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Int GCSE Biology 4BI1 2BR

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Introduction

This paper once again provided candidates with the opportunity to demonstrate their knowledge and understanding of the specification content. It also enabled candidates to show how they can apply their knowledge and understanding to novel contexts such as in the questions on a printed passage or in interpreting novel experiments or investigations. Most candidates were also able to carry out calculations correctly. Centres are reminded that the list of experimental skills is provided on page 28 of the specification and the list of mathematical skills is provided in appendix 4 on page 43 of the specification. The list of command words and their meaning is given in appendix 5 of the specification on page 45.

Question 1(a)

Question 1 provided a passage on pollination in fruit trees. Candidates had to use the information in the passage and their own knowledge to answer the questions that follow.

Question 1a asked candidates to explain the differences between self-pollination and cross□pollination. Most were able to answer this correctly using their knowledge of pollination and the information about cultivars given in the passage.

Cross-pollinating fruit trees should be planted no more than 60 m apart. This will ensure that bees visit the trees often enough to ensure pollination. Nut trees need
25 to be planted no more than 15 m apart.

A further complication is that a few apple and pear cultivars, known as triploids, produce sterile pollen. Triploid cultivars have three sets of chromosomes within their cells. A triploid cultivar will require another cultivar for pollination, and the trees must flower at the same time.

(a) Explain the differences between self-pollination and cross-pollination.
(lines 3 to 5 and 9 to 11)

(2)

Self pollination is the transfer of pollen from anther to stigma of same plant
Cross-pollination is the transfer of pollen from anther of one plant to stigma of another plant. (same species)

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Examiner Comments

This answer gains full marks as it clearly explains that self-pollination is transfer of pollen from the anther to stigma in thr same plant and that cross-pollination is transfer from another plant.

Cross-pollinating fruit trees should be planted no more than 60 m apart. This will ensure that bees visit the trees often enough to ensure pollination. Nut trees need
25 to be planted no more than 15 m apart.

A further complication is that a few apple and pear cultivars, known as triploids, produce sterile pollen. Triploid cultivars have three sets of chromosomes within their cells. A triploid cultivar will require another cultivar for pollination, and the trees must flower at the same time.

(a) Explain the differences between self-pollination and cross-pollination.
(lines 3 to 5 and 9 to 11)

(2)

Self pollination does not require ~~any~~ insects, it is ~~a~~ direct. Self pollinating produces ~~genetically identical fruits~~ Self pollination is the transfer of pollen from another tree ~~to~~ of the same cultivar. Cross pollination can only produce fruit by fertilization from a different cultivar.

ResultsPlus
Examiner Comments

This answer also gains full marks for explaining that self-pollination is within the same cultivar whilst cross-pollination is from a different cultivar.

Cross-pollinating fruit trees should be planted no more than 60 m apart. This will ensure that bees visit the trees often enough to ensure pollination. Nut trees need
25 to be planted no more than 15 m apart.

A further complication is that a few apple and pear cultivars, known as triploids, produce sterile pollen. Triploid cultivars have three sets of chromosomes within their cells. A triploid cultivar will require another cultivar for pollination, and the trees must flower at the same time.

(a) Explain the differences between self-pollination and cross-pollination.
(lines 3 to 5 and 9 to 11)

(2)

self-pollination is when the pollen grain is transferred to the ova by stigma catching it within the same flower while cross-pollination is when the pollen grain is taken to the other flower or plant to the sticky stigma to fuse the pollen and ova nucleus together.

ResultsPlus
Examiner Comments

This response scores both marks for explaining that self-pollination is pollen transferred to the same flower. Cross-pollination is when the pollen grain is taken to another plant.

Cross-pollinating fruit trees should be planted no more than 60 m apart. This will ensure that bees visit the trees often enough to ensure pollination. Nut trees need
25 to be planted no more than 15 m apart.

A further complication is that a few apple and pear cultivars, known as triploids, produce sterile pollen. Triploid cultivars have three sets of chromosomes within their cells. A triploid cultivar will require another cultivar for pollination, and the trees must flower at the same time.

(a) Explain the differences between self-pollination and cross-pollination.
(lines 3 to 5 and 9 to 11)

(2)

Self-pollinated plants need bees or other insects to transfer pollen, however

In the process of self-pollination plants need bees or other insects to transfer pollen, however in the process of cross-pollination pollen can be transfered by wind.

ResultsPlus
Examiner Comments

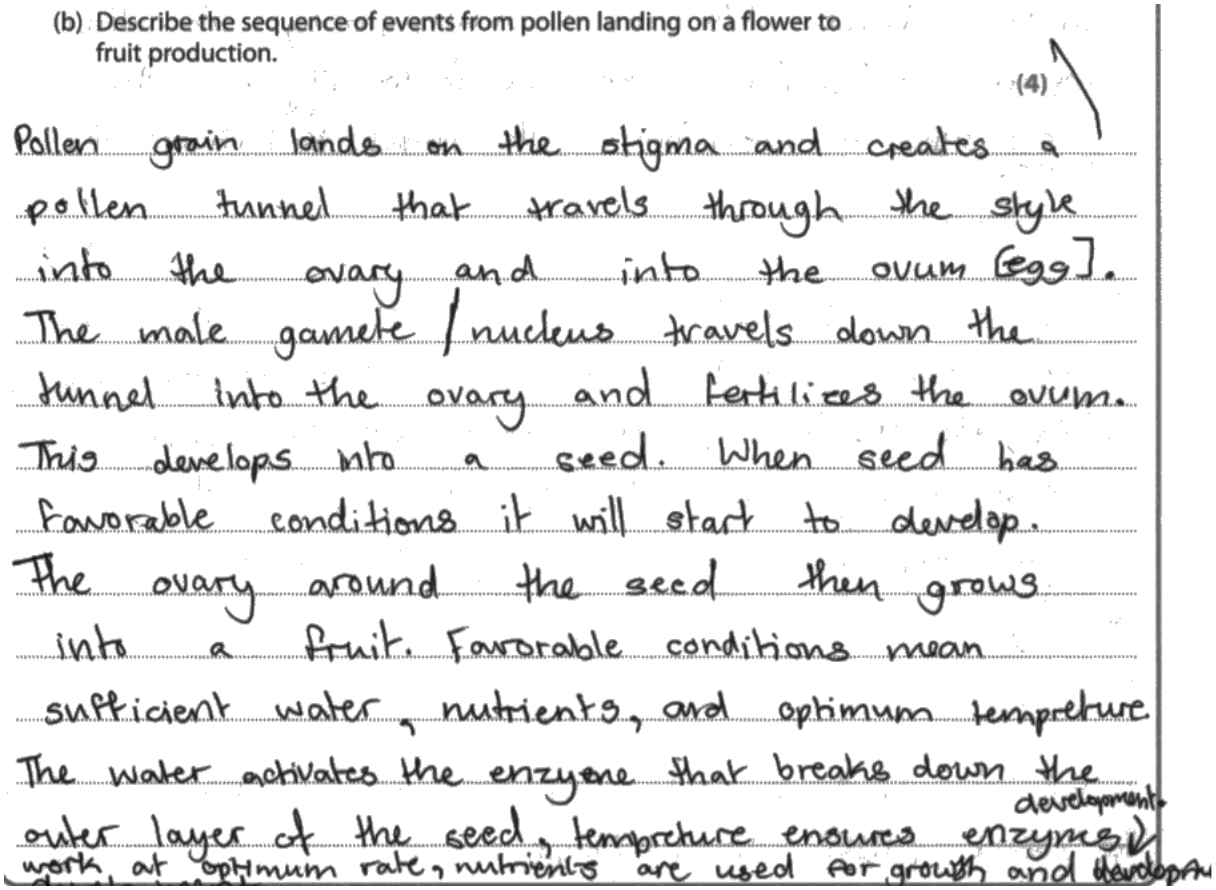
This candidate does not gain any credit as they think self-pollination occurs by insects and cross-pollination happens by wind.

