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June 2025

Int GCSE Biology 4BI1 1B

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June 2025

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Introduction

The examiners were once again impressed with the standard of many of the candidate responses. Centres continue to work hard to prepare candidates for all of the styles of question and all areas of specification content. Many candidates were able to demonstrate very good levels of knowledge and understanding of the specification content. Many were also able to apply their knowledge to novel contexts both theoretical and practical. There was little evidence of candidates being short of time on the paper. Most candidates attempted all questions. Candidates continue to achieve well in the items requiring an evaluation response. In this paper these items used the command words 'comment' and 'discuss' as well as explain. Centres are reminded that a list of command words are provided in the appendix of the specification. Many centres use this list with its definitions to help prepare candidates to answer these questions.

Most candidates did well on the items examining the mathematical skills outlined in the appendix at the end of the specification. The best candidates were able to correctly express their answer in standard form and correctly calculate combined probability. In the calculations, many candidates showed their working so that even if they did not get the final answer, they were able to gain some credit.

Question1(c)

Question 1(c) required candidates to state what is meant by the term organelle. Most were able to correctly achieve this.

(c) Some of the labelled structures are known as organelles.

State what is meant by the term **organelle**.

(1)

a structure within a cell that has a particular function

ResultsPlus
Examiner Comments

This answer gains the mark for a structure in a cell which has a particular function.

(c) Some of the labelled structures are known as organelles.

State what is meant by the term **organelle**.

(1)

A structure within a cell which ~~carries~~ performs a specific function.

ResultsPlus
Examiner Comments

This answer gains the mark for "a structure within a cell performs a specific function".

(c) Some of the labelled structures are known as organelles.

State what is meant by the term **organelle**.

(1)

Structures that make up cells

ResultsPlus
Examiner Comments

No credit for this answer as it does not refer to a specific function of an organelle.

ResultsPlus
Examiner Tip

Make sure you completely state what is meant by the term.

Question1(d)

Question 1(d) asked candidates to explain which two labelled structures allow Euglena to move through water.

Refer to the diagram and your own knowledge in your answer.

Three marks were available.

(d) Explain which two labelled structures allow *Euglena* to move through water.

Refer to the diagram and your own knowledge in your answer.

(3)

1 mitochondria which is used to release energy and awaws movement

2 flagellum awows Euglena to navigate, move and swim thraugh water because it acts like a tail.

ResultsPlus
Examiner Comments

This response gains full credit. It identifies the mitochondria and its function. It also identifies the flagellum.

(d) Explain which two labelled structures allow *Euglena* to move through water.

Refer to the diagram and your own knowledge in your answer.

(3)

1 Structure R being the tail allows ~~the~~ Euglena to flow through water by pushing it forward

2 The mitochondria provide the tail with the necessary energy for movement

ResultsPlus
Examiner Comments

This response also gains full credit. It identifies structure R. It also explains the mitochondria provide energy for the cell.

(d) Explain which two labelled structures allow *Euglena* to move through water.

Refer to the diagram and your own knowledge in your answer.

(3)

1 R, which is flagella, it makes the bacteria move faster and supports the movement

2 P, which is cell membrane, which give the cell its shape that allows it to move easier in water

ResultsPlus
Examiner Comments

This response gains one mark for identifying the flagella. It gains no credit for reference to cell membrane.

Question2(a)i

Question 2 (a)(i) asks candidates to give one variable that the teacher controls in the investigation.

2 A teacher uses Benedict's solution to investigate the concentration of glucose in four flavoured waters, A, B, C and D.

↓ high conc
due to red

This is the teacher's method.

green (low conc

Step 1 add 5 cm^3 of flavoured water to a boiling tube

Step 2 add 5 cm^3 of Benedict's solution to the boiling tube

Step 3 keep the boiling tube at 70 °C for five minutes

Step 4 record the colour of the solution

The teacher uses this method for each of the four flavoured waters.

The table shows the teacher's results.

Flavoured water	Colour of the solution after heating for five minutes
A	yellow
B	brick red
C	blue
D	green

→same

(a) (i) Give one variable that the teacher controls in the investigation.

(1)

the volume of Benedicts solution added to each test tube.

ResultsPlus
Examiner Comments

This response correctly gives volume of Benedict's as a control variable.

2 A teacher uses Benedict's solution to investigate the concentration of glucose in four flavoured waters, A, B, C and D.

This is the teacher's method.

Step 1 add 5 cm^3 of flavoured water to a boiling tube

Step 2 add 5 cm^3 of Benedict's solution to the boiling tube

Step 3 keep the boiling tube at 70 °C for five minutes

Step 4 record the colour of the solution

The teacher uses this method for each of the four flavoured waters.

The table shows the teacher's results.

Flavoured water	Colour of the solution after heating for five minutes
A	yellow
B	brick red
C	blue
D	green

Most
A lot
~~No~~ glucose
Not much
Some

(a) (i) Give one variable that the teacher controls in the investigation.

(1)

Time kept for boiling tube at 70°C

ResultsPlus
Examiner Comments

This response gains the mark for time at 70 o C.

2 A teacher uses Benedict's solution to investigate the concentration of glucose in four flavoured waters, A, B, C and D.

This is the teacher's method.

Step 1 add 5 cm^3 of flavoured water to a boiling tube

Step 2 add 5 cm^3 of Benedict's solution to the boiling tube

Step 3 keep the boiling tube at 70 °C for five minutes

Step 4 record the colour of the solution

The teacher uses this method for each of the four flavoured waters.

The table shows the teacher's results.

Flavoured water	Colour of the solution after heating for five minutes
A	yellow
B	brick red
C	blue
D	green

(a) (i) Give one variable that the teacher controls in the investigation.

(1)

what flavour the water is

ResultsPlus
Examiner Comments

No credit for flavour of water as this is not a control variable.

Question2(a)ii

This item asked candidates to give a method that the teacher could safely use to keep the boiling tube at 70 °C for five minutes in step 3.

(ii) Give a method that the teacher could safely use to keep the boiling tube at 70 °C for five minutes in step 3.

(1)

Use a water bath ~~to record the temperature~~ as you can set the temperature and it won't change

ResultsPlus
Examiner Comments

This response gains the mark for using a water bath.

(ii) Give a method that the teacher could safely use to keep the boiling tube at 70 °C for five minutes in step 3.

(1)

Water bath

ResultsPlus
Examiner Comments

This response also gains the mark for using a water bath.

(ii) Give a method that the teacher could safely use to keep the boiling tube at 70°C for five minutes in step 3.

(1)

Use a thermometer to measure the temperature

ResultsPlus Examiner Comments

This response does not gain credit.

ResultsPlus Examiner Tip

If the response does not refer to a water bath credit can be earned by referring to a beaker of water and a Bunsen.

Question2(b)

In question 2(b) candidates are told that an athlete wants to drink flavoured water to help them run a long□distance race.

The candidates are then required to use the data in the table to explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

flavoured water B. this is because it turned brick red with benedicts solution meaning it has the highest concentration of glucose. this will allow the athlete to respire more resulting in them having more energy for their race. if they drank the other waters they would not get as much glucose into their body

ResultsPlus
Examiner Comments

This item gains full marks. It gains mp 1 for identifying drink B. It gains mp 2 for noting Benedict's turns brick red. It gains mp3 for stating that it has the highest glucose concentration. It gains mp 4 for more respiration. That scores 4 marks In addition it mentions mp 5 providing more energy.

(b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

B, it contains most concentrated glucose. This glucose will cause pancreas to release insulin turning glucose into glycogen which is a storage of glucose and during run it will be released to muscles ~~and send~~ and sweat inserting to allow aerobic respiration in the muscles, preventing build up of lactic acid, allowing the athlete to run for a longer time from anaerobic respiration.

ResultsPlus
Examiner Comments

This response also gains full marks. It gains mp 1 for drink B. It gains mp 2 for most glucose. It gains mp 4 for more respiration. It gains mp 7 for being able to run for longer.

(b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

Water B because it contains the most amount of glucose which is needed in ~~ma~~ aerobic respiration. During a long-distance race the cells in the muscles are respiring more meaning they need more glucose in order to produce energy. When Benedict's solution is added, the solution will turn from blue to brick red with blue containing no glucose and brick red containing a lot of glucose. Green contains a little glucose and Yellow contains a medium amount.

ResultsPlus
Examiner Comments

This response also gains full marks. It gains mp 1 for drink B. It gains mp 2 for most glucose. It gains mp 4 for respiration. It gains mp 3 for brick red.

ResultsPlus
Examiner Tip

The candidate writes about producing energy, this should be that respiration releases energy.

(b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

water D because the solution turned green which means it has the highest concentration of glucose. This is beneficial for the athlete as they will have more energy which will provide energy for the muscles as they contract more and more aerobic respiration can occur and more oxygen is taken in so they can run longer and not get tired as fast.

ResultsPlus
Examiner Comments

This response wrongly identifies drink D, so does not score mp 1. But it correctly notes mp 4 respiration, mp 5 providing energy and mp6 for muscle contraction.

Question2(c)

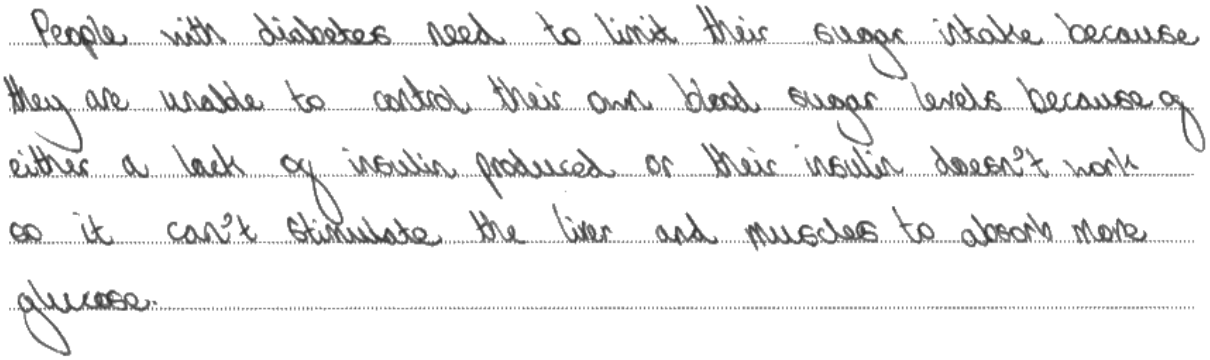
Question 2(c) tells candidates that some flavoured waters do not contain glucose.

They are asked to suggest why this may be an advantage for some people.

(c) Some flavoured waters do not contain glucose.

Suggest why this may be an advantage for some people.

(2)



ResultsPlus
Examiner Comments

This response gains both marks for identifying people with diabetes and that they may be unable to control their blood sugar levels due to a lack of insulin produced.

(c) Some flavoured waters do not contain glucose.

Suggest why this may be an advantage for some people.

(2)

& high glucose levels can ~~be~~ lead to weight gain, excess glucose in blood is stored as fat, increasing weight which may lead to various health problems.

ResultsPlus
Examiner Comments

This response scores 1 mark for leading to weight gain.

(c) Some flavoured waters do not contain glucose.

Suggest why this may be an advantage for some people.

(2)

Some may have diabetes which inhibits the production of insulin. This means some cannot convert glucose to glycogen. It cannot lower blood glucose levels. If they consume more glucose, it will raise their blood glucose levels resulting in high blood pressure and lead to cardiac arrest.

ResultsPlus
Examiner Comments

This response also gains both marks for identifying people with diabetes and that they may be unable to produce insulin.

