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Examiners' Report
June 2022

International GCSE Biology Science Double Award 4SD0 1B

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Introduction

The new qualification was examined for the second time in this June 2022 series. The examiners were impressed with the standard of candidate responses. Centres have prepared candidates well for the new style of questions and the new areas of specification content. Generally, despite the interruption and disruptions to candidate learning, most candidates were able to demonstrate very good levels of knowledge and understanding of the specification content. There was little evidence of candidates running out of time on the paper and most candidates attempted all questions.

Candidates did better than in previous series on the longer prose questions which used the command words 'comment', 'discuss' and 'evaluate'. Candidates also did well on applying their knowledge to novel scenarios including those describing practical experiments. Most candidates did well on the questions examining the mathematical skills outlined in the appendix at the end of the specification. In the calculations, most candidates showed their working so that even if they did not get the final answer, they were able to gain some credit.

Question 1 (b)(i)

In this question candidates were given data about the speed of nervous and hormonal communication. Candidates were then asked to determine the ratio of the speed of nervous communication to the speed of hormonal communication and give the answer in the form n:1. The best responses were able to gain all three marks while those who showed their working but did not get the correct ratio could gain some credit.

This response gains full credit for giving the correct ratio.

(b) The human body has two systems of communication, nervous and hormonal.

(i) Students research the speed of nervous and hormonal communication.

They find this data

- hormones travel at a speed of 420 centimetres per minute
- nerve impulses travel at a speed of 55 metres per second

Determine the ratio of the speed of nervous communication to the speed of hormonal communication.

Give your answer in the form n:1

(3)

420cm/min = 7cm/sec

55m/sec : 5500cm/sec ~~7cm:1sec~~

5500 : 7 = 785.714 : 1

ratio = 785.714:1

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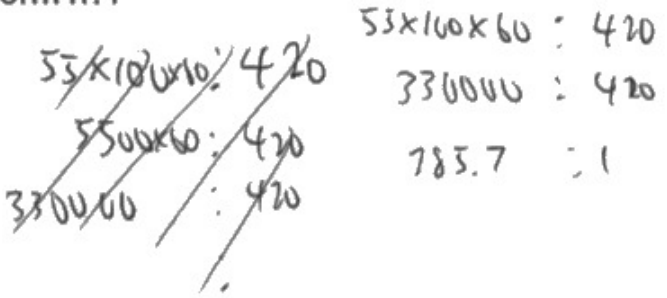
Examiner Comments

The ratio could have been expressed as 786:1.

Give your answer in the form n : 1



(3)

ratio = 785.7 : 1

ResultsPlus
Examiner Comments

This response also gains full credit as 785.7:1 is acceptable.

ResultsPlus
Examiner Tip

Again the ratio could have been expressed as 786:1

Question 1 (b)(ii)

In this question candidates were asked to describe three other differences between the nervous system and the hormonal system. The strongest candidates were able to give three differences. Some weaker responses included the speed of transmission, even though the question clearly stated other differences.

(ii) Describe three other differences between the nervous system and the hormonal system.

(3)

- Nervous system impulses are localised whereas hormonal system is widespread, but only target cells respond
- Nervous system is electrical impulses, whereas hormones are chemicals in the blood
- Nervous system reactions are instant and react very quickly, whereas hormones are often/ are long-lasting

ResultsPlus
Examiner Comments

This response gains all three marks.

(ii) Describe three other differences between the nervous system and the hormonal system.

(3)

nervous system is faster than the normonal System.
the nervous system uses electrical impulses rather than hormones.
the nervous system ~~of~~ a has shorter lasting effects compared to normonal.
In the hormonal system the normones have to travel through blood.

ResultsPlus
Examiner Comments

This response repeats the difference referring to speed but it also goes on to include three other correct differences.

(ii) Describe three other differences between the nervous system and the hormonal system.

(3)

- Nervous System is electical impulses, hormonal is not
- Nervous System is through the nerves, hormonal is through the blood.
- Nervous System is faster than hormonal System.

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Examiner Comments

This response scores two marks for two other differences.

ResultsPlus
Examiner Tip

Candidates should ensure they carefully read the stem of the question.

Question 2 (a)

In this question candidates needed to complete the passage about fungi by writing a suitable word or words in each blank space. The best responses gained all four marks but some candidates scored only one or two marks.

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

(4)

Fungi do not carry out photosynthesis. Their body is usually organised into a mycelium made from thread-like structures called hyphae.

Fungal cell walls are made of chitin.

Fungi feed by extracellular secretion of digestive enzymes onto food material and absorption of the organic products. This is known as saprotrophic nutrition.

ResultsPlus
Examiner Comments

This response scores all four marks for hyphae, chitin, digestive enzymes and saprotrophic.

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

(4)

Fungi do not carry out photosynthesis. Their body is usually organised into a mycelium made from thread-like structures called Hyphae.

Fungal cell walls are made of chitin.

Fungi feed by extracellular secretion of enzymes onto food material and absorption of the organic products. This is known as Sapatrophic nutrition.

ResultsPlus
Examiner Comments

This response also scores all four marks for hyphae, chitin, enzymes and saprotrophic.

Question 2 (b)(i)

Almost all candidates could correctly name the gas produced by yeast during anaerobic respiration.

Question 2 (b)(ii)

In this question candidates were asked to explain the effect that increasing temperature has on the rate of gas production by the yeast. Most responses gained some credit with the better responses scoring all three marks. These responses explained that as the temperature increases the kinetic energy of the enzyme and substrate molecules increases so that they collide more frequently and form enzyme substrate complexes. This continues until the temperature causes the enzymes to denature so the active site can no longer fit the substrate molecule.

(ii) Explain the effect that increasing temperature has on the rate of gas production by the yeast.

(3)

Increasing temperature, increases the rate of gas production by the yeast until the temperature goes beyond the optimum temperature for the enzymes in the yeast and they become denatured, so the rate of gas production decreases. It initially increases because the higher temperature increases the kinetic energy of the enzymes, so there are more successful collisions, so anaerobic respiration and therefore release of gas increases.

ResultsPlus
Examiner Comments

This response gains all three marks for enzymes denature, increasing kinetic energy and more collisions.

(ii) Explain the effect that increasing temperature has on the rate of gas production by the yeast.

(3)

increasing temperature means more kinetic energy so therefore more collision enzyme substrate complexes this means the rate of gas production increases. at a certain temperature (39°C) the enzymes begin to denature and the active sites 3D shape can no longer form enzyme substrate complexes meaning the rate of gas decreases

ResultsPlus
Examiner Comments

This also scores all three marks.

(ii) Explain the effect that increasing temperature has on the rate of gas production by the yeast.

(3)

increasing the temperature allows the enzymes to gain kinetic energy, this means that there are more frequent successful collisions and therefore it speeds up the rate of reaction.

ResultsPlus
Examiner Comments

This response scores two marks for increasing energy and more collisions.

Question 2 (b)(iii)

In Q2(b)(iii) candidates were asked to describe how the rate of gas production could be measured in this experiment. Only the best responses earned full marks for describing how a gas syringe could be used to collect and measure a volume of gas in a certain time period.

(iii) Describe how the student could measure the rate of gas production in this experiment.

(2)

By using an air tight compartment containing the yeast, a syringe can then by connected to the air tigh compartment, the student could then measure the volume of gas produced by looking at the plunger of the syringe and time the reaction, then calculating rate of gas production

ResultsPlus Examiner Comments

This scores both marks.

(iii) Describe how the student could measure the rate of gas production in this experiment.

(2)

Use a gas syringe to measure the volume of gas produced, and a stopwatch to time how long this takes, then calculate volume produced ÷ time taken to find rate of gas production.

ResultsPlus Examiner Comments

This also scores full marks.

(iii) Describe how the student could measure the rate of gas production in this experiment.

(2)

The student could use a gas syringe ~~and~~ to measure how much gas is produced at each temperature.

ResultsPlus
Examiner Comments

This scores one mark for the correct reference to a syringe.

Question 3 (a)(i)

In Q3(a)(i) almost all candidates could state what is meant by the term median.

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

(1)

the middle term, when all the terms are ascending in order.

ResultsPlus
Examiner Comments

This gains the mark.

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

(1)

The After ordering a list of numbers, in ascending order, the number in the middle.

ResultsPlus
Examiner Comments

This also scores the mark.

Question 3 (a)(ii)

In Q3(a)(ii) most responses were able to give a reason why the median is used rather than the mean. Suitable correct responses noted that the median would be less influenced by extreme values than the mean.

(ii) Give a reason why the median is used rather than the mean.

(1)

If the mean is used there may have been a really high or low anamolous piece of data which would have negatively affected the average value as all data is added up.

If a median is used these anomalies would affect the average to a smaller extent.

ResultsPlus
Examiner Comments

This gains the mark for noting that the median is less affected by extreme values than the mean.

(ii) Give a reason why the median is used rather than the mean.

(1)

There could be outliers that affect the mean much more than the median.

ResultsPlus
Examiner Comments

This also scores the mark.

Question 3 (a)(iii)

In this question candidates were required to describe the relationship between vital capacity and age shown by the graph. Most candidates gained both marks for describing the increase in vital capacity up to age 20 and then the subsequent decrease. Some answers did not refer to age.