ResultsPlus
Examiner Tip

Candidates need to be sure they understand the difference between self-pollination and cross-pollination and that insects can transfer pollen in both cases.

Question 1(b)

Question 1b asks candidates to describe the sequence of events from pollen landing on a flower to fruit production. Many responses gained full marks for a detailed and accurate account using precise language to describe how the pollen grain germinates, a pollen tube grows down the style entering the ovule. The male nucleus then travels down the tube and fertilises the female gamete, the ovule becoming the seed and the ovary becoming the fruit. Some weaker responses confused ovule and ovary or described the pollen as going down the style.



(b) Describe the sequence of events from pollen landing on a flower to fruit production.

(4)

Pollen grain lands on the stigma and creates a pollen tunnel that travels through the style into the ovary and into the ovum [egg]. The male gamete / nucleus travels down the tunnel into the ovary and fertilises the ovum. This develops into a seed. When seed has favorable conditions it will start to develop. The ovary around the seed then grows into a fruit. Favorable conditions mean sufficient water, nutrients, and optimum tempreture. The water activates the enzyme that breaks down the outer layer of the seed, tempreture ensures enzymes (development) work at optimum rate, nutrients are used for growth and develop

ResultsPlus
Examiner Comments

This response gains four marks. It gains mp2 for pollen tunnel as equal to tube growing down style. Mp 4 for male gamete travels down tunnel and mp 5 for fertilising the ovum, mp 7 for ovary becomes the fruit.

ResultsPlus
Examiner Tip

Although this gains four marks it could be improved by describing how the ovule becomes the seed.

(b) Describe the sequence of events from pollen landing on a flower to fruit production.

(4)

When pollen grain lands on stigma, it grows a pollen tube through the style to the ovary into the ovum. Through the tube, a male nucleus will go down to meet the female gamete (fertilisation) Once a zygote is formed, it will divide by mitosis, forming the seed ~~ovary~~ whole ovary becomes the fruit.

ResultsPlus
Examiner Comments

This response also gains four marks. Pollen tube grows down the style, male nucleus goes down tube, fertiises female gamete and ovary becomes fruit.

(b) Describe the sequence of events from pollen landing on a flower to fruit production.

through wind or insect pollination (4)

The pollen grains land on the stigma. The pollen tube ~~grows out of~~ moves out of the pollen grain ~~moves out~~ down the style ~~to~~ and into the ovary and to the ~~ovule~~ ovule. The male nucleus of the plant/flower which is the pollen grain fuses with the female gamete to form a zygote. The zygote undergoes mitosis to form a seed. The seed coat becomes the ovule wall and the seed becomes the fruit of the plant.

ResultsPlus
Examiner Comments

This response scores three marks. Growth of pollen tube down style, male nucleus fuses with female gamete and seed (coat) becomes ovule (wall).

(b) Describe the sequence of events from pollen landing on a flower to fruit production.

(4)

most fruit trees require the presence of 2 different cultivars that are compatiable for pollination to result in fruit prodeuction. Pollen can be transfered by wind, ingects or birds. Although many fruit trees are polinated by insects. After polination, the pollen grain must germinate in order for it to lead to fertilization. This process will only success if the enviromental conditions are suitable. It also depends on if the right pollen grain reeches the right flower. This is because the pollen can only fertilize specific flowers.

ResultsPlus
Examiner Comments

This answer scores one mark for describing germination of a pollen grain.

Question 1(c)i

Question 1ci asks candidates to name the three elements in carbohydrates. Almost all responses were able to gain the mark.

(c) Fruit trees often produce sweet-tasting fruit containing sugars.

(i) Sugars are carbohydrates.

Name the three elements in carbohydrates.

(1)

Carbon, Hydrogen, Oxygen.

ResultsPlus
Examiner Comments

This gains the mark for correctly naming carbon, hydrogen and oxygen.

(c) Fruit trees often produce sweet-tasting fruit containing sugars.

(i) Sugars are carbohydrates.

Name the three elements in carbohydrates.

(1)

Carbon, ~~oxygen~~ and Hydrogen

ResultsPlus
Examiner Comments

This also gains the mark.

(c) Fruit trees often produce sweet-tasting fruit containing sugars.

(i) Sugars are carbohydrates.

Name the three elements in carbohydrates.

(1)

Carbon, Hydrogen and Nitrogen

ResultsPlus
Examiner Comments

No credit for this response as it includes nitrogen but not oxygen.

Question 1(c)ii

Question 1cii asks candidates to suggest how production of sweet-tasting fruit may help spread the seeds of fruit trees. Some responses confused seed dispersal with pollination but many responses correctly noted that animals would eat the fruit and then egest the seeds in their faeces.

(ii) Suggest how production of sweet-tasting fruit may help spread the seeds of fruit trees. (lines 7 to 8)

(2)

Sweet tasting fruits attracts animals and insects such as bees. They consume the fruits and the ~~seed~~ undigested seed is dropped to random places throug feaces. This also help the transfer of pollens.

ResultsPlus
Examiner Comments

This response gains full marks for writing that animals consume the fruits then undigested seeds are dropped in faeces.

(ii) Suggest how production of sweet-tasting fruit may help spread the seeds of fruit trees. (lines 7 to 8)

(2)

Animals will eat the fruit and then move to another location where the seeds will be removed from their body in faeces.

ResultsPlus
Examiner Comments

This response also gains full marks.

(ii) Suggest how production of sweet-tasting fruit may help spread the seeds of fruit trees. (lines 7 to 8)

(2)

Insect pollination occurs the sweet tasting fruit's nectar attracts the insects which are pollinators. ~~Eg tasty~~ The pollen sticks to the body of insects and ~~a~~ pollination occurs when they land on a ~~stigma~~ of flower

ResultsPlus
Examiner Comments

This response does not score any marks as it confuses pollination with seed dispersal.

