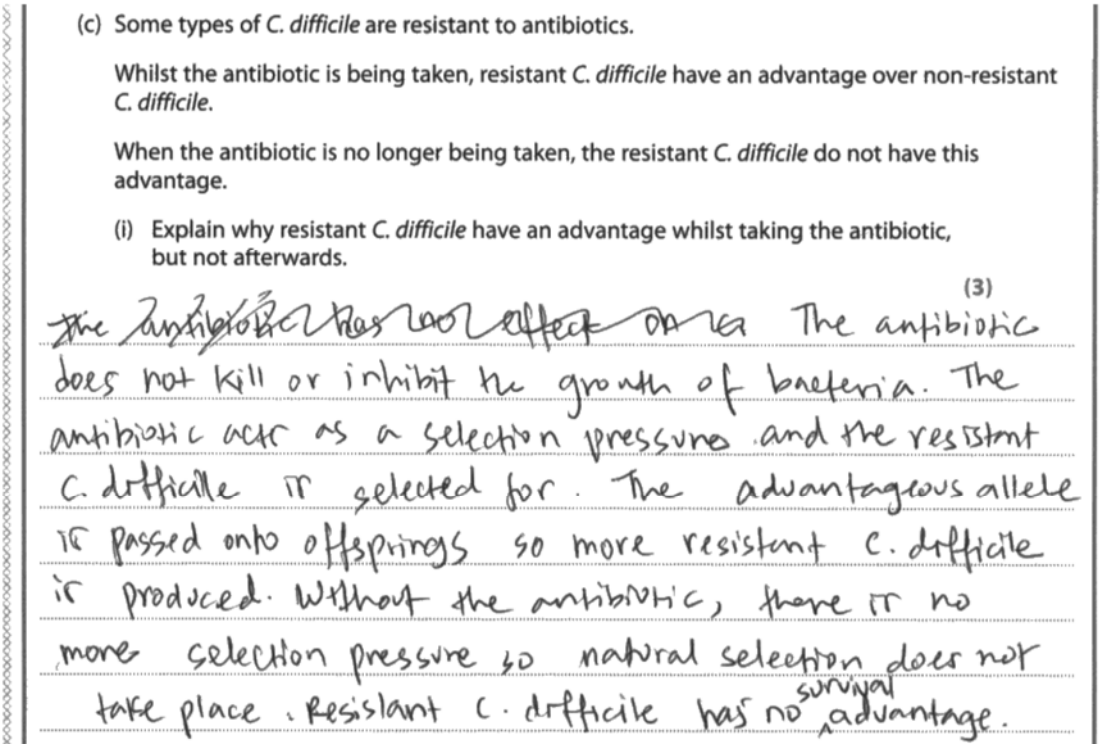
(i) Explain why resistant *C. difficile* have an advantage whilst taking the antibiotic, but not afterwards.

(3)

The antibiotic acts as a selection pressure. ^Resistant C.difficile have advantageous alleles that allow them to survive as the antibiotic is taken and pass on those advantageous alleles to their offspring. However, after the antibiotics is not being used, the non-resistant C. difficile will be able to survive and outcompete the resistant ones for nutrients and space as there is no longer a selection pressure, limiting the non-resistant C.difficile's growth.

Examiner Comment
Mark points 1 and 2.

Examiner Tip
Although this candidate has tried to explain what happens after the antibiotics have been taken, they have focussed on what will not happen and not what will happen.



(c) Some types of *C. difficile* are resistant to antibiotics.

Whilst the antibiotic is being taken, resistant *C. difficile* have an advantage over non-resistant *C. difficile*.

When the antibiotic is no longer being taken, the resistant *C. difficile* do not have this advantage.

(i) Explain why resistant *C. difficile* have an advantage whilst taking the antibiotic, but not afterwards.

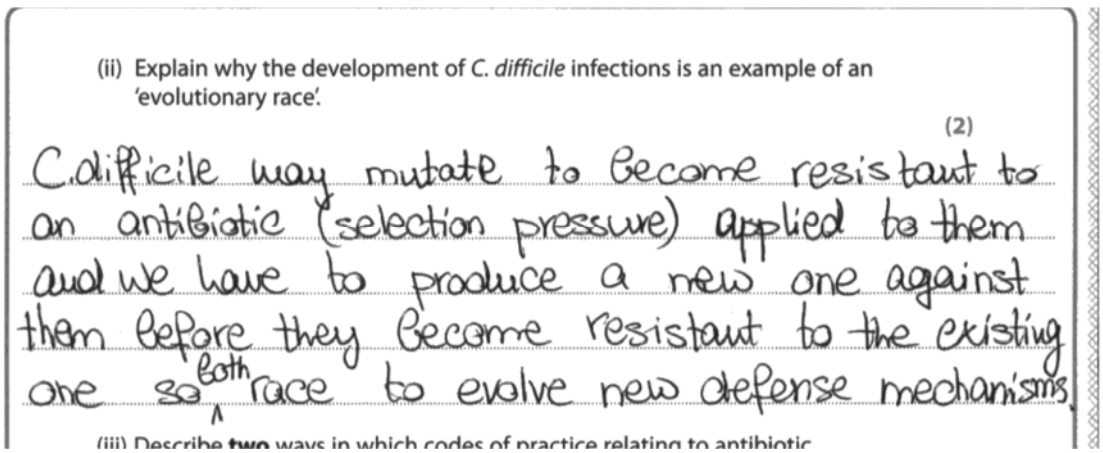
(3)

~~the antibiotic has no effect on~~ The antibiotic does not kill or inhibit the growth of bacteria. The antibiotic acts as a selection pressure and the resistant C. difficile is selected for. The advantageous allele is passed onto offsprings so more resistant C. difficile is produced. Without the antibiotic, there is no more selection pressure so natural selection does not take place. Resistant C. difficile has no survival advantage.

WBI04_01_Q05cii

Introduction
This question was quite discriminating as this is a rarely tested spec point, especially in a new scenario. Not surprisingly it was quite discriminating.

Examiner Comment
This was an example of the few high-quality responses that we saw.