(iii) Describe the relationship between vital capacity and age shown by the graph.

(2)

Up until the age reaches early 20s, as age increases, vital capacity increases. This happens at a fairly constant rate until teenage years, where the median vital capacity then suddenly increases. The median vital capacity then plateaus at around 5 - 5 litres for a very short time, then declining at a fairly slow rate, reaching about 4 litres by the age of 80.

ResultsPlus
Examiner Comments

This scores both marks.

(iii) Describe the relationship between vital capacity and age shown by the graph.

(2)

The graph shows that as the age increases until 20 years, the median vital capacity also increases by over 4.5 litres, however, after 20 years, the median vital capacity decreases from 5.5 l to approximately 4 l

ResultsPlus
Examiner Comments

This also scores both marks.

(iii) Describe the relationship between vital capacity and age shown by the graph.

(2)

Between ages 0 and 20, the vital capacity strongly increases. However between ages 20 + 80, vital capacity slowly decreases.

ResultsPlus
Examiner Comments

This response also scores both marks.

Question 3 (a)(iv)

In this question candidates found it more difficult to explain why vital capacity changes with age. Only the better responses gained credit with some explaining that the body and lungs are growing up to age 20 and after that the lungs stop growing and the intercostal muscles and diaphragm become weaker.

(iv) Explain why vital capacity changes with age.

(2)

It increases at first because the body is still developing and the lungs are still growing. At roughly 25, the body stops developing so the lungs stop growing, after which point they shrink because more cells are dying then those being made

ResultsPlus
Examiner Comments

This response gains two marks for growing and then stops growing.

(iv) Explain why vital capacity changes with age.

(2)

Firstly, for people grow until their mid-twenties. Therefore, their vital capacity increases as they get bigger their lungs get bigger. However, as the people get older their vital capacity decreases as their muscle intercostal muscles and diaphragm factor weakens

ResultsPlus
Examiner Comments

This response also gains two marks for growing and then intercostal muscles and diaphragm becoming weaker with age.

Question 3 (a)(v)

In Q3(a)(v) most responses were able to give two other variables that can affect a person's vital capacity. Suitable correct responses included smoking and fitness.

(v) Age is not the only variable that can change vital capacity.

Give two other variables that can affect a person's vital capacity.

(2)

1 Smoking - Damages a persons lungs

2 Medical conditions like Asthma that effect a persons breathing

ResultsPlus
Examiner Comments

This scores both marks.

(v) Age is not the only variable that can change vital capacity.

Give two other variables that can affect a person's vital capacity.

(2)

1 The physical size of that person

2 A person's fitness and health

ResultsPlus
Examiner Comments

This also gains both marks.

(v) Age is not the only variable that can change vital capacity.

Give two other variables that can affect a person's vital capacity.

(2)

1 ~~Height~~ Sex

2 Mass

This also gains both marks as sex and mass will affect vital capacity.

Question 3 (b)

In Q3(b) only the best answers gained all three marks for describing a method you could use to demonstrate the effect of exercise on breathing rate in candidates. Some candidates did not describe how to measure the breathing rate by counting how many breaths a person took in a set time. Responses should also refer to a stated period of exercise and repeating using similar students.

(b) Describe a method you could use to demonstrate the effect of exercise on breathing rate in students.

(3)

1) Get 1 student to sit still for 1 minute, count the number of breaths taken to find breaths taken per minute. Then make them do substancial excercise for 5 minutes like running and the straight after they finished count breaths for 1 minute. Find difference in rate by minus rate after finish by original. ~~Repeat and~~ Repeat whole ~~excercise this~~ method when breathing has returned to normal.

ResultsPlus
Examiner Comments

This response earns three marks.

(b) Describe a method you could use to demonstrate the effect of exercise on breathing rate in students.

(3)

Asking every student to ~~perform~~ count their number of breaths stably for 15 seconds and multiplying by four, or for 60 seconds, then recording their results. You would have students breaths per minute.
Then asking every student to perform cardio excersize for 5 minutes then recording their breaths /m again. You would have their second recording to see and compare differences.

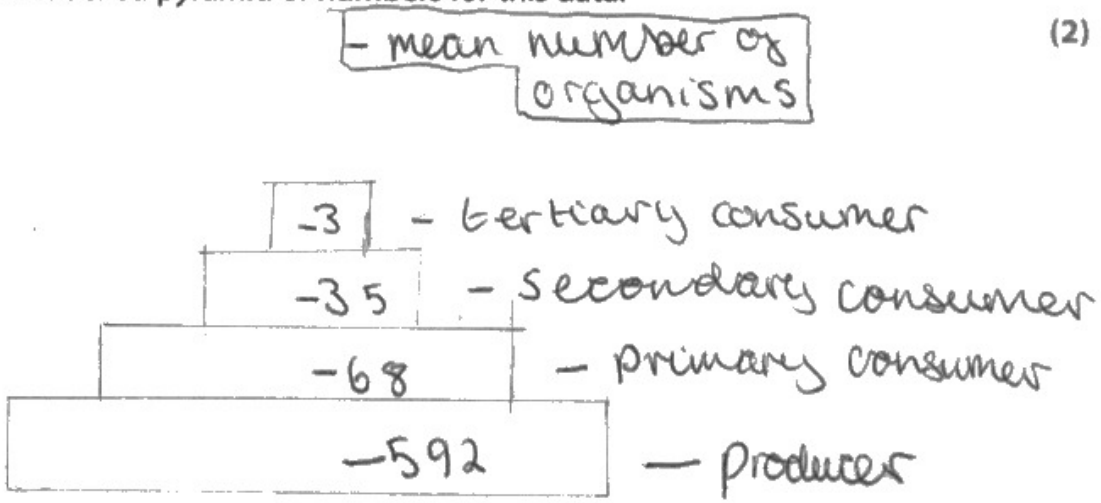
ResultsPlus
Examiner Comments

This response gains all three marks.

Question 4 (a)(i)

In Q4(a)(i) most candidates could correctly draw a pyramid of numbers using the data provided.

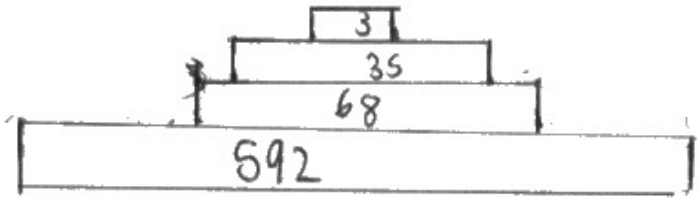
(a) (i) Draw a labelled pyramid of numbers for this data. (2)



ResultsPlus Examiner Comments

This scores two marks for correct shape and order.

(a) (i) Draw a labelled pyramid of numbers for this data. (2)



ResultsPlus Examiner Comments

This scores one mark for correct shape.

Question 4 (a)(ii)

In Q4(a)(ii) most candidates could describe how you could collect data to find the mean number of producers per square metre in the ecosystem. They described how many quadrats could be placed randomly and the number of producers in each quadrat would be counted.

(ii) Describe how you could collect data to find the mean number of producers per square metre in the ecosystem.

(3)

Use a quadrat and place in a random area within ~~an~~ the ecosystem. Count the number of producers. ~~and~~ repeat several times and find an average by adding all the numbers of producers and divide by number of ~~sqm~~ m^2.

ResultsPlus
Examiner Comments

This scores all three marks.

(ii) Describe how you could collect data to find the mean number of producers per square metre in the ecosystem.

(3)

You could use a 1m x 1m quadrat and then count the number of producers within the quadrat then repeat this 20 times in 20 random areas within the ecosystem before ~~dividing by 20 to find~~ finding the average number per $1m^2$ in the ~~area~~ ecosystem.

ResultsPlus
Examiner Comments

This also scores all three marks.

(ii) Describe how you could collect data to find the mean number of producers per square metre in the ecosystem.

(3)

I will use a quadrate and place ~~them~~ it randomly by using a random number generator. Then I will count the number of each square ~~in~~ and find the mean number of them.

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Examiner Comments

This scores two marks for placing a quadrat randomly. It does not clearly state using many quadrats or repeating.

Question 4 (b)(i)

In this question candidates were asked to calculate the percentage of biomass in the secondary consumers that is transferred to the tertiary consumers. About half of the responses correctly calculated the percentage energy transferred.

The percentage of biomass in the producers that is transferred to the primary consumers is 4.5%.

(i) Calculate the percentage of biomass in the secondary consumers that is transferred to the tertiary consumers.

(1)

$\frac{2.4}{10.6} \times 100$

percentage = 22.6 %

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Examiner Comments

This response gets the mark.

Question 4 (b)(ii)

In Q4(b)(ii) candidates were required to comment on the energy transfers in this ecosystem. In this longer prose question many candidates scored well gaining three or four marks. The best responses noted that energy is lost at each transfer due to heat loss, not all of the organisms being eaten or digested and some energy lost in excretion. Other creditworthy points included noting that the number of organisms decreases along the food chain as does the biomass.

(ii) Comment on the energy transfers in this ecosystem.

