Pearson
Edexcel

Examiners' Report
June 2024

Int GCSE Single Science 4SS0 1B

ResultsPlus

Introduction

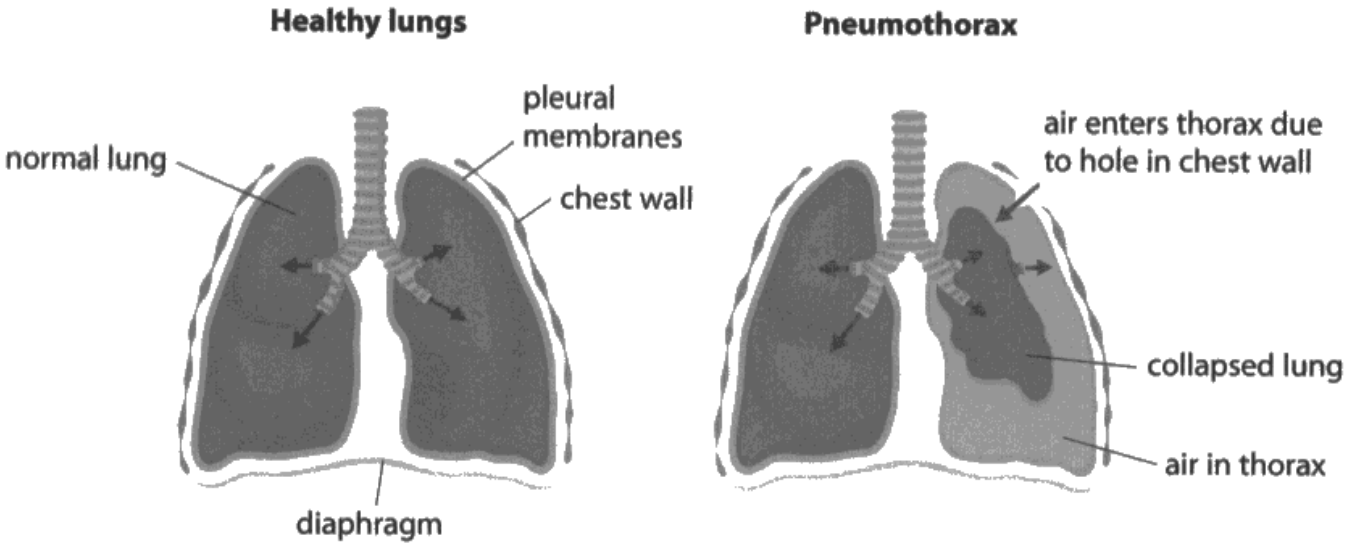
This was the third time that candidates had an opportunity to sit a full summer series examination since 2019. The examiners were pleased that that almost all candidates attempted to answer all questions and there was little evidence of candidates running out of time on this paper. Candidates and centres are working hard to prepare for this examination, and most are able to access all question types. Many candidates were able to demonstrate their knowledge and understanding of the specification content and to apply this in familiar and novel contexts. Examiners were also pleased to note that most candidates were able to produce good answers to the more challenging evaluative and experimental design items.

Question 1 (b)(i)

In Q01bi candidates were given a diagram showing healthy lungs and a pneumothorax, a lung condition that can develop if the chest wall is punctured. Amost all candidates could give one difference between the healthy lung and the lung in pneumothorax. Suitable answers included that in pneumothorax the lung is smaller, is collapsed or has air in thorax.

(b) A lung condition called pneumothorax can develop if the chest wall is punctured.

The diagram shows healthy lungs and a pneumothorax.



(Source: https://www.shutterstock.com/image-vector/human-lungs-pneumothorax-hemothorax-hemopneumothorax-1405120004)

(i) Give one difference between the healthy lung and the lung in pneumothorax.

(1)

a diffrence is that the Pneumothorax has a collapsed lung whereas the heathy lung is in full shape

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Examiner Comments

This response gains the mark for noting that in pneumothorax the lung is collapsed.

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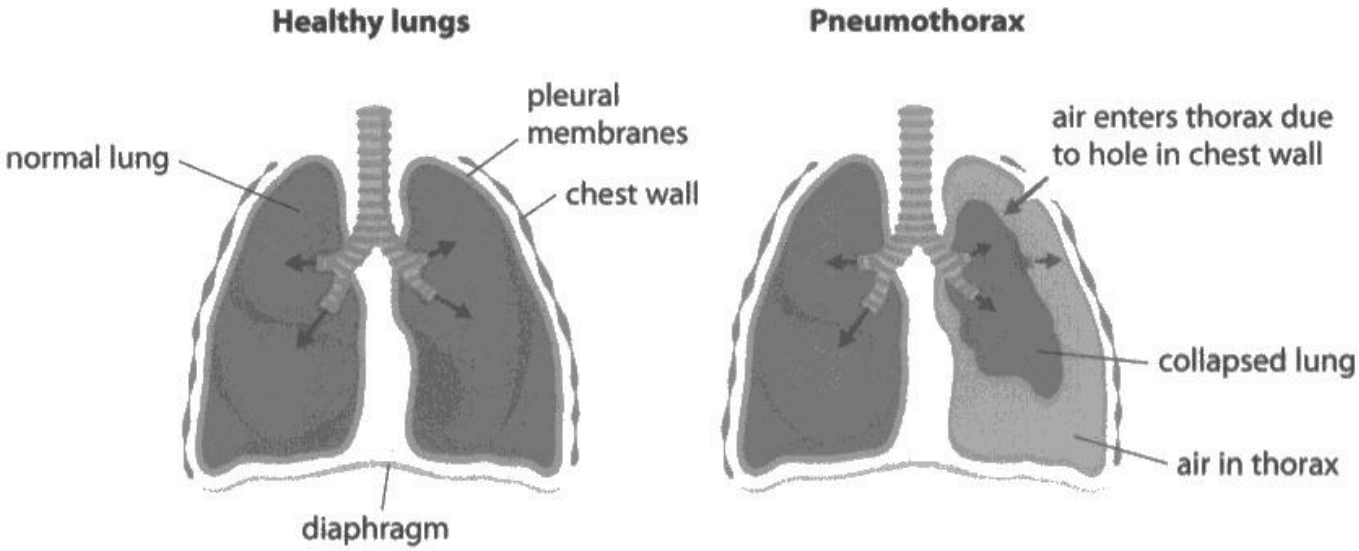
Examiner Tip

In difference responses always make clear which you are writing about. This candidate clearly states that the collapsed lung is in the pneumothorax.

(b) A lung condition called pneumothorax can develop if the chest wall is punctured.

The diagram shows healthy lungs and a pneumothorax.



(Source: https://www.shutterstock.com/image-vector/human-lungs-pneumothorax-hemothorax-hemopneumothorax-1405120004)

(i) Give one difference between the healthy lung and the lung in pneumothorax.

(1)

The healthy lung has an unbreaked chest wall but Pneumothorax lung has a hole in the chest wall that causes the air to enter thorax due to hole in chest wall.