Question3(a)

In Question 3(a) candidates are asked to give the energy conversion that occurs during photosynthesis

3 Plant cells use photosynthesis to produce carbohydrates.

(a) Give the energy conversion that occurs during photosynthesis.

(2)

from sunlight energy to chemical energy

ResultsPlus
Examiner Comments

This response gains both marks for sunlight and chemical.

3 Plant cells use photosynthesis to produce carbohydrates.

(a) Give the energy conversion that occurs during photosynthesis.

(2)

from light energy to chemical energy

ResultsPlus
Examiner Comments

This response also gains both marks for light and chemical.

3 Plant cells use photosynthesis to produce carbohydrates.

(a) Give the energy conversion that occurs during photosynthesis.

(2)

from Light energy to water energy

ResultsPlus
Examiner Comments

This response gains one mark for light but no credit for water.

Question3(b)i

In question 3(b)(i) candidates are told that a student investigates whether carbon dioxide is needed for photosynthesis.

Firstly, the student needs to remove all the starch from the plant's leaves.

The candidates are asked to explain how the student could do this.

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

the student leaves the plant in darkness/ dark cupboard for 24 hours so that no photosynthesis takes place, instead plant respires using up all of its starch (glucose)

ResultsPlus
Examiner Comments

This response gains both marks. It explains that the plant is in the dark for 24 hours. It also explains that by respiration the starch is used up. This response includes all 3 marking point so scores 2 marks.

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

- keep the leaf in the dark for 24 hours.

ResultsPlus
Examiner Comments

This response gains one mark for "in dark for 24 hours".

ResultsPlus
Examiner Tip

To gain full credit the response needs to include an explanation as to how this removes the starch.

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

The student should place the plant in a dark room with no light for over 24 hours so that no photosynthesis can occur and therefore the plants starch reserves will be used up for energy in respiration.

ResultsPlus
Examiner Comments

This response also gains both marks. It explains that the plant is in the dark for 24 hours. It also explains that starch is used up for respiration. This response includes all 3 marking point so scores 2 marks.

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

boil in ethanol place in dark room, uses up starch for photosynthesis as it has no light

boil in ethanol

ResultsPlus
Examiner Comments

This response also gains one mark for "uses up the starch".

ResultsPlus
Examiner Tip

To gain another mark the response needs to refer to how long the plant is placed in the dark for or for explaining that respiration uses up the starch.

Question3(b)ii

In 3(b)(ii) candidates are asked to complete and label diagram 2 to show the results of the starch test.

(ii) After the starch has been removed from the leaves, the student uses the apparatus in diagram 1 to prevent carbon dioxide from reaching part of one of the leaves.

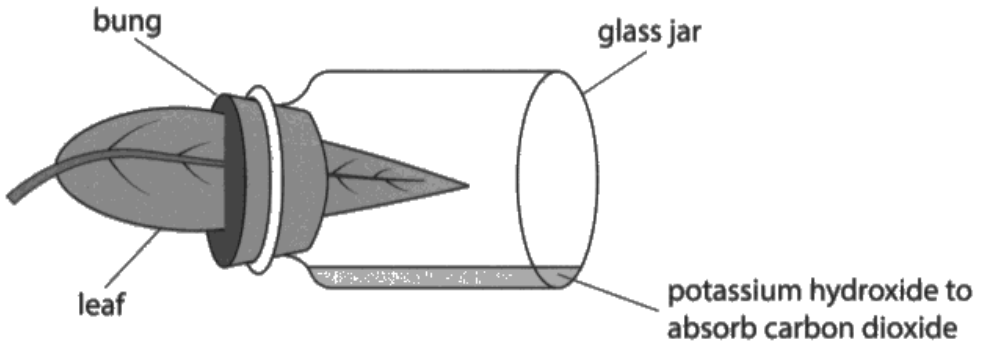


Diagram 1

The student places the apparatus in the light for 24 hours, and then tests the leaf for starch.

Complete and label diagram 2 to show the results of the starch test.

(2)

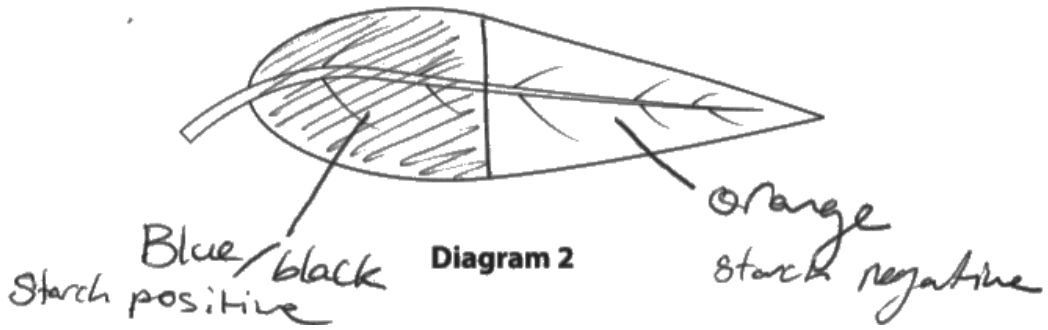


Diagram 2

ResultsPlus
Examiner Comments

This response clearly identifies the left-hand side as blue-black and the right hand side as orange. This scores 2 marks.

(ii) After the starch has been removed from the leaves, the student uses the apparatus in diagram 1 to prevent carbon dioxide from reaching part of one of the leaves.

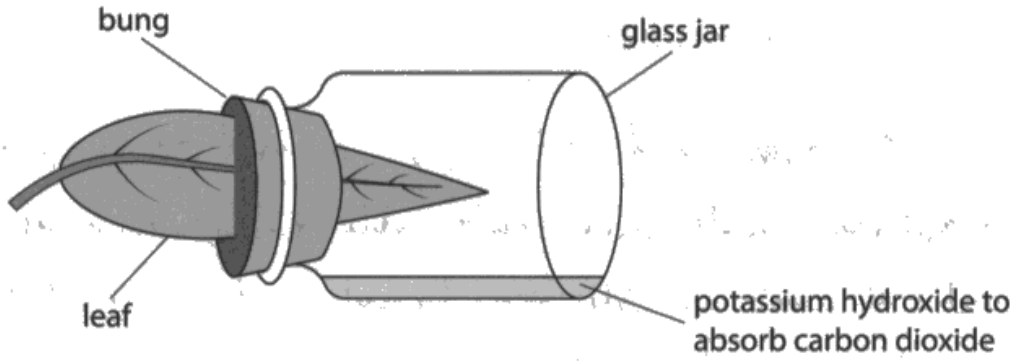


Diagram 1

The student places the apparatus in the light for 24 hours, and then tests the leaf for starch.

Complete and label diagram 2 to show the results of the starch test.

(2)

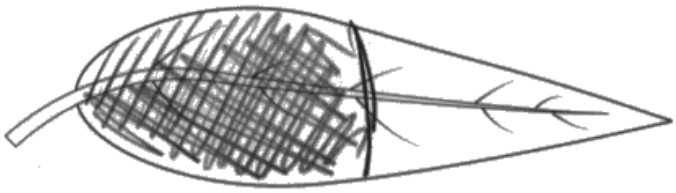


Diagram 2

ResultsPlus
Examiner Comments

This response gains one mark for shading in the left hand-side correctly.

ResultsPlus
Examiner Tip

To gain both marks candidates were asked to label the diagram.

(ii) After the starch has been removed from the leaves, the student uses the apparatus in diagram 1 to prevent carbon dioxide from reaching part of one of the leaves.

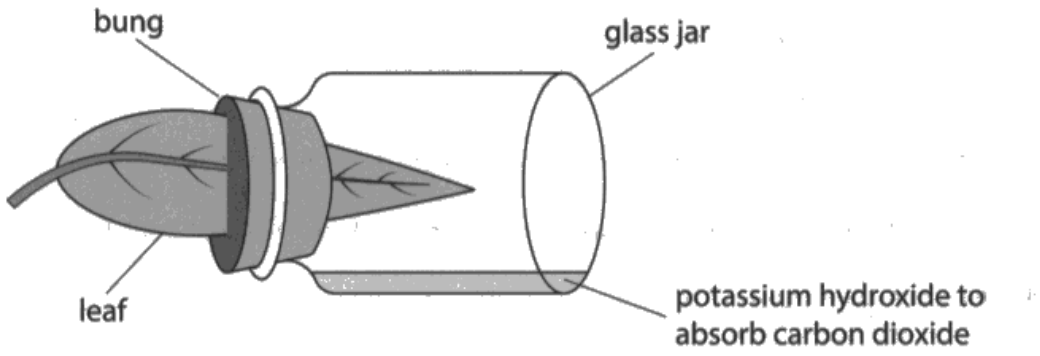


Diagram 1

The student places the apparatus in the light for 24 hours, and then tests the leaf for starch.

Complete and label diagram 2 to show the results of the starch test. (2)

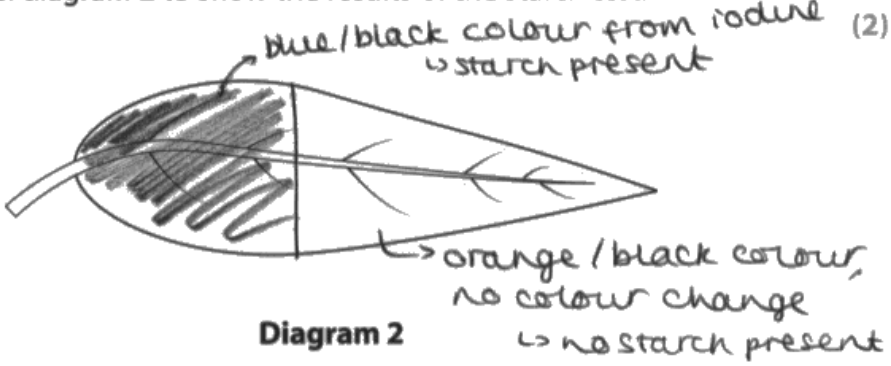


Diagram 2

ResultsPlus
Examiner Comments

This response also clearly identifies the left-hand side as blue-black and the right hand side as orange. This scores 2 marks.

Question3(c)

In 3(c) candidates were told that plants need mineral ions as well as carbon dioxide and water.

The candidates were asked to give the functions of two named mineral ions that a plant needs.

(c) Plants need mineral ions as well as carbon dioxide and water.

Give the functions of two named mineral ions that a plant needs.

(4)

1 Nitrates make amino acids in plants. Amino acids are used to make proteins required for growth and repair.

2 Magnesium is required for chlorophyll. Chlorophyll is found in chloroplasts and traps light energy used for photosynthesis.

ResultsPlus
Examiner Comments

This response gains full 4 marks. It identifies nitrates and correctly gives their function to produce amino acids. It also identifies magnesium and give its function as being required for chlorophyll.

(c) Plants need mineral ions as well as carbon dioxide and water.

Give the functions of two named mineral ions that a plant needs.

(4)

1 Nitrates are needed for growth and repair of the [redacted] leaf.

2 Magnesium is needed for chlorophyll and therefore photosynthesis.

ResultsPlus
Examiner Comments

This response gains 3 marks. It gives nitrates but does not provide sufficient detail for their function. It identifies magnesium and gives its function as being required for chlorophyll.

ResultsPlus
Examiner Tip

To gain full credit state the function of nitrates to produce amino acids for protein synthesis.

(c) Plants need mineral ions as well as carbon dioxide and water.

Give the functions of two named mineral ions that a plant needs.

(4)

1 Nitrates - for growth of a plant

2 Magnesium - colour of plant

ResultsPlus
Examiner Comments

This response correctly gives nitrates and magnesium.