(ii) Explain why the development of *C. difficile* infections is an example of an 'evolutionary race'.

(2)

C.difficile may mutate to become resistant to an antibiotic (selection pressure) applied to them and we have to produce a new one against them before they become resistant to the existing one so both race to evolve new defense mechanisms.

(iii) Describe **two** ways in which codes of practice relating to antibiotic

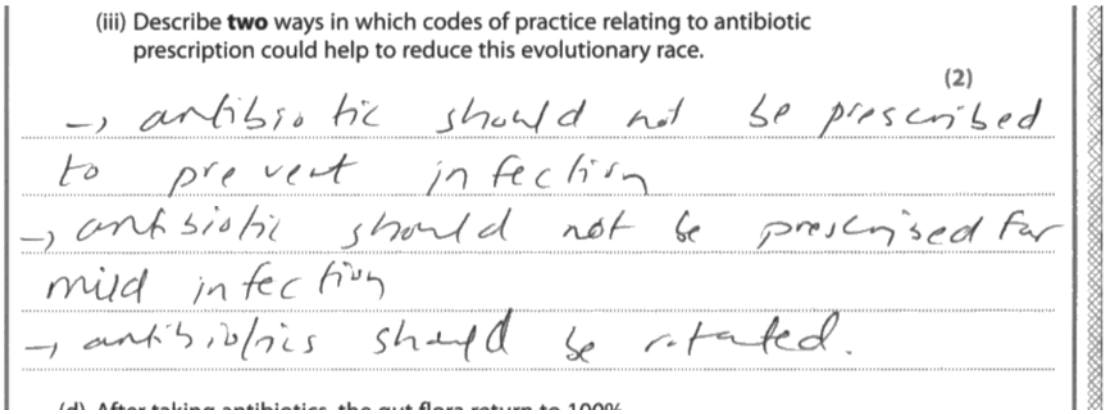
WBI04_01_Q05ciii

Introduction

Unfortunately too many candidates did not read the question carefully enough and simply churned out previous mark schemes, points from which were not actually applicable.

Examiner Comment

This was an example of points that were applicable to the scenario of the question.



(iii) Describe **two** ways in which codes of practice relating to antibiotic prescription could help to reduce this evolutionary race.

(2)

→ antibiotic should not be prescribed to prevent infection

→ antibiotic should not be prescribed for mild infection

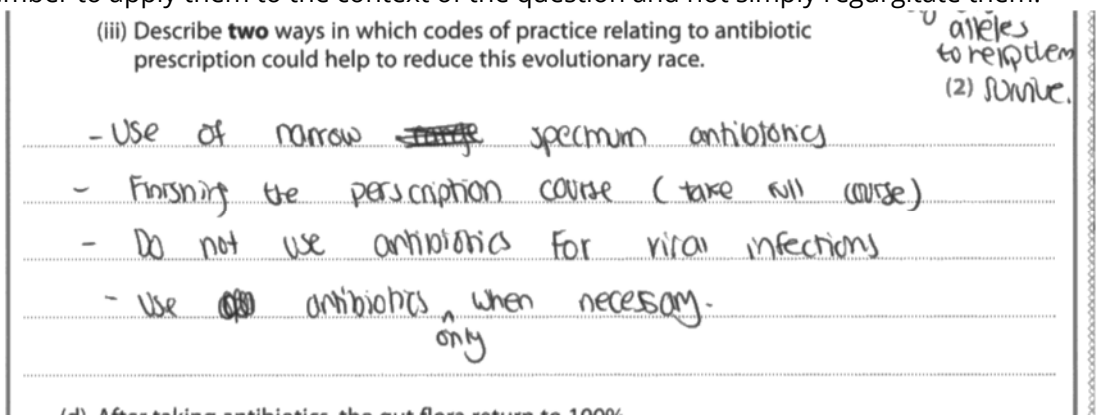
→ antibiotics should be rotated.

Examiner Comment

Mark point 1 could be awarded. Reference to narrow spectrum antibiotics was not relevant to the context of the question. Reference to finishing the course was not applicable to the context of the question.

Examiner Tip

Although the mark schemes from past papers are very useful in preparing you for the exam, you must remember to apply them to the context of the question and not simply regurgitate them.



(iii) Describe **two** ways in which codes of practice relating to antibiotic prescription could help to reduce this evolutionary race.

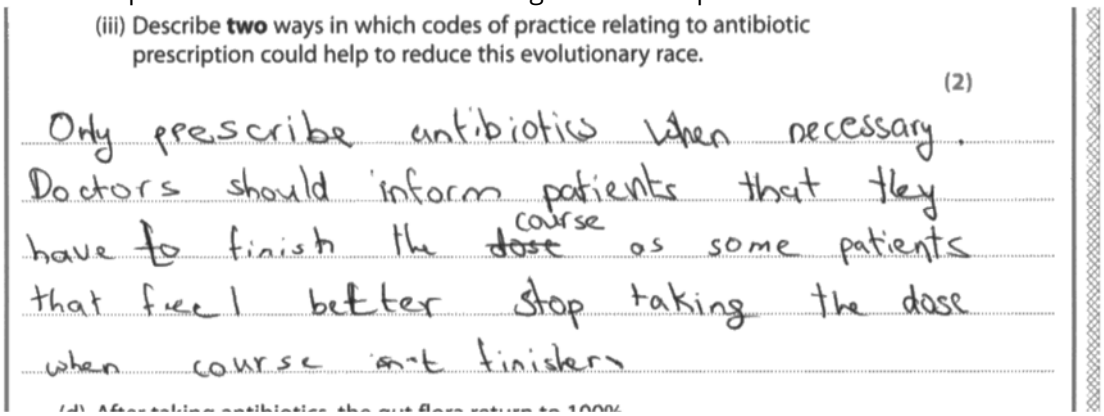
alleles to resistance

(2) survive.

- Use of narrow ~~range~~ spectrum antibiotics
- Finishing the prescription course (take full course)
- Do not use antibiotics for viral infections
- Use ~~(0)~~ antibiotics only when necessary.

Examiner Comment

This is an example of an answer that was too vague for mark point 1 - this is A2.



