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Examiners' Report
June 2024

Int GCSE Biology 4BI1 1BR

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Introduction

The examiners were impressed with the high standard of many of the exam scripts seen. The majority of candidates had clearly prepared well for the examination and had an excellent understanding of most topic areas. Candidates and centres should be commended for their obvious hard work in preparing for this examination.

Most candidates were able to use correct scientific terminology accurately in their answers. It was pleasing to see that most candidates have a strong understanding of the demands of each of the command words listed in the specification, although a few candidates still have a tendency to confuse the command word, 'explain' with 'describe'.

The examiners noted that the majority of candidates are approaching the longer, discussion and evaluation questions with far more confidence. With these longer questions that usually have data as a stimulus, candidates should ensure that they explore all aspects of the data, consider the validity of the data and also use their own knowledge to support any conclusions.

Maths and graph skills were generally excellent and it is clear that most candidates have an excellent understanding of how to draw appropriate graphs and use the correct number of significant figures. Practical skills are assessed within the paper and it was pleasing to see that most candidates have a good, strong understanding of the nature of the scientific method, being able to plan valid investigations and identify variables. Question 1(b)(i) was a practical question that asked candidates how to make a dilution of a solution. Only a minority of candidates suggested an appropriate piece of laboratory equipment to make the dilution – it is good practice to give some experimental details when asked 'how' to perform a practical technique. Most candidates completed the paper and left few blank questions.

Question 1 (b)(i)

This question assessed AO3 practical skills. Candidates were required to describe how a solution could be diluted. Strong answers correctly referred to adding the same volumes of solution and water and referred to an appropriate piece of laboratory equipment such as a measuring cylinder. Weaker answers gave vague references to mixing the solutions without giving volumes or failed to mention any equipment. Candidates should always refer to practical methods when asked 'how to' do a practical method.

(i) Describe how to make 10 cm^3 of a 5% sucrose solution from a 10% sucrose solution and pure water.

(2)

Use a measuring cylinder to measure out 5 cm^3 of pure water.
then add in 5 cm^3 of 10% sucrose solution

ResultsPlus
Examiner Comments

This is a strong answer that gained both marks. The candidate gives two correct volumes of the solutions and also refers to the use of a measuring cylinder.

ResultsPlus
Examiner Tip

Always give full practical details when describing 'how to' do a method.

(i) Describe how to make 10 cm^3 of a 5% sucrose solution from a 10% sucrose solution and pure water.

(2)

First measure out 5 cm^3 of 10% sucrose solution, as well as 5 cm^3 of pure water. Then, mix them together. This will combine and turn into 10 cm^3 of 5% sucrose solution.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that equal volumes of solution and water are added. No mention was made of any equipment.

(i) Describe how to make 10 cm^3 of a 5% sucrose solution from a 10% sucrose solution and pure water.

(2)

dilute the solution by adding pure water. This will decrease the sucrose concentration. measure 10 cm^3 using a measuring cylinder.

ResultsPlus
Examiner Comments

This answer gained one mark for mention of the measuring cylinder. No credit is awarded for the mixing of sucrose and water as there is no mention of the volumes.

Question 1 (b)(ii)

This question presented candidates with pictures of onion epidermis cells before and after placing them into a solution of sucrose. Candidates were asked to explain the change in appearance of the cells. Strong answers correctly referred to the process of osmosis, the movement of water from the cells across a partially permeable membrane, the detachment of the cell membrane from the cell wall and the movement of water down a water potential gradient. It was pleasing to see that many candidates correctly referred to water potentials rather than ambiguous references to concentrations (where it is often not clear if the candidate is referring to water concentration or sucrose concentration). Some candidates did not appreciate that water had left the cells and referred to movement of the red pigment or movement of sucrose solution into the cells. A small number of candidates incorrectly referred to water moving from a low water potential to a high water potential.

(ii) **Explain the change in appearance of the onion cells shown in the images after being in the 5% sucrose solution for one hour.**

(3)

vacuole lose water because osmosis. water moves from high water potential to ~~to~~ low water potential across semi-permeable membrane. 5% sucrose solution has lower water potential. so vacuole / cell becomes flaccid, shrinks.