ResultsPlus
Examiner Tip

To gain the function marks more detail is required for example to produce amino acids and for chlorophyll.

Question3(d)

In question3(d) candidates are told that the concentration of mineral ions in the soil is often lower than the concentration in the plant and that waterlogged soil does not contain air.

The candidates are asked to explain why plants in waterlogged soil cannot absorb mineral ions.

(d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

If the concentration of mineral ions in the soil is lower than the concentration in the plant active transport is required which through the use of carrier proteins to transport mineral ions into the plant against a concentration gradient as diffusion cannot take place. Active transport requires energy from respiration however in water logged soil there is no air and therefore no oxygen for aerobic respiration to take place. Therefore energy cannot be produced from respiration in order for active transport to take place and the plants cannot absorb mineral ions.

(Total for Question 3 = 13 marks)

ResultsPlus
Examiner Comments

This gains full marks. It scores 3 but includes all 4 marking points. It scores mp 1 for active transport, mp 4 for energy, mp 3 for respiration and mp 2 for no oxygen available.

(d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

The plant requires air for respiration
The plant needs it to respire to get the energy required to absorb the mineral ions through active transport

ResultsPlus
Examiner Comments

This also gains 3 marks. It scores mp 3 for respiration, mp 4 for energy and mp 1 for active transport.

ResultsPlus
Examiner Tip

It needs to refer to oxygen rather than air to gain mp2.

(d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

- They cannot respire as there is no air
- no respiration means they have no energy to take up the ions
- no room for the ions
- ~~ions cannot do osmosis and the~~
- plant cannot use osmosis

ResultsPlus
Examiner Comments

This response scores 2 marks. It refers to mp 3 for no respiration and mp4 for no energy.

(d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

waterlogged soil means that the plant cannot use the oxygen from the air to respire. water is being absorbed by osmosis, so no room to absorb ~~nutrients~~ sugars. theres already a high concentration of mineral ions in the plant, ~~some~~ oxygen cant diffuse into the roots to respire so no more minerals are needed

~~carbon dioxide + water → glucose + oxygen~~

glucose + oxygen → carbon dioxide + water

ResultsPlus
Examiner Comments

This response scores 2 marks. It gains mp 2 for no oxygen and mp3 for respiration.

Question4(a)i

Question 4(a)(i) asks candidates to name two substances carried in the phloem.

4 Insect pests can eat and damage crop plants.

The cottony cushion scale insect is a pest that feeds on orange trees.

(a) This insect feeds from the phloem of the trees, reducing crop yield.

(i) Name two substances carried in the phloem.

(2)

1 Dissolved sucrose

2 [redacted] Amino acids

ResultsPlus
Examiner Comments

This response gains two marks for sucrose and amino acids.

4 Insect pests can eat and damage crop plants.

The cottony cushion scale insect is a pest that feeds on orange trees.

(a) This insect feeds from the phloem of the trees, reducing crop yield.

(i) Name two substances carried in the phloem.

(2)

1 [redacted] sucrose

2 amino acids .

ResultsPlus
Examiner Comments

This also correctly names sucrose and amino acids.

4 Insect pests can eat and damage crop plants.

The cottony cushion scale insect is a pest that feeds on orange trees.

(a) This insect feeds from the phloem of the trees, reducing crop yield.

(i) Name two substances carried in the phloem.

(2)

1 sugar solution

2 minerals ions

ResultsPlus
Examiner Comments

This gains one mark for sugar solution.

ResultsPlus
Examiner Tip

To be more precise candidates should refer to sucrose rather than sugar.

Question4(a)ii

In question 4(a)(ii) candidates were asked to explain why insects feeding from the phloem can reduce crop yield from the orange trees.

(ii) Explain why insects feeding from the phloem can reduce crop yield from the orange trees. * as starch.

(3)

· If the insect eats the sugars, there are 2a less glucose sugars to be turned into ~~those~~ fruit*. This means that the less fruit is produced, which reduces crop yield.

· If the amino acids are eaten, the plant can produce less proteins. This results in less growth, so less fruit is made. This reduces the crop yield.

ResultsPlus
Examiner Comments

This response gains 3 marks. It scores mp 2 for less proteins, mp 3 for less growth and mp 4 for less fruit.

(ii) Explain why insects feeding from the phloem can reduce crop yield from the orange trees.

(3)

If insects feeds on phloem, not enough sugar is and amino acids are transported around the plant. Less amino acids means less proteins which are needed for enzymes and growth. Sugar is the reactant in respiration (less respiration) and the products of respiration are needed for photosynthesis. → less photosynthesis → less growth. Less respiration means less energy (ATP) released. Sugar is a needed for energy. Less amino acids and less sugar means reduced growth and reduced yield.

ResultsPlus
Examiner Comments

This response also gains 3 marks. It scores mp3 for less protein, mp 1 for less respiration and mp 3 for less growth.

(ii) Explain why insects feeding from the phloem can reduce crop yield from the orange trees.

(3)

The phloem transports all the minerals and vitamins needed in the plant, and if they are taken from the phloem, they cannot be transported to the areas of the plant ~~that~~ they need to, which can reduce growth and production of crops. Eg without glucose, cannot respire, so cannot release energy to grow and produce. Without nitrates, amino acids and proteins cannot be made, so no growth.

ResultsPlus
Examiner Comments

This response also gains 3 marks. It scores mp 1 no respiration, mp 3 no growth, mp 2 no proteins.

ResultsPlus
Examiner Tip

The candidate response would be more accurate if they wrote about less respiration, less growth and less proteins.

Question4(b)i

Question 4(b) gave some information about controlling insect pests.

The graph showed how the number of scale insects changes after the introduction of ladybugs. The graph also showed how the number of scale insects changes after being sprayed with an insecticide, a pesticide that kills insects.

Candidates were asked to discuss the effects that the introduction of ladybugs, and the use of insecticides has on the numbers of scale insects.

The candidates were told to use information from the graph and your own knowledge to help with your answer.

(i) Discuss the effects that the introduction of ladybugs, and the use of insecticides, has on the numbers of scale insects.

Use information from the graph and your own knowledge to help with your answer.

(5)

At the introduction of the Ladybug at around 1888, the number of Scale insects dramatically drops. This is due to the fact that ladybugs would eat these insects. The number of scale insects were decreased by a large amount, and continued with ups and downs until the introduction of insectide spray. This is due to the fact that biological control is not always ~~exact~~ consistent, as the population or health of ladybugs may not be consistent. There is a dramatic increase in scale insects after insecticide spray was introduced. However, it is not ~~eff~~ that effective to scale ~~insec~~ insects as the number suddenly increases, although not to the amount when it peaked before the ladybug ~~bug~~ being introduced. This show that it is not that effective at killing scale insects.

ResultsPlus
Examiner Comments

This response gains 5 marks. It scores mp 1 for decrease in insects after ladybugs are introduced. It also scores mp 2 for insects eaten by ladybugs. It gains mp3 for numbers fluctuate. Then it gains mp5 for increase in number after insecticide used. Finally it gains mp10 for insecticide less effective than ladybugs.

(i) Discuss the effects that the introduction of ladybugs, and the use of insecticides, has on the numbers of scale insects.

Use information from the graph and your own knowledge to help with your answer.

(5)

When the number of scale insects it high, the ladybug is introduced. From around 1885, the number of scale ~~sect~~ insects rapidly decrease ~~its~~ until a relatively constant low number of scale insects*. In 1945 the insecticide sprayed killing the ladybug and having a rapid increase of scale insects again as there are no ladybugs to eat them and eat them.

* it is fluctuating depending on the rate of reproduction of the scale insects.

ResultsPlus
Examiner Comments

This response also gains 5 marks. It scores mp1 for insects decrease. It scores mp3 for numbers fluctuate. It scores mp6 for as ladybugs are killed by insecticide It scores mp 5 for insect numbers then rise It scores mp 7 for as fewer insects are eaten.

(i) Discuss the effects that the introduction of ladybugs, and the use of insecticides, has on the numbers of scale insects.

Use information from the graph and your own knowledge to help with your answer.

(5)

- the graph shows that when ladybugs were introduced the number of scale insects drastically decreased and then fluctuated over the years until the use of insecticide which killed all the ladybugs resulting in scale insects numbers rising very high again before falling bach down due to the insecticide reaching them after which the graph cuts off giving us no more data.
- This demonstrates how both are very effective but here we can infer insecticide was only a temporary fix due to its spraying being a single event making ladybugs better in the long term. However more data is needed to be certain and draw an absolute conclusion.

ResultsPlus
Examiner Comments

This response also gains full 5 marks. It includes the following mp1, mp3, mp6, mp5, mp9 and mp10.

Question4(b)ii

In question 4(b)(ii) candidates were asked to give three advantages of using biological control instead of pesticides to control pests.

(ii) Give three advantages of using biological control instead of pesticides to control pests. to 1940

(3)

1 biological control does not lead to bioaccumulation or eutrophication

2 pests can develop resistance against pesticides but not against predation

3 biological control doesn't need to re-applied as often as pesticides ~~that~~ (that becomes expensive)

ResultsPlus
Examiner Comments

This response scores 3 marks. It gives no bioaccumulation, no resistance and no need to reapply biological control.

(ii) Give three advantages of using biological control instead of pesticides to control pests.

(3)

1 will have a more long term effect as ~~it would not~~ pests can mutate to become resistant to pesticides stopping them from working whilst animals won't stop eating the pests

2 biological control won't kill any other insects that were not meant to be killed but pesticides will kill all insects

3 biological control can be cheaper long term as pesticides will need to be reapplied more often or new ones will need to be used if the pests become resistant

ResultsPlus
Examiner Comments

This response also gains full 3 marks. It gives long term effect, resistance to pesticide and biological not killing other insects.

(ii) Give three advantages of using biological control instead of pesticides to control pests.

(3)

1 less harm for the environment, as no artificial products are used.

2 Does not disrupt food chains, still maintains desired crop yield without energy transfer disrupted.

3 longer effect, due to reproduction, pesticides shorter time period of effect, and must constantly be reapplied.

ResultsPlus
Examiner Comments

This scores 2 marks. No credit for harm to environment. Credit for not disrupting food chains and for longer term effect.

ResultsPlus
Examiner Tip

Statements such as causing harm to environment are too general and unlikely to gain credit.

and the explanations are due to the fact that biological control does not

(ii) Give three advantages of using biological control instead of pesticides to control pests.

being used, eradicate pests completely. (3) so numbers varied naturally.

1 Biological control is more specific which means that organisms of other species/populations are not affected/killed

2 Biological control, unlike pesticides, does not need to be reapplied.

3 Unlike with pesticides, there is no risk of bioaccumulation or biomagnification when using biological control.

ResultsPlus
Examiner Comments

This response also gains 3 marks. It gives more specific, no need to be reapplied and no risk of bioaccumulation.

Question5(a)i

This item asks candidates to state what is meant by the term genome. Most were able to do this.

5 (a) Inheritance involves genomes, genes and alleles.

(i) State what is meant by the term **genome**.

(1)

All of the genetic information / DNA ~~of our~~ within an organism

ResultsPlus
Examiner Comments

This response gains the mark for all the DNA in an organism.

5 (a) Inheritance involves genomes, genes and alleles.

(i) State what is meant by the term **genome**.

(1)

- All the genetic material ; The entire sequence of DNA of all the chromosomes ; the entirety of all the genetic ~~material~~ information of an organism

ResultsPlus
Examiner Comments

This also gains the mark.

5 (a) Inheritance involves genomes, genes and alleles.