(iii) Describe **two** ways in which codes of practice relating to antibiotic prescription could help to reduce this evolutionary race.

(2)

Only prescribe antibiotics when necessary. Doctors should inform patients that they have to finish the ~~dose~~ course as some patients that feel better stop taking the dose when course isn't finished

WBI04_01_Q05d

Introduction

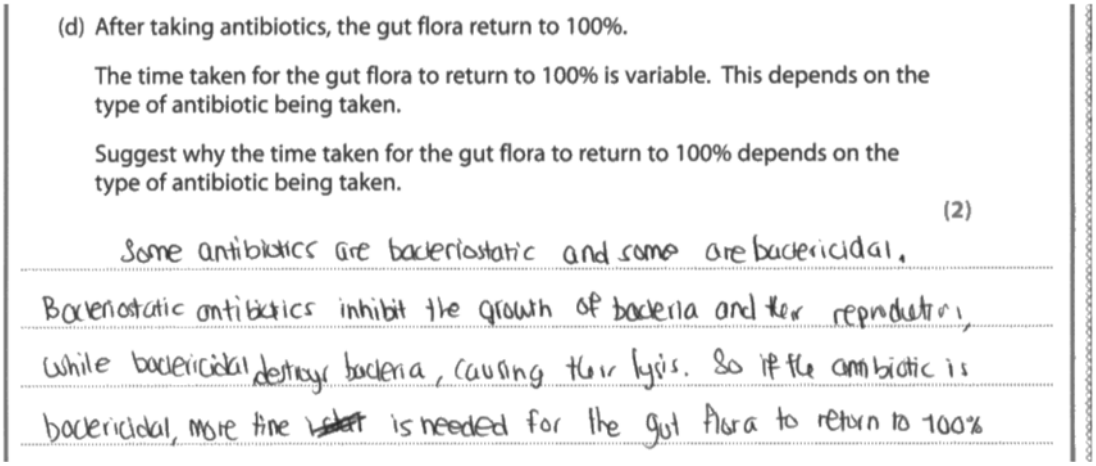
Mixed responses were seen here.

Examiner Comment

This is an example of what we were hoping for.

Examiner Tip

If you are struggling to work out the answer to a question, try and remember what you have been taught and try to apply this knowledge to the question.



(d) After taking antibiotics, the gut flora return to 100%.

The time taken for the gut flora to return to 100% is variable. This depends on the type of antibiotic being taken.

Suggest why the time taken for the gut flora to return to 100% depends on the type of antibiotic being taken.

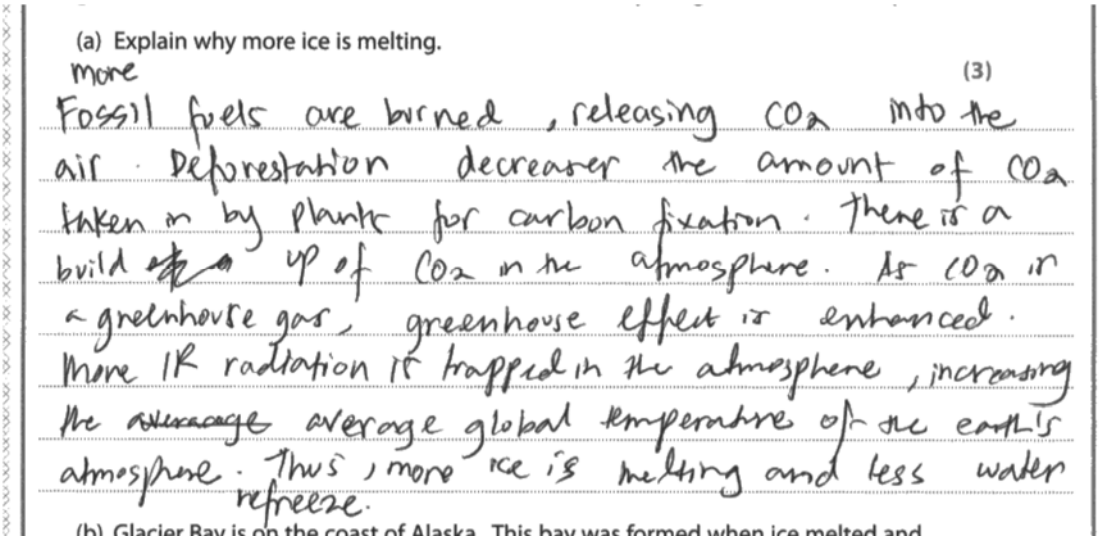
(2)

Some antibiotics are bacteriostatic and some are bactericidal. Bacteriostatic antibiotics inhibit the growth of bacteria and their reproduction, while bactericidal destroy bacteria, causing their lysis. So if the antibiotic is bactericidal, more time ~~is~~ is needed for the gut flora to return to 100%

WBI04_01_Q06a

Introduction
Candidates have clearly used past mark schemes to learn the global warming story.

Examiner Comment
This response illustrates all four of our mark points nicely.



(a) Explain why more ice is melting.

more (3)