ResultsPlus
Examiner Comments

In this response one mark is also gained for noting the hole in the chest wall in pneumothorax.

Question 1 (b)(ii)

In Q01bii candidates were asked to comment on the effects of pneumothorax on the processes of breathing and gas exchange. They were told to use information from the diagram and their own knowledge. This evaluative item was more challenging for candidates, whilst most responses gained credit, only the best responses gained full marks. The best responses noted that in pneumothorax the thorax is not sealed so as the volume increases the pressure will not change. This means that the lung cannot inflate so breathing is laboured and therefore gas exchange is poor with less oxygen diffusing into the blood.

(ii) **Comment on the effects of pneumothorax on the processes of breathing and gas exchange.**

Use information from the diagram and your own knowledge.

(4)

When a person with Pneumothorax takes in oxygen, they will take in less oxygen than a normal person. This is because only one lung is working. Due to the other lung having been punctured lung air can go enter in the thorax preventing the collapsed lung to expand. Gas exchange is also difficult due to the only one lung is working. The person with Pneumothorax has to take in more oxygen due to only having one operating lung which means they get tired faster.

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Examiner Comments

This response gains full marks. It states that only one lung is working (marking point 5). It gains marking point 1 for stating that there is air in the thorax. It notes that the lung cannot expand (marking point 4) and states that gas exchange is difficult. (marking point 6)

(ii) Comment on the effects of pneumothorax on the processes of breathing and gas exchange.

Use information from the diagram and your own knowledge.

(4)

• Pneumothorax has a collapsed lung, with won't allow it to have to much air in it, so you could breath less and less gas exchange will occure because less alveoli there are less alveoli in good conditions.

• The air entering through the thorax due to make a hole in the chest wall, will apply more pressure to the lungs so you are not going to be allowed to breath normally, because the lung will not be able to expand, and less oxygen in lungs means less gas exchange.

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Examiner Comments

This response also scores four marks. In the second paragraph it gains the following marking points: air enters through thorax (1) , cannot breathe normally (5) lung cannot expand(4), and less gas exchange (6).

(ii) Comment on the effects of pneumothorax on the processes of breathing and gas exchange.

Use information from the diagram and your own knowledge.

(4)

Due to the damage in Pneumothorax ~~XXXXX~~ & righ lunes to be able to breath ~~ang~~ and gas exchang would be had Because there is ahole in the chest wall that makes the air enters through this hole in the chest wall. And that will cause abreathing problem

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Examiner Comments

This gains three marks for mp 5, mp 6 and mp 1.

Question 2 (b)(i)

In question 2 candidates were given a diagram showing part of a food web from a desert. In Q02bii they were told that a disease develops in the rabbit population which results in a decrease in the number of rabbits. The candidates were asked to explain what effect this decrease in the number of rabbits would have on the population of hawks. Most candidates were able to gain both marks for explaining that the hawk population would fall as there would be less food available. Some responses also got credit for explaining that the hawk numbers may not fall much as they could feed on the lizards or kangaroo rats.

(b) A disease develops in the rabbit population which results in a decrease in the number of rabbits.

(i) Explain what effect this decrease in the number of rabbits would have on the population of hawks.

(2)

The Population of hawks will decrease because one of it's main food sources is the rabbit, and now that they are decreasing, the amount of food that the [illegible] have everyday isn't enough to survive.

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Examiner Comments

This response scores both marks.

(b) A disease develops in the rabbit population which results in a decrease in the number of rabbits.

(i) Explain what effect this decrease in the number of rabbits would have on the population of hawks.

(2)

There will be a decrease in the population of Hawks, as ~~their~~ they will not have a major source of food (rabbit) they will only be able to eat cacti.

ResultsPlus
Examiner Comments

This response also scores both marks.

(b) A disease develops in the rabbit population which results in a decrease in the number of rabbits.

(i) Explain what effect this decrease in the number of rabbits would have on the population of hawks.

(2)

It wouldent really have that much effect on a hawk because hawk's can eat lizards and kangaroo rat so its diet will still be okay.

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Examiner Comments

This response also gains two marks.

Question 2 (b)(ii)

In Q02bii candidates were told that the rabbit immune system responds to infection in a similar way to the human immune system. They were then asked to describe the response of the immune system of the rabbit to a bacterial infection. This item discriminated well between candidates, almost all responses gained some credit with the best gaining all four marks. The best responses described how two different type of white blood cells would respond to the infection. Lymphocytes secreting antibodies and phagocytes engulfing the bacteria.

(ii) The rabbit immune system responds to infection in a similar way to the human immune system.

Describe the response of the immune system of the rabbit to a bacterial infection.

(4)

White blood cells kill ~~the~~ pathogens. Phagocyte undergo phagocytosis to engulf and digest pathogens. Lymphocytes create antibodies specific to the pathogen. They also label pathogens to be easily recognised by phagocyte and stick them together for easier digestion

ResultsPlus
Examiner Comments

This response gains all four marks for correct description of white blood cells, phagocytes engulfing and lymphocytes secreting antibodies.

(ii) The rabbit immune system responds to infection in a similar way to the human immune system.

Describe the response of the immune system of the rabbit to a bacterial infection.

(4)

~~Igm~~ Lymphocytes will create anti-bodies to destroy the antigen, whilst phagocytes will engulf pathogens.

There are two types of white blood cells lymphocytes and phagocytes. Lymphocytes create anti-bodies to destroy the disease, whilst phagocytes engulf pathogens.

ResultsPlus
Examiner Comments

This response also gains full marks.

(ii) The rabbit immune system responds to infection in a similar way to the human immune system.

Describe the response of the immune system of the rabbit to a bacterial infection.

(4)

The rabbit immune system contains white blood cells that fights against disease and infections. The white blood cells has anti-bodies which attacks any bacteria infection that enters a host body. The white blood cells also has phenosopholen which also captures and engulfes any infection ~~that~~ and bacteria that is found in the body.

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Examiner Comments

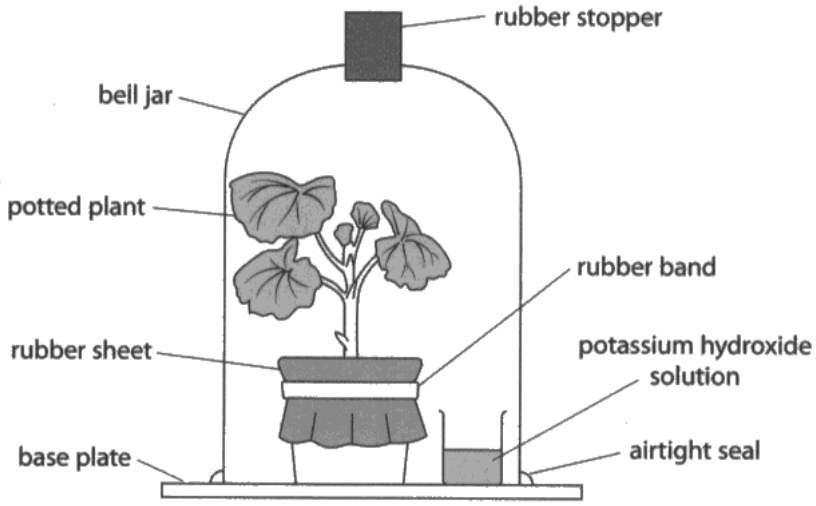
This response gains three marks. It mentions white blood cells and describes antibody production and engulfing pathogens.