(i) State what is meant by the term **genome**.

(1)

The entire set of DNA in an organism.

ResultsPlus
Examiner Comments

This response also gains the mark for entire set of DNA in an organism.

5 (a) Inheritance involves genomes, genes and alleles.

(i) State what is meant by the term **genome**.

(1)

3 [illegible] genes which line up with each other.

ResultsPlus
Examiner Comments

No credit for this response.

Question5(a)ii

This item asked candidates to explain the difference between a gene and an allele. Candidates tended to be better at explaining an allele than a gene.

(ii) Explain the difference between a gene and an allele.

(2)

A gene is a section of DNA that codes for one specific protein and therefore characteristics whereas an allele a different form of the same gene that give rise to differences in inherited characteristics.

ResultsPlus
Examiner Comments

This response correctly explains that a gene is a section of DNA that codes for a protein and that an allele is a different form of a gene.

(ii) Explain the difference between a gene and an allele.

(2)

A gene is a section of DNA that codes for a protein, but an allele is a specific section of gene which codes to make genotypes

ResultsPlus
Examiner Comments

This scores one mark for explaining what a gene is.

ResultsPlus
Examiner Tip

The response does not correctly describe an allele.

(ii) Explain the difference between a gene and an allele.

(2)

Allele is different versions of gene.
Gene is specific genetic information that ~~has~~ can be certainly expressed

ResultsPlus
Examiner Comments

This response correctly describes an allele.

ResultsPlus
Examiner Tip

To gain both marks it needs to describe or explain what a gene is.

(ii) Explain the difference between a gene and an allele.

(2)

Gene is a section of DNA which codes for a particular protein however an allele is a specific trait. An allele is smaller than a gene. and an allelle is more specific when coding for particular genotypes

ResultsPlus
Examiner Comments

This gains one mark for correctly describing what a gene is.

Question5(b)i

In part (b) candidates were given the following information:

In horses, black hair is caused by a dominant allele, B. The recessive allele, b, codes for brown hair.

A heterozygous black-haired male horse breeds with a heterozygous black-haired female horse.

The candidates were then asked to draw a genetic diagram to show the genotypes of the parents, the gametes

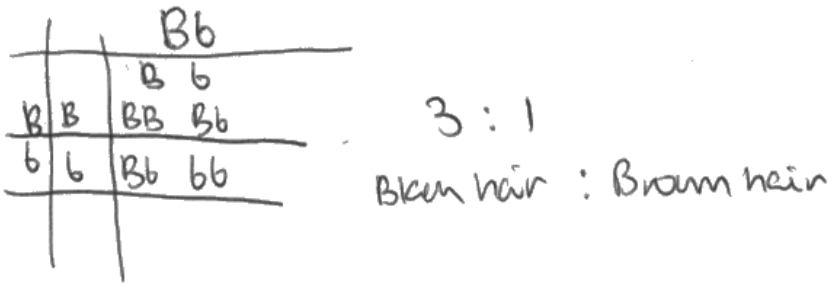
they can produce and the genotypes and ratio of phenotypes of their possible offspring.

(b) In horses, black hair is caused by a dominant allele, B. The recessive allele, b, codes for brown hair.

A heterozygous black-haired male horse breeds with a heterozygous black-haired female horse.

(i) Draw a genetic diagram to show the genotypes of the parents, the gametes they can produce and the genotypes and ratio of phenotypes of their possible offspring.

(4)



ResultsPlus
Examiner Comments

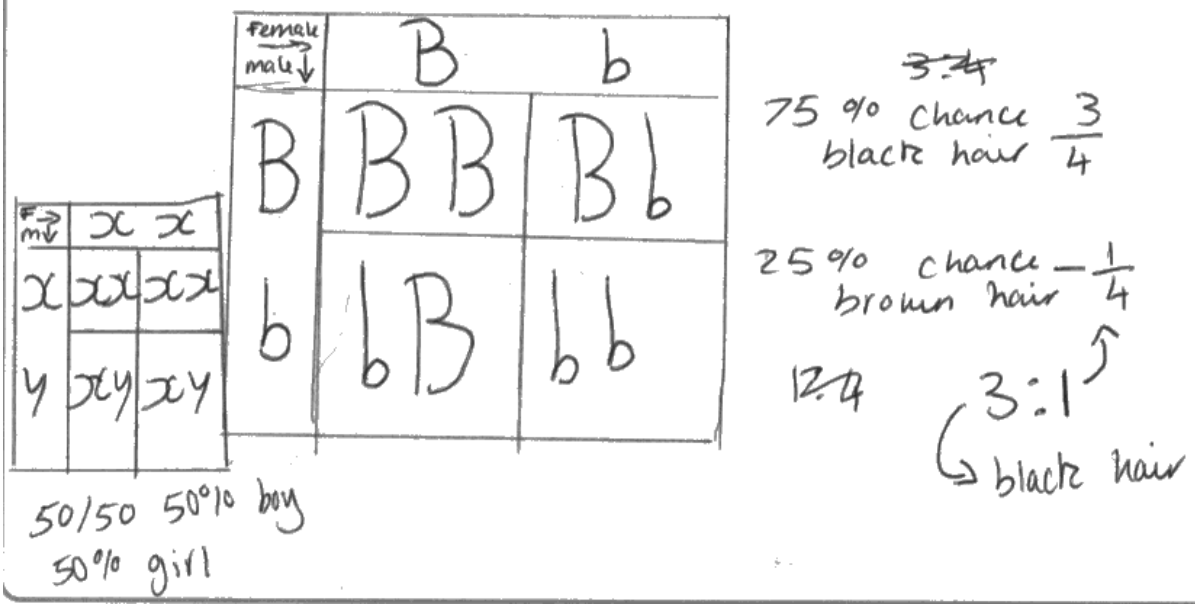
This response scores full marks for parent genotypes, gametes offspring genotypes and phenotypes.

(b) In horses, black hair is caused by a dominant allele, B. The recessive allele, b, codes for brown hair.

A heterozygous black-haired male horse breeds with a heterozygous black-haired female horse.

(i) Draw a genetic diagram to show the genotypes of the parents, the gametes they can produce and the genotypes and ratio of phenotypes of their possible offspring.

(4)



ResultsPlus
Examiner Comments

This response also scores full marks for parent genotypes, gametes offspring genotypes and phenotypes.

(b) In horses, black hair is caused by a dominant allele, B. The recessive allele, b, codes for brown hair.

A heterozygous black-haired male horse breeds with a heterozygous black-haired female horse.

(i) Draw a genetic diagram to show the genotypes of the parents, the gametes they can produce and the genotypes and ratio of phenotypes of their possible offspring.

(4)

BB = 1/4
Bb = 2/4
bb = 1/4

ResultsPlus
Examiner Comments

This response gains 3 marks for parent genotypes, gametes and offspring genotypes. No offspring phenotypes shown.

ResultsPlus
Examiner Tip

To gain full marks make sure all the information is given in the answer.

Question5(b)ii

This item asked candidates to calculate the probability that the first offspring will be male and have black hair. Many candidates were able to correctly multiply the two probabilities together.

(ii) Calculate the probability that the first offspring will be male and have black hair.

(2)

Male = 50% or $\frac{1}{2}$

Black hair = 75%

$\frac{1}{2} \times 75 = 37.5\%$

probability = 37.5 %

ResultsPlus
Examiner Comments

This response gains full marks for the correct answer expressed as a percentage.

(ii) Calculate the probability that the first offspring will be male and have black hair.

(2)

will be male = 50% or 0.5

will have black hair = 75% or 0.75

$0.5 \times 0.75 = 0.375$

probability = 0.375

ResultsPlus
Examiner Comments

This response also gains full marks for the correct answer given as a decimal.

(ii) Calculate the probability that the first offspring will be male and have black hair.

(2)

$\frac{1}{2} \times \frac{3}{4} = \frac{3}{8}$

probability = $\frac{3}{8}$

ResultsPlus
Examiner Comments

This response also gains full marks for the correct answer given as a fraction.

(ii) Calculate the probability that the first offspring will be male and have black hair.

(2)

75

$0.75 \times 0.5 = 0.375 \times 100 = 37.5$

probability = 37.5 %

ResultsPlus
Examiner Comments

This also gives the correct answer and shows the working out.

Question5(c)

This item asks candidates to explain how the farmer could determine the genotype of this male horse.

(c) In horses, eye colour is also controlled by a single gene with two alleles.

The dominant allele causes brown eyes and the recessive allele codes for blue eyes.

A farmer has a male horse with brown eyes.

Explain how the farmer could determine the genotype of this male horse.

(3)

Breed the male horse with a female horse who has blue eyes. The genotype of the female horse must be bb as the allele is recessive. Breed these horses so they have many offspring, and if one of the offspring have blue eyes, then the male horse's genotype is Bb, because if it was BB, only offspring with brown eyes could be born

ResultsPlus
Examiner Comments

This response gains all 3 marks. For mp1 cross with blue eyed female, mp 2 if one has blue eyes male is Bb and mp 4 if only brown eyed offspring then male is BB.

(c) In horses, eye colour is also controlled by a single gene with two alleles.

The dominant allele causes brown eyes and the recessive allele codes for blue eyes.

BB Bb bb

A farmer has a male horse with brown eyes.

Explain how the farmer could determine the genotype of this male horse.

(3)

The farmer could determine the genotype by breeding the male horse with a homozygous recessive female horse which would produce half the offspring to have blue eyes, showing the genotype of the male horse to be Bb. But, if the offspring produced all have brown eyes from the same female horse, the male horse has the genotype BB.

ResultsPlus
Examiner Comments

This response also gains 3 marks. Mp 1 for breeding with female homozygous recessive horse. Mp 2 for if offspring have blue eyes Male is Bb, mp 4 for if all brown offspring male is BB.

Question6(a)i

In this item candidates were asked to calculate the percentage of the total days that the temperature in room B is between 10 °C and 30 °C.

6 Some scientists investigate the effect of temperature on the growth of maize seedlings.

The scientists keep the seedlings in two rooms, A and B.

- in room A, they keep the temperature between 10 °C and 30 °C for 120 days
- in room B, they keep the temperature between 10 °C and 30 °C for 82 days and above 30 °C for 38 days.

The scientists measure the leaf area in square centimetres for each seedling every 20 days.

(a) (i) Calculate the percentage of the total days that the temperature in room B is between 10 °C and 30 °C.

(2)

$82 + 38 = 120$

$82/120 = 68.3$

percentage = 68.3 %

ResultsPlus
Examiner Comments

This response gains full marks for the correct answer.

6 Some scientists investigate the effect of temperature on the growth of maize seedlings.

The scientists keep the seedlings in two rooms, A and B.

- in room A, they keep the temperature between 10 °C and 30 °C for 120 days
- in room B, they keep the temperature between 10 °C and 30 °C for 82 days and above 30 °C for 38 days.

The scientists measure the leaf area in square centimetres for each seedling every 20 days.

(a) (i) Calculate the percentage of the total days that the temperature in room B is between 10 °C and 30 °C.

(2)

$\frac{82}{38+82} \times 100$

percentage = 68.3 %

ResultsPlus
Examiner Comments

This response also gains full marks for the correct answer.

6 Some scientists investigate the effect of temperature on the growth of maize seedlings.

The scientists keep the seedlings in two rooms, A and B.

- in room A, they keep the temperature between 10 °C and 30 °C for 120 days
- in room B, they keep the temperature between 10 °C and 30 °C for 82 days and above 30 °C for 38 days.

The scientists measure the leaf area in square centimetres for each seedling every 20 days.