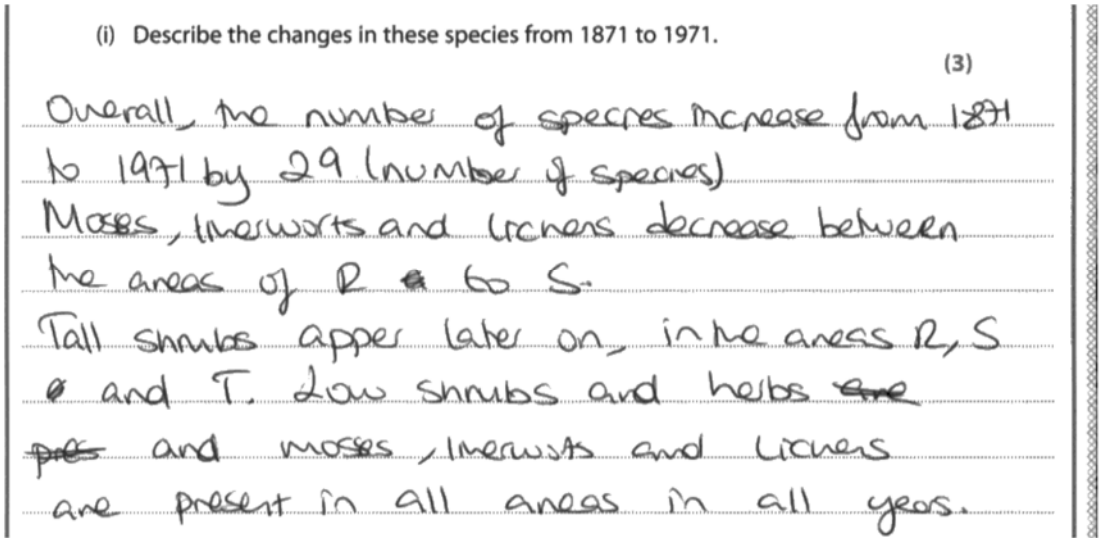
Fossil fuels are burned, releasing CO_2 into the air. Deforestation decreases the amount of CO_2 taken in by plants for carbon fixation. There is a build up of CO_2 in the atmosphere. As CO_2 is a greenhouse gas, greenhouse effect is enhanced. More IR radiation is trapped in the atmosphere, increasing the average global temperature of the earth's atmosphere. Thus, more ice is melting and less water refreeze.

(b) Glacier Bay is on the coast of Alaska. This bay was formed when ice melted and

WBI04_01_Q06bi

Introduction
Candidates picked out that there was an increase in species (for one mark) but only the better answers distinguished between the increase in the total number of species and the total number of different species (for two marks).

Examiner Comment
This response illustrates this point.



(i) Describe the changes in these species from 1871 to 1971.

(3)

Overall, the number of species increase from 1871 to 1971 by 29 (number of species)
Mosses, liverworts and lichens decrease between the areas of R to S.
Tall shrubs appear later on, in the areas R, S and T. Low shrubs and herbs ~~are~~ ~~pre~~ and mosses, liverwsts and lichens are present in all areas in all years.

Examiner Comment

This response illustrates mark point 2 and 3.

(i) Describe the changes in these species from 1871 to 1971.

(3)

From 1871 to 1971, more complex species were formed - e.g in area 7 which was amongst the last to form as it is furthest away from the front edge of the glacier, there are trees whereas before there are no trees. As the seasons, more species exist - at P which is formed after about 6 years, @ Q which is a few years later there are only mosses, lichens, liverworts, lichens & low shrubs and herbs whereas in R & S which are formed a few years after Q & P, there are also tall shrubs and 7 - the last to form many years later has all the other species, there at more abundant now in the other areas as they had more time to establish themselves, as well as tall trees.

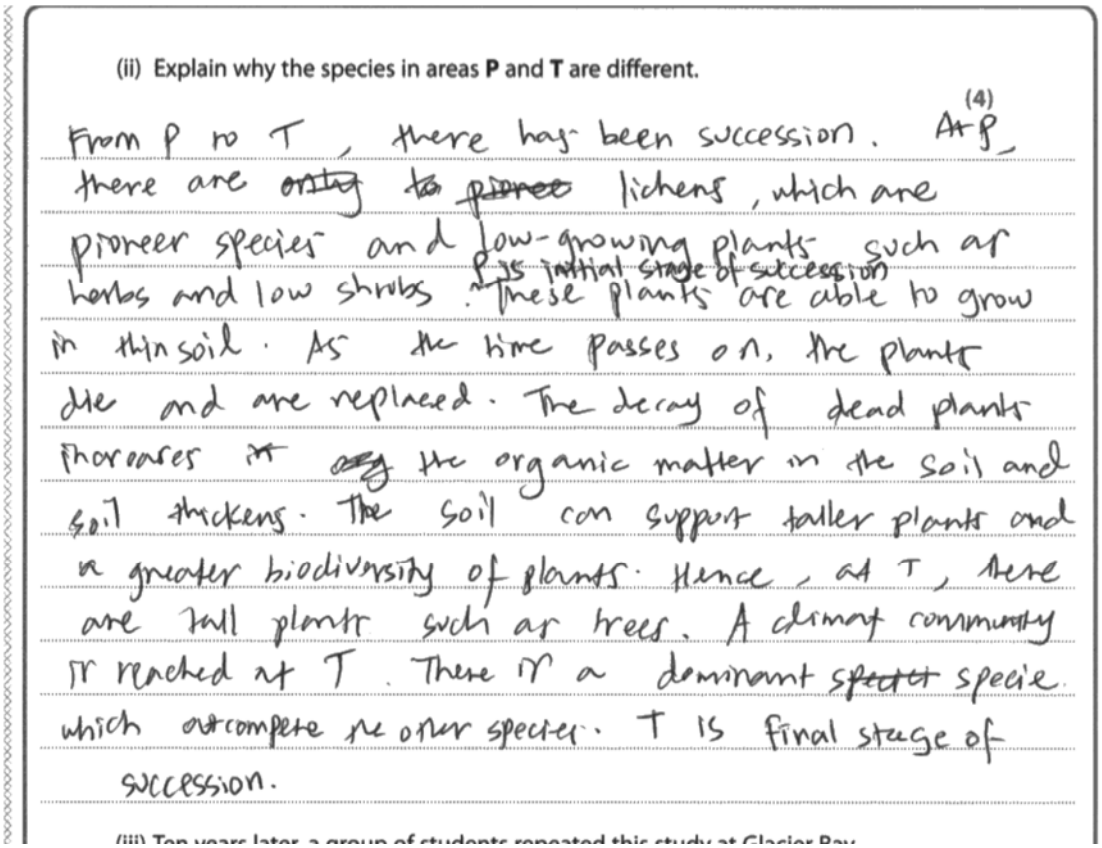
WBI04_01_Q06bii

Introduction

We saw some very good responses from the candidates who identified that this question was about succession.

Examiner Comment

This is an example of the quality of response that we saw, scoring mark points 1, 2, 4, 5 and 6.



(ii) Explain why the species in areas **P** and **T** are different.