Question 3 (a)(i)

Question 3 described how a teacher uses an experiment to show that carbon dioxide is required for photosynthesis. In Q03ai candidates were asked to state the function of the potassium hydroxide solution.

3 A teacher uses this method to show that carbon dioxide is required for photosynthesis.

- step 1 destarch a potted plant by placing it in a dark place for 48 hours
- step 2 cover the soil in the plant pot with a rubber sheet
- step 3 use a rubber band to hold the rubber sheet in position
- step 4 place the destarched plant in a bell jar
- step 5 place a small beaker of potassium hydroxide solution in the bell jar
- step 6 make sure the bell jar has an airtight seal
- step 7 shine a light on the potted plant for 6 hours
- step 8 remove a leaf from the plant
- step 9 test the leaf for starch



(a) (i) State the function of the potassium hydroxide solution.

(1)

it's used to remove the CO_2 in the atmosphere in the air tight seal

ResultsPlus
Examiner Comments

This response gains the mark.

3 A teacher uses this method to show that carbon dioxide is required for photosynthesis.

- step 1 destarch a potted plant by placing it in a dark place for 48 hours
- step 2 cover the soil in the plant pot with a rubber sheet
- step 3 use a rubber band to hold the rubber sheet in position
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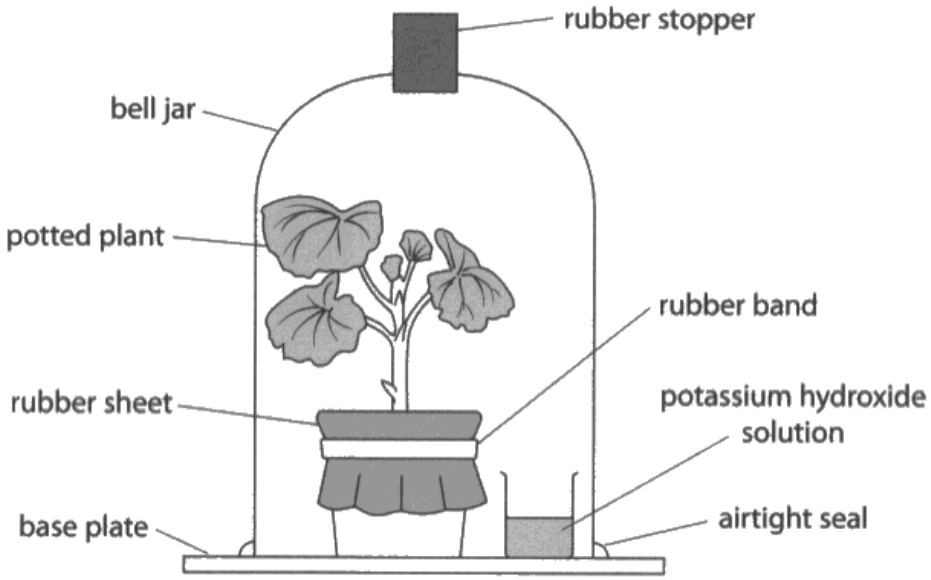


(a) (i) State the function of the potassium hydroxide solution.

(1)

To react with any carbon dioxide inside the jar

ResultsPlus
Examiner Comments

This response also gains the mark as the potassium hydroxide removes the carbon dioxide by reacting with it.

Question 3 (a)(ii)

In Q03aii candidates were asked to explain the reason for covering the soil of the potted plant in step 2. Only the very best candidates gained both marks for explaining that this prevents the release of carbon dioxide from respiration by microrganisms in the soil.

(ii) Explain the reason for covering the soil of the potted plant in step 2.

(2)

- so no carbon dioxide escapes from the soil
- ~~so the plant~~ due to respiration of microorganisms in the soil

ResultsPlus
Examiner Comments

This response gains both marks.

(ii) Explain the reason for covering the soil of the potted plant in step 2.

(2)

- ~~so that potassium don't~~
- so that CO_2 doesn't come from the soil
- so potassium doesn't effect the soil

ResultsPlus
Examiner Comments

This scores one mark for reference to prevent release of carbon dioxide from the soil.

ResultsPlus
Examiner Tip

To gain the second mark the response needed to state that it is soil organisms that are releasing the carbon dioxide.

Question 3 (b)

In Q03b candidates were asked to give the reason for step 6 in the teacher's method. Many candidates were able to state that the sealed jar prevents carbon dioxide from entering the bell jar. Some candidates did not gain the marks as they wrote about gases or air entering but did not specify carbon dioxide.

(b) Give the reason for step 6 in the teacher's method.

(1)

ensure no carbon dioxide seeps in and conditions are controlled, for accuracy.

ResultsPlus Examiner Comments

This scores the mark.

(b) Give the reason for step 6 in the teacher's method.

(1)

prevent carbon dioxide from entering or the temperature from changing

ResultsPlus Examiner Comments

This scores the mark.

(b) Give the reason for step 6 in the teacher's method.

(1)

To ensure that carbon dioxide does ~~at~~ not reach the plant.

ResultsPlus
Examiner Comments

This also scores the mark.

Question 3 (c)

In Q03c candidates were asked to describe how the teacher could safely test the leaf for starch in step 9. This is a required practical detailed in section 2.23 of the specification and whilst most candidates gained some credit only best responses gained full marks. These responses described how the leaf would be placed in boiling water, then boiled in ethanol using a water bath, as ethanol is flammable. This removes the chlorophyl from the leaf. Then iodine solution is dropped onto the leaf and a blue/black colour indicates that starch is present.

(c) Describe how the teacher could safely test the leaf for starch in step 9.

(4)

Boil the leaf in a water bath. Then by using the same water bath, which has hot water, turn off the bunsen burner and place the boiled leaf on a test tube filled with alcohol and place it in the water bath. When the green colour of the leaf disappears remove the leaf and wash it with distilled water and allow it to dry. Then place drops of iodine solution on the leaf. Since CO_2 was not present there will ~~no~~ be no change of the indicator colour it will remain brown.

ResultsPlus
Examiner Comments

This response scores full marks. It mentions boiling the leaf in a water bath then using the water bath to boil in ethanol. The green colour being removed. Then testing the leaf with iodine.

(c) Describe how the teacher could safely test the leaf for starch in step 9.

(4)

To test leaf for starch ~~we~~ we need to reduce first layer of the ~~leave~~ leaf by using ethanol and boil it in the water bc (leave should be in jar of ethanol during boiling it in water as water has (100c°) to boil, ethanol needs 178c°) Leave will become colorless and ready to be tested by putting iodine solution on the leaf we will ~~check to it~~ see brown - blue colour if it has starch and no reaction if it has starch!