Question 1(d)

Question 1d asks candidates to explain how self-incompatibility prevents self-fertilisation. The best responses explained how pollen from the same flower or cultivar is unable to germinate so no pollen tube grows and no fertilisation can occur.

(d) Explain how self-incompatibility prevents self-fertilisation. (lines 11 to 13)

(2)

The pollen from same tree can not fertilise tree of the same cultivar. Thoat due to the pollen can not exchange genes.

ResultsPlus
Examiner Comments

This scores both marks for noting that pollen from the same tree cannot fertilise the same cultivar.

(d) Explain how self-incompatibility prevents self-fertilisation. (lines 11 to 13)

(2)

because self-incompatibility prevents same plant or cultiver from fertilising in own flowers.

ResultsPlus
Examiner Comments

This response gains one mark for noting that no fertilisation can occur within the same flower.

ResultsPlus
Examiner Tip

To gain full marks the response needs to include reference to pollen from same plant.

Question 1(e)

Question 1e asks candidates to describe how the structure of insect□pollinated flowers helps to achieve pollination. Many responses gained full credit for describing large, brightly coloured flowers with scent and nectary.

(e) Describe how the structure of insect-pollinated flowers helps to achieve pollination. (line 16)

(3)

Insect-pollinated flower often has large, colourful petals with insect guides to attract insects. Nectaries may also be present to attract insects. Anther and stigma are enclosed with the flower so insects have to brush pass them in order to reach the nectary

ResultsPlus
Examiner Comments

This response gains full marks. It describes large colourful petals and nectaries. It also notes that anther and stigma are enclosed.

(e) Describe how the structure of insect-pollinated flowers helps to achieve pollination. (line 16)

(3)

They have brightly coloured large petals to attract insects.
They have sticky stigma with in the flower so that insects can deposit ~~nectar~~ pollen onto stigma. They have the anther within the flower so the insects can enter the flower to carry pollen produced from anther.
They also produce sweet nectar to attract pollinators.
The pollens are also sticky so sticks to the pollinators, helping the pollinators carry pollen.

ResultsPlus
Examiner Comments

This response also scores three marks. Brightly coloured, large petals, stigma within the flower and nectar.

(e) Describe how the structure of insect-pollinated flowers helps to achieve pollination. (line 16)

(3)

They have large, brightly ~~-~~ coloured petals to attract insects. Their anthers and stigma are inside the flower, so insects can easily pick up and deposit pollen from the anther to the stigma. The stigma is sticky, so pollen is more likely to be transferred from the body of insects to the stigma for fertilisation.

ResultsPlus
Examiner Comments

This response also scores three marks. Large, coloured flowers with anthers and stigma within the flower.

(e) Describe how the structure of insect-pollinated flowers helps to achieve pollination. (line 16)

(3)

- insect pollinated flowers a bright and colourful petals that are large, and that creates a scent desired to insect pollinators, such as bees.
- the pollen grains ~~&~~ produced are also large and sticky, so that it's easy ~~&~~ for insects to carry.

ResultsPlus
Examiner Comments

This response also scores three marks for bright, colourful and large petals and having a scent.

Question 1(f)

This item asks candidates to give a reason why nut trees need to be planted closer together than fruit trees. Many candidates noted that nut trees are wind pollinated so cannot rely on insects to carry the pollen long distances.

(f) Give a reason why nut trees need to be planted closer together than fruit trees.
(lines 23 to 25)

(1)

This is because they do not rely on insects for pollination, instead by the wind.

ResultsPlus
Examiner Comments

This answer gains the mark for noting that they do not rely on insects and are pollinated by wind.

(f) Give a reason why nut trees need to be planted closer together than fruit trees.
(lines 23 to 25)

(1)

So that the wind can easily blow pollen away and it lands on another tree to ensure safe pollination. Less distance would make it easy for pollen to land on plant.

ResultsPlus
Examiner Comments

This response also gains the mark for stating that wind can easily blow pollen to another tree.

(f) Give a reason why nut trees need to be planted closer together than fruit trees.
(lines 23 to 25)

(1)

The nuts are the seeds, so they can germinate by themselves.

ResultsPlus
Examiner Comments

This response does not gain any credit.

Question 1(g)

The final item based on the printed passage asks candidates to explain why triploid cultivars produce sterile pollen. The best responses noted that a triploid cell would be unable to divide evenly by meiosis to form haploid gametes so fertilisation would not be possible.

(g) Explain why triploid cultivars produce sterile pollen. (lines 26 to 29)

(2)

Fertilisation requires the pollen grains to be haploid in order to form a diploid offspring. ~~Triploid~~ Pollen from triploid cultivars can't fuse with haploid eggs to form diploid offspring

ResultsPlus
Examiner Comments

This response scores both marks. It notes how gametes need to be haploid for fertilisation. This is the converse of the marking points mp2 and mp3.

(g) Explain why triploid cultivars produce sterile pollen. (lines 26 to 29)

(2)

Pollen contains male garete which is supposed to have a haploid nucleus. Chromosores cannot be evenly divided in meiosis since there is 3 sets of chromosomes so pollen is sterile.

ResultsPlus
Examiner Comments

This response also gains full marks. It writes that chromosomes cannot be divided in meisois to form haploid gametes.

(g) Explain why triploid cultivars produce sterile pollen. (lines 26 to 29)

(2)

Because it got 3 set chromosome in the sterile pollen. it don't allow meiosis to happen. so it cannot produce offspring.

ResultsPlus
Examiner Comments

This response scores one mark for noting that meiosis does not happen.

Question 2(a)

Question 2 gave candidates a diagram showing a section through an eye with some parts labelled.

Item 2a required students to correctly identify the lens, cornea and retina. Almost all responses gained three marks.

Question 2(b)

Item 2b required candidates to describe how structure Z changes when a person moves into a dark room. Most responses could correctly describe how the circular muscles relax and the radial muscles contract causing the pupil to dilate. Some responses wrote about ciliary muscles contracting so gained no credit.

(b) Describe how structure Z changes when a person moves into a dark room.

(3)

When move into a dark room, circular muscle relax and radial muscle ~~contract~~ contract and pupil expand. Z is iris

ResultsPlus
Examiner Comments

This gains full marks for circular muscles relax, radial muscles contract and pupil expands.

(b) Describe how structure Z changes when a person moves into a dark room.

(3)

- radial muscles contract and circular muscles relax
- iris allows more light through the pupil and pupil dilates
- iris relaxes to allow as much as light in

ResultsPlus
Examiner Comments

This response also gains full marks for radial muscles contract, circular muscles relax and pupil dilates.

(b) Describe how structure Z changes when a person moves into a dark room.