(4)

From P to T, there has been succession. At P, there are ~~orsig~~ ~~to~~ ~~pioneer~~ lichens, which are pioneer species and low-growing plants such as herbs and low shrubs. ~~P is initial stage of succession~~ These plants are able to grow in thin soil. As the time passes on, the plants die and are replaced. The decay of dead plants increases ~~it~~ ~~org~~ the organic matter in the soil and soil thickens. The soil can support taller plants and a greater biodiversity of plants. Hence, at T, there are tall plants such as trees. A climax community is reached at T. There is a dominant ~~specie~~ ~~s~~ specie which outcompete the other species. T is final stage of succession.

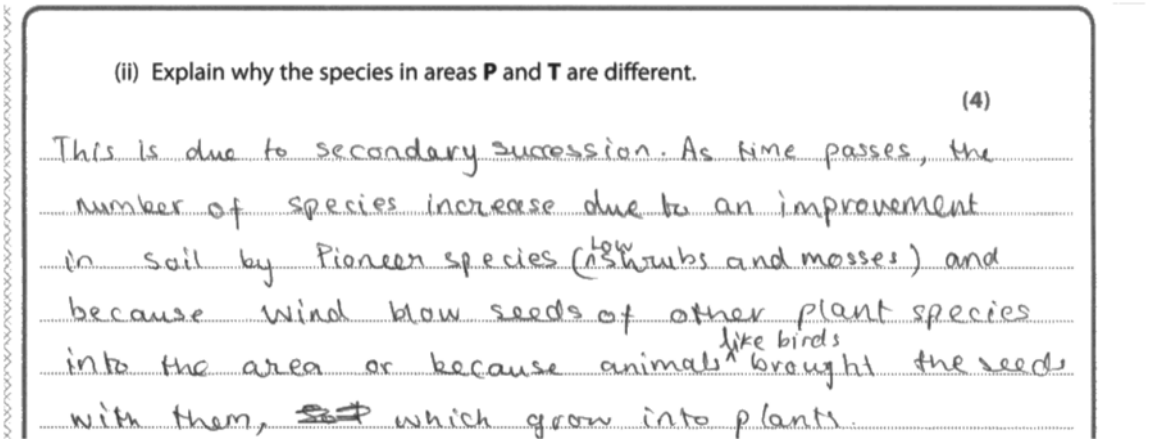
(iii) Ten years later, a group of students repeated this study at Glacier Bay

Examiner Comment

Unfortunately not all candidates had quite such a good understanding of succession.

Examiner Tip

Be careful to distinguish between primary and secondary succession and what types of species are considered to be pioneer species.



(ii) Explain why the species in areas **P** and **T** are different.

(4)

This is due to secondary succession. As time passes, the number of species increase due to an improvement in soil by Pioneer species (low shrubs and mosses) and because wind blow seeds of other plant species into the area or because animals like birds brought the seeds with them, ~~so~~ which grow into plants

WBI04_01_Q06biii

Introduction

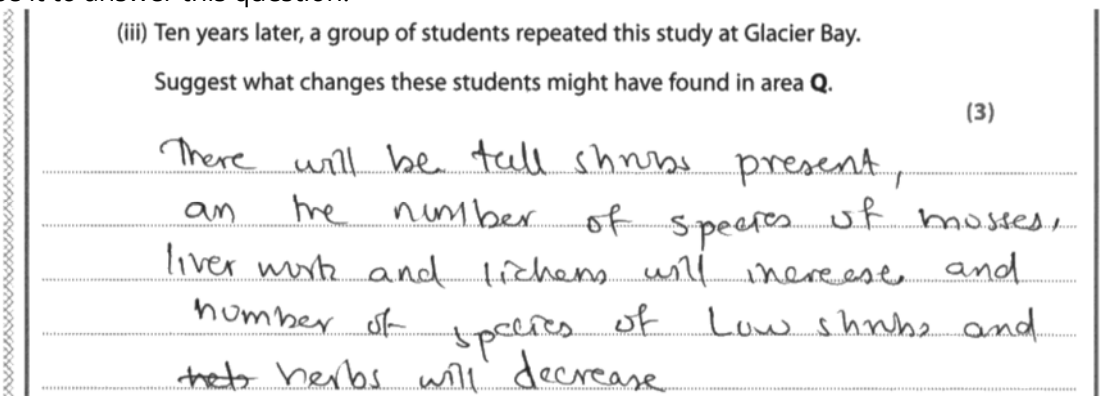
Not all candidates picked up on the subtlety of this question.

Examiner Comment

This was one of the better responses.

Examiner Tip

Read all the information carefully and make sure that you use all of it somewhere in your answers. Information is there for a reason. In this question, a scale was included with the diagram as you needed to use it to answer this question.



(iii) Ten years later, a group of students repeated this study at Glacier Bay.

Suggest what changes these students might have found in area **Q**.

(3)

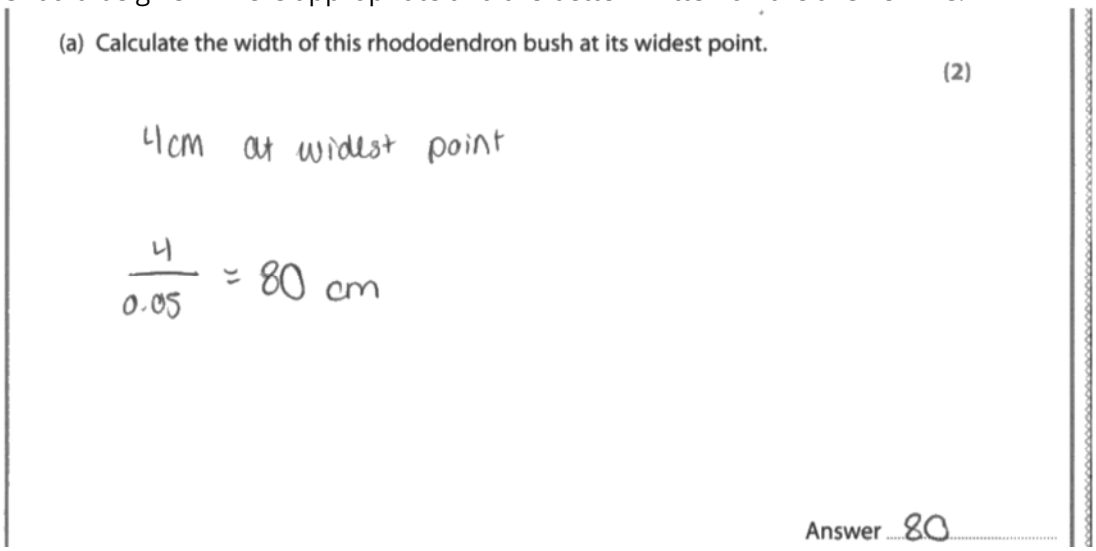
There will be tall shrubs present, an the number of species of mosses, liver wort and lichens will increase and number of species of Low shrubs and ~~herbs~~ herbs will decrease