ResultsPlus
Examiner Comments

This also gains full marks for describing boiling in ethanol, using water, how the leaf goes colourless and adding iodine to the leaf.

(c) Describe how the teacher could safely test the leaf for starch in step 9.

(4)

To test a leaf for starch, an iodine test must be conducted. Firstly, boil the leaf in hot water to break the cell wall. After boiling, & carefully place the leaf in ethanol, to get rid of the chlorophyll (green pigment). After the green pigment has been removed, apply ~~2-tt two to the~~ a few drops of iodine solution to the surface of the & leaf. The leaf contains starch if the leaf turns from orange to blue-black. Make sure to ~~be~~ turn off the flame used to boil the water when placing the leaf in ethanol as ethanol is highly flammable.

ResultsPlus
Examiner Comments

This response also gains full marks. Boiling the leaf in water, removing green colour, adding iodine which will turn blue black in starch. It also refers to turning off Bunsen flame when boiling ethanol.

Question 3 (d)

In Q03d candidates were asked to describe a suitable control for this experiment. Some responses gained one mark but only the best could gain both marks for describing how a plant of the same species would be set up in the same light but with no potassium hydroxide or not in a bell jar so that it can have access to carbon dioxide.

(d) The teacher needs to set up a control for this experiment.

Describe a suitable control experiment.

(2)

Take another plant of the same kind and ~~test~~ repeat the experiment just without using a bell jar. Test again for starch after the same amount of time as in the other experiment

ResultsPlus
Examiner Comments

This response scores two marks for using a plant of the same kind without a bell jar.

(d) The teacher needs to set up a control for this experiment.

Describe a suitable control experiment.

(2)

A ~~plant Similar to the~~ A Similar plant that doesnt have its Soiled covered with no potassium hydroxide solution and that isnt closed and de-Starched in the dark for 48 hours to photosynthesize.

ResultsPlus
Examiner Comments

This also scores two marks for using a similar plant but without potassium hydroxide.

(d) The teacher needs to set up a control for this experiment.

Describe a suitable control experiment.

(2)

The controled variable is te items in the experiment but they to stay the same for ~~ex~~ example in this experiment is the type of plant and temprater

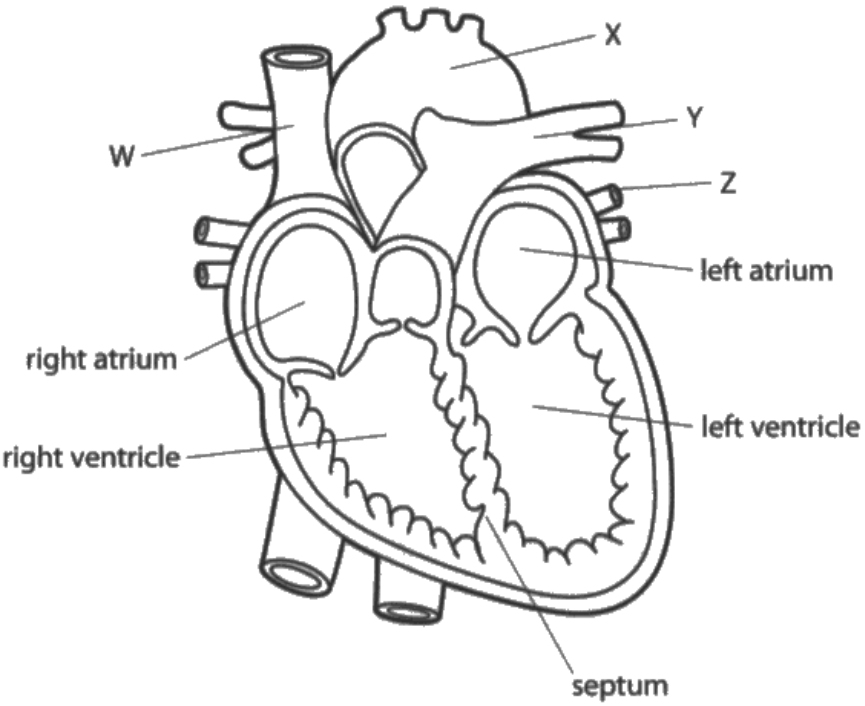
ResultsPlus
Examiner Comments

This also scores two marks for using the same type of plant and the same temperature.

Question 4 (a)

In Q04a candidates were given a diagram shows the human heart with some blood vessels. They had to name the four labelled blood vessels. Some candidates were unable to label the vessels whilst others had clearly learned this part of the specification. The specification states: understand the general structure of the circulation system, including the blood vessels to and from the heart and the lungs.

4 The diagram shows the human heart with some blood vessels.



(Source: https://www.shutterstock.com/image-vector/heart-anatomy-cross-section-outline-vector-561719803)

(a) Name the blood vessels labelled W, X, Y and Z.

(4)

W Vena Cava

X Aorta

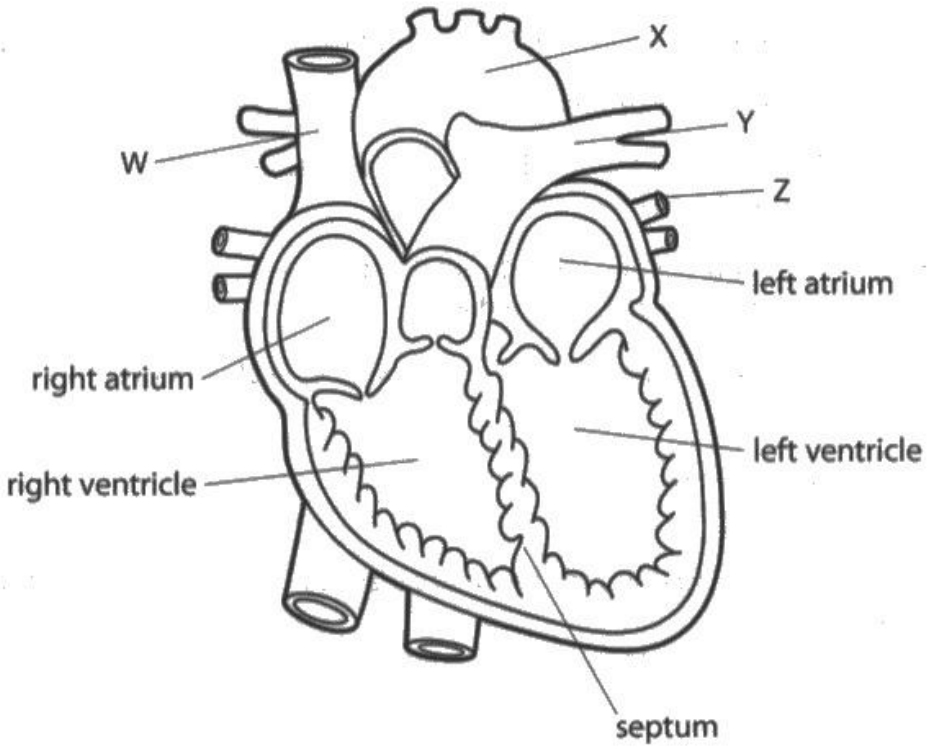
Y Pulmonary ~~vein~~ artery

Z Pulmonary vein

ResultsPlus
Examiner Comments

This response correctly names all four blood vessels.