ResultsPlus
Examiner Comments

This is an excellent answer that gained all three marks. The candidate correctly referred to osmosis and explains how the water moves out of the cells from a high water potential to a low water potential. The candidate also correctly refers to the membrane and the fact that the cells become flaccid.

ResultsPlus
Examiner Tip

If a question is clearly about osmosis, give a definition of osmosis and a direction of movement of the water.

(ii) Explain the change in appearance of the onion cells shown in the images after being in the 5% sucrose solution for one hour.

(3)

The cell is plasmolysed ~~because~~ because it has losed water from osmosis, water goes from a high water potential area to a lower water potential area. The cytoplasm has left the cell ~~wall~~ membrane.

ResultsPlus
Examiner Comments

This strong answer gains all three marks. There is a clear reference to plasmolysis and the candidate explains the movement of water out of the cells by osmosis.

(ii) Explain the change in appearance of the onion cells shown in the images after being in the 5% sucrose solution for one hour.

(3)

Water moved out of the onion cells due to osmosis. The concentration of water was higher in the cell than the solution. The onion cells are flaccid.

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate correctly refers to the movement of water out of the cells by osmosis and gives a correct description of the water concentration gradient.

(ii) Explain the change in appearance of the onion cells shown in the images after being in the 5% sucrose solution for one hour.

(3)

After being in the sucrose solution for an hour, the water is drawn out of the cell via osmosis as there is an absense of water in the sucrose solution. This results in the onion cell ~~is~~ containing less water.

ResultsPlus
Examiner Comments

This answer gained two marks for referring to the movement of water out of the cells by osmosis. There is no mention of the membrane or the water potential gradient.

(ii) Explain the change in appearance of the onion cells shown in the images after being in the 5% sucrose solution for one hour.

(3)

the red onion cells are lose lot of water. because the osmosis. is high to low, the water in red onion cell is more than 5% scurose solution, so the. water will flow to the sucrose solution,

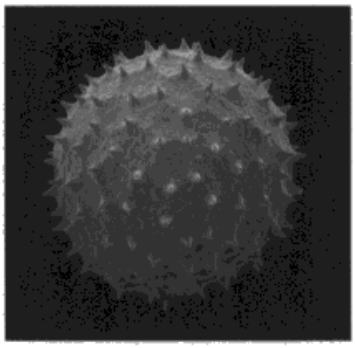
ResultsPlus
Examiner Comments

This answer gained two marks for the movement of water out of the cells by osmosis. The reference to high and low is too vague as there is no reference to water potential or concentrations.

Question 2 (b)(i)

This question was well answered by many candidates. The question required candidates to convert units, calculate a magnification and correctly round the answer to the nearest whole number.

(b) The image shows a pollen grain produced by the plant.



(Source: © STEVE GSCHMEISSNER / SCIENCE PHOTO LIBRARY)

(i) The diameter of the pollen grain in the image is 30 mm.

The pollen grain has an actual diameter of 313 µm.

Calculate the magnification of the pollen grain in the image.

Give your answer to the nearest whole number.

[1 mm = 1000 µm]

30 × 1000 = 30000

magnification = $\frac{30000}{313}$

= 95.846

≈ 96

(3)

magnification = × 96

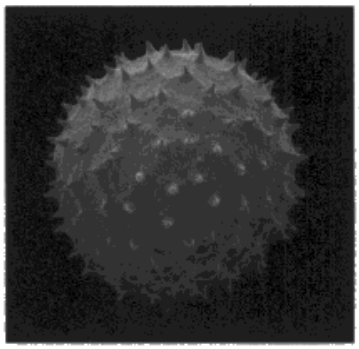
ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate shows all their working clearly – this is good practice as it means that some credit may be awarded even if the final answer is incorrect. The candidate clearly converts millimetres into micrometres (30 000), does a correct division and then rounds their answer to the nearest whole number (96).

ResultsPlus
Examiner Tip

Always show working clearly – it may gain some credit if the final answer is incorrect.

(b) The image shows a pollen grain produced by the plant.