WBI04_01_Q07a

Introduction
The majority of candidates could measure the widest point of the bush but not all of them could then go on and do the calculation.

Examiner Comment
Units were needed to gain full marks but we did look in the body of the calculation for them.

Examiner Tip
Units should be given where appropriate and are better written on the answer line.


(a) Calculate the width of this rhododendron bush at its widest point.

(2)

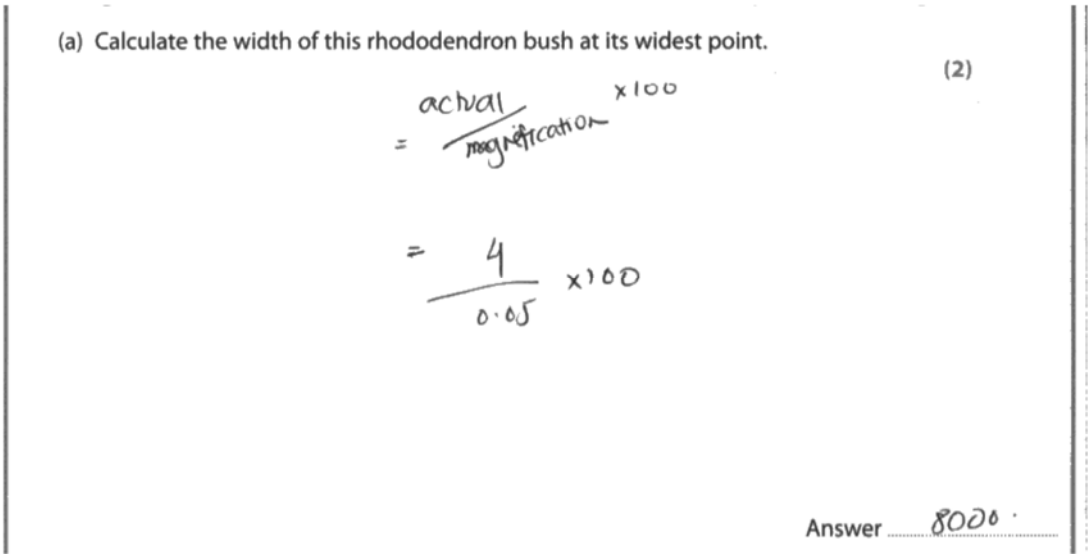
4cm at widest point

$\frac{4}{0.05} = 80$ cm

Answer 80

Examiner Comment
If we do not state the units for the calculation then we will accept anything, provided that the units are stated.

Examiner Tip
Always give units.


(a) Calculate the width of this rhododendron bush at its widest point.

(2)

$= \frac{\text{actual}}{\text{magnification}} \times 100$

$= \frac{4}{0.05} \times 100$

Answer 8000.

WBI04_01_Q07b

Introduction
This was a slightly different approach to field work questions which did not seem to phase candidates too much.

Examiner Comment
This response scored mark points 3, 1, 4 and 5.

Examiner Tip
Just stating that the investigation should be repeated is insufficient at A2. Depending on the context of the question, it may be necessary to add 'in order to calculate a mean' but more often actual details should be given. In this question we wanted to know that several plants were planted at each distance.

Not all practical work requires a graph to be drawn - think about the context of the question and decide how the results should be used. In this case, the closest distance to the bush that plants were healthy was the answer.

(b) Describe an investigation to determine how near to the rhododendron bush the gardener could grow new plants.

(4)

1) ~~Pick~~ Set several areas (6) near to the rhododendron (each further ~~away~~ by 50 cm) use a transect

2) Areas should be equal in size 1m x 1m

3) Put in each equal number of plant seed (20) of the same age, origin

4) Control humidity, light intensity, mineral ions supply in each area

5) At equal periods of time (2 weeks) record increase in length or organs formation (leaves, roots etc.)

6) Repeat experiment several times for each area

7) Plot a graph distance from rhododendron vs increase in length

WBI04_01_Q07ci

Introduction
This question was reasonably well done by the candidates who remembered to write about the measurement of both variables.

Examiner Comment
A typical response.

Examiner Tip
You will not score full marks if you do not answer all parts of the question.

(c) The rhododendron bush could also affect the growth of other plants by reducing water availability and light.

(i) Describe how water availability and light could be measured.

(4)

Light could be measured using a light probe and taking several measurments around the plant. Water availability can be measured by taking samples of the soil and drying them to measure the dry mass and thus the water in each sample by subtracting the initial mass by the dry mass.

WBI04_01_Q08ai

Introduction
Unfortunately too many candidates had seen the question about collecting DNA from brown bear foot prints and wrote about the safety of the bear / scientist, instead of answering this question.

Examiner Comment
This was a typical response that we accepted as our bottom line; it would have been more reassuring to know that the contamination being avoided was from other sources of DNA.

Examiner Tip
Try to be as specific as possible as you may lose marks if your answers are too vague.

(i) State **one** precaution that had to be taken when the blood and fur samples were collected.