4 The diagram shows the human heart with some blood vessels.



(Source: https://www.shutterstock.com/image-vector/heart-anatomy-cross-section-outline-vector-561719803)

(a) Name the blood vessels labelled W, X, Y and Z.

(4)

W Vena cava

X ~~atrium~~ artery

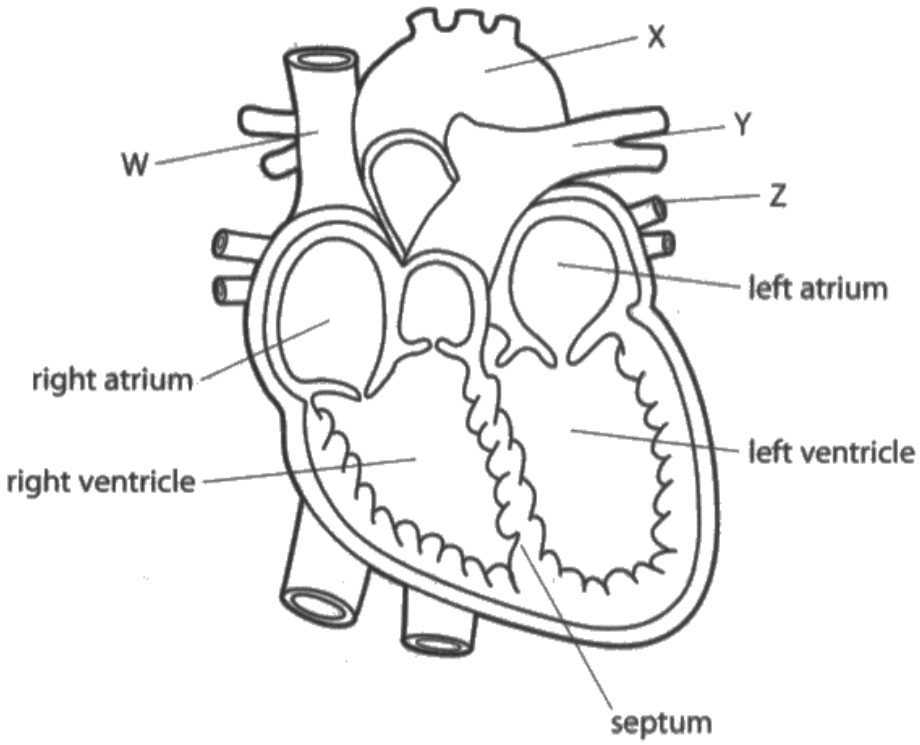
Y pulmonary ~~atrium~~ ~~ventricle~~ ~~vena cava~~ artery

Z ~~vena cava~~ pulmonary ~~artery~~ vein

ResultsPlus
Examiner Comments

This response correctly names three blood vessels.

4 The diagram shows the human heart with some blood vessels.



(Source: https://www.shutterstock.com/image-vector/heart-anatomy-cross-section-outline-vector-561719803)

(a) Name the blood vessels labelled W, X, Y and Z.

(4)

W vena cava

X

Y pulmonary artery

Z pulmonary vein

ResultsPlus
Examiner Comments

This response correctly names three blood vessels.

Question 4 (b)

In Q04b candidates were asked to give the function of the septum. Some responses gave the function as separating the left and right ventricles but examiners wanted reference to preventing mixing of oxygenated and deoxygenated blood.

(b) Give the function of the septum.

(1)

It separates the oxygenated blood from the deoxygenated blood.

ResultsPlus
Examiner Comments

This response gains the mark.

(b) Give the function of the septum.

(1)

it Separates left and right sides of the heart.

ResultsPlus
Examiner Comments

No credit as no reference to preventing mixing of oxygenated and deoxygenated blood.

(b) Give the function of the septum.

(1)

allow the transport of blood and oxygen from the right ventricle to the left ventricle

ResultsPlus
Examiner Comments

No credit as no reference to preventing mixing of oxygenated and deoxygenated blood.

(b) Give the function of the septum.

(1)

The septeum is the muscle that ~~given~~ maintains the cone shape of the heart.

ResultsPlus
Examiner Comments

No credit as no reference to preventing mixing of oxygenated and deoxygenated blood.

Question 4 (c)(i)

In Q04c candidates were given data from 140 different studies looking at the relationship between smoking and heart disease and stokes.

The data showed the risk factor for developing heart disease and the risk factor for having strokes in men and women. The data was from men and women who smoked one cigarette a day and for men and women who smoked 20 cigarettes a day.

In Q04ci the candidates had to calculate the percentage increase in the risk factor for developing heart disease in men who smoke 20 cigarettes per day compared with men who smoke one cigarette per day. The best responses calculated the percentage correctly. Some candidates used the wrong divisor dividing by the 20 cigarette risk rather than the one cigarette risk. These responses may pick up one mark if they had subtracted the risks correctly.

(c) Scientists produced a report that looked at the link between smoking, heart disease and strokes.

A stroke happens when the blood supply to part of the brain is reduced.

The scientists used data from 140 different studies, so included many patients.

They calculated the risk factor for developing heart disease and the risk factor for having strokes in men and women.

They did this for men and women who smoked one cigarette a day and for men and women who smoked 20 cigarettes a day.

A risk factor of 2.0 would mean that a person is twice as likely to develop the condition.

The table shows their results.

Group	Risk factor for heart disease		Risk factor for strokes	
	men	women	men	women
non-smokers	1.00	1.00	1.00	1.00
smoked one cigarette per day	1.74	2.19	1.30	1.46
smoked 20 cigarettes per day	2.27	3.95	1.56	2.42

(i) Calculate the percentage increase in the risk factor for developing heart disease in men who smoke 20 cigarettes per day compared with men who smoke one cigarette per day.

(2)

$\frac{2.27 - 1.74}{1.74} \times 100$

$= 30.5$

increase = 30.5 %

ResultsPlus
Examiner Comments

This response gains full marks for the correct answer.

(c) Scientists produced a report that looked at the link between smoking, heart disease and strokes.

A stroke happens when the blood supply to part of the brain is reduced.

The scientists used data from 140 different studies, so included many patients.

They calculated the risk factor for developing heart disease and the risk factor for having strokes in men and women.

They did this for men and women who smoked one cigarette a day and for men and women who smoked 20 cigarettes a day.

A risk factor of 2.0 would mean that a person is twice as likely to develop the condition.

The table shows their results.

Group	Risk factor for heart disease		Risk factor for strokes	
	men	women	men	women
non-smokers	1.00	1.00	1.00	1.00
smoked one cigarette per day	1.74	2.19	1.30	1.46
smoked 20 cigarettes per day	2.27	3.95	1.56	2.42

(i) Calculate the percentage increase in the risk factor for developing heart disease in men who smoke 20 cigarettes per day compared with men who smoke one cigarette per day.