(3)

The circular muscles relax and the radial muscles contract. The iris dilates to let in more light into the eye so we can see more.

ResultsPlus
Examiner Comments

This response scores two marks for circular muscles relax and radial muscles contract but no credit for iris dilating.

See below.

(b) Describe how structure Z changes when a person moves into a dark room.

(3)

When a person enters a dark room the iris contracts which causes the pupil to dilate so that more light is refracted into the eye.

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See below.

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Examiner Tip

This response gains one mark for pupil dilates.

Question 3(b)

In question 3 candidates are given a diagram and told that a student uses this apparatus to investigate water loss from a plant. In 3b candidates have to calculate, in grams per hour, the rate of change of mass. The are told to give the answer to two significant figures. Many responses gained full marks. However, some candidates did not give their answer to two significant figures confusing decimal places with significant figures. These responses often gained one mark for their working.

(b) The total mass changes from 207.25 g to 204.50 g in the first 48 hours.

Calculate, in grams per hour, the rate of change of mass.

Give your answer to two significant figures.

(2)

207.25 - 204.50 = 2.75

$\frac{2.75}{48} = 0.05729$

rate of change of mass = 0.057 grams per hour

ResultsPlus
Examiner Comments

This answer gives correctly to two significant figures and gains full marks.

(b) The total mass changes from 207.25 g to 204.50 g in the first 48 hours.

Calculate, in grams per hour, the rate of change of mass.

Give your answer to two significant figures.

(2)

207.25 - 204.50 = 2.75

2.75 ÷ 48 = 0.057291

rate of change of mass = 0.057 grams per hour

ResultsPlus
Examiner Comments

This answer also gains full marks.

(b) The total mass changes from 207.25 g to 204.50 g in the first 48 hours.

Calculate, in grams per hour, the rate of change of mass.

Give your answer to two significant figures.

(2)

$$\frac{207.25 - 204.5}{48}$$

$$= 0.06$$

rate of change of mass = 0.06 grams per hour

ResultsPlus
Examiner Comments

This answer gains one mark as it is given to two decimal places not two significant figures.

(b) The total mass changes from 207.25 g to 204.50 g in the first 48 hours.

Calculate, in grams per hour, the rate of change of mass.

Give your answer to two significant figures.

(2)

$207.25 - 204.50$

rate of change of mass = 2.75 grams per hour

ResultsPlus
Examiner Comments

This answer gains no marks.

Question 3(c)

Question 3c asks candidates to explain why the student repeats the investigation with the same conditions. Most were able to explain that this allows the mean to be calculated, increasing reliability, allowing detection of anomalous results. Credit was also given for explaining that if conditions change the water loss may be affected.

(c) Explain why the student repeats the investigation with the same conditions.

(2)

- to identify the anomalous results and ~~measure~~ calculate the average of the loss of mass
- to increase the reliability of the investigation

ResultsPlus
Examiner Comments

This response scores full marks for identifying anomalous results, calculate mean and increases reliability.

(c) Explain why the student repeats the investigation with the same conditions.

(2)

Calculate the meannumber ~~accurate data~~ accute

ResultsPlus
Examiner Comments

This response scores one mark for calculate mean. No credit for accuracy.

(c) Explain why the student repeats the investigation with the same conditions.

(2)

make the investigation more reliable ~~reliable~~ and accurate.

~~so~~ and with same condition is make same independent variable

ResultsPlus
Examiner Comments

This response also gains one mark for increases reliability.

(c) Explain why the student repeats the investigation with the same conditions.

(2)

Repeat the experiment prevent ~~error~~ ensure accuracy of the experiment.

ResultsPlus
Examiner Comments

No credit for accuracy.

Question 3(d)i

Item 3di asks candidates to describe how the student could investigate the effect that moving air has on the change in mass. Most answers were able to gain at least one mark for describing how they would use a fan but fewer gained the second mark for describing controlling a named environmental condition such as temperature or light.

(d) The student then changes the conditions surrounding the plant.

(i) Describe how the student could investigate the effect that moving air has on the change in mass.

(2)

Use a fan, repeat 3 times and use same steps 1–4, measure change in mass in 48 hours. Compare results to one without a fan, ensuring the same plant, apparatus / method and humidity, temperature and light intensity.

ResultsPlus
Examiner Comments

This response gains both marks for using a fan and same temperature.

(d) The student then changes the conditions surrounding the plant.

(i) Describe how the student could investigate the effect that moving air has on the change in mass.

(2)

~~Could~~ The student could use a fan to blow the plant lightly and use one without any wind, keeping temp, humidity and the species the same for 4 x

ResultsPlus
Examiner Comments

This response also gains both marks.

(d) The student then changes the conditions surrounding the plant.

(i) Describe how the student could investigate the effect that moving air has on the change in mass.

(2)

keep all other conditions same and use a fan to on the plant and repeat the experiment calculate the change in mass.

ResultsPlus
Examiner Comments

This response gains one mark for use a fan.

ResultsPlus
Examiner Tip

To gain the second mark the answer needs to state which environmental condition they are controlling.

(d) The student then changes the conditions surrounding the plant.

(i) Describe how the student could investigate the effect that moving air has on the change in mass.

(2)

he can place one of the weight potometers in/ a row shown infront of a fan (standing fan) so wind hitting plant can increase. Then again he can record the change in mass at end.

ResultsPlus
Examiner Comments

This response also gains one mark.

Question 3(d)ii

In item 3dii candidates are asked to explain the effect that faster moving air has on the change in mass. The best responses gained full marks for explaining that moving air removes moist air away from the leaf increasing the concentration gradient allowing faster transpiration so leading to more mass lost.

(ii) Explain the effect that faster moving air has on the change in mass.

(3)

When the faster moving air, water vapour on the surface of plant evaporates more quickly and the concentration gradient increases. The transpiration rate increases so the total muss will decreases

ResultsPlus
Examiner Comments

This response scores full marks for increases evaporation increasing concentration gradient and total mass decreases.

(ii) Explain the effect that faster moving air has on the change in mass.

(3)

faster moving air increases rate of transpiration as wind blows away water molecules in the air this increases the concentration gradient of water inside and outside the leaf. which means water molecules from high water potential, inside the plant will diffuse out in the air with low water potential through the process of ~~osmosis~~ Osmosis

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Examiner Comments

This response also gains full marks for increasing transpiration by blowing away water molecules, increasing concentration gradient.

(ii) Explain the effect that faster moving air has on the change in mass.

(3)

It will make the change in mass increases

ResultsPlus
Examiner Comments

This response gains one mark for increasing mass change.

Question 3(e)

Item 3e asks candidates to describe how the student could modify the investigation to study the role of roots in the loss of water from a plant. Many responses gained full marks for describing using two plants of the same species, one with roots removed and keeping temperature/ light/ humidity constant.