(a) (i) Calculate the percentage of the total days that the temperature in room B is between 10 °C and 30 °C. (2)

$\frac{38}{120} = 0.316$

$0.316 \times 100 = 31.6\%$

percentage = 31.6 %

ResultsPlus
Examiner Comments

This response does not have the correct answer. It gains one mark for correctly dividing by 120 in the working.

ResultsPlus
Examiner Tip

Always show working to gain some marks even if the final answer is incorrect.

Question6(a)ii

In this item candidates were asked to explain why the scientists allow the temperature to vary within a range in each room.

(ii) Explain why the scientists allow the temperature to vary within a range in each room.

(2)

to make it more realistic, as if the seedlings were grown outside they would experience a range of temperatures, as it would be colder at night and temperature naturally varies.

ResultsPlus
Examiner Comments

This response scores full marks for being more realistic and temperatures being colder at night.

(ii) Explain why the scientists allow the temperature to vary within a range in each room.

(2)

~~To allow the stomata to~~ To imitate the normal, natural temperature change between night and day. To allow certain enzymes with different optimum temperatures to work at these optimum temperatures for the highest possible rates of reaction.

ResultsPlus
Examiner Comments

This response also gains both marks. Imitate the natural change between night and day.

(ii) Explain why the scientists allow the temperature to vary within a range in each room.

(2)

it is more realistic to outside and less difficult to control temperature.

ResultsPlus
Examiner Comments

This response gains one mark for more realistic.

(ii) Explain why the scientists allow the temperature to vary within a range in each room.

(2)

to mirror an outside enviroment, in the cold outdoors

ResultsPlus
Examiner Comments

This response also scores one mark for 'mirror outside environment '.

Question6(a)iii

In this item candidates were asked to give the dependent variable in this investigation.

(iii) Give the dependent variable in this investigation.

growth of maize seedlings

ResultsPlus
Examiner Comments

This gains the mark.

(iii) Give the dependent variable in this investigation.

leaf area of seedlings

ResultsPlus
Examiner Comments

This also gains the mark.

(iii) Give the dependent variable in this investigation.

(1)

amount of days between measurements

ResultsPlus
Examiner Comments

No credit as this is not the dependent variable.

ResultsPlus
Examiner Tip

Candidates need to be able to identify the dependent, control and independent variables in an experiment.

Question6(b)i

In this item candidates had to plot two line graphs to show the mean leaf area in each room at each time.

(b) The table shows the scientists' results.

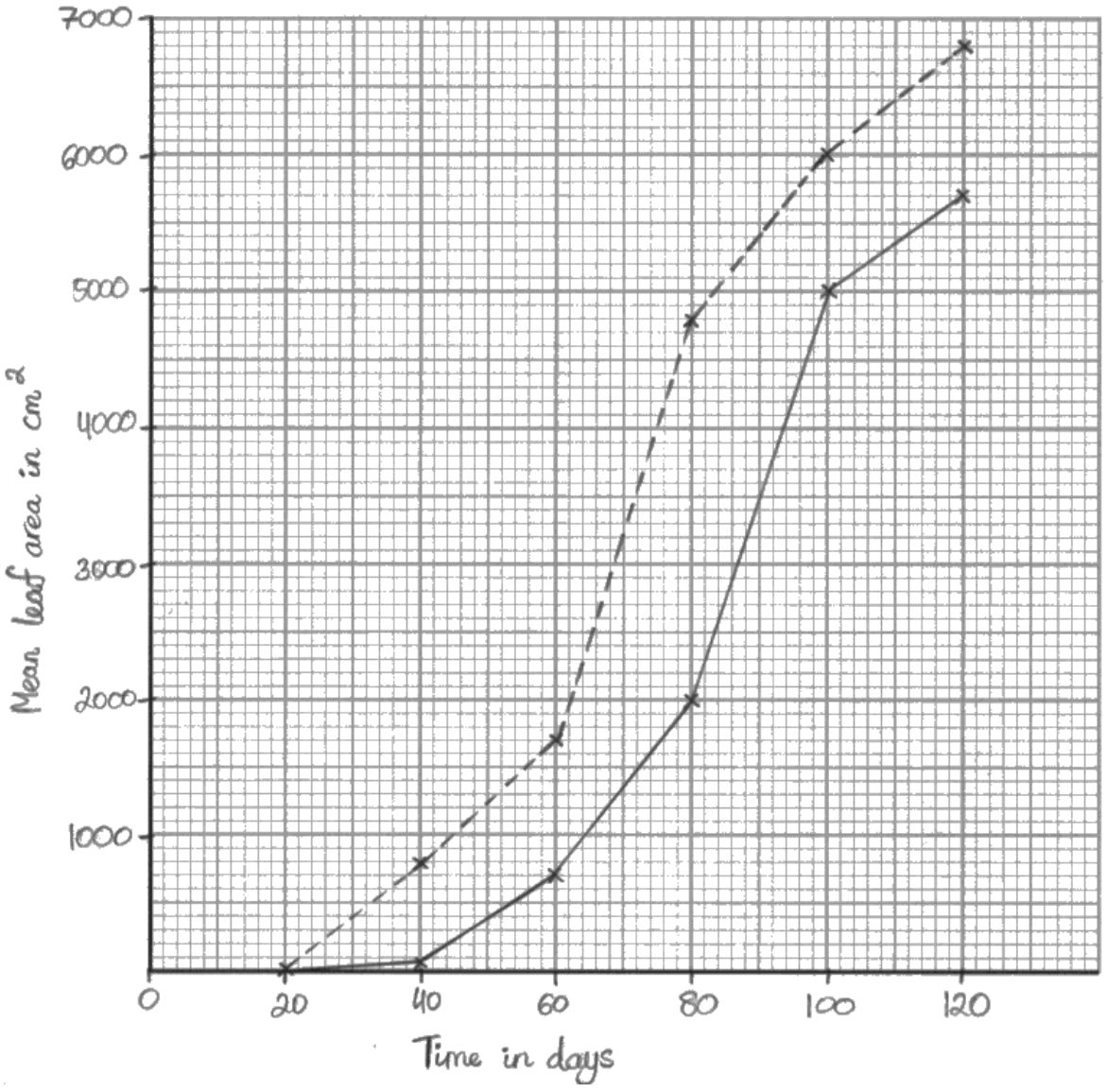
Time in days	Mean leaf area in cm^2	
	room A	room B
20	6	10
40	50	800
60	700	1700
80	2000	4800
100	5000	6000
120	5700	6800

Key:
/ = room A
--- = room B

(i) Plot **two** line graphs to show the mean leaf area in each room at each time.

Use a ruler to join your points for each room with straight lines.

(5)



This response scores full marks.

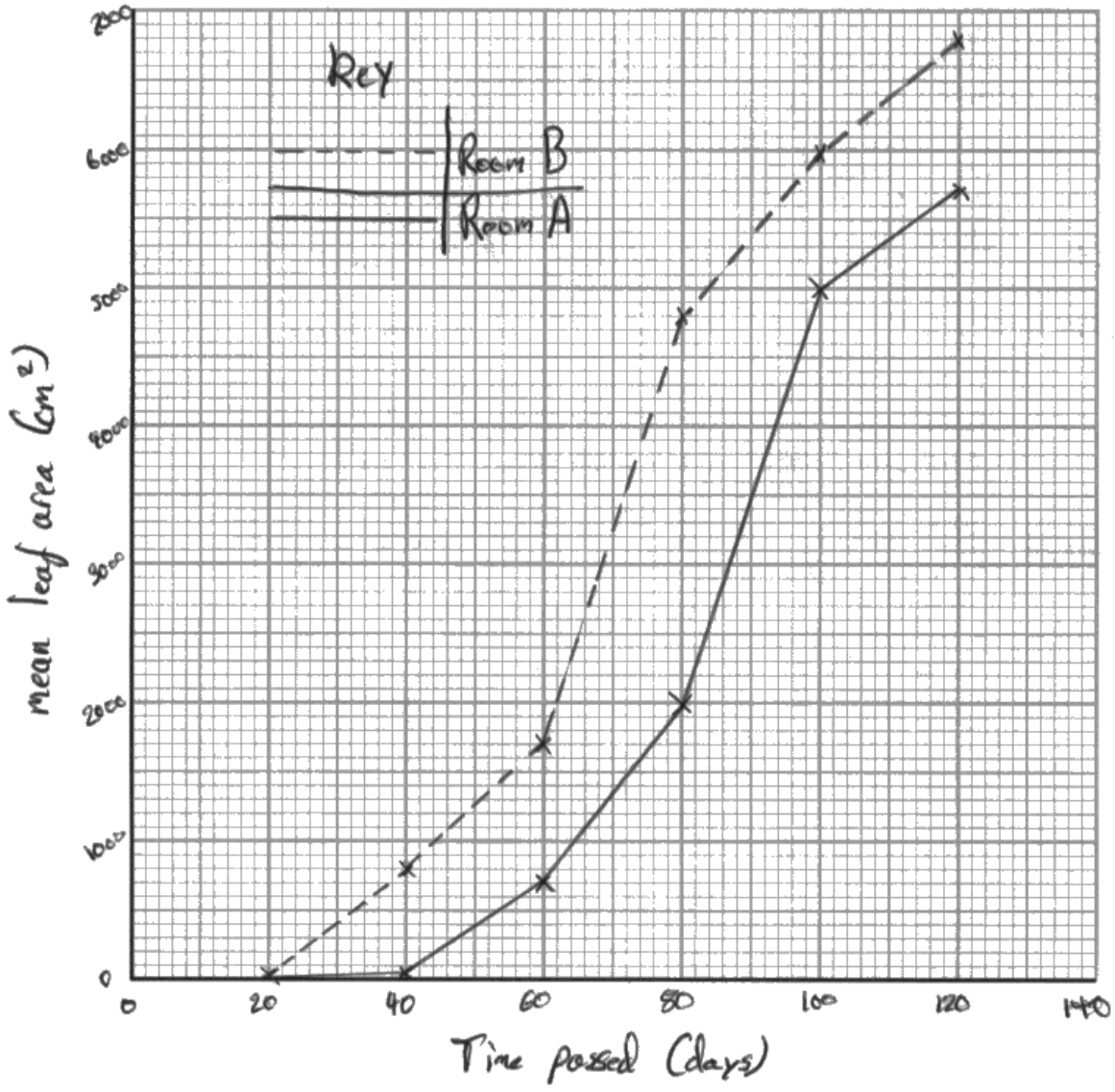
(b) The table shows the scientists' results.

Time in days	Mean leaf area in cm^2	
	room A	room B
20	6	10
40	50	800
60	700	1700
80	2000	4800
100	5000	6000
120	5700	6800

(i) Plot **two** line graphs to show the mean leaf area in each room at each time.

Use a ruler to join your points for each room with straight lines.

(5)



This response also gains full marks.