(2)

$\frac{2.27 - 1.74}{1.74} \times 100$

increase = 23.3 %

This response gains one mark for correct subtraction of risks.

By showing working this response gains one mark even though the final answer is incorrect.

(c) Scientists produced a report that looked at the link between smoking, heart disease and strokes.

A stroke happens when the blood supply to part of the brain is reduced.

The scientists used data from 140 different studies, so included many patients.

They calculated the risk factor for developing heart disease and the risk factor for having strokes in men and women.

They did this for men and women who smoked one cigarette a day and for men and women who smoked 20 cigarettes a day.

A risk factor of 2.0 would mean that a person is twice as likely to develop the condition.

The table shows their results.

Group	Risk factor for heart disease		Risk factor for strokes	
	men	women	men	women
non-smokers	1.00	1.00	1.00	1.00
smoked one cigarette per day	1.74	2.19	1.30	1.46
smoked 20 cigarettes per day	2.27	3.95	1.56	2.42

(i) Calculate the percentage increase in the risk factor for developing heart disease in men who smoke 20 cigarettes per day compared with men who smoke one cigarette per day.

(2)

$$\frac{3.95 - 2.27}{2.27}$$

increase = 74 %

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Examiner Comments

This response gains no credit.

Question 4 (c)(ii)

In Q04cii candidates were told that a newspaper article claimed 'The scientists' report proves that it is better to quit smoking entirely rather than cutting down in order to reduce the risk of these two diseases.' Candidates were asked to discuss the newspaper's claim. Most candidates were able to score some marks but only the best responses gained four or more marks.

(ii) A newspaper article claimed

'The scientists' report proves that it is better to quit smoking entirely rather than cutting down in order to reduce the risk of these two diseases.'

Discuss the newspaper's claim.

Refer to information about the report and the data in the table in your answer.

(5)

It includes many patients so claim report is reliable.
Age, fitness and diet were not controlled so and this could interfere with report.
It is true it is better to quit smoking entirely as the mean for men and women ~~were~~ (20 cigarette a day) - ~~were~~ mean men and women for heart disease is 1·2047. It is less harmful for men than women. The difference in risk factor for strokes on average is 0·1386 so it is less harmful to cut down for risk of stroke than heart disease.
They didn't ~~in~~ control if the men and women were already at risk for heart disease. It is ~~a lot more~~ the most at risk for harmful for women who smoke 20 cigarettes a day but it is better to reduce smoking than do nothing at all.
Women are almost 4 times as likely to get heart disease if they smoke 20 cigarettes. Men are approximately 2·3 times as likely but if you cut down women are 2·14 times as ~~fily~~ likely and men are 1·74 times as likely.

This response scores full marks for the following marking points: Mp 2 large reliable study, mp 3 no information on age/ fitness, mp 1 better to quit than cut down agreed, mp 5 increased risk lower in men than women, mp 10 better to cut down than do nothing.

(ii) A newspaper article claimed

'The scientists' report proves that it is better to quit smoking entirely rather than cutting down in order to reduce the risk of these two diseases.'

Discuss the newspaper's claim.

Refer to information about the report and the data in the table in your answer.

(5)

There is a risk of both diseases even if the person is a smoker or a non-smoker, but ~~thet~~ the risk factor of both diseases are high for both men and women who smoker, women show greater risk factors than men and risk of heart diseases is more in both genders. However, ~~quiting~~ stopping smoking entirely will not reduce the risk of both diseases fully, but it can be controlled by exercising and consuming a healthy diet. Therefore, stopping smoking entirely will reduce some risk factors.

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Examiner Comments

This response gains four marks: Mp 5 greater risk in women, mp 8 greater risk of heart disease than strokes, mp 3 risk may depend upon diet and exercise, and mp 1 stopping smoking entirely will reduce risks.

(ii) A newspaper article claimed

'The scientists' report proves that it is better to quit smoking entirely rather than cutting down in order to reduce the risk of these two diseases.'

Discuss the newspaper's claim.

Refer to information about the report and the data in the table in your answer.

(5)

The newspaper article is right that if you stop smoking entirely, you won't be vunerable to getting the two diseases. If you were to cut down and to take one everyday, the risk factor is still as high (1.74)(men) compared to 20 cigarettes a day which is (2.27)(men). For females who smoke one every day, they are higher than men, to getting/encountering a stroke and to heart disease. So for females, if you smoke one every day its (2.14), but for men its (2.27) to get heart disease. So it wouldn't change anything by lowering the risk as instead, it would get worse for females as their close to the mens number of smoking 20 cigarretes a day by only smoking one a day. Therefore the newspaper article claim is advised for women to not smoke at all. And for men to not smoke at all as the risk for heart disease is much higher than the risk for encountering a Strote.

(Total for Question 4 = 12 marks)

ResultsPlus
Examiner Comments

This response also scores four marks: Mp 1 article is correct, mp 6 still a high risk smoking one per day, mp 5 risk higher for women than men, mp8 risk of heart disease higher than strokes.

Question 5 (a)

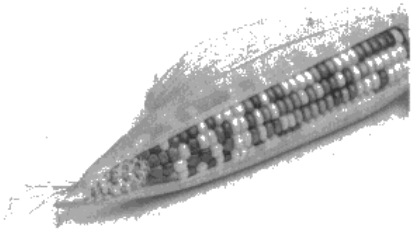
Q05 gave candidates details of a genetic cross in corn. In Q05a candidates were asked to use a genetic diagram to show a second (F1) cross including the phenotypes and genotypes of the parents, the gametes and the genotypes and phenotypes of the offspring. Most responses gained some credit with the best clearly showing the purple parents, Pp x Pp, producing gametes P or p, and offspring genotypes PP, Pp, Pp, and pp with a ratio of 3 purple to 1 yellow. Some responses used a labelled Punnett square to gain full marks.

5 The photograph shows a corn cob with different coloured kernels.

A single corn cob can have as many as 200 kernels.

If planted, each kernel can grow into a new corn plant.

The colours of the corn kernels are inherited from the parent plants.



(Source: https://www.shutterstock.com/image-photo/purple-corn-studio-shoot-white-background-145326139)

The colour of the kernel is determined by a single gene with two alleles. The allele P codes for purple kernel and the allele p codes for yellow kernel.

In a first cross a plant grown from a purple kernel is crossed with a plant grown from a yellow kernel.

All the kernels produced are purple.

In a second cross one of the offspring from the first cross is allowed to self-pollinate.

(a) Use a genetic diagram to show the second cross including the

- phenotypes and genotypes of the parents
- gametes
- genotypes and phenotypes of the offspring

(4)

phenotypes of parents	purple	purple
genotypes of parents	Pp	Pp
genotypes of gametes	P, P, p, p	
genotypes of offspring	1PP, 1pp, 2Pp	
phenotypes of offspring	3 purple : 1 yellow	

	P	p
P	PP	Pp
p	Pp	pp

ResultsPlus
Examiner Comments

This response gains full marks.