(e) Describe how the student could modify the investigation to study the role of roots in the loss of water from a plant.

(2)

Prepare a different plant with no roots and place in the same apparatus. Ensure the plants are the same species.

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This response gains two marks for using a plant of the same species and for removing the roots of one plant.

(e) Describe how the student could modify the investigation to study the role of roots in the loss of water from a plant.

(2)

Perform the experiment with one plant without root (cut off roots) and another plant with roots. Use the some species of plant with the some surface ~~area~~ a area of leaves. Compare change in ~~wt~~ mass (which is water loss) over a period of time).

(Total for Question 3 = 12 marks)

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Examiner Comments

This response also scores two marks.

(e) Describe how the student could modify the investigation to study the role of roots in the loss of water from a plant.

(2)

have ~~out~~ a plant, with normal characteristics and control the variables and compare its water loss with a plant without roots with the same control variables.

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This response scores one mark for using one plant without roots.

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Examiner Tip

To gain the second mark the response should either state the same species of plant or the condition to be controlled such as temperature.

(e) Describe how the student could modify the investigation to study the role of roots in the loss of water from a plant.

(2)

Remove
~~Cut~~ the roots to investigate the water loss ~~of~~ from a plant.
No water is lost as root is responsible for absorbing water.

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Examiner Comments

This response also scores one mark.

Question 4(a)

In question 4a candidates were asked to explain what is meant by the term biodiversity. Many candidates gained full marks for explaining that biodiversity is the variation in an ecosystem and consists of the number of different species and their relative abundance.

4 A group of students investigate the biodiversity in two fields, A and B.

Field A is grazed by cattle and field B has no cattle.

(a) Explain what is meant by the term **biodiversity**.

(2)

The range of type of species and abundance of each species.

ResultsPlus
Examiner Comments

This response scores both marks for mp 1 and mp 2.

4 A group of students investigate the biodiversity in two fields, A and B.

Field A is grazed by cattle and field B has no cattle.

(a) Explain what is meant by the term **biodiversity**.

(2)

Bio diversity is the variety of living organisms and the abundance of each species.

ResultsPlus
Examiner Comments

This response also scores both marks.

4 A group of students investigate the biodiversity in two fields, A and B.

Field A is grazed by cattle and field B has no cattle.

(a) Explain what is meant by the term **biodiversity**.

(2)

Biodiversity refers to the range of species that are present across a specific location.

ResultsPlus
Examiner Comments

This response scores one mark.

Question 4(b)i

Item 4bi asks candidates to describe how the quadrats should be placed to obtain unbiased species numbers for each field. The best responses described how quadrats should be paced at random coordinates.

(i) Describe how the quadrats should be placed to obtain unbiased species numbers for each field.

(2)

Tape measure should be used to map out coordinates for each field. Using a random number generator for the coordinates, the quadrats can be placed at random areas in each field – this is random sampling.

ResultsPlus
Examiner Comments

This response gains both marks.

(i) Describe how the quadrats should be placed to obtain unbiased species numbers for each field.

(2)

numbered (with 10 squares horizontally and vertically)

A grid should be drawn over the field. A random number generator can then be used to randomly generate two numbers (in the range from 1–10), which will serve as the coordinate location on the field at which the quadrat should be placed. This process should be repeated 5 times for each field.

ResultsPlus
Examiner Comments

This response also gains both marks.

(i) Describe how the quadrats should be placed to obtain unbiased species numbers for each field.

(2)

The quadrats must be placed randomly. This can be done by using a random number generator to generate coordinates of which the quadrat will be placed.

ResultsPlus
Examiner Comments

This response also gains both marks.

(i) Describe how the quadrats should be placed to obtain unbiased species numbers for each field.

(2)

The quadrats should be placed ~~next~~ randomly using a computer generator and multiply by the area to find the total and repeat. Count number of species in each quadrat. Use a random number generator.

ResultsPlus
Examiner Comments

This response gains one mark for randomly pacing but no reference to coordinates.

Question 4(b)ii

4bii asks candidates for the most frequently occurring plant species in field B, calculate the number of plants in one square metre. To answer this candidates needed to identify the most frequent species in field B and then using the data calculate the number of plants in one metre. Many candidates were able to gain full marks and those who failed to could gain some credit if they showed some correct working.

(ii) For the most frequently occurring plant species in field B, calculate the number of plants in one square metre.

(3)

$0.5 \times 0.5 = 0.25\ m^2$

$0.25 \times 5 = 1.25\ m^2$

~~$(20+5+10) \div 1.25 = 28$~~

$(20+5+10) \div 1.25 = 28$

number of plants = 28

ResultsPlus
Examiner Comments

This answer gains full marks.

(ii) For the most frequently occurring plant species in field B, calculate the number of plants in one square metre.

(3)

$20 + 5 + 10 = 35$

$$\frac{35}{0.5 \times 0.5} = 140$$

number of plants = 140

ResultsPlus
Examiner Comments

Answer is incorrect but working gains two marks as this has identified the correct species and divided by area.

ResultsPlus
Examiner Tip

Always show working as this can gain credit even if the final answer is incorrect.

See below.

(ii) For the most frequently occurring plant species in field B, calculate the number of plants in one square metre.

(3)

10 + 5 + 20 = 35

number of plants = 35

ResultsPlus
Examiner Comments

See below.

ResultsPlus
Examiner Tip

The answer is incorrect. However response gains one mark for working as it has used data from common sorrel so has identified most frequent species.

Question 4(b)iii

In part 4biii candidates had to name the species with the greatest variation in number of plants recorded in quadrats for field B. Some candidates did not realise that a blank square in the table meant no species in that quadrat would contribute to the variation.

Question 4(b)iv

In item 4biv candidates were told that the students conclude that grazing affects the species in field A. The candidates were asked to use information in Table 1 and their own knowledge, and discuss the students' conclusion. Many candidates gained 4 or 5 marks for this item.

(iv) **The students conclude that grazing affects the species in field A.**

Using information in Table 1 and your own knowledge, discuss the students' conclusion.

(5)

The students' conclusion is correct. There is a greater number of species in field A, and a greater number/abundance of each species in field A, and so there is a greater biodiversity in field A. Additionally, in field A, more quadrats contain plants, implying/showing that there is a more uniform or even distribution/spread of plants in field A. Cows prefer/consume common sorrels more than other plants. This is shown by the fact there are no common sorrels in field A, how they are abundant in field B. Common sorrels may outcompete other plants, and so when they are consumed it is easier/there is more space/soil/nutrients available for other plants to grow. Additionally, grazing cattle's faeces contain nutrients such as nitrates for amino acids or phosphates for ATP/DNA, which are absorbed by plants' roots, allowing them to grow and reproduce more, which is why there are more plants overall in field A.