In your answer, refer to data from the table and the percentages of biomass transferred.

(4)

In this ecosystem, from the producer to the primary consumer, only 4·5% of energy is transferred as energy is lost through undigested parts like the roots and is lost through respiration. From the primary to secondary 28·6% of energy is ~~stores~~ transferred which is greater than the first one. However, energy can be lost through movement & faeces. In the last transfer 22·6% of energy is transferred and there are only 3 ~~decomposers~~ organisms. The number of producers is far larger at 592. Over the whole process, only 0·29% is passed from the producers to the tertiary consumers. Most energy is lost in the first transfer.

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Examiner Comments

This response gains four marks for reference to energy loss and its causes. It also notes that most energy is lost between producer and primary consumer and that the number of organisms is fewer at the top of the pyramid.

(ii) Comment on the energy transfers in this ecosystem.

In your answer, refer to data from the table and the percentages of biomass transferred.

(4)

The energy passed on between trophic levels is never high. between producers and primary consumers, only 4.5% of biomass is passed on, though the number of primary consumers is much lower than producers. After this, there is approximately half the number of secondary consumers than primary consumers (35 secondary and 68 primary), while the biomass passed on is 28.6% - more than before, but still not very efficient. After this, there are only 3 tertiary consumers to 35 secondary consumers - a ratio less than that of primary to producer, however, the biomass change is still much higher at 22.6%. This must be because tertiary consumers are apex predators who consume most of the animal. Other reasons for low transfer include energy being lost to egestion, respiration and movement.

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Examiner Comments

This response also gains four marks.

(ii) Comment on the energy transfers in this ecosystem.

In your answer, refer to data from the table and the percentages of biomass transferred.

(4)

- the highest percentage of biomass is transferred from primary to secondary consumers.
  ↳ 28.6%.
- smallest amount of biomass is transferred from producers to primary consumers
  ↳ 4.5%.
- ~~mass is lost~~ biomass is lost as organisms not fully digested.
- lost in excretion and urine.
- lost in egestion
- organisms die.
- movement and respiration

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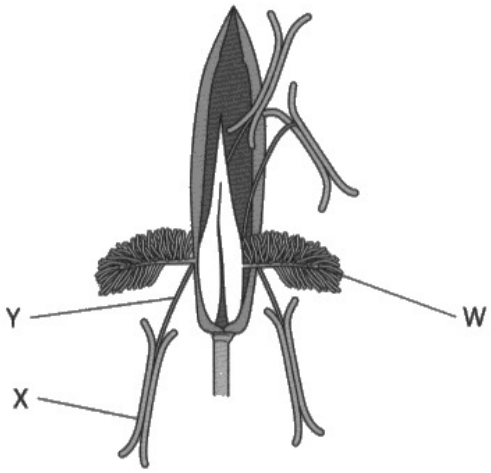
Examiner Comments

This response gains three marks for most energy lost between producer and primary consumer. It also gains marks for energy losses due to excretion and egestion.

Question 5 (a)(i)

In Q5(a)(i) candidates were given a diagram of a wind pollinated flower and were asked to describe how structures W, X and Y are adapted for wind pollination. Most responses gained two or three marks. Some candidates confused or misnamed the structures. They described how W or the stigma is exposed outside the flower and X or the anther is also outside the flower and that Y or the filament is long.



(a) (i) Describe how structures W, X and Y are adapted for wind pollination.

(3)

the structure W, has feathers to be able to catch pollen blowing in the wind
Y has a long filament ~~because~~ to extend the anther away from the plant into the wind.
X ~~is~~ has a large surface area to be able to ~~is~~ allow as much pollen to be blown away from the plant ~~to be~~ for pollination also sticks out to catch the wind. Allows pollen to

ResultsPlus
Examiner Comments

This response scores all three marks.

(a) (i) Describe how structures W, X and Y are adapted for wind pollination.

(3)

W is the stigma, it is large and feathery and hangs out of the leaves to catch pollen in the wind.
Y is the filament which are long to enable the anther (X) to hang out so wind can carry pollen from the anther to other stigmas.

ResultsPlus
Examiner Comments

This also scores all three marks.

(a) (i) Describe how structures W, X and Y are adapted for wind pollination.

(3)

The structure of W sticks out from the flower, exposing it more to the wind. It also is made up of lots of small parts which facilitate their removal by the wind so it can carry them. Structures X and Y also stick out from the flower so they are more exposed to the wind. Structure Y is loose and dangles and structure X is made to catch things so it has a large surface area.

ResultsPlus
Examiner Comments

This response also scores all three marks.

Question 5 (a)(ii)

(ii) Structures W, X and Y are adapted for wind pollination.

Give two other differences between wind-pollinated flowers and insect-pollinated flowers.

(2)

1 Insect-pollinated ~~have~~ produce sweet nectar and have colourful petals to attract insects, but wind-pollinated are more green and don't ~~and don't~~ produce sweet nectar.

2 The stigma is exposed in a wind-pollinated plant but is enclosed in a insect-pollinated flower.

ResultsPlus
Examiner Comments

This gains both marks.

(ii) Structures W, X and Y are adapted for wind pollination.

Give two other differences between wind-pollinated flowers and insect-pollinated flowers.

(2)

1 insect-pollinated are ~~very~~ smell nice, this attracts insects as well as the sticky style, which means pollen on insects sticks.

2 the petals are large and brightly coloured on an insect pollinated as it would attract.

ResultsPlus
Examiner Comments

This also scores both marks.

(ii) Structures W, X and Y are adapted for wind pollination.

Give two other differences between wind-pollinated flowers and insect-pollinated flowers.

(2)

1 Insect pollinated flowers have the reproductive parts on the inside of the flower whereas wind pollinated do

2 Insect pollinated flowers are more attractive with bright colours, nice scents and are generally larger

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Examiner Comments

This scores both marks for brightly coloured with scent.

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Examiner Tip

The first part of the candidate's answer gains no marks as it refers to structures W, X and Y.

Question 5 (b)

This discuss question required candidates to examine a graph of pollen counts and table giving diary information showing how the allergic response of five people changes during a year. Candidates were required to use the data in the table and the information from the graph to discuss the likely causes of the allergic responses in each person. This was very well answered by most candidates who linked the pollen count with the symptoms and gave the cause of the allergic response for each person.

Using the data in the table and the information from the graph, discuss the likely causes of the allergic responses in each person.

(5)

Person A, has severe symptoms in April & May, where tree weed pollen count is at its peak / highest. In march & june, the tree pollen count is lower, person A = mild syptoms, no symptoms in July to September. Person A more likely is allegic to tree pollen. Person B, experiences the most symptoms in June–July, which is when grass pollen is at its highest count, which means they are probably allegic to tree grass pollen. Person C has serese symptoms in April to septenber, and no mild symptoms in march. In march, only tree pollen is present. The rest of the time, all the other allergics are present in the time the of june – septenber, so C is allegic to all pollen, tree & weed & grass. Person D has no allergics, due to no symptoms all year rard. Peson E has most allegies June to septenber, meaning they are most likely allegic to grass & weed, which causes symptons. Mild symptons in march to May may suggest a mild allery to tree pollen.

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Examiner Comments

This response gains all five marks.

Using the data in the table and the information from the graph, discuss the likely causes of the allergic responses in each person.

(5)

Firstly, the experiment would be more efficient and easy to read if the experiment was repeated to gain reliability and to double check.
A is clearly "tree weed" as his "seure" and "mid" symptom match to the tree weed in the pollen count.
B is trickier as many have seure reaction in June to July, yet it could be grass as it is the most prominent, yet the other month are almost flat, which does not correlate to as his mild "March-April" symptons, showing uncertainty but it is hay.
C has a very large range of "seure" month this provide little detail and evidence making it almost useless to what cause her hay fever.
D, show that someone is not allergic to tree pollen. This is a good control variable, showing the experiment doe work.
E is confusing as it can only be grass or weed as there are high in E's most seure months. also they are very low in the E's mild months. So it could be eigther of them. The experiment doe provide evidence, but is not in enough detail to accurally understand what causes hayfever for each person. Having more people (more data) would help as more results

ResultsPlus
Examiner Comments

This response also gains all five marks.

Using the data in the table and the information from the graph, discuss the likely causes of the allergic responses in each person.

(5)

Person 1 has the most severe symptoms from ~~March~~ April to May, and ~~the~~ on the graph it has ~~th~~ tree pollen count the most, and mild symptoms in march and June, the tree pollen ~~still are~~ is ~~the~~ nearly zero, which indicate that this person is allergic to tree pollen.

Person 2, most servere at June and July but very mid from March to June, July to August. Suggest that he has grass allergic response.

Person 3, has servere symptoms from April to sep-temp- suggest that this person is allergic to 3 things tree weeds and grass.

Person 4 doesn't have symtoms so is not allergic to any of them

Person 5 has severe symptoms at June to septemper which means ~~she~~ may have grass or weed allergy and both of them are low counts in March to May. ~~So~~ ~~If~~ this person is allergic to weed and gruss.

ResultsPlus
Examiner Comments

This response also gains all five marks.