5 The photograph shows a corn cob with different coloured kernels.

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(a) Use a genetic diagram to show the second cross including the

- phenotypes and genotypes of the parents
- gametes
- genotypes and phenotypes of the offspring

(4)

purple : yellow

gametes →

	R	r
R	RR	Rr
r	Rr	rr

r – yellow kernel
R – purple kernel

RR : rr : Rr
1 : 1 : 2
purple yellow
3 : 1

ResultsPlus
Examiner Comments

This response also gains full marks.

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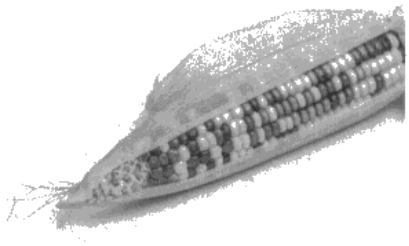

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(a) Use a genetic diagram to show the second cross including the

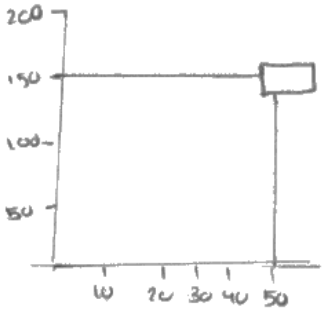
- phenotypes and genotypes of the parents
- gametes
- genotypes and phenotypes of the offspring

(4)

~~Purple PP~~

~~Yellow pp~~

	P	p
P	PP	Pp
p	Pp	pp



Purple is the dominant as there is more probabilities that it will be purple than yellow

ResultsPlus
Examiner Comments

This response gains 3 marks. It doesn't show the phenotypes of the offspring.

Question 5 (b)

In Q05b candidates were told that the second cross was repeated several times. The offspring had cobs with a total of 1915 kernels and the cobs had 1453 purple kernels. Candidates were asked to calculate the ratio of purple to yellow kernels and to express their answer as N : 1. Most responses gained some credit with the best gaining both marks.

(b) This second cross was repeated several times.

The offspring had cobs with a total of 1915 kernels.

The cobs had 1453 purple kernels.

Calculate the ratio of purple to yellow kernels. Express your answer as N : 1

(2)

1915 − 1453 = 462

ratio = 3.1us : 1

ResultsPlus
Examiner Comments

This answer gains full marks.

(b) This second cross was repeated several times.

The offspring had cobs with a total of 1915 kernels.

The cobs had 1453 purple kernels.

Calculate the ratio of purple to yellow kernels. Express your answer as N:1

(2)

1915
− 1453
462 yellow

purple : yellow
1453 : 462

$\frac{1453}{462} = 3.145$

ratio = 3.145:1

ResultsPlus
Examiner Comments

This answer also gains full marks.

(b) This second cross was repeated several times.

The offspring had cobs with a total of 1915 kernels.

The cobs had 1453 purple kernels.

Calculate the ratio of purple to yellow kernels. Express your answer as N:1

(2)

1915
-1453
462

1915 : 1453

Purple : yellow
1453 : 462
3 : 1

÷462

ratio = 3 :1

ResultsPlus
Examiner Comments

This response gains one mark for its working. Showing 1453 purple and 462 yellow.

Question 5 (c)

In Q05c candidates were told scientists expected an exact ratio of 3 : 1. They were asked to calculate the expected number of purple kernels out of the 1915 produced. Many responses were able to use the data to calculate the expected number.

(c) Scientists expected an exact ratio of 3:1.

If this exact ratio was observed, calculate the expected number of purple kernels out of the 1915 produced.

$\frac{1915}{4} = 478.75$ (2)

478.75×3

$= 1436.25$

number of purple kernels = 1436.25

ResultsPlus
Examiner Comments

This calculates the correct expected number so gains both marks.

(c) Scientists expected an exact ratio of 3:1.

If this exact ratio was observed, calculate the expected number of purple kernels out of the 1915 produced.

(2)

$\frac{3}{1} \times 1915 = 5745$

number of purple kernels = 5745

ResultsPlus
Examiner Comments

This does not have the correct expected number but gains one mark for x3 in its working.

ResultsPlus
Examiner Tip

Always show stages of working in all calculations.

(c) Scientists expected an exact ratio of 3:1.

If this exact ratio was observed, calculate the expected number of purple kernels out of the 1915 produced.

(2)

$1915 \times \frac{3}{1}$

~~1915~~ $(1915 \div 4) \times 3 = 1436.25$

number of purple kernels = 1436.

ResultsPlus
Examiner Comments

This also calculates the correct expected number so gains both marks.

Question 5 (d)

In Q05d candidates were asked to explain why the number of purple kernels observed is not the same as the expected number of purple kernels. Most candidates found this item demanding and only the best responses gained both marks for explaining that the combination of gametes at fertilisation is a random process.

(d) Explain why the number of purple kernels observed is not the same as the expected number of purple kernels.

(2)

As the gametes that fuse during fertilisation are produced during meiosis the outcome is purely random, as it is random which genetic allele will be selected. We can calculate the probability but it can still happen that this probability is not true as it is purely random, it will only be visible once we look at the total amount in the world as a large number.

(Total for Question 5 = 10 marks)

ResultsPlus
Examiner Comments

This response scores both marks for reference to random fusion of gametes during fertilisation.

(d) Explain why the number of purple kernels observed is not the same as the expected number of purple kernels.

(2)

Because Fertilisation is always random and can not be exactly calculated. accurate.

ResultsPlus
Examiner Comments

This also gains both marks.

(d) Explain why the number of purple kernels observed is not the same as the expected number of purple kernels.

(2)

It is random and unpredictable

ResultsPlus
Examiner Comments

This response scores one mark for reference to the random nature of the process.

(d) Explain why the number of purple kernels observed is not the same as the expected number of purple kernels.

(2)

due to the ~~random nature of the~~ theoritical yeald being always altered by random chance. and outside factors

ResultsPlus
Examiner Comments

This response also scores one mark for the role of chance in the process.

Question 6 (a)

In Q06a candidates were asked to describe how named enzymes can be used to produce a genetically modified plant. Some candidates, who had revised this part of the specification, could gain full marks for describing how a restriction enzyme can be used to cut a specific gene or section of DNA out of the donor plant. How the same restriction enzyme can be used to cut open a plasmid. Then ligase enzyme is used to join the sticky ends of the DNA into the plasmid which can then be inserted into the bacterium and the plant cell. Some weaker candidates wrote about enzymes speeding up chemical reactions.

6 Genetically modified plants can be used to improve crops.

(a) Describe how named enzymes can be used to produce a genetically modified plant.

(4)

first by using the restriction enzyme part of a plasmid from bacteria and a part of the DNA from a plant can be cut with sticky ends. Then both the strands can be transfered to a culture medium and by the use of DNA ligase the two strands can be joined together. Next, allow the bacteria to absorb the genetically modified plasmid, so that it will produce a genetically modified plant when replicating.

ResultsPlus
Examiner Comments

This response gains four marks. It describes the use of restriction enzyme to cut a plasmid and to cut the DNA producing sticky ends. It also refers to joining the strands together using ligase.