This response gains full marks. They note that there are a greater number of species in field A(mp1). That there is greater biodiversity in field A(mp4). More uniform distribution in field A (mp2). No common sorrel in field A(mp3). Cattle faeces contains nutrients (mp 10).

(iv) The students conclude that grazing affects the species in field A.

Using information in Table 1 and your own knowledge, discuss the students' conclusion.

(5)

There are more species in field A than in field B
Though they are no common sorrel and stinging nettle in field A.
The species in field A such as ~~yellow~~ meadow buttercup is more spread out than field B.
Cattle gives off methane. Methane is a greenhouse gas which increases global warming.
Increase in temperature, ~~the~~ enzyme-substrate complex increases. More plants are grown as a result, due to increase in photosynthesis which produce glucose, hence increasing respiration, more energy, more growth.
as enzymes have more kinetic energy and collide more.

There are 5 repeats in the experiment.
Though other factors may affect the species such as pollution and disease and predators and the soil pH and minerals in the soil.

ResultsPlus
Examiner Comments

This response gains four marks. It scores mp 1 more species in field A, mp 3 no common sorrel in field A, mp 5 experience repeated and mp 6 no information about soil pH.

(iv) The students conclude that grazing affects the species in field A.

Using information in Table 1 and your own knowledge, discuss the students' conclusion.

(5)

Field A has a higher biodiversity than that of field B, as more species of plants with higher abundance are present. Since field A is grazed by cattle and field B has no cattle, it is very likely that grazing affects the species in field A, increasing their abundance. This may be resulted by dead bodies, waste products and faeces of the cattle, which are putrefied by putrefying bacteria, increasing the amount of ammonium ions in the soil, allowing more plants to grow better, as ammonium ions are nitrified by nitrifying bacteria into nitrite and the nitrate. Then nitrate is fixed by nitrogen fixing bac

ResultsPlus
Examiner Comments

This response gains three marks. It scores mp 4 increased biodiversity, mp1 more species and mp10 cattle provide nitrates/minerals.

(iv) The students conclude that grazing affects the species in field A.

Using information in Table 1 and your own knowledge, discuss the students' conclusion.

(5)

With ~~no~~ cattles in field A, nitrate ions in cattle faeces cane be ~~#~~ putrified into ammonia and become nutrients for ribwort plantain and yellow rattle. These two species grows a lot more having nitrate ions from cattle wastes. On the other hand, cattle may produce some bacteria or greenhouse gas such as methane, this traps heat in the atmosphere and causes temperature rise in the field, ~~and~~ also reduces oxygen concentration in air, enzymes carry out less respiration and have less energy for reproduction. Common sorrel can't grow in a cattle polluted field but grows much more in field B.

ResultsPlus
Examiner Comments

This response scores two marks. It gains mp 10 for cattle adding minerals and mp 3 for no common sorrell in field A.

Question 5(a)

Item 5a asks candidates to calculate the percentage of embryos transferred that result in live calves being born. Many responses gained full marks.

5 Scientists collect data to measure how successful cloning is in cattle.

Table 1 shows the scientists' data.

	Number
embryos transferred	3374
live calves born	317
calves surviving 24 hours	279
calves surviving 150 days	225

Table 1

(a) Calculate the percentage of embryos transferred that result in live calves being born.

(2)

3374 − 317 = 3057

percentage = 9.4 %

$\frac{317}{3374} \times 100 = 9.395$

≈ 9.4 %

ResultsPlus
Examiner Comments

This gains both marks for correct answer.

5 Scientists collect data to measure how successful cloning is in cattle.

Table 1 shows the scientists' data.

	Number
embryos transferred	3374
live calves born	317
calves surviving 24 hours	279
calves surviving 150 days	225

Table 1

(a) Calculate the percentage of embryos transferred that result in live calves being born.

(2)

percentage = 9.4 %

$\frac{317}{3374} \times 100 = 9.39\% = 9.4\%$

ResultsPlus
Examiner Comments

This response also gains both marks for correct answer.

5 Scientists collect data to measure how successful cloning is in cattle.

Table 1 shows the scientists' data.

	Number
embryos transferred	3374
live calves born	317
calves surviving 24 hours	279
calves surviving 150 days	225

Table 1

(a) Calculate the percentage of embryos transferred that result in live calves being born.

~~225~~ $\frac{225}{3374} \times 100 = 6.67\% \approx 7\%$ **(2)**

percentage = 7 %

ResultsPlus
Examiner Comments

The answer is incorrect but this response gains one mark for working ÷ 3374.

ResultsPlus
Examiner Tip

Always show working so you can score marks even if final answer is incorrect.

Question 5(b)

Item 5b requires candidates to describe the stages in the production of a cloned mammal from an adult mammal. Many responses gained full credit for describing how the nucleus of a body cell is inserted into an enucleated egg cell and given an electric shock to stimulate mitosis. The embryo is inserted into the uterus of a surrogate mother.

(b) Describe the stages in the production of a cloned mammal from an adult mammal.

(4)

A body cell is extracted from the adult mammal. The nucleus is removed from body cell. The nucleus is planted in an enucleated cell embryo is inserted into the uterus of a surrogate mother.

→shocked electrically to undergo mitosis
→embryo implanted into surrogate.

ResultsPlus
Examiner Comments

This response gains full marks. Nucleus of body cell inserted. Embryo into uterus of surrogate mother. Electric shock to stimulate mitosis.

(b) Describe the stages in the production of a cloned mammal from an adult mammal.

(4)

extract nucleus from an adult mammal body cell, place in emucleated egg cell, electric shock to start mitosis, once it turns into an embryo, place embryo in uterus of surrogate mother

ResultsPlus
Examiner Comments

This response gains full marks. Nucleus from body cell into enucleated egg cell, electric shock to start mitosis. Embryo into uterus of surrogate mother.

See below.

(b) Describe the stages in the production of a cloned mammal from an adult mammal.

(4)

Get a diploid body cell of mammal that needs to be cloned → nucleus from insert in ~~nucleated~~ enucleated cell. Pass an electric shock or electricity. When cell starts to divide by mitosis insert embryo in uterus of surrogate mother.

ResultsPlus
Examiner Comments

See below.

ResultsPlus
Examiner Tip

This response also gains four marks. It includes mp 1, mp 2, mp 3 , mp 4, mp 5 and mp 6.

(b) Describe the stages in the production of a cloned mammal from an adult mammal.

(4)

we firstly locate a mammal with a desirable trait. ~~the~~ Then extract a cell from that ~~mamm~~ mammal and extract the dna out of the cell. Then take an ~~embryo from a female mammal~~ egg cell from a female mammal and remove its nucleus. Then inject the dna extracted out of the cell from the desired mammal and inject it into the unucleated egg cell. Once its its injected place it into a womb of a mother host known as the Saggiturus.