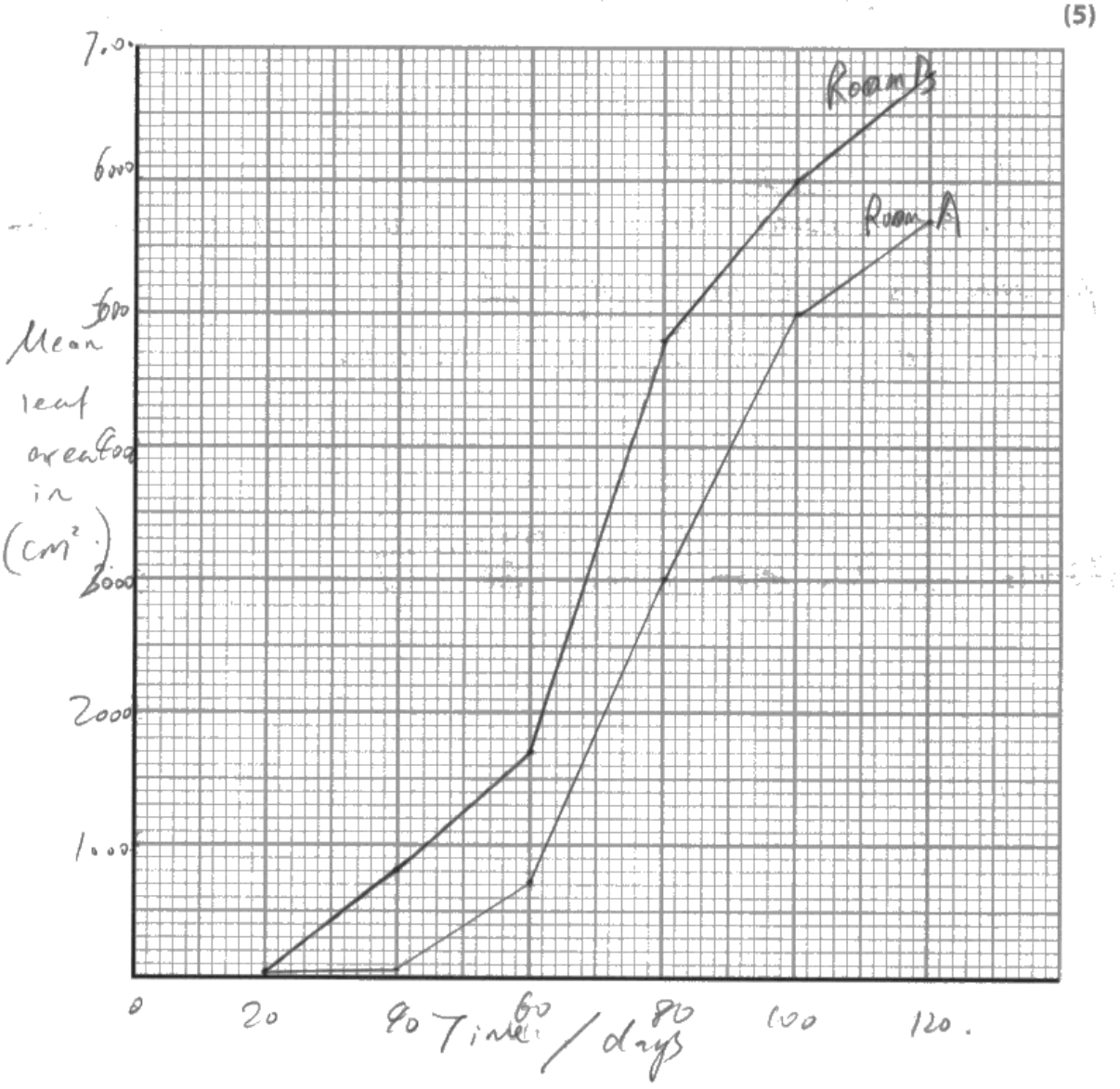
(b) The table shows the scientists' results.

Time in days	Mean leaf area in cm^2	
	room A	room B
20	6	10
40	50	800
60	700	1700
80	2000	4800
100	5000	6000
120	5700	6800

(i) Plot **two** line graphs to show the mean leaf area in each room at each time.

Use a ruler to join your points for each room with straight lines.

(5)



ResultsPlus
Examiner Comments

This response scores 4 marks. The plot is incorrect for room A at 80 days.

Question 6(b)ii

Most candidates were able to calculate the increase in mean leaf area per day from day 20 to day 120 for room B.

(ii) For room B, calculate the increase in mean leaf area per day from day 20 to day 120.

(2)

120 - 20 = 100

6800 − 10 = 6790

$\frac{6790}{100} = 67.9$

increase = 67.9 cm^2 per day

ResultsPlus
Examiner Comments

The correct answer, 67.9, gains full marks.

(ii) For room B, calculate the increase in mean leaf area per day from day 20 to day 120.

(2)

679 = $\frac{6800 - 10}{10}$ × 100 = 99.85

9.85

$\frac{679}{100}$ = 6.79

6.79

increase = 6.79 cm² per day

ResultsPlus Examiner Comments

The answer is incorrect but the response scores 1 mark for dividing by 100 in the working.

(ii) For room B, calculate the increase in mean leaf area per day from day 20 to day 120.

(2)

6800 − 10 = 6790

$\frac{6790}{100}$

increase = 68 cm² per day

ResultsPlus Examiner Comments

The answer 68 is correct to two significant figures and scores both marks.

Question 6(b)iii

In this item candidates were asked to explain the effect of temperature on the growth rate of the seedlings.

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

(2)

Above 30°C the ~~seedlings~~ seedlings to grow less than they did in the range of temperature. This is because above 30°C it is not at the optimum temperature of the enzyme in the seeds, and may have even denatured some of the enzymes ~~energy~~ causing less respiration to occur and thus less growth

ResultsPlus
Examiner Comments

This response gains full marks for noting that above 30 o C the seedlings grow less well and that 30 o C is not the optimum temperature and the enzymes denature.

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

(2)

As the temperature increased above 30 for room B the growth rate of the seedlings decreased because the enzymes begin to denature so the shape of the active site changes, meaning less enzyme-substrate complexes were formed so the rate of reaction decreased, so less energy was released for growth

ResultsPlus
Examiner Comments

This response also scores 2 marks. It notes that above 30 o C the rate of growth decreased because the enzymes denatured.

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

(2)

The warmer the temperature, the faster the growth rate. This is because the particles have more energy, therefore more successful collisions. Therefore the seedlings can grow faster increasing the growth rate.

ResultsPlus
Examiner Comments

This response fails to note that after the temperature is increased the rate goes down in room B. However it gains a mark from additional guidance for correctly describing the link between temperature and kinetic energy.

Question 6(b)iv

In this item candidates were asked to describe how the scientists could measure the surface area of a leaf.

(iv) Describe how the scientists could measure the surface area of a leaf.

(2)

Place the leaf on a grid then ~~on~~ outline it. Count all full squares and 2 half ones

ResultsPlus
Examiner Comments

This response gains full credit for drawing around the leaf on a grid and counting the squares.

(iv) Describe how the scientists could measure the surface area of a leaf.

(2)

to measure the surface area of the leaf the scientist could draw around it on squared 1x1cm² paper, then count the squares within the drawing

ResultsPlus
Examiner Comments

This response also gains full credit for drawing around the grid on squared paper and counting the squares.

(iv) Describe how the scientists could measure the surface area of a leaf. optimum temperature, growth rate is usually highest

(2)

They could trace around the surface of the leaf using tracing paper. Then, place the tracing paper on ~~square~~ graph paper with squares. Then count the number of squares within the leaf outline and multiply that number by the area of each square.

(Total for Question 6 = 16 marks)

*as the greatest number of enzyme-substrate complexes can be formed per unit time.

ResultsPlus
Examiner Comments

This response also gains 2 marks for describing tracing the leaf onto graph paper and counting the squares.

Question 7(b)

Question 7(b) asks candidates to describe how the human immune system reacts to an infection.

(b) Some types of blood cells are involved in the human immune response.

Describe how the human immune system reacts to an infection.

(4)

When the immune system recognises foreign bodies (infection) in the body, it uses white blood cells to fight the infection. Phagocytes engulf and destroy pathogens ~~and~~ in phagocytosis. Lymphocytes produce antibodies which stick to antigens on the outside of pathogens to destroy the body. The ~~respons~~ immune response also results in the production of memory cells which remember the antibodies for the antigens on specific pathogens and can produce them quickly if a familiar pathogen is recognised in the body again later on.

ResultsPlus
Examiner Comments

This response gains full marks. Phagocytes engulf the pathogens gains mp1. Lymphocytes produce antibodies, mp3. These bind with antigens, mp5. Memory cells are produced mp6.

(b) Some types of blood cells are involved in the human immune response.

Describe how the human immune system reacts to an infection.

(4)

- Lymphocytes detect the antigens of a pathogen and produce complimentary antibodies
  - ↳ those mark out the pathogens marked by antibodies
- Phagocytes engulf the ~~marked~~ pathogens ^ and ~~remove~~ destroy them with digestive enzymes
- Lymphocytes also produce memory cells to respond faster & future infections with the same pathogen.
- Phagocytes are non-specific.

ResultsPlus
Examiner Comments

This response also gains 4 marks. It gains mp 4 and mp3. Mp 1 and mp2. It also mentions mp 6 but has already gained 4 marks.

(b) Some types of blood cells are involved in the human immune response.

Describe how the human immune system reacts to an infection.

(4)

Phagocytes and lymphocytes are involved in eliminating pathogens. Phagocytes detect unwanted substances such as pathogens and engulf them. Lymphocytes however, produce antibodies that attach themselves to the antigens on the pathogen's surface. They either mark the pathogen for destruction or break it apart. Memory cells are also produced, so the antibodies for that pathogen will already be in the body to destroy it should the pathogen ever re-enter the body.

ResultsPlus
Examiner Comments

This response also gains full marks. Mp 1, mp 3, mp 5 and mp 6.

(b) Some types of blood cells are involved in the human immune response.

Describe how the human immune system reacts to an infection.

(4)

When a foreign pathogen enters the body white blood cells called lymphocytes latch on to the antigen on the pathogens surface. Lymphocytes then 'mark them for destruction' to phagocytes which are non-specific and engulf the pathogen that has entered the body and digest it. Lymphocytes then produce antibodies and memory cells specific to that pathogen so if it ever enters the body again they can detect it quicker.

ResultsPlus
Examiner Comments

Another correct 4 mark answer.

Question 7(c)i

Item 7(c)(i) asks candidates to use the data provided to calculate the number of red blood cells in a 2 mm3 sample of blood.

Answers should be given in standard form.

(c) Scientists collect blood samples from two people.

One person does not have a blood condition and the other person has a blood condition.

The scientists count the number of platelets, phagocytes, lymphocytes, and red blood cells for each sample.

The table shows the scientists' results.

Blood component	Number of each component in 1 dm^3 of blood	
	person without blood condition	person with blood condition
platelets	2.5×10^{11}	2.5×10^{11}
phagocytes	5.5×10^{11}	1.2×10^{12}
lymphocytes	3.0×10^{11}	9.2×10^{11}
red blood cells	5.0×10^{12}	5.0×10^{12}

(i) Each blood sample has a volume of 2 mm^3.

Calculate the number of red blood cells in a 2 mm^3 sample of blood.

Give your answer in standard form.

[1 $dm^3 = 1 \times 10^6 mm^3$]

(3)

$1dm^3 = 1 \times 10^6 mm^3$

$2dm^3 = 2 \times 10^6 mm^3$

RBCs = $5 \times 10^{12} \times 2$

$1dm^3 = 5 \times 10^{12}$ RBCs

$1dm^3 = 1000000 mm^3$

$5 \times 10^{12} \times 1000000 =$

$\frac{1}{1000000} = 1mm \times 2 = 2 \times 10^{-6}$

$\frac{5.0 \times 10^{12}}{1000000} \times 2 = 1 \times 10^{7}$

number = 1×10^7

ResultsPlus
Examiner Comments

This response gives the correct answer in standard form. So scores full marks.

(c) Scientists collect blood samples from two people.

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The scientists count the number of platelets, phagocytes, lymphocytes, and red blood cells for each sample.

The table shows the scientists' results.