(Source: © STEVE GSCHMEISSNER / SCIENCE PHOTO LIBRARY)

(i) The diameter of the pollen grain in the image is 30 mm.

The pollen grain has an actual diameter of 313 µm.

Calculate the magnification of the pollen grain in the image.

Give your answer to the nearest whole number.

[1 mm = 1000 µm]

(3)

I
A M = Magnification = $\frac{\text{Image size}}{\text{actual size}}$

$= \frac{30\text{ mm}}{313\ \mu\text{m}} = \frac{30000\ \mu\text{m}}{313\ \mu\text{m}} = 95.8$

magnification = × 95.8

ResultsPlus
Examiner Comments

This answer gained two marks – the candidate correctly converts the units and calculates the magnification but does not round their answer to the nearest whole number.

ResultsPlus
Examiner Tip

Be careful to read all the instructions in the question.

Question 2 (b)(ii)

This question asked candidates to describe how the pollen grain shown in a micrograph is adapted for insect pollination. Most candidates correctly referred to hooks or stickiness. A few candidates misread the question and referred to the adaptations of insect pollinated flowers, eg bright petals.

(ii) State how the structure of the pollen grain is adapted to ensure insect pollination.

(1)

The Pollen grain is adapted to get stuck on the surface of an insect.

ResultsPlus
Examiner Comments

This answer gained no marks. There is no reference to any adaptations of the actual pollen grain.

(ii) State how the structure of the pollen grain is adapted to ensure insect pollination.

(1)

it has spikes so it is easy to laten onto insect bodies

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that the pollen grain has spikes.

(ii) State how the structure of the pollen grain is adapted to ensure insect pollination.

(1)

Sticky, so insects (bees) ~~eat~~ carry it while they're looking for nectar
↳ It sticks to their bodies.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that the pollen grain is sticky.

Question 2 (c)

This question assessed candidates' understanding of the purposes of taking cuttings. Strong answers correctly stated that taking cuttings is a form of asexual reproduction and so produces genetically identical copies. Some candidates referred to identical copies or copies with the same characteristics but did not refer to genes. Candidates should use precise language – 'genetically identical' gained a mark but 'identical' did not gain a mark. Many candidates correctly stated that taking cuttings would be quicker or could be done at all times of the year.

(c) Gardeners often reproduce plants by taking cuttings.

Explain why gardeners often reproduce plants by taking cuttings instead of growing the plants from seeds.

(2)

Cuttings can be cheaper and doesn't require much effort.

ResultsPlus
Examiner Comments

This answer gained no marks. The candidate gives vague references to cost and effort – this is insufficient detail to gain any marks.

(c) Gardeners often reproduce plants by taking cuttings.

Explain why gardeners often reproduce plants by taking cuttings instead of growing the plants from seeds.

(2)

Because it takes less time. And to reproduce plants by taking cuttings is more easier and less care. need

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of speed. No further detail is given – the reference to ease is too vague.

(c) Gardeners often reproduce plants by taking cuttings.

Explain why gardeners often reproduce plants by taking cuttings instead of growing the plants from seeds.

(2)

Cuttings are faster and produce a clone so there is no variation. It is guaranteed that the plant would produce the same yield.

ResultsPlus
Examiner Comments

This answer gained two marks for the idea of speed and the reference to producing clones.

ResultsPlus
Examiner Tip

Always use precise, accurate vocabulary eg clones or **genetically** identical.

(c) Gardeners often reproduce plants by taking cuttings.

Explain why gardeners often reproduce plants by taking cuttings instead of growing the plants from seeds.

(2)

- they take cuttings of the plant to asexually reproduce the plant.
- It takes less time for the plant to grow this way.
- No variation / mutation.

ResultsPlus
Examiner Comments

This answer gained two marks for the references to asexual reproduction and quick process. No marks would have been awarded for the idea of no variation as there is no reference to genes.

(c) Gardeners often reproduce plants by taking cuttings.

Explain why gardeners often reproduce plants by taking cuttings instead of growing the plants from seeds.

(2)

This is because that cuttings is a form of asexual reproduction and it. It creates a clone. It is faster. There is less genetic variation. phenotype is maintained. They can choose what part they want.