ResultsPlus
Examiner Comments

This response gains one mark for mp1 using an enucleated egg cell.

Question 5(c)

Item 5c asks candidates to explain why a weakened immune system can affect the health of cloned cattle. Many responses could explain that fewer white blood cells would produce fewer antibodies so make the cattle more prone to infection.

(c) There is some evidence that cloned cattle may have weakened immune systems.

Explain why a weakened immune system can affect the health of cloned cattle.

(2)

Such as virus, bacteria, fungus
Pathogens may reproduce ~~the~~ in their body easily, as lymphocyte ~~or~~ do not produce enough antibodies to kill them, or phagocytes cannot engulf them, causing diseases.

ResultsPlus
Examiner Comments

This response gains full marks for too few antibodies and bacteria not killed.

See below.

(c) There is some evidence that cloned cattle may have weakened immune systems.

Explain why a weakened immune system can affect the health of cloned cattle.

(2)

There may be fewer lymphocytes producing less antibodies.
There may also be fewer phagocytes engulfing pathogens.
The above allows foreign pathogens to destroy body cells and tissues as they enter the body with less ~~reference~~ interference by the weakened immune system.

ResultsPlus
Examiner Comments

See below.

ResultsPlus
Examiner Tip

This response also gains full marks for fewer lymphocytes so fewer antibodies.

(c) There is some evidence that cloned cattle may have weakened immune systems.

Explain why a weakened immune system can affect the health of cloned cattle.

(2)

cloned cattle are genetically identical to parents. If they have weakened immune system, then ~~less~~ lymphocytes will produce less antibodies rapidly when there are pathogens. The cloned cattle will be infected and get sick easily. Pathogens can invade body cells easily. ~~secondary IM~~

develop less memory cells,

ResultsPlus
Examiner Comments

This response also gains full marks.

(c) There is some evidence that cloned cattle may have weakened immune systems.

Explain why a weakened immune system can affect the health of cloned cattle.

(2)

A wealcened immune system means that the cloned cattle ~~cannot~~ has a weaker ability to have immune response against pathogens, which may cause the cattle to have disease.

ResultsPlus
Examiner Comments

This response gains one mark for cattle may develop disease.

Question 5(d)

Item 5d gave candidates a table with some information about cloned cattle and a control group.

Candidates were asked to comment on the effects of cloning on the growth and development of these cattle. Many responses gained three or four marks. These responses noted that it was a small study and not related. That the clones had a higher birth mass and took longer to reach a higher mass at puberty. Also that there is no significant difference in growth rate per day and that no information is provided about the diet of the cattle.

(d) Scientists also collected data comparing cloned cattle and a control group.

Table 2 shows their results.

	Group	
	clones	controls
number of cows	10	11
mean birth mass in kg	45.8	39.6
mean age at puberty in days	419.3	356.5
mean body mass at puberty in kg	359	303
daily mass increase in kg per day	0.75	0.78

Table 2

Comment on the effects of cloning on the growth and development of these cattle.

- specie / age of cows in both groups isn't identified. (4)
- repeats are not taken for reliability. cloning causes slow growth.
- clones have a greater mass ~~of~~ at birth. ~~were~~ however, daily mass increase of 0.75 kg is lower than of control group ~~not fast~~ showing slow growth. ~~inefficient~~
- clones take longer time to reach puberty than control showing slow development of their secondary sexual characteristics.
- mean body mass at puberty of clones is also greater than control growth but this is due to ~~more~~ more days taken by ~~control~~ clones to reach puberty. gain of mass is just daily gain of mass. slow growth and development is seen of clones.
- control group will develop & grow faster than clones due to early puberty and greater daily mass gain

(Total for Question 5 = 12 marks)

- clones have weak immune system so slow growth.
- no. of cows taken for each group is not same

ResultsPlus
Examiner Comments

This response scores full marks. No repeats noted mp 2, clones have greater mass at birth mp 3, clones take longer to reach puberty mp 4 and mean body mass at puberty is higher in clones mp5.

(d) Scientists also collected data comparing cloned cattle and a control group.

Table 2 shows their results.

	Group	
	clones	controls
number of cows	10	11
mean birth mass in kg	45.8	39.6
mean age at puberty in days	419.3	356.5
mean body mass at puberty in kg	359	303
daily mass increase in kg per day	0.75	0.78

Table 2

Comment on the effects of cloning on the growth and development of these cattle.

(4)

Mean birth mass is more of clones so the growth is better of cloned cattle. More healthy cattle. Body mass at puberty of clones is also more showing that ~~there~~ this cattle has better development and growth. However there is 1 less cow in clones growth and development would be difficult as many do not survive. Growth of cloned cattle is taking more time as age at puberty is more than of control group.

Gender of cattle is not given. Experiment is not repeated.

ResultsPlus Examiner Comments

This response also gains four marks. It gains mp 3, mp 5, mp 4 and mp 2.

(d) Scientists also collected data comparing cloned cattle and a control group.

Table 2 shows their results.

	Group	
	clones	controls
number of cows	10	11
mean birth mass in kg	45.8	39.6
mean age at puberty in days	419.3	356.5
mean body mass at puberty in kg	359	303
daily mass increase in kg per day	0.75	0.78

Table 2

Comment on the effects of cloning on the growth and development of these cattle.

(4)

Cloned cattle are born at a larger mass than normal cattle. They increase in mass slower than normal cattle at 0.75 kgs per day as opposed to 0.78. Their The cloned cattle develope slower on average and therefore hit puberty later than normal cattle. Cloning slows down the rate of growth and development of cattle, but tend to weigh more at birth and at puberty than normal cattle.

This response scores three marks. It gains mp 3, mp 4 and mp 5.

The growth rate per day in clones and controls is very similar or not significantly different. Few candidates registered that this difference was very small.

Question 6(b)i

In 6b candidates were given data about the concentrations of protein and glucose in blood plasma, in glomerular filtrate and in urine. In 6bi they were asked to calculate the mass of glucose in 5 dm3 of blood plasma. Most responses gained full marks.

(b) The table shows the concentrations of protein and glucose in blood plasma, in glomerular filtrate and in urine.

Substance	Concentration of substance in grams per 100 cm^3		
	blood plasma	glomerular filtrate	urine
protein	8.0	0.0	0.0
glucose	0.1	0.1	0.0

(i) Calculate the mass of glucose in 5 dm^3 of blood plasma.

(2)

[1000 cm^3 = 1 dm^3]

1000 – 1
5000 cm^3 – 5 dm^3
100 cm^3 — 0·1 dm^3
5000 cm^3 — ? 1

$\frac{5000 \times 0.1}{100} = 5$

mass = 5 grams

ResultsPlus
Examiner Comments

The correct answer gains both marks.

(b) The table shows the concentrations of protein and glucose in blood plasma, in glomerular filtrate and in urine.