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lymphocytes	3.0×10^{11}	9.2×10^{11}
red blood cells	5.0×10^{12}	5.0×10^{12}

(i) Each blood sample has a volume of 2 mm^3.

Calculate the number of red blood cells in a 2 mm^3 sample of blood.

Give your answer in standard form.

[1 $dm^3 = 1 \times 10^6 mm^3$]

(3)

in 1 dm^3 => 5.0×10^{12}

in 1×10^6 mm^3 => 5.0×10^{12}

in 2 mm^3 => [illegible] = 5.0×10^{12} ÷ 500000 = 1.0×10^7

number = 1.0×10^7

ResultsPlus
Examiner Comments

This response also gives the correct answer in standard form. So scores full marks.

(c) Scientists collect blood samples from two people.

One person does not have a blood condition and the other person has a blood condition.

The scientists count the number of platelets, phagocytes, lymphocytes, and red blood cells for each sample.

The table shows the scientists' results.

Blood component	Number of each component in 1 dm^3 of blood	
	person without blood condition	person with blood condition
platelets	2.5×10^{11}	2.5×10^{11}
phagocytes	5.5×10^{11}	1.2×10^{12}
lymphocytes	3.0×10^{11}	9.2×10^{11}
red blood cells	5.0×10^{12}	5.0×10^{12}

(i) Each blood sample has a volume of 2 mm^3.

Calculate the number of red blood cells in a 2 mm^3 sample of blood.

Give your answer in standard form.

[1 $dm^3 = 1 \times 10^6 mm^3$]

(3)

$\frac{2}{1000000} \times 5.0 \times 10^{12}$

$= 1000000 (2 \times 10^{-6}) \times (5 \times 10^{12})$

$= 10000000$

number = 10000000

ResultsPlus
Examiner Comments

This answer is the correct value but is not given in standard form so scores 2 marks.

(c) Scientists collect blood samples from two people.

One person does not have a blood condition and the other person has a blood condition.

The scientists count the number of platelets, phagocytes, lymphocytes, and red blood cells for each sample.

The table shows the scientists' results.

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lymphocytes	3.0×10^{11}	9.2×10^{11}
red blood cells	5.0×10^{12}	5.0×10^{12}

(i) Each blood sample has a volume of 2 mm^3.

Calculate the number of red blood cells in a 2 mm^3 sample of blood.

Give your answer in standard form.

[1 $dm^3 = 1 \times 10^6 mm^3$]

1.2×10^{12}

(3)

$2.5 \times 10^{11} \div 1 \times 10^6$

2.5×10^5

number = 5×10^5

5×10^5

This response does not give the correct answer but gains one mark for dividing by 1 x 10 6 in working.

Question 7(c)ii

This item required candidates to comment on the effects that the numbers of each blood component could have on the person with the blood condition.

Candidates were told to use the data in the table and your own knowledge to help with your answer.

(ii) Comment on the effects that the numbers of each blood component could have on the person with the blood condition.

Use the data in the table and your own knowledge to help with your answer.

(5)

Platelets are used in blood clotting and scabs, to prevent excess loss of blood, and pathogens entering a wound causing infection. The person with condition has a normal number of platelets so isn't overly at risk of an infected wound. Phagocytes aid in fighting infection by engulfing and digesting pathogens, the person with condition has significantly more phagocytes than normal, so may fight infection quickly, rarely experiencing symptoms of illness. Lymphocytes produce antibodies that attach to ~~part~~ antigens on pathogens to kill them; the person with condition has more lymphocytes than average so will quickly fight infection and rarely feel symptoms, as more antibodies are produced. Red blood cells contain haemoglobin and transport oxygen around the body to be respired. The person with condition has the normal number of red blood cells so has normal rates of respiration, releasing the same amount of energy - so won't feel abnormally fatigued.

ResultsPlus
Examiner Comments

This response gained full marks. The credited marking points include: Mp1 no difference in platelets numbers, mp3 more phagocytes to engulf pathogens, mp5 can fight infection better, mp 4 more lymphocytes to produce antibodies, mp 8 no difference in red blood cells and mp9 no difference in oxygen transport.

ResultsPlus
Examiner Tip

This candidate gains full marks as they are able to link the data in the table such as more lymphocytes to increased production of antibodies.

(ii) Comment on the effects that the numbers of each blood component could have on the person with the blood condition.

Use the data in the table and your own knowledge to help with your answer.

(5)

they have the same number of platelets as the person without the condition this means they have the same thickness of blood. They have more phagocytes so this means that they can engulf and digest more pathogens however these micro-organisms may be useful in the gut. They also have 6.2×10^{11} more lymphocytes this means that they release more antigens specific to the pathogen however this means that they have a highly alert immune response. They have the same number of red blood cells so same oxygen carrying capasity. However they don't state the gender, or age or blood group of the person and it is only from 2 people meaning the sample size is small may not be reliable as there are no repeats. taking blood could cause infection meaning that's the reason for more phagocytes and lymphocytes.

(Total for Question 7 = 16 marks)

ResultsPlus
Examiner Comments

This response also gains full marks. It gains mp1, mp3, mp5, mp8 and mp9.

ResultsPlus
Examiner Tip

Although this response gains full marks the candidate confuses antigens with antibodies.

(ii) Comment on the effects that the numbers of each blood component could have on the person with the blood condition.

Use the data in the table and your own knowledge to help with your answer.

(5)

The number of rea blood cells is the same, so there would be no effects to do with them. There is also the same number of platelets, so there would be no blood clotting problems.

However, there are more lymphocytes and phagocytes in the samples of blood from the person that has a blood condition. This means that their immune system would be stronger, as they have more white blood cells, meaning they can fight infections quickly.

ResultsPlus
Examiner Comments

This response scores 4 marks. It gains credit for mp 8, mp1 and mp2. It aslo gains mp 5.

ResultsPlus
Examiner Tip

This answer could be improved by relating the red blood cell numbers to no difference in oxygen transport and the differences in phagocytes to more engulfing and the difference in lymphocytes to more antibody release.

Question 8(a)i

Question 8 was about ecology is the study of organisms and their environment.

8(a)(i) asked candidates to state what is meant by the term ecosystem.

8 Ecology is the study of organisms and their environment.

(a) (i) State what is meant by the term **ecosystem**.

(1)

Biological Community of interacting organisms aswell as their physical habitats

ResultsPlus
Examiner Comments

This response gains the mark for organisms interacting with their habitats.

8 Ecology is the study of organisms and their environment.

(a) (i) State what is meant by the term **ecosystem**.

(1)

All the ~~living~~ abiotic and biotic factors interacting in the same area at the same time

ResultsPlus
Examiner Comments

This scores the mark for abiotic and biotic factors interacting.

8 Ecology is the study of organisms and their environment.

(a) (i) State what is meant by the term **ecosystem**.

(1)

~~ecosystem is the organisms in the environment~~

ecosystems are all the organisms in the environment

ResultsPlus
Examiner Comments

This response does not gain the mark. It mentions organisms in the environment but does not clearly state interaction.

Question 8(a)ii

This item asks candidates to state what is meant by the term community.

(ii) State what is meant by the term **community**.

(1)

All of the organisms of all the species in an area.

ResultsPlus
Examiner Comments

This response gains the mark for all of the species in an area.

(ii) State what is meant by the term **community**.

(1)

many different species in the same area interacting with one another

ResultsPlus
Examiner Comments

This also gains the mark for many species in an area.

(ii) State what is meant by the term **community**.

(1)

A group of organisms that depend on one another for survival.

ResultsPlus
Examiner Comments

No credit for this response.

(ii) State what is meant by the term **community**.

(1)

~~Different organisms species living in a certain area~~

The number of same species / organisms living in an area.

ResultsPlus
Examiner Comments

No credit for the same species.

Question 8(a)iii

This question asks candidates to state what is meant by the term population.

(iii) State what is meant by the term **population**.

M the organisms of one species in an area

ResultsPlus
Examiner Comments

This response gains the mark.

(iii) State what is meant by the term **population**.

(1)

the total living organisms of a specific species in an area.

ResultsPlus
Examiner Comments

This response also gains the mark.

(iii) State what is meant by the term **population**.

(1)

The number of ~~a species~~ one type of species living in an area.

ResultsPlus
Examiner Comments

This response also gains the mark.

(iii) State what is meant by the term **population**.

the number of a specific organism

ResultsPlus
Examiner Comments

This does not gain the mark as there is no reference to in an area or location.

Question 8(b)

Question 8(b) asks candidates to complete the passage about feeding relationships by writing a suitable word or words in each blank space.

(b) Complete the passage about feeding relationships by writing a suitable word or words in each blank space.

(8)

Food chains show the flow of energy through an ecosystem from one organism to the next. The arrows in a food chain show the direction of energy flow. The first organism in a food chain is a producer. The position that an organism has in a food chain is known as its trophic level.

Not all the energy from one level reaches organisms in the next level. Some of the energy is released as heat energy during respiration or movement. Some of the energy remains in undigested food which is released as faeces. Some of the energy is released in metabolic waste which is excreted as urine. Some of the energy remains in the dead organism until the organism is broken down by decomposers such as bacteria and fungi.

ResultsPlus
Examiner Comments

This response gains full marks for correctly completing all of the missing words.

(b) Complete the passage about feeding relationships by writing a suitable word or words in each blank space.

(8)

Food chains show the flow of energy through an ecosystem from one organism to the next. The arrows in a food chain show the direction of energy flow. The first organism in a food chain is a producer. The position that an organism has in a food chain is known as its Trophic level.

Not all the energy from one level reaches organisms in the next level. Some of the energy is released as heat energy during activity or movement. Some of the energy remains in undigested food which is released as feces. Some of the energy is released in metabolic waste which is excreted as urine. Some of the energy remains in the dead organism until the organism is broken down by decomposers such as bacteria and fungi.

ResultsPlus
Examiner Comments

This response gains 7 of the 8 marks. It incorrectly writes activity rather than respiration in space 5.

(b) Complete the passage about feeding relationships by writing a suitable word or words in each blank space.

(8)

Food chains show the flow of energy through an ecosystem from one organism to the next. The arrows in a food chain show the ..direction.. of energy flow. The first organism in a food chain is a ..producer.. .

The position that an organism has in a food chain is known as its ..hirachy.. level.

Not all the energy from one level reaches organisms in the next level. Some of the energy is released as ..thermal.. energy during ..respiration.. or movement. Some of the energy remains in undigested food which is released as ..excreation.. . Some of the energy is released in metabolic waste which is excreted as ..faeces sweat.. . Some of the energy remains in the dead organism until the organism is broken down by decomposers such as ..bacteria.. and fungi.

ResultsPlus
Examiner Comments

This response gains 6 out of 8. It incorrectly writes hierarchy in space 3 rather than trophic and excretion rather than faeces in space 6.