ResultsPlus
Examiner Comments

This excellent answer illustrates all three mark points: asexual reproduction, fast and no genetic variation (clones).

Question 3 (a)(i)

This question was well answered with most candidates correctly identifying the diaphragm.

Question 3 (a)(iii)

This question required candidates to give two reasons why the bell jar model was not an accurate model of human ventilation. Strong answers identified the lack of ribs or intercostal muscles, the lack of movement of the bell jar and the absence of pleural fluid. Weaker answers often gave vague references to a lack of alveoli or blood – these would not be relevant to the process of ventilation.

(iii) Give two reasons why the apparatus does not give an accurate representation of human ventilation.

(2)

1 There are no ribs and intercostal muscles moving to increase volume and decrease pressure.

2 The apparatus is not made in scale with the structures of the body. Diaphragm is too big.

ResultsPlus Examiner Comments

This answer gained two marks in the first sentence for the idea of ribs / intercostal muscles and the movement of them to change the volume.

(iii) Give two reasons why the apparatus does not give an accurate representation of human ventilation.

(2)

1 The lung is bigger and can hold more air

2 There is no intercostal muscle and ribs representation ~~representation~~

ResultsPlus Examiner Comments

This answer gained one mark for the idea of intercostal muscles.

(iii) Give two reasons why the apparatus does not give an accurate representation of human ventilation.

(2)

1 Intercostal muscles contract and relax to increase and decrease the volume, but the glass jar doesn't change in size.

2 The glass jar doesn't represent the ribcage moving up and down during ventilation.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly referring to the intercostal muscles and their role in the movement of the thorax.

Question 3 (b)(ii)

This calculation required candidates to calculate the total surface area of a lung and give the answer in standard form. Many candidates gained both marks. Some candidates did not convert the answer to correct standard form and some candidates divided the area of an alveolus by the number of alveoli.

(ii) The total surface area of the alveoli in lungs is very large.

A typical human lung has 480 000 000 alveoli.

Each alveolus has a surface area of 0.0040 mm^2.

Calculate the total surface area, in mm^2, of the alveoli in one typical human lung.

Give your answer in standard form.

(2)

$0.0040 \times 480\,000\,000 = 1920000\ mm^2$

$= 1.92 \times 10^6$

total surface area in one human lung = 1.92×10^6 mm^2

ResultsPlus
Examiner Comments

This correct answer gained both marks for correctly calculating the surface area and giving the answer in standard form.

(ii) The total surface area of the alveoli in lungs is very large.

A typical human lung has 480 000 000 alveoli.

Each alveolus has a surface area of 0.0040 mm^2.

Calculate the total surface area, in mm^2, of the alveoli in one typical human lung.

Give your answer in standard form.

(2)

0.0040 × 480 000 000 =

total surface area in one human lung = 1920000 mm^2

ResultsPlus
Examiner Comments

This answer gained one mark for correctly calculating the surface area. The answer has not been converted into standard form.

ResultsPlus
Examiner Tip

Always read all the instructions in a question, eg 'give your answer in standard form'.

Question 3 (b)(iii)

This question required candidates to explain two ways in which a single alveolus is adapted for maximising gas exchange. Strong answers referred to the thin or one cell thick wall linked to a short diffusion path, the capillary network maintaining the diffusion gradient, and the moisture allowing gases to dissolve. Many answers incorrectly referred to large surface areas – this is not a feature of a single alveolus. Some candidates referred to cell walls rather than the alveolar walls – candidates should be careful to use terminology accurately.

(iii) Explain two ways that a single alveolus is adapted to maximise gas exchange.

(4)

1 Alveoli is one cell thick so it decreases the diffusion distance which increases the rate of gas exchange

2 ~~[illegible]~~ close to the network of capillaries to decrease the distance for diffusion and the concentration gradient is maintained so gas exchange is maximised, more diffusion of Oxygen to the capillaries

ResultsPlus
Examiner Comments

This strong answer gained all four marks. The candidate has correctly identified the thin wall and capillary network and in each case given a correct explanation.