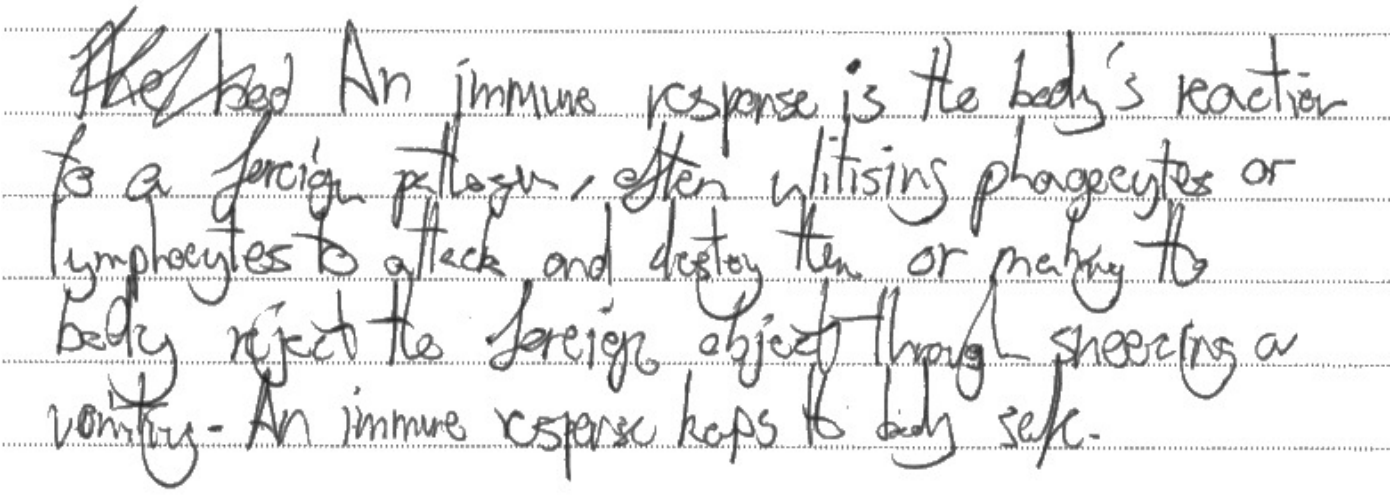
Question 5 (c)

In Q5(c) many candidates could correctly explain what is meant by the term immune response. These answers explained that this is the body's response to a pathogen in which lymphocytes release antibodies and phagocytes engulf the pathogens.

(c) The allergic response to pollen is part of the body's immune response.

Explain what is meant by the term **immune response**.

(2)



ResultsPlus
Examiner Comments

This answer gains two marks for explaining that lymphocytes and phagocytes respond to a pathogen.

(c) The allergic response to pollen is part of the body's immune response.

Explain what is meant by the term **immune response**.

(2)

Immune epone is the body detecting a harmful substance/ pathogen and using the immune system (such as white blood cells) to deal with it and make it leave the body

ResultsPlus
Examiner Comments

This also gains two marks for explaining that the immune response involves the white blood cells responding to a pathogen.

(c) The allergic response to pollen is part of the body's immune response.

Explain what is meant by the term **immune response**.

(2)

An immune response is when the body tries to flush out, ~~a pathogen~~ or destroy a pathogen.

ResultsPlus
Examiner Comments

This scores one mark for reference to response to a pathogen.

Question 6 (b)(i)

This question gave a diagram showing a plant cell in distilled water and a plant cell in a concentrated solution of sodium chloride. Only the strongest candidates could give the name of the liquid found in the gap labelled O in the cell in the concentrated solution of sodium chloride.

(b) (i) Give the name of the liquid found in the gap labelled O in the cell in the concentrated solution of sodium chloride.

(1)

[redacted] Sodium chloride solution

ResultsPlus
Examiner Comments

This is the correct liquid.

Question 6 (b)(ii)

In this question candidates were asked to explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride. Most responses could gain at least a mark with many gaining all four for explaining that in distilled water the cell would become turgid as water enters by osmosis down a water potential gradient causing the cell membrane to be pushed against the cell wall. In the case of the cell in the concentrated sodium chloride solution, water would exit by osmosis down a water potential gradient causing the cell to become plasmolysed and the cell membrane to shrink away from the cell wall.

(ii) Explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride.

(4)

• The cell in distilled water has enough water going into the cell via osmosis so the cell is flaccid.

• The cell in the concentrated solution of sodium chloride has not got enough water in it as water is moving out of the cell via osmosis due to the low water potential outside the cell. This means that the cell membrane is coming away from the cell wall edges and is shrivelling up as it is dehydrated.

ResultsPlus
Examiner Comments

This scores four marks for water exiting the cell in salt solution by osmosis to a lower water potential and for the cell membrane moving away from the cell wall.

(ii) Explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride.

(4)

The cell in distilled water is turgid as water is moving into the cell via osmosis. The cell in a concentrated solution of sodium chloride has the cytoplasm pulling away from the edges of the cell wall, this is because there is a higher concentration of water within the cell than outside it in the solution so water is moving out the cell via osmosis.

ResultsPlus
Examiner Comments

This also scores four marks.

ResultsPlus
Examiner Tip

It is better if candidates write about water potential gradient or concentration of solutions rather than water concentration.

(ii) Explain the differences in the appearance of the cell in distilled water and the cell in the concentrated solution of sodium chloride.

(4)

In distilled water the levels of concentrated substances in the cell would be higher than in the solution of sodium chloride, the concentration of salt outside the cell is higher than inside the cell, meaning osmosis occurs, water inside the cell passes through the cell membrane to balance the concentration and the cell becomes hypotonic. In distilled water, water outside passes into the cell to balance concentration but the cell doesn't burst because the cell wall holds it's structure. In an animal cell, it will become hypertonic and burst because of the lack of a cell wall.

ResultsPlus
Examiner Comments

This response scores three marks for water exiting towards a more concentrated salt solution by osmosis.

Question 6 (c)

In Q6(c) the strongest candidates were able to describe the experiment using onion epidermis immersed in a range of salt concentrations of the same volume for a stated period and then examined using a microscope. Some candidates described investigations using cylinders of potato tissue rather than a single layer of cells.

(c) Describe an experiment you could do to show how different concentrations of sodium chloride solution affect the appearance of plant cells.

(4)

get 4 different boiling tubes, all with different sodium chloride concentrations. The first one should be control and have distilled water and then the other ~~leaves~~ boiling tubes can increase the concentration of sodium chloride solution by 1mol/dm^3 each time, ~~the 4th boiling~~ Then place ~~the~~ a (part of a leaf) plant cell in each tube. the cells should be from the same leaf, and be in ~~a~~ similar conditions and ages. Leave in the solutions for 2 hours then take the section of leaf out and place under a microscope to observe its ~~condition~~ condition. ~~Repeat~~ the experiment 3 times in case of an ~~anom~~ anomaly.

ResultsPlus
Examiner Comments

This scores three marks for reference to using different concentrations of sodium chloride solution, leaving the cells in the solution for two hours and examining using a microscope.

(c) Describe an experiment you could do to show how different concentrations of sodium chloride solution affect the appearance of plant cells.

(4)

Get two a peices of onion skin, put one in destilled water and the rest in concentrations sodium chloride solutions ~~are~~ are different ~~pots~~, ~~after~~ an hour return and look at the plant cells of the onions through a microscope* and draw ~~as~~ what you see in each plant cell(s)

* by dipping the onion skins in iodine

ResultsPlus
Examiner Comments

This scores four marks for using onion cells, different concentrations of salt solution and leaving for an hour before examining under a microscope.

Question 7 (a)(iii)

In this question candidates had to explain the difference in the wall of chamber S and the wall of chamber Z. Many candidates could gain three marks for explaining that the walls of S are thinner than Z with less muscle as they need to generate less force as they pump blood to the lungs.

(iii) Explain the difference in the wall of chamber S and the wall of chamber Z.

(3)

~~Chamber S and~~ The walls of chamber Z are thick, elastic, muscular, while the walls of chamber S are less thick. This is because the left side of the heart, containing chamber Z, pumps blood around the whole body under a very high pressure, while the right side with chamber S pumps blood only under a low pressure to the lungs, so ~~&~~ thick walls aren't needed to withstand the high pressure.

ResultsPlus
Examiner Comments

This response scores three marks for reference to chamber Z having thick muscular walls to pump blood all around the body.

(iii) Explain the difference in the wall of chamber S and the wall of chamber Z.

(3)

The wall of chamber Z is much thicker and more muscular than the wall of chamber S. This is because it needs to generate more pressure to pump blood through the aorta to the whole body, whereas the chamber S only needs to pump the blood to the lungs, which is a shorter distance.

ResultsPlus
Examiner Comments

This excellent response gains all three marks for reference to Z being thicker and more muscular to generate more pressure to pump blood to the whole body.

(iii) Explain the difference in the wall of chamber S and the wall of chamber Z.

(3)

The wall of chamber Z is thicker than the wall of chamber S because it is the left ventricle and needs to pump blood around the entire body, whereas chamber S only pumps it to the lungs.

ResultsPlus
Examiner Comments

This response scores two marks for Z having thicker walls to pump blood all around the body.