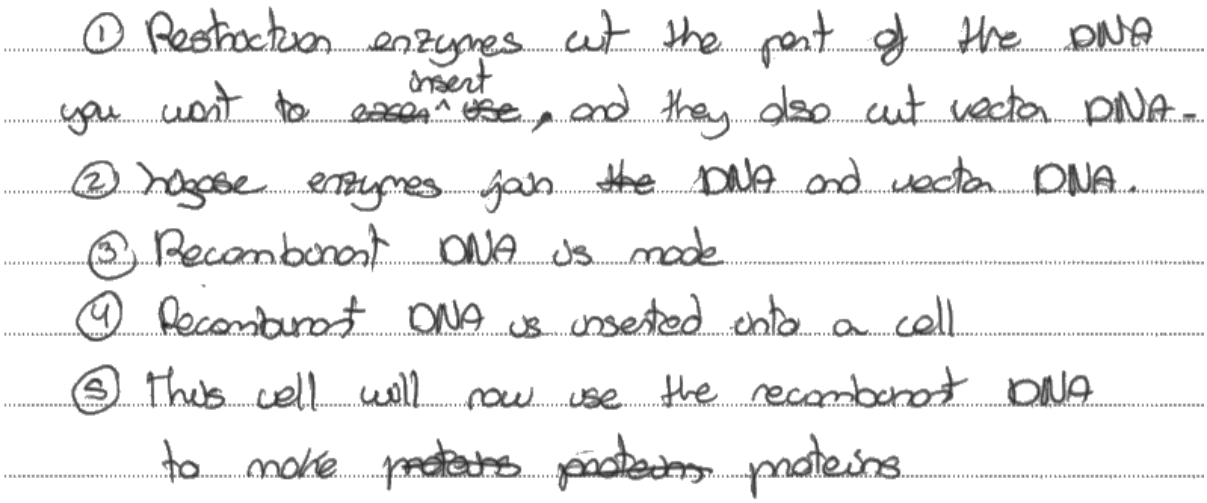
Question 9(a)

Question 9(a) asks candidates to describe how two named enzymes are used in genetic modification.

9 Scientists can produce new varieties of plants by genetic modification.

(a) Describe how two named enzymes are used in genetic modification.

(4)



ResultsPlus
Examiner Comments

This response gains full marks for correctly describing restriction and ligase and their functions.

9 Scientists can produce new varieties of plants by genetic modification.

(a) Describe how two named enzymes are used in genetic modification.

(4)

The restriction enzyme is used to cut out the plasmid from a bacteria and the same restriction enzyme is used to cut out the DNA from a donor.

The ligase enzyme is used to join the plasmid to the extracted DNA at the sticky ends.

ResultsPlus
Examiner Comments

This response also gains full marks for correctly describing restriction and ligase and their functions.

9 Scientists can produce new varieties of plants by genetic modification.

(a) Describe how two named enzymes are used in genetic modification.

(4)

Restriction enzymes are used to cut the desired gene and to put the gene in the bacteria or virus

ResultsPlus
Examiner Comments

This response describes restriction enzyme and how it is used.

9 Scientists can produce new varieties of plants by genetic modification.

(a) Describe how two named enzymes are used in genetic modification.

~~ligase~~ restriction enzyme

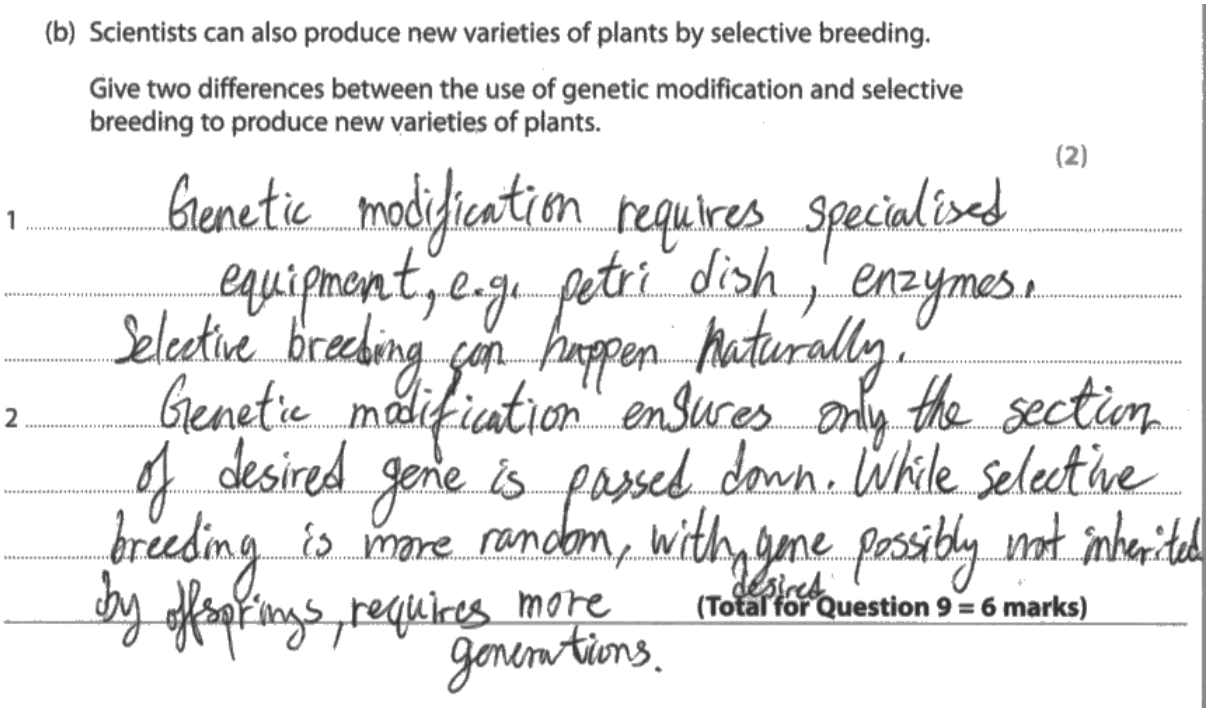
One named enzyme that is used in genetic modification is the ligase enzyme. This is used to modify and ~~not~~ mutate the genes in a plant and helps to speed up the progress. the other ex Enzyme that is used is the restrichive enzyme, this stops any other mutations or modifications happening to the plant except for the ones that were intended.

ResultsPlus
Examiner Comments

This response names the two enzymes but does not correctly describe their functions.

Question 9(b)

This item asks candidates to give two differences between the use of genetic modification and selective breeding to produce new varieties of plants.



(b) Scientists can also produce new varieties of plants by selective breeding.

Give two differences between the use of genetic modification and selective breeding to produce new varieties of plants.

(2)

1 Genetic modification requires specialised equipment, e.g. petri dish, enzymes. Selective breeding can happen naturally.

2 Genetic modification ensures only the section of desired gene is passed down. While selective breeding is more random, with gene possibly not inherited by offsprings, requires more desired generations.

(Total for Question 9 = 6 marks)

ResultsPlus
Examiner Comments

This response gains both marks. The use of enzymes in GM and that selective breeding requires more generations.

(b) Scientists can also produce new varieties of plants by selective breeding.

Give two differences between the use of genetic modification and selective breeding to produce new varieties of plants.

(2)

1 genetic modification is faster than selective breeding

2 selective breeding is less accurate and does not always produce desired characteristics genetic modification is more accurate

ResultsPlus Examiner Comments

This response gains one mark for writing that GM is faster.

(b) Scientists can also produce new varieties of plants by selective breeding.

Give two differences between the use of genetic modification and selective breeding to produce new varieties of plants.

(2)

1 selective breeding happens over many generations

2 genetic modification can only happen in plants but selective breeding can happen in both plants and animals

ResultsPlus Examiner Comments

This response also gains one mark.

Question 10

The final question asks candidates to design an investigation to determine if exposure to light affects germination.

10 Some species of seed will only germinate after they have been exposed to light.

Design an investigation to determine if exposure to light affects germination.

Include experimental details in your answer and write in full sentences.

(6)

3 × 1cm³ of Get cress seeds, ensuring they are the same species. Put each 1cm³ of cress seeds into 3 different test tubes - tubes a, b, and c. Tube a is the control so leave it how it is. Tube b will be partially blocked by light so wrap aluminium foil around the whole tube. Tube c will be put in a dark room with no access to sunlight. Put tubes a and b ~~[illegible]~~ in front of a lamp, both at 10cm away from the lamp. Ensure tube b is tilted so exactly half of the tube is blocked from light by the aluminium foil. Keep oxygen level and temperature the same for all 3 test tubes. Leave the seeds to germinate for a week and check for any growth once a day at 8pm. Measure any growth using a mm ruler and record this in a table. Incorporate your results into a graph after the week has passed, eliminating any anomalies. Repeat your experiment 3 times to ensure accurate and reliable results.

ResultsPlus
Examiner Comments

This response gains full marks. It gains O for same species, C for different exposures to light, S1 for same temperature, S2 for same oxygen, M2 for same time stated and R for repeating.

10 Some species of seed will only germinate after they have been exposed to light.

Design an investigation to determine if exposure to light affects germination.

Include experimental details in your answer and write in full sentences.

(6)

Place 5 of the seeds onto a dish with some cotton ~~wool~~ wool and 2cm^2 of water. ~~Place another 5 dis~~ Repeat this to obtain ~~another~~ a second dish with 5 seeds. Place one dish in light and the other one somewhere dark (no exposure to light). The seeds should be the same species and mass. Then, leave them to germinate for one week, and measure their ~~root~~ length of their radicle using a ruler. Record the results, and repeat the experiment 5 times in order to obtain reliable results. The temperature, ~~carbon dioxide~~ oxygen and water concentrations should be controlled, kept the same.

ResultsPlus
Examiner Comments

This also gains full marks. It includes S2 R C O M2 and S1.

10 Some species of seed will only germinate after they have been exposed to light.

Design an investigation to determine if exposure to light affects germination.

Include experimental details in your answer and write in full sentences.

(6)

Get 2 seeds ~~and~~ of the same species and place them on a tray* water both the seeds and give them the same minerals, temperature and CO_2 concentration but place one seed in a dark room and the other seed on a windowsill where it can access light the seed should have a greater relative light intensity. Leave the seeds on there tray for a week making sure to water them daily with 2 drops of water. After the week has passed check both of the seeds and see if they have germinated.

*on top of a wet tissue.

ResultsPlus
Examiner Comments

This scores 5 marks for O S2 S1 C and M2.

10 Some species of seed will only germinate after they have been exposed to light.

Design an investigation to determine if exposure to light affects germination.

Include experimental details in your answer and write in full sentences.

(6)

To investigate ~~the speed of germination~~ ~~if~~ if exposure to light affects germination you will need to have ~~two rooms in which~~ three two rooms in which one will be ~~dark~~ dark (no light) and the other will have exposure to light. There will be Three samples of the same * seeds in each room. After 24 hours ~~The~~ You should enter the room and observe ~~the~~ if germination has occured and measure to what extent if it has. You should then repeat the experiment 3-5 times and calculate the mean so that you have accurate results. The same type of seeds should be used and the conditions of the rooms except of temperature e.g (humidity, temperature should be the same.

* type and amount

ResultsPlus
Examiner Comments

This response also scores 5 marks. It gains C O M2 R and S1.

Paper Summary

Based on their performance on this paper, candidates should:

- Ensure that you read the question carefully and include sufficient points to gain full credit. Include as many points as there are marks available in 'discuss' and 'comment' items.
- Make sure you have practised calculations, given in the appendix of the specification, and that you understand and know how to apply formulae and always include all your working. Be able to express your answer in standard form and be careful with rounding errors.
- Write in detail and use correct and precise biological terminology.
- Revise all practical work especially the core practicals from the specification. These will help in questions about unfamiliar or novel practical procedures.
- Note that sometimes questions require candidates to make links between different parts of the specification, so when considering a question remember to use all the knowledge and understanding you have gained throughout the specification.
- Make sure you know and understand all of the terms in the specification.
- Always be able to identify the variables in experiments.
- Ensure in experiment design questions to give the independent variable and the range you are going to use, the dependent variable, how you are going to measure it and the control variables and explain how these will be controlled.
- Always read through your responses and ensure that what you have written makes sense and answers the question fully.

Grade boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link: https://qualifications.pearson.com/en/support/support-topics/results-certification/grade-boundaries.html

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