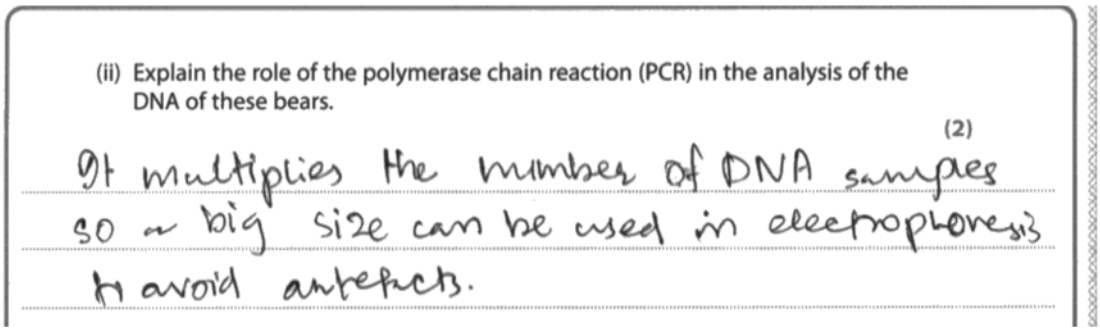
(1)

~~Blood~~ - avoid any ~~Cont~~ contamination of mixing of samples.

WBI04_01_Q08aii

Introduction
Only the better candidates took their answer far enough and linked the DNA analysis with gel Electrophoresis.

Examiner Comment
This is one such answer.



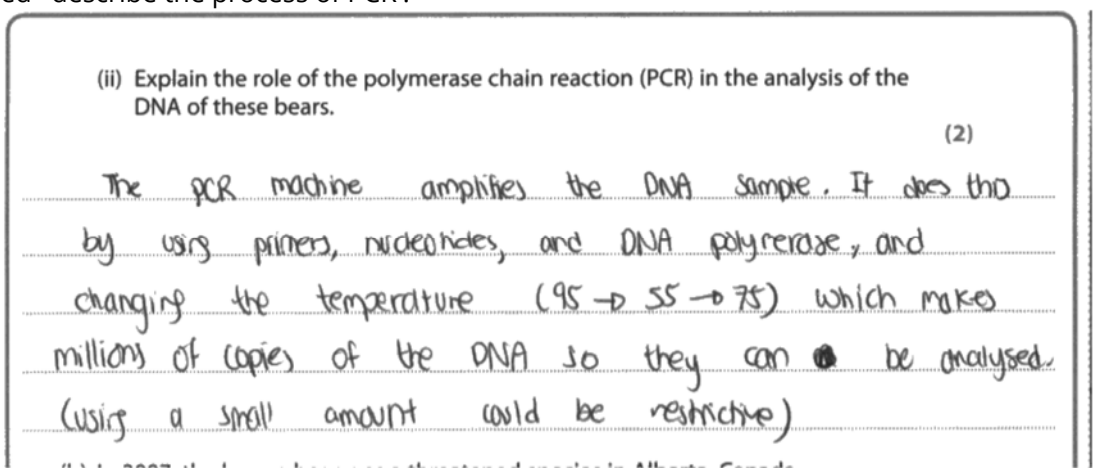
(ii) Explain the role of the polymerase chain reaction (PCR) in the analysis of the DNA of these bears.

(2)

It multiplies the number of DNA samples so a big size can be used in electrophoresis to avoid artefacts.

Examiner Comment
There were quite a few candidates who wrote lots of details of PCR, as seen in this response.

Examiner Tip
Learn to recognise the command words. If we had wanted details of PCR the question would have been worded ' describe the process of PCR'.



(ii) Explain the role of the polymerase chain reaction (PCR) in the analysis of the DNA of these bears.

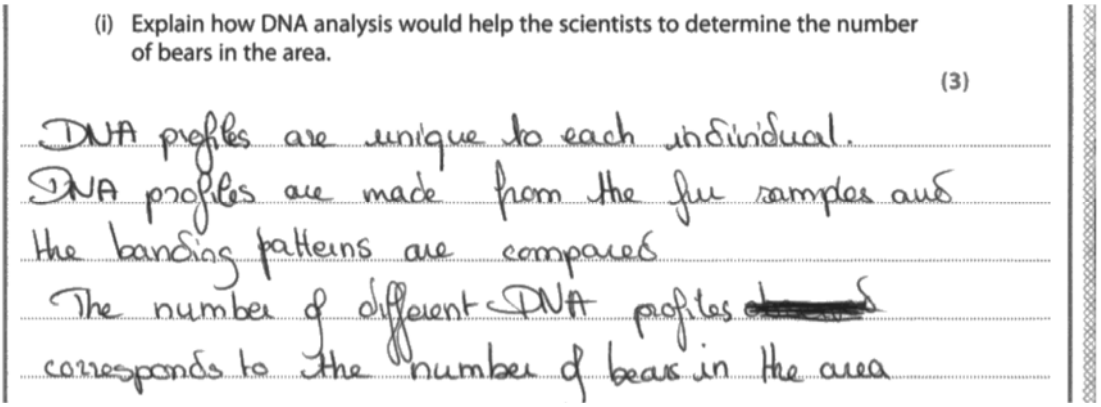
(2)

The PCR machine amplifies the DNA sample. It does this by using primers, nucleotides, and DNA polymerase, and changing the temperature (95 → 55 → 75) which makes millions of copies of the DNA so they can be analysed. (using a small amount could be restrictive)

WBI04_01_Q08bi

Introduction
We saw some good responses to this question.

Examiner Comment
This is one such example, scoring all three of our mark points.



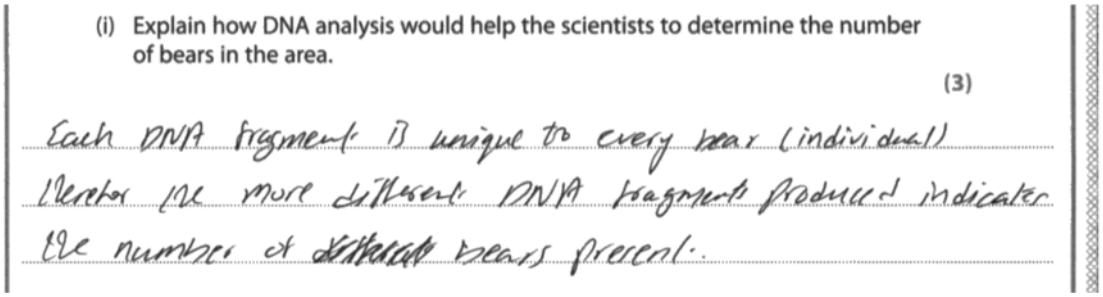
(i) Explain how DNA analysis would help the scientists to determine the number of bears in the area.