Substance	Concentration of substance in grams per 100 cm^3		
	blood plasma	glomerular filtrate	urine
protein	8.0	0.0	0.0
glucose	0.1	0.1	0.0

(i) Calculate the mass of glucose in 5 dm^3 of blood plasma. (2)

[1000 cm^3 = 1 dm^3]

100 cm^3 = 0.1 dm^3

0.1 cm^3 = 0.0001 dm^3

0.1 : 5 = 0.001 : x

$\frac{5}{0.001}$ $\frac{5 \times 0.001}{0.1}$

0.005

mass = 0.005 grams

ResultsPlus
Examiner Comments

Incorrect answer but one mark for x 5 in working.

(b) The table shows the concentrations of protein and glucose in blood plasma, in glomerular filtrate and in urine.

Substance	Concentration of substance in grams per 100 cm^3		
	blood plasma	glomerular filtrate	urine
protein	8.0	0.0	0.0
glucose	0.1	0.1	0.0

(i) Calculate the mass of glucose in 5 dm^3 of blood plasma.

(2)

[1000 cm^3 = 1 dm^3]

= 5 x 1000

= 5000 cm^3

= $\frac{5000}{0.1}$

= 50000

mass = 50000 grams

ResultsPlus
Examiner Comments

Again incorrect answer but one mark for x 5 in working.

Question 6(b)ii

In item 6bii candidates were asked to explain why there is no protein in the urine. Many good responses earned full credit for explaining that protein molecules are too large to pass out of glomerulus into Bowman's capsule so stay in the blood.

(ii) Explain why there is **no** protein in the urine.

(2)

There is no protein in the urine because the protein molecules are too big and so they can't enter the bowman's capsule ~~and the fil~~

ResultsPlus
Examiner Comments

This response gains both marks for protein molecules are too big to enter Bowman's capsule.

(ii) Explain why there is **no** protein in the urine.

(2)

Protein is a large molecule. This means that in the glomerulus is doesn't get ultrafiltrated into the nephron however, it stays in the blood. This means that no protein is in the urine because it didn't pass to the nephron from ultrafiltration.

ResultsPlus
Examiner Comments

This response also gains two marks for protein molecules are large therefore stay in blood.

(ii) Explain why there is **no** protein in the urine.

(2)

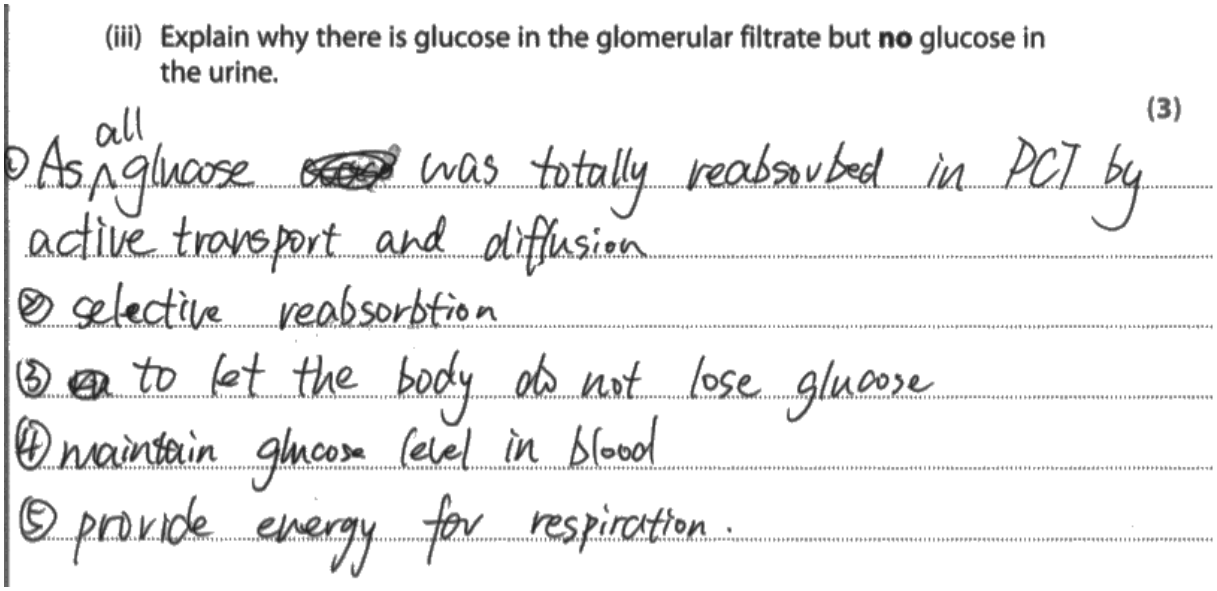
Because it is large molecules, so it is ultrafiltrated in the glomerulus.

ResultsPlus
Examiner Comments

This response gains one mark for protein is large molecule.

Question 6(b)iii

The final item on the paper asks candidates to explain why there is glucose in the glomerular filtrate but no glucose in the urine. Again most responses gained credit with many gaining full marks for explaining that glucose can pass into Bowman's capsule but is reabsorbed in the proximal convoluted tubule by active transport.



(iii) Explain why there is glucose in the glomerular filtrate but **no** glucose in the urine.

(3)

1. As all glucose was totally reabsorbed in PCT by active transport and diffusion
2. selective reabsorbtion
3. to let the body do not lose glucose
4. maintain glucose level in blood
5. provide energy for respiration.

ResultsPlus
Examiner Comments

This response gains full credit for reabsorbed in PCT by active transport.

(iii) Explain why there is glucose in the glomerular filtrate but **no** glucose in the urine.

(3)

Glucose is in the glomerular filtrate as it is comprised of smaller molecules that can be diffused through the capillary walls of the glomerulus during ultrafiltration into the Bowman's Capsule). However, during the process of selective reabsorption, sufficient number of gates found within the proximinal convulted tubule reabsorbs all glucose molecules within glomerular filtrate using the process of active transport. As a resulted, urine released from the body contains no glucose.

ResultsPlus
Examiner Comments

This complete answer gains full marks. It refers to all four marking points. Glucose can pass into Bowman's capsule (mp1). Selective reabsorption (mp2) in proximal convoluted tubule (mp4) by active transport (mp3).

(iii) Explain why there is glucose in the glomerular filtrate but **no** glucose in the urine.

(3)

The glucose is re-absorbed into the blood at the proximal convulated tubule through active transport as the body ~~still~~ should needs glucose for energy and urine only contains urea to be ~~excreted~~ ejected out the body

This response also gains full marks.

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.
- Look at data provided carefully and judge whether any differences are significant or small and due to chance.
- 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 to the correct number of significant figures 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.
- Make sure you know and understand and can explain all of the terms in the specification.
- Always be able to identify the variables in experiments.
- In questions about experiments describe the control variables in detail 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

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