Question 7 (b)

Q7(b) asked for the function of three different components of a balanced diet. Most candidates were able to gain full marks on this question.

(b) Humans need a balanced diet for healthy growth and development.

Give the function of three different components of a balanced diet.

(3)

1 Protein can be used for growth and repair

2 Lipids can be used for heat insulation and act as an energy store

3 Carbohydrates provide energy for the body.

ResultsPlus
Examiner Comments

This response gains three marks.

(b) Humans need a balanced diet for healthy growth and development.

Give the function of three different components of a balanced diet.

(3)

1 protien helps the bodies grauth and repair of muscles and organs

2 ~~calcium~~ Carbahyarates = gives energy stors to the body and

3 Vitamin D - helps the bodys grauth ~~and~~ and stronger bones

4 calcium - helps stranger bones and teeth

ResultsPlus
Examiner Comments

This response also gains three marks.

ResultsPlus
Examiner Tip

There is no benefit in giving four functions when asked for three.

(b) Humans need a balanced diet for healthy growth and development.

Give the function of three different components of a balanced diet.

(3)

1 Calcium is necessary for the production and maintanance of bones and teeth

2 fibre helps with good movement throughout the gut and peristalsis

3 carbohydrates provides energy (glucose for respiration

ResultsPlus
Examiner Comments

This also gains three marks.

Question 7 (c)

Q7(c) gave candidates a table of data from an investigation into the link between body mass and coronary heart disease in a population in Australia. They were asked to evaluate what the data shows about the relationship between classification of body mass, age and heart attacks. This question produced a range of responses from those scoring no marks to those gaining all five. Most responses scored at least three marks.

(c) Scientists investigated the link between body mass and coronary heart disease in a population in Australia.

The scientists recorded the number of heart attacks in a population of 850 people for a period of 20 years.

They classified the people as normal mass, overweight or obese.

They calculated rates of heart attacks that allowed a valid comparison to be made between the groups.

Gender

Age in years	Calculated rate of heart attacks in arbitrary units		
	normal mass	overweight	obese
under 40	3.7	6.4	12.1
40 to 60	18.6	21.4	27.0
over 60	36.1	36.4	17.3
all ages	11.3	16.3	20.2

Evaluate what the data shows about the relationship between classification of body mass, age and heart attacks.

(5)

firstly, the data shows that as body mass ~~age~~ increase - the rate of heart attacks will increase (3.7 → 12.1) because additional weight puts more strain on the heart and a diet high in ~~saturated~~ fats cholesterol increases likelihood of plaques forming (leading to a heart attack). additionally as age increases, the ~~risk~~ rate of heart attacks will increase (3.7 - 36.1), because of weakening heart muscles. however the data has not told us these people's sex, whether they have inherited a heart condition. also there is an anomaly where the rate of heart attacks for an obese over 60 is less than normal mass over 60 - which affects the validity of the experiment

(Total for Question 7 = 13 marks)

ResultsPlus
Examiner Comments

This response scores all five marks. It scores marks for noting that as mass increases and age increases so does the rate of heart attacks. It also notes that the sex and genetics of the participants is unknown. It also notes that in the over 60 group, the risk of heart attacks is less for obese patients than for those of normal mass.

Evaluate what the data shows about the relationship between classification of body mass, age and heart attacks.

(5)

From the ages under 40 the People at most risk of heart attacks are people with obesety with their being a 8.4 in increase in of People who had heart attacks under 40 who were obease compared to 3.7 People who he were a normal mass having heart attacks. From 40 to 60 the risk of heart attacks unrelated to wight does increase, People at normal mass go went from 3.7 to 18.6 heartattaars. However The People with who were obesity and overweight were still having more heart attacks. However over the ages of 60 weight is not as impactfull in the change of having heart attans as People of a normal weight were at 36.1 compared to People who had obesity with 17.3

The ~~graph~~ table shows that weight has an impact on the chances of heart attacks, the higher mass, the higher the risk. however as age increases it also increases the risk no matter what wight you are. **(Total for Question 7 = 13 marks)**

ResultsPlus
Examiner Comments

This response scores four marks. It gains credit for stating that under 40 years old obese people are more at risk. It also notes that heart attacks increase with age. It also states that up to age 60, obese people are more at risk and over 60 the risk for obese is the same as overweight.

The data shows that across most age groups (excluding over 60s) obesity in body mass can increase the risk of heart attacks. This is seen as all ages have 20.2 risk in arbitrary units of heart attacks. Additionally as age increases the risk of heart attacks of individuals with normal mass or categorised as overweight increases. However the risk of heart attacks in obese people over 60 is significantly lower than the other over 60s. The obesity may increase the risk of heart attacks as fat is deposited in the coronary artery, restricting blood flow and oxygen supply to the cardiac muscle which may increase anaerobic respiration and lactic acid due to less aerobic respiration. **(Total for Question 7 = 13 marks)**

ResultsPlus
Examiner Comments

This scores three marks for noting the relationship between obesity and heart attacks up to age 60. Also as age increases the risk increases. Finally it notes that for over 60 the risk to obese people is less than other masses.

Question 8 (a)(i)

In Q8(a)(i) most responses could correctly identify agouti as the dominant allele as all of the heterozygous offspring had this phenotype.

8 Fur colour in rats is controlled by a gene with two alleles.

One allele codes for black fur colour. The other allele codes for agouti fur colour.

Several female rats with agouti coloured fur are mated with several male rats with black coloured fur.

All of the offspring have agouti coloured fur.

(a) (i) Explain which allele is dominant.

(2)

The agouti fur, as all the rats inherited both but their for was agouti.

ResultsPlus
Examiner Comments

This scores both marks.

8 Fur colour in rats is controlled by a gene with two alleles.

One allele codes for black fur colour. The other allele codes for agouti fur colour.

Several female rats with agouti coloured fur are mated with several male rats with black coloured fur.

All of the offspring have agouti coloured fur.

(a) (i) Explain which allele is dominant.

(2)

agouti is the dominant allele because all offspring are agouti which shows that it has taken precidance over the recessive black coloured allele

ResultsPlus
Examiner Comments

This response also scores both marks.

8 Fur colour in rats is controlled by a gene with two alleles.

One allele codes for black fur colour. The other allele codes for agouti fur colour.

Several female rats with agouti coloured fur are mated with several male rats with black coloured fur.

All of the offspring have agouti coloured fur.

(a) (i) Explain which allele is dominant.

(2)

The allele for agouti coloured fur because it all the offspring display that characteristic

ResultsPlus
Examiner Comments

This response also scores both marks.

Question 8 (a)(ii)

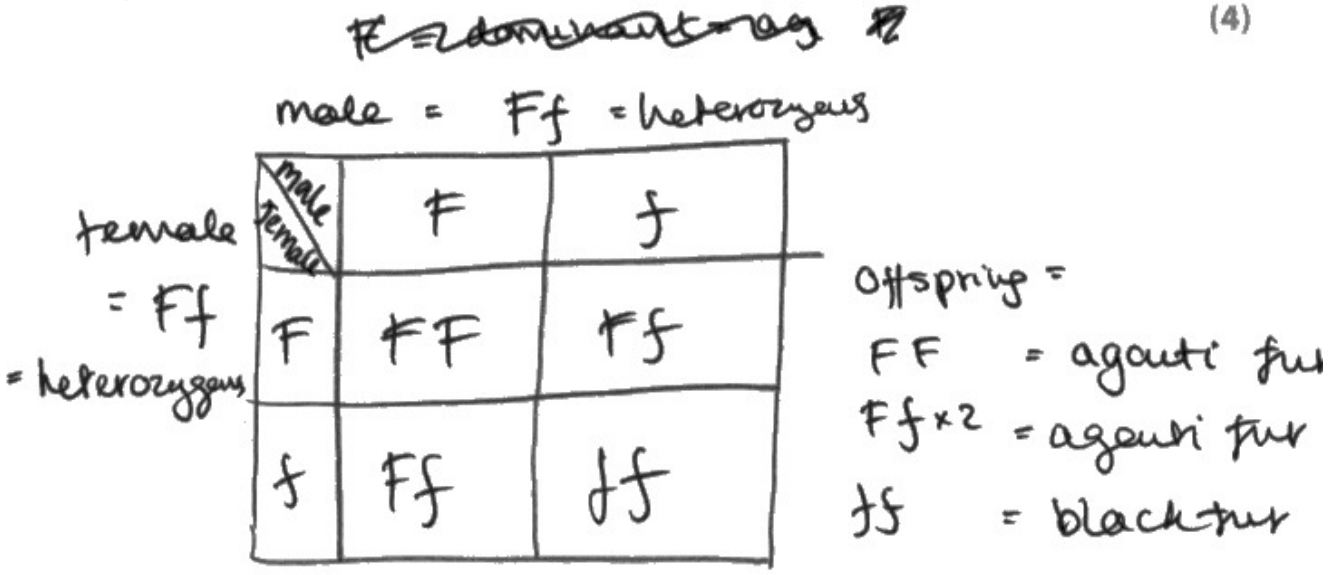
In this question candidates had to draw a genetic diagram to show this second cross and include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring. Many responses gained full marks and those who failed to gain all four usually missed the mark for giving the phenotypes of the offspring.