(3)

DNA profiles are unique to each individual.
DNA profiles are made from the fur samples and the banding patterns are compared
The number of different DNA profiles corresponds to the number of bears in the area

Examiner Comment
There were candidates who failed to score well due to poor expression.

Examiner Tip
In gel electrophoresis, the DNA is cut into fragments by the restriction endonucleases, producing bands on the gel.



(i) Explain how DNA analysis would help the scientists to determine the number of bears in the area.

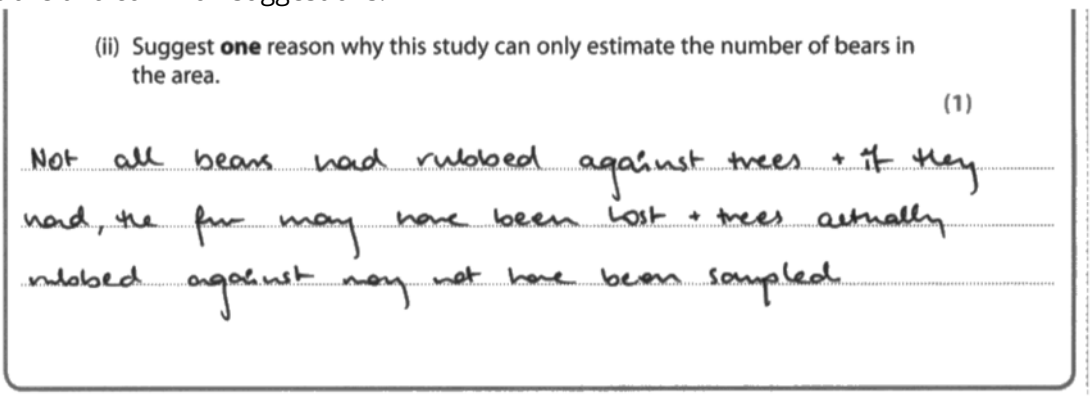
(3)

Each DNA fragment is unique to every bear (individual)
Therefor the more different DNA fragments produced indicates the number of bears present.

WBI04_01_Q08bii

Introduction
Some good suggestions were made in response to this question.

Examiner Comment
These are two common suggestions.



(ii) Suggest **one** reason why this study can only estimate the number of bears in the area.

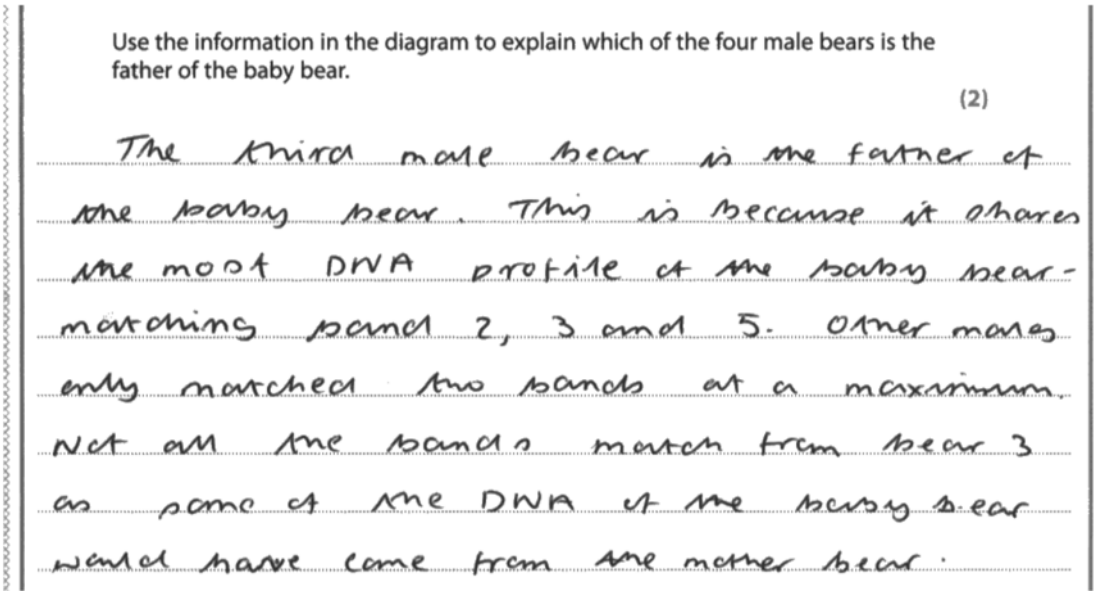
(1)

Not all bears had rubbed against trees + if they had, the fur may have been lost + trees actually rubbed against may not have been sampled

WBI04_01_Q08c

Introduction
The majority of candidates picked out bear 3 as the father but only the more able candidates selected just bands 2 and 3 as the reason.

Examiner Comment
As seen in this response, many candidates included band 5 in their explanation.



Use the information in the diagram to explain which of the four male bears is the father of the baby bear.

(2)

The third male bear is the father of the baby bear. This is because it shares the most DNA profile of the baby bear - matching band 2, 3 and 5. Other males only matched two bands at a maximum. Not all the bands match from bear 3 as some of the DNA of the baby bear would have come from the mother bear.

Paper Summary

The following advice is offered to candidates in order to improve performance on WBIO4 papers in future sessions:

- prepare for the exam by knowing the meaning of each command word and then identify the command word used in the question before starting your response

- read the question through very carefully a couple of times to make sure that the information that you have learnt is presented in such a way as to actually answer the question

- try not to leave any responses blank; this will guarantee you a mark of zero whereas a guess may score you a couple of extra marks.

- attempt all calculations even if you cannot finish them; there may be method marks that you could pick up

- use the mark allocation for each question to help you know how many points to make

- at the end of the paper read through all the questions carefully to ensure that you have used all the information given to you in the question.

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