6 Genetically modified plants can be used to improve crops.

(a) Describe how named enzymes can be used to produce a genetically modified plant.

(4)

The enzyme known as restriction enzyme is used to cut ~~the~~ part of the plasmid (which is taken from the bacteria) and the same ~~restric~~ restriction enzyme is used to cut the gene, needed for the plant, from the donor cell. The enzyme known as ligase is used to ~~join~~ ~~the~~ to ~~gene~~ join/attach the gene ~~with~~ to the plasmid. Then the recombinant plasmid (which is the plasmid with the gene) is put into culture mediums ~~to~~ with bacteria so the bacteria can take up the recombinant plasmid.

ResultsPlus
Examiner Comments

This also scores four marks. Restriction enzymes cutting a plasmid, and cutting the required gene. Ligase used to join the gene into the plasmid. Bacteria then takes up recombinant plasmid.

6 Genetically modified plants can be used to improve crops.

(a) Describe how named enzymes can be used to produce a genetically modified plant.

(4)

→ • Restri. Restriction enzyme.
cut DNA molecule at specific Points at
different Places.
→ • ligaes Join the sticky end at the DNA molec.
• ~~Plasmid are isolated~~
• leaf disc which can be obtained by looking leaf
into a microsphore.
→ • Restriction enzymes
cut DNA molecules at specific Point.
• ligases Join the sticky end da DNA molecule.

ResultsPlus
Examiner Comments

This response scores three marks for reference to using restriction enzymes to cut DNA, producing sticky ends and then using ligase to join the DNA.

Question 6 (b)(i)

In Q06bi candidates were asked to state what is meant by the term transgenic. Even though this term is defined in the specification only some candidates could state that it is an organism that contains a gene or DNA from another species.

(b) The plants produced are described as transgenic.

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

(1)

~~uses enzyme to fasten up the reaction~~

they have 2 diffrent gens ~~for~~ from diffrent species.

ResultsPlus
Examiner Comments

This scores the mark.

(b) The plants produced are described as transgenic.

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

(1)

when species have DNA of another type of species

ResultsPlus
Examiner Comments

This also gains the mark.

(b) The plants produced are described as transgenic.

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

(1)

An organism which contains a foreign gene.

ResultsPlus
Examiner Comments

This also gains the mark.

Question 6 (b)(ii)

In Q06bii candidates were asked to give an example of how genetically modifying a plant has resulted in improved food production. Many different responses gained credit including frost resistant, longer shelf life, herbicide resistant and improved nutritional content.

(ii) Give an example of how genetically modifying a plant has resulted in improved food production.

(1)

It can survive in colder temperatures

ResultsPlus Examiner Comments

This scores the mark.

(ii) Give an example of how genetically modifying a plant has resulted in improved food production.

(1)

can prevent insect from eating the plant

ResultsPlus Examiner Comments

This scores the mark.

Question 7

Finally candidates had to design an investigation to find out if a change in breathing rate also produces a change in heart rate. This item produced a whole range of scores with most gaining three or more marks. Candidates who recognised that the best way to conduct this investigation was to get subjects to perform different levels of exercise and measure their heart rate and breathing rate during the exercise and at rest scored highest marks.

7 Breathing rate and heart rate are often related.

Design an investigation to find out if a change in breathing rate also produces a change in heart rate.

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

(6)

Measure heartrate of one human, this person must be the same person for all parts of the expiriament. Measure ones resting heart rate 3 times and record the detail when the person is stationary, then measure the heart rate and breathing rate when that person is running. conduct these measurments 3 times for a duration of 3 minutes. use a fitness tracker and timer to record results. It is evident that when one moves more their breathing rate is increased to be able to provide for the oxygen levels of the blood.

ResultsPlus
Examiner Comments

This response scores 6 marks. It uses the same person O, measures heart rate and breathing rate M1 and M2, uses exercise to increase rates, C and measures for a stated time S1 and repeats the readings R.

7 Breathing rate and heart rate are often related.

Design an investigation to find out if a change in breathing rate also produces a change in heart rate.

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

(6)

1. Get 3 volonteers that are the ~~same~~ near the same height and weight.
2. measure ~~bre~~ the amount of breaths and their hearts BPM at their resting rate.
3. Make ~~so~~ volonteers do 1 hour of running and measure breathing rate and BPM.
4. Repeat 3 more times to make sure.

ResultsPlus
Examiner Comments

This also gains 6 marks. For O, M1 and M2, S1 and C and R.

7 Breathing rate and heart rate are often related.

Design an investigation to find out if a change in breathing rate also produces a change in heart rate.

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

(6)

During exercise, the cells in the body will need more oxygen to respirate at a faster rate. Breathing rate increases to adapt to oxygen needs, and heart rate quickens so oxygen can circulate quickly. With that in mind, running can be used as a method in this experiment.

To avoid biased results, independent variables are controlled: the demographic of the subject (choose subjects of same gender, age group, bodily fitness, without preexisting ~~ill~~health conditions), the duration of the experiment, and the environment the experiment takes place in.

Each subject's heart and breathing rate must be recorded before and after the experiment with a stopwatch to measure it against time. The experiment ~~has~~ also has to be repeated several times so that anomalous and regular results can be determined.

After the experiment, the data obtained may be illustrated into a graph – two graphs, one for heart rate and breathing rate before exercise, and another with results from after exercise. This will make it easier to interpret the data and form a conclusion about the relationship between the two.

ResultsPlus
Examiner Comments

This response aslo gains full marks.

It gains: O, S1, M1 ,M2, R and C.

7 Breathing rate and heart rate are often related.

Design an investigation to find out if a change in breathing rate also produces a change in heart rate.

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

(6)

- have someone stationary measure their heart and breathing rate for a minute
- have the person exercise on a treadmill.
- as the heart rate increases the demand for oxygen will increase. This will result in the breathing rate increasing to get more oxygen in the blood.
- The heart rate needs to increase to get more oxygen around the body faster.
- measure the rates every minute and the trend of more physical exertion = more breaths and faster heart rate should be observed.
- reduce the exercise at the end the heart rate will decrease. the ~~oxygen~~ oxygen need decreases therefore the heart rate will begin to drop and breathing rate will slow.

(Total for Question 7 = 6 marks)

ResultsPlus
Examiner Comments

This response scores 4 marks. It gains O, M1 , M2, and C.

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 comment or discuss items.
- Make sure you are familiar with the core practicals listed in the specification.
- Make sure you have practised calculations, especially magnification, understand and know how to apply formulae and always include all your working.
- Write in detail and use correct and precise biological terminology, such as the role of different white blood cells.
- Make links between different parts of the specification, and when considering a question remember to use all the knowledge and understanding you have gained throughout the specification.
- Make sure you know and understand all of the terms in the specification including transgenic, ligase and restriction enzyme.
- Be able to use genetic diagrams correctly and understand inheritance.
- Be able to name the independent variable in experimental design questions and give the range of values, the dependent variable, how you are going to measure it and the control variables and explain how these will be controlled.
- Always read through your responses and ensure that what you have written makes sense and answers the question fully.