(iii) Explain two ways that a single alveolus is adapted to maximise gas exchange.

(4)

1 ~~0~~ High surface area to maximise contact with gasses. so that gasses can be ~~transfered~~ ~~diffused~~ ↑ diffused efficiently.

2 One cell thick capilary walls. / alveoli walls
Short diffusion pathway for effective diffusion.

ResultsPlus
Examiner Comments

This answer gained two marks for the one cell thick wall and short diffusion path. No credit was awarded for the reference to surface area.

(iii) Explain two ways that a single alveolus is adapted to maximise gas exchange.

(4)

1 It has walls that are one cell thick, there is a shorter diffusion distance between air and blood, therefore increasing the rate of diffusion

2 It has a rich blood supply to maintain a steep gradient between alveoli and blood, to increase rate of diffusion.

ResultsPlus
Examiner Comments

This excellent answer gained all four marks for correctly referring to the one cell thick wall and the blood capillaries lined to their roles.

(iii) Explain two ways that a single alveolus is adapted to maximise gas exchange.

(4)

1 Alveolus have only one cell thick walls. This allows gas diffusion to happen much quicker as they only have to go through one cell.

2 Alveolus has a moist lining, this allows gasses to move through it faster and easily and so it can diffuse much quicker.

ResultsPlus
Examiner Comments

This answer gained three marks for correctly stating that the alveolus is one cell thick for rapid diffusion and that there is a layer of moisture. There is no reference to gases dissolving in the moisture.

(iii) Explain two ways that a single alveolus is adapted to maximise gas exchange.

(4)

1 It has thin walls to provide a short diffusion distance to maximise gas exchange

2 It is moist so it can dissolve gases to provide a steep concentration gradient for diffusion to maximise rate of gas exchange

ResultsPlus
Examiner Comments

This strong answer gained all four marks. There are correct references to the thin wall and the moisture with both correctly explained.

Question 3 (b)(iv)

This question assessed candidates' understanding of a core practical. The question asked candidates to describe how a student could investigate the effect of exercise on carbon dioxide release. Strong answers described the use of lime water or hydrogen-carbonate indicator, sampling before and after exercise, the use of replicates for reliability and the idea that other factors need to be controlled. A significant number of candidates did not give an appropriate experiment and instead described an investigation into the effect of exercise on heart rate. Candidates should make sure that they have a full knowledge of all the core practicals listed in the specification.

(iv) Describe a simple laboratory experiment to investigate the effect of exercise on the rate of carbon dioxide release from a human.

(3)

Set up an apparatus with lime water with tubes connecting near the mouth, while exercising, record an observation of the lime water with and without exercise.

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Examiner Comments

This answer gained two marks. One mark is awarded for the use of limewater. A second mark is awarded for measuring before and after exercise.

ResultsPlus
Examiner Tip

Make sure that you know all the core practicals.

(iv) Describe a simple laboratory experiment to investigate the effect of exercise on the rate of carbon dioxide release from a human.

(3)

measure the amount of CO^2 released regularly, then make them excersize then measure the amount of CO^2 released after.

ResultsPlus
Examiner Comments

This answer gained one mark for the measurement of carbon dioxide before and after exercise.

(iv) Describe a simple laboratory experiment to investigate the effect of exercise on the rate of carbon dioxide release from a human.

(3)

Let a person not do exercise at all and sit down for around 10minutes. While let another person do a moderate amount of exercise for 10minutes. Let another person do intense exercise (e.g. running) for 10minutes. Then let all of them use a straw to blow into limewater. The more CO_2 there is, the more cloudy the limewater will be. Repeat each time for each person for at least 3 times for reliability. Or observe how much the people exhale (as more exercise needs more oxygen and glucose for aerobic respiration to release more energy for muscle contraction). More exercise means more rate of CO_2 release, use hydrogen carbonate aid let the people breath in. The more yellow it is, the high the concentration of carbon dioxide.

(Total for Question 3 = 14 marks)

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate correctly describes the use of limewater, measuring before and after exercise and the use of repeats.

(iv) Describe a simple laboratory experiment to investigate the effect of exercise on the rate of carbon dioxide release from a human.