(ii) A male and female rat from these offspring are then mated together in a second cross.

Some of the offspring of this second cross have agouti coloured fur and some have black coloured fur.

Draw a genetic diagram to show this second cross. Include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring.

(4)



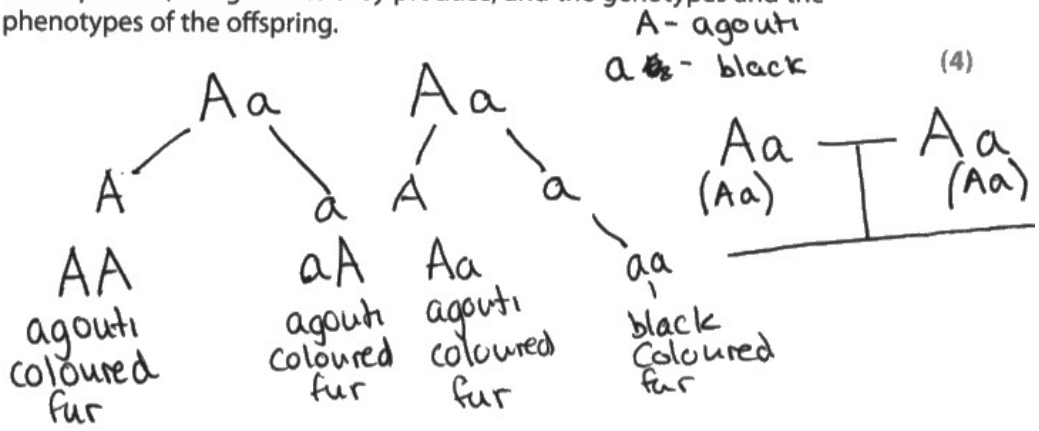
ResultsPlus
Examiner Comments

This scores all four marks.

ResultsPlus
Examiner Tip

Marks can be credited from a Punnett square.

Draw a genetic diagram to show this second cross. Include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring.

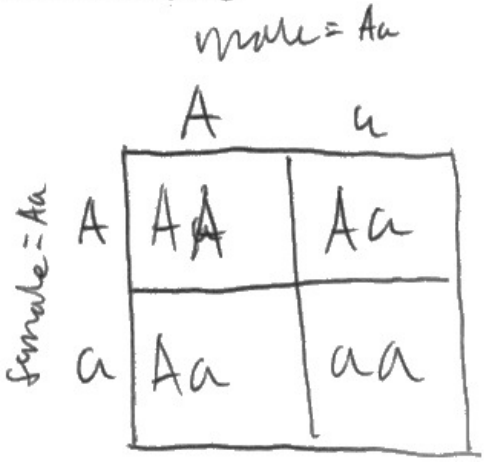


ResultsPlus
Examiner Comments

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

Draw a genetic diagram to show this second cross. Include the genotypes of the parents, the gametes they produce, and the genotypes and the phenotypes of the offspring.

(4)



ResultsPlus
Examiner Comments

This gains three marks from the Punnett square but does not give offspring phenotypes.

Question 8 (a)(iii)

In Q8(a)(iii) candidates were asked to calculate the probability of any one offspring from this second cross being male with agouti coloured fur. Many candidates gained full marks for multiplying the probability of being agouti by the probability of being male.

(iii) Calculate the probability of any one offspring from this second cross being male with agouti coloured fur.

agouti fur - 75%.
male - 50%.

75 × 0.5 = 37.5% (2)

probability = 37.5%

ResultsPlus
Examiner Comments

This scores both marks. Answers can be expressed as a percentage.

(iii) Calculate the probability of any one offspring from this second cross being male with agouti coloured fur.

(2)

Male = 50%

0.75 × 0.5 = 3/8

probability = 3/8

ResultsPlus
Examiner Comments

This also scores both marks. Answers can be expressed as a fraction.

Question 8 (b)(i)

Only a small percentage of candidates could state the name of the type of genetic control where many genes control one phenotype.

Question 8 (b)(ii)

In Q8(b)(ii) many responses could gain full marks for explaining why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour. The best responses explained that an increase in the size of the adrenal glands would lead to more adrenaline production and increased heart rate and a more obvious 'fight or flight response'. An increase in neurotransmitters would affect synaptic transmission and lead to faster reflexes.

(ii) Explain why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour.

(3)

Adrenal glands Produce Adrenaline

Adrenaline Control "Fight or flight" response.

Can increase breathing rate and ~~blood pressure~~ heart beat.

~~Production of Neuro transmitters~~ The larger the adrenal glands, the more adrenaline produced. Rat more active.

If Increase ~~production~~ production of neuro transmitters can be cause faster reflexes. Diffuse across synapse quicker. Respond to stimuli faster.

ResultsPlus
Examiner Comments

This response gains three marks for more adrenaline produced, more flight or fight response and faster reflexes.

(ii) Explain why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour.

(3)

Bigger adrenal glands would mean greater production of adrenaline, so more so the rat would behave more actively (and be able to evade predators better) by fight or flight response. More production of neurotransmitters means more nerve impulses would be sent to the brain, so the rat would understand its surroundings better and be able to evade predators.

ResultsPlus
Examiner Comments

This response scores two marks for more adrenaline produced and the idea of evading predators as an example of a 'fight or flight' response.

(ii) Explain why the size of the adrenal glands and the production of neurotransmitters would affect rat behaviour.

(3)

Bigger adrenal glands means more adrenaline produce therefore more energy with more respiration as blood is richer in glucose and oxygen, with carbohydrates converting to glucose, and blood diverting to muscles.
less neurotransmitters produced means slower responses to stimulus as less information as fewer numbers of neurotransmitters get to the Central Nervous System and can't properly detect a stimulus and know what to do with it. how to respond to it.

ResultsPlus
Examiner Comments

This response also scores three marks. More adrenaline produced, increased blood flow to muscles and less neurotransmitters causing slower responses.

Question 8 (c)

This question required candidates to explain how this difference in the iris affects vision in the rats with pink eyes. Most responses scored one or two marks. The best responses explained that a transparent iris would be unable to control the amount of light falling on the retina which could lead to damage and poor vision.

(c) Some rats with white fur also have pink eyes.

These rats have pink eyes because they do not have pigment in their irises.

This means that their irises let light pass through, unlike the coloured irises found in other rats.

Explain how this difference in the iris affects vision in the rats with pink eyes.

(3)

These rats would find it hard to see in bright light and easier to see in dim light. More light would be let into the eye and they would not be able to control it. Unless kept in dim light, these rats would probably go blind due to the cones and neurones being damaged by the bright lights.

ResultsPlus
Examiner Comments

This answer scores all three marks for reference to more light falling on the retina and the no control over the amount of light leading to cones being damaged.

(c) Some rats with white fur also have pink eyes.

These rats have pink eyes because they do not have pigment in their irises.

This means that their irises let light pass through, unlike the coloured irises found in other rats.

Explain how this difference in the iris affects vision in the rats with pink eyes.

(3)

This difference means that more light hits the retina, activating the rods in the eye. This allows pink-eyed rats better vision in the dark, however in bright light, too much light enters the eye, causing reduced vision, overtime and likely damaging the eye.

ResultsPlus
Examiner Comments

This response scores two marks for reference to too much light and reduced vision in bright light.

Question 9 (a)

Q9(a) asks candidates to describe how scientists could use selective breeding to increase wheat yield. Most responses scored at least one mark with the best ones describing how wheat with high yield should be self-pollinated or crossed with another high yield strain. The offspring with the highest yield should be selected as parents and bred. This process should be continued for many generations.

9 Selective breeding has been used to develop modern varieties of wheat.

(a) Describe how scientists could use selective breeding to increase wheat yield.

(3)

Scientists could select several wheat plants with high yields of wheat, and breed them together, to produce offspring with the desired characteristics. From the offspring select ones with desired traits and disregard ones without and breed them together. Repeat this process over several generations until all wheat plants produce desired characteristics.

ResultsPlus
Examiner Comments

This answer scores all three marks for selecting parents and breeding, then selecting the best offspring and breeding these and repeating this over generations.

9 Selective breeding has been used to develop modern varieties of wheat.

(a) Describe how scientists could use selective breeding to increase wheat yield.

(3)

Scientists could select wheat which produce high yield. They must breed it. Once there is offspring, you select the offspring with desired characteristics and breed it again. You must do this over various generations

ResultsPlus
Examiner Comments

This response also gains all three marks.

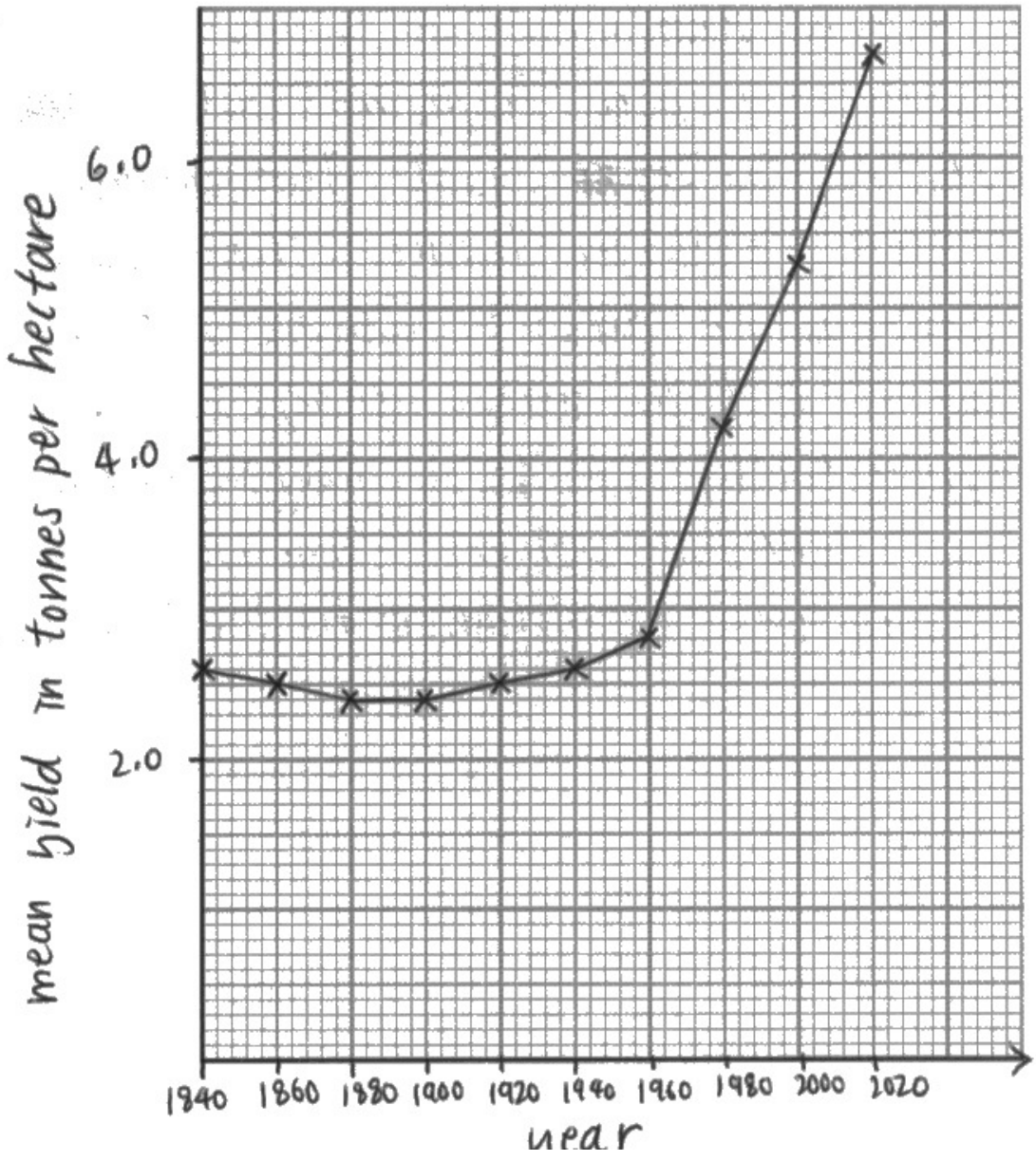
Question 9 (b)(i)

Candidates were given a table of data of wheat yield from a long-term study of selective breeding. They were required to plot a line graph to show how the mean yield changed from 1840 to 2020. Most candidates could draw a line graph and many gained full marks.

(i) Plot a line graph to show how the mean yield changes from 1840 to 2020.

Use a ruler to join the points with straight lines.

(5)



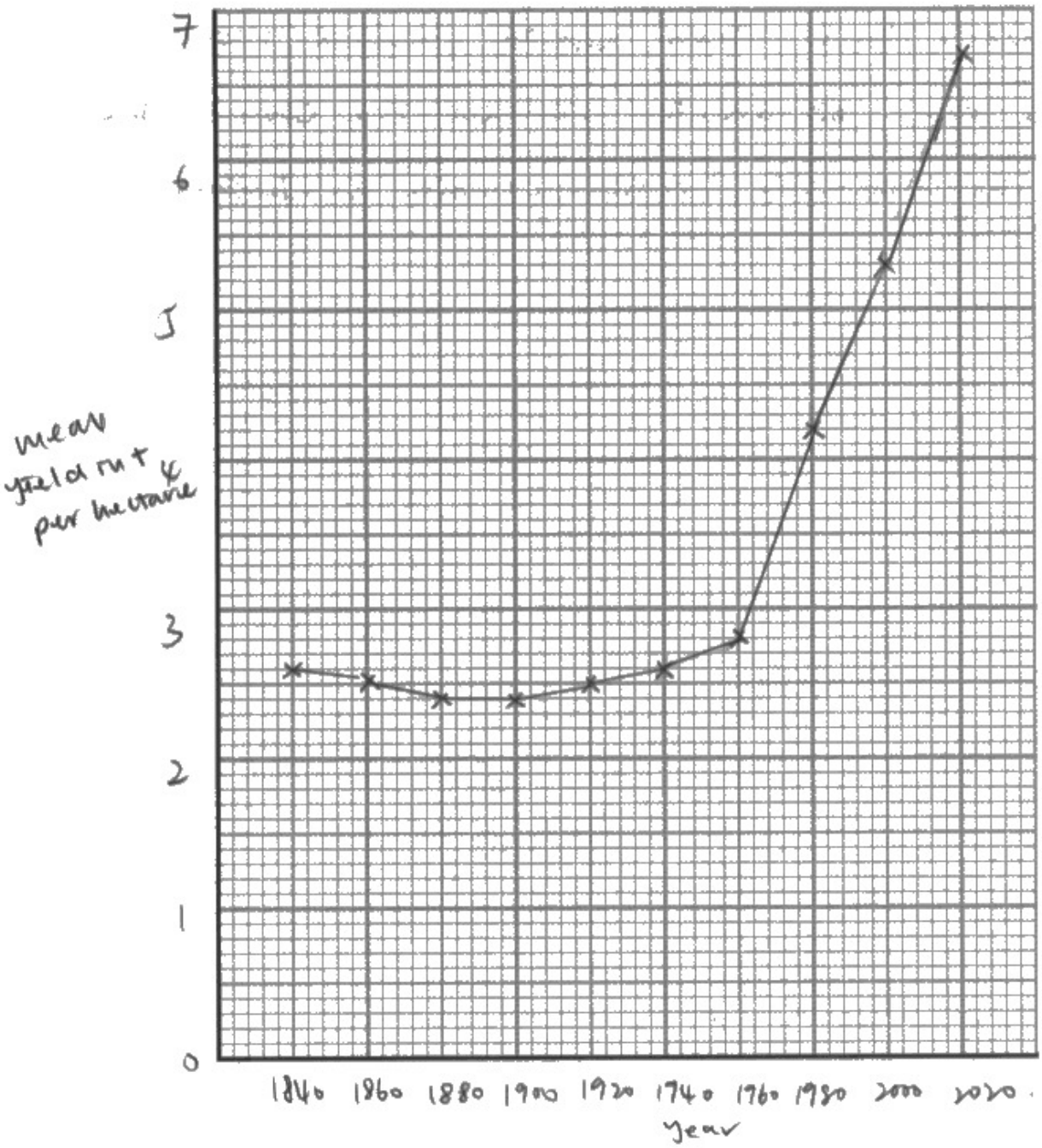
ResultsPlus
Examiner Comments

This graph scores full marks.

(i) Plot a line graph to show how the mean yield changes from 1840 to 2020.

Use a ruler to join the points with straight lines.

(5)