(3)

Have 2 participants, one resting and actively exercing / running on a treadmil. Use a glass beaker and add lime water to it, cover the container but make sure there is a hole for the straw to fit into. Ask the resting person to exhale into the straw every 5 minutes for 30 minutes, do the same with the person exercising, make sure the straw is sealed when not in use. After 30 minutes record the clour change use a black file to see the colour change more vividly, repeat the experiment.

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate correctly describes the use of limewater, measurement before and after exercise and the comparison of the limewater cloudiness after a stated time.

Question 4 (b)(i)

Many candidates found this question challenging. The question assessed the practical understanding of candidates by asking why samples are kept separately in a water bath before mixing. Strong answers explained that the samples need to reach the temperature before mixing. A significant number of candidates focused on the role of a water bath in maintaining a constant temperature rather than the reason for keeping them in the water bath before mixing.

(b) (i) State why the test tubes are placed in a water bath for 10 minutes before mixing the contents.

(1)

to get [redacted] the test tubes to the ~~same~~ right temperature. They need time to change their temperature

ResultsPlus Examiner Comments

This answer correctly states that the tubes need time to reach the temperature of the water bath.

(b) (i) State why the test tubes are placed in a water bath for 10 minutes before mixing the contents.

(1)

to get the test tubes up to the right temperature.

ResultsPlus Examiner Comments

This example also gained the mark for the idea that the tubes need to reach the temperature.

(b) (i) State why the test tubes are placed in a water bath for 10 minutes before mixing the contents.

(1)

to make them optimum temperature for enzyme activity.

ResultsPlus
Examiner Comments

This answer did not gain any credit. The candidate has not given the purpose of keeping the tubes in the water bath before mixing.

Question 4 (b)(ii)

This question assessed candidates understanding of the biochemical test for starch. The specification lists four biochemical tests (starch, glucose, lipid and protein) – candidates should be aware of how to carry out each test and the positive results of the tests. Strong answers stated that iodine solution is used and that the positive result is a black colour. Weaker answers often referred to wrong tests such as Benedict's.

(ii) Describe how the student could test a sample of the mixture for starch.

(2)

add iodine solution
if starch present turns brick red,
orange, yellow
if not present stays blue

ResultsPlus
Examiner Comments

This answer gained one mark for the use of iodine. The candidate incorrectly states that the result would be a brick red colour.

(ii) Describe how the student could test a sample of the mixture for starch.

(2)

- Use yellow - brown iodine solution
- blue - black colour would be present if mixture have starch

ResultsPlus
Examiner Comments

This answer gained both marks for correctly describing the use of iodine and the positive result.

Question 4 (c)(i)

This calculation required candidates to calculate a mean value and give the final answer to two significant figures. Most candidates were able to calculate the mean correctly and many went on to give the answer to the correct number of significant figures.

(c) The table shows the results of the student's investigation.

Temperature in °C	Time taken for all starch to be digested in minutes			
	1	2	3	mean
10	45	50	50	48
20	30	35	35	33
30	20	25	25	23
40	10	10	15	12
50	starch not digested	starch not digested	starch not digested	starch not digested

(i) Calculate the mean time taken for all starch to be digested at 30 °C.

Give your answer to two significant figures.

(2)

$\frac{20+25+25}{3} = 23.33$

≈ 23

mean time = 23 minutes

ResultsPlus
Examiner Comments

This answer gained both marks. The candidate has clearly shown their working.

ResultsPlus
Examiner Tip

Always show your working for calculations.

(c) The table shows the results of the student's investigation.

Temperature in °C	Time taken for all starch to be digested in minutes			
	1	2	3	mean
10	45	50	50	48
20	30	35	35	33
30	20	25	25	
40	10	10	15	12
50	starch not digested	starch not digested	starch not digested	starch not digested

(i) Calculate the mean time taken for all starch to be digested at 30 °C.

Give your answer to two significant figures.

(2)

$20 + 25 + 25 = \frac{70}{3} = 23.3$

mean time = 23.3 minutes

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Examiner Comments

This answer gained one mark. The candidate has correctly calculated the mean but not given their answer to the correct number of significant figures.