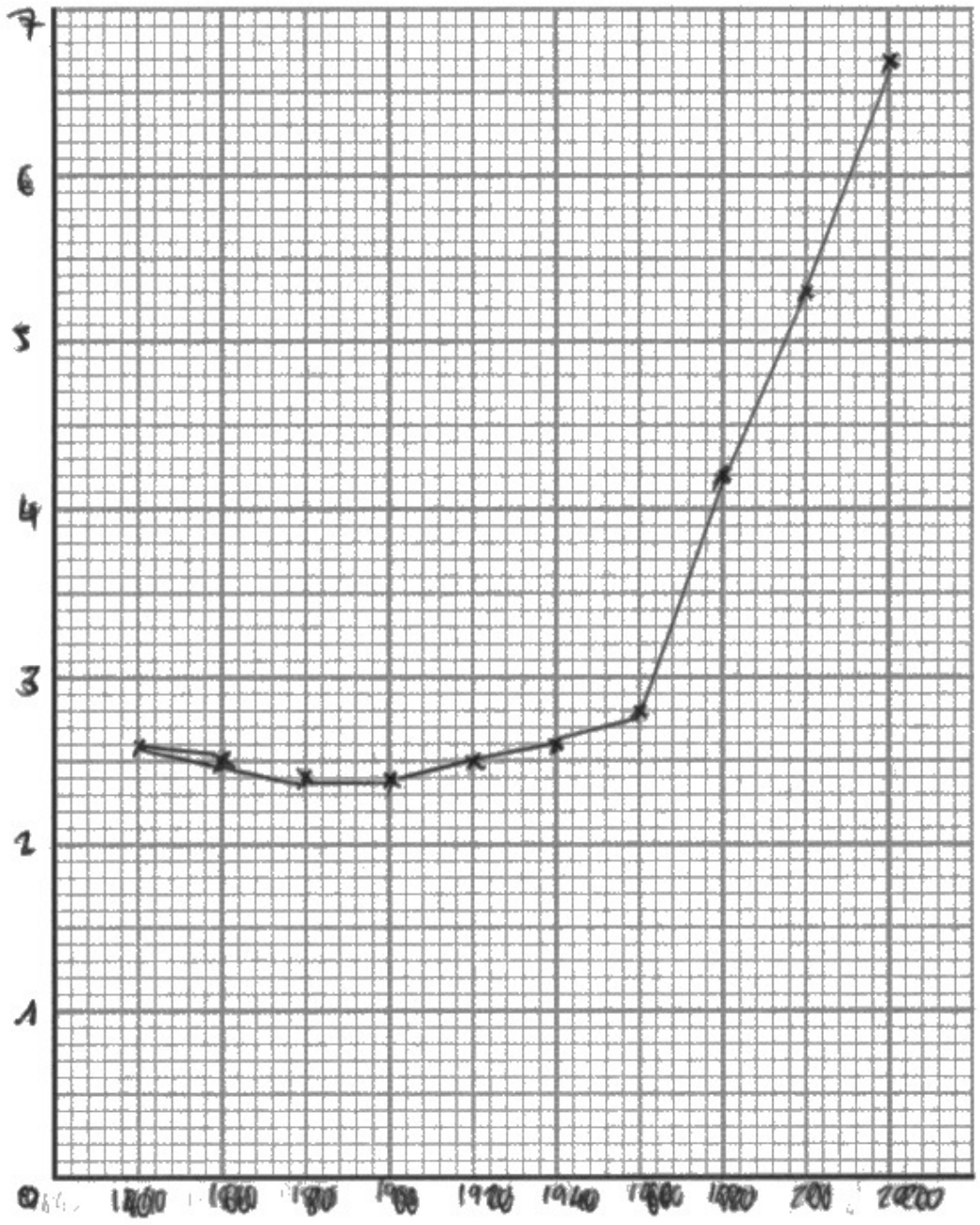
ResultsPlus
Examiner Comments

This graph also scores full marks.

(i) Plot a line graph to show how the mean yield changes from 1840 to 2020.

Use a ruler to join the points with straight lines.

(5)



ResultsPlus
Examiner Comments

This graph scores four marks. It does not include an axis label with units on the y axis.

Question 9 (b)(ii)

In this question candidates had to calculate the percentage change in yield per year from 1960 to 2020. Many found this difficult and only the best responses gained full marks. Some candidates gained some credit for their working such as dividing by 60 even if their final answer was incorrect.

(ii) In 1960, a dwarf variety of wheat replaced the old variety.

Scientists compared the percentage change in yield for the two varieties.

The percentage change in yield per year from 1840 to 1960 was 0.06% per year.

Calculate the percentage change in yield per year from 1960 to 2020. (3)

$\left(\frac{6.7-2.8}{2.8}\right) \div 60 \times 100\% = 2.32\%$

2020 = 6.7
1960 = 2.8

60 years

percentage change = 2.32 %

ResultsPlus
Examiner Comments

This calculation scores full marks.

(ii) In 1960, a dwarf variety of wheat replaced the old variety.

Scientists compared the percentage change in yield for the two varieties.

The percentage change in yield per year from 1840 to 1960 was 0.06% per year.

Calculate the percentage change in yield per year from 1960 to 2020. **(3)**

$\frac{6.7 - 2.8}{2.8} \times 100\% = 139.3\%$

~~130~~ $\frac{139.3\%}{60} = 2.32\%$

percentage change = 2.32% %

ResultsPlus
Examiner Comments

This calculation also scores full marks.

(ii) In 1960, a dwarf variety of wheat replaced the old variety.

Scientists compared the percentage change in yield for the two varieties.

The percentage change in yield per year from 1840 to 1960 was 0.06% per year.

Calculate the percentage change in yield per year from 1960 to 2020.

(3)

$\frac{0.2}{120} = 0.0016$ $\frac{6.7 - 1.8}{2020 - 1960} = \frac{3.9}{60} = 0.065$

0.065 | ×100

percentage change = 6.5 %

ResultsPlus
Examiner Comments

Although the final answer is incorrect, this response scores two marks for its working. One for 3.9 and the other for dividing by 60.

ResultsPlus
Examiner Tip

Candidates should always show their working, so as in this case, marks can be gained for correct working.

Question 9 (b)(iii)

In Q9(b)(iii) many responses could suggest why growing dwarf wheat is an advantage for farmers. Suitable answers noted that less energy would be used to grow the stem, so more would be used to develop the grain, thus increasing the yield and that the wheat would be stronger and less likely to be blown over. Others suggested that the wheat would be easier to harvest.

(iii) Dwarf wheat has a shorter, thicker stem than the old variety.

Suggest why growing dwarf wheat is an advantage for farmers.

(3)

A shorter stem is an advantage to farmers because it means there will be a bigger yield ~~more~~ of the wheat and more energy + nutrients or the plant is going to growing + increasing the size of the wheat, rather than the stem. And wheat is the part of the plant that gets eaten + can be sold. A thicker stem is important to support the plant.

ResultsPlus
Examiner Comments

This answer gains three marks for a higher yield, with more energy going to the wheat rather than the stem.

(iii) Dwarf wheat has a shorter, thicker stem than the old variety.

Suggest why growing dwarf wheat is an advantage for farmers.

(3)

the structure is stonger so the wheat isnt blown around and broken by wind so can survive longer and produce more offspring as they have better survival ~~so can~~ wheat and reproduction so can increase v crop yield.

ResultsPlus
Examiner Comments

This scores two marks for higher yield and not being blown over.

Question 10

The final question was the experimental design question. Candidates were asked to design an investigation to find out if the colour of a flower affects how attractive it is to pollinators. Many responses scored full marks. The best answers used flowers of the same species, with different colours but the same size and scent. They exposed these flowers to an insect population such as a nearby beehive at the same time of day in the same season. They then recorded the number of insects visiting each coloured flower over a period of, for example, one hour. The experiment was repeated on more than one day.

10 There is a relationship between the colour of a flower and pollination by insects.

Design an investigation to find out if the colour of a flower affects how attractive it is to pollinators.

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

(6)

You would need to take 6 identical flowers, apart from the colour of their petals / flowers* ~~You~~ They should be the same species, the same size, the same scent. Then you would place them all into a large container with many of the same type of insect such as butterflies. You would then leave it for 30 minutes with a camera set up, ~~record~~ recording. You would then at the end of the 30 minutes count how many times the butterflies had ~~reached~~ gone to each flower. You would then be able to compare if colour is attractive, and which colour is more attractive. You would then need to repeat the same experiment 2 ~~to~~ twice more to gain a mean. ~~How would also need to see~~

(* one green / colourless one, one pink, one white, one red, one yellow, one purple)

ResultsPlus
Examiner Comments

This answer scores all six marks. It uses different coloured flowers of the same species with the same scent. It uses the same species of insects and records how many visits to each flower in a 30 minute period. The experiment is then repeated.

10 There is a relationship between the colour of a flower and pollination by insects.

Design an investigation to find out if the colour of a flower affects how attractive it is to pollinators.

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

(6)

The studer should use a range of colour of flowers. The studer should control the species / surface area of the flower and the studer should repeat of the same colour more than once and produce use more than one flower of the same colour / larger group of flowers. The studer should measure how attractive it is to insects / ~~by~~ pollinators by either counting the number of insect that land on the plant every ~~10 minutes~~ hour / the growth of the pollen tube) increase in mass every 24 hours / day. The ~~student~~ should control the time of year / light intensity / temperature and type of pollinator.

ResultsPlus
Examiner Comments

This response also gains full marks.

corms

10 There is a relationship between the colour of a flower and pollination by insects.

Design an investigation to find out if the colour of a flower affects how attractive it is to pollinators.

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

(6)

- have two ~~contrasting~~ flowers of the same species with contrasting petal colours, one green, one bright e.g red
- place the ~~flo~~ flowers in the same garden and have people monitor how many insects approach each flower
- repeat this three times, take an average + identify anomalies

ResultsPlus
Examiner Comments

This response scores five marks. It changes the colour of flowers but uses the same species, it places the flowers in the same garden and repeats the experiment.

Paper Summary

Based on their performance on this paper, candidates should:

- ensure that they read the question carefully and include sufficient points to gain full credit.
- include points for and against in 'evaluate' questions and make sure that you include as many points as there are marks available to reach a conclusion that reflects the points you have made.
- make sure you have practised calculations especially percentages and understand and know how to apply formulae.
- write in detail and use correct and precise biological terminology.
- revise practical work to help in questions about unfamiliar or novel practical procedures. 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.
- always be able to name the independent variable and give the range of values, the dependent variable, and 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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