Question 4 (c)(ii)

This question was well answered by many candidates and it is clear that most candidates have a good understanding of how temperature affects the activity of enzymes. Strong answers explained that an increase in temperature would increase kinetic energy, particle movement and the collision rate of enzymes and substrates. Weaker answers often gave descriptions of the increase in speed of reaction without giving an explanation.

(ii) Explain the effect of increasing the temperature from 10 °C to 40 °C on the time taken for all the starch to be digested.

(2)

The enzymes are getting closer to their optimum temperature so the time for the starch to be broken down by the enzyme quicker resulting in faster digestion as ~~the~~ the time reduces.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that increasing the temperature means that the optimal temperature is reached.

(ii) Explain the effect of increasing the temperature from 10 °C to 40 °C on the time taken for all the starch to be digested.

(2)

~~Increase~~ Increasing the temperature reduces the time taken for the starch to be digested as the enzymes have more kinetic energy and are moving ~~faster~~ faster at 40°C so there are more collisions per minute.

ResultsPlus
Examiner Comments

This answer gained both marks. The candidate clearly states that the enzymes have more kinetic energy and that the frequency of collisions increases.

(ii) Explain the effect of increasing the temperature from 10 °C to 40 °C on the time taken for all the starch to be digested.

(2)

as temperature increased to 40° particles have more kinetic energy which resulted in more successful collisions between particles resulting in less time taken for the complete digestion of starch

ResultsPlus
Examiner Comments

This strong answer gained two marks for correctly stating that the kinetic energy increases causing an increase in collision frequency.

Question 4 (c)(iii)

This question assessed candidates' understanding of the effect of excess temperature on enzyme activity. Many candidates were able to correctly state that the enzymes would denature and that this means that the shape of the active site would change. Some candidates correctly stated that the enzymes would denature but did not give further details.

(iii) Explain why the starch was not digested when the temperature was 50 °C.

(2)

The temperature too high so that the amyles are dead and dont work.

ResultsPlus
Examiner Comments

This answer did not gain any credit. There is no mention of denaturation or changes in shape of the enzyme.

(iii) Explain why the starch was not digested when the temperature was 50 °C.

(2)

- The enzymes have been denatured.
- This means that the shape of their active site have changed and the substrate can longer fit in, leading to failure of the formation of enzyme - substrate complex, where starch will not be digested.

ResultsPlus
Examiner Comments

This excellent answer gained both marks. The candidate correctly states that the enzymes denature and that the active site changes shape so that E-S complexes cannot form.

(iii) Explain why the starch was not digested when the temperature was 50 °C.

(2)

Because the temperature is too high, the heat denatures the enzyme. The active sites change shape and no longer fit into substrates so sample couldn't be broken down & digested.

ResultsPlus
Examiner Comments

This is another excellent answer that correctly states that the enzymes denature and goes on to give an explanation of denaturation.

(iii) Explain why the starch was not digested when the temperature was 50 °C.

(2)

The optimum temperature for the enzyme to digest starch passed. This is also because of the enzyme amylase denaturing and therefore being unable to digest starch

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that the enzymes denature but does not go on to explain what denaturation means.

Question 4 (c)(iv)

This question assessed candidates' understanding of generic practical skills. The question focused on how the accuracy of the results and conclusion could be improved. Strong answers explained that closer temperature or time increments would be used. Strong answers also gave the range in which closer increments would need to be taken in order to identify the optimal temperature.

(iv) Explain how the student could modify the investigation to give a more accurate measure of the temperature at which the amylase activity is fastest.

(2)

The student could use smaller temperature gaps, and could go up by 5°C each time rather than 10°C.

ResultsPlus
Examiner Comments

This answer gained one mark for correctly stating that closer increments would be required. The candidate has not, however, given the range of temperatures in which the increments need to be taken.

(iv) Explain how the student could modify the investigation to give a more accurate measure of the temperature at which the amylase activity is fastest.

(2)

Use smaller range of temperatures in between for example 40°C, 42°C, 44°C, etc.

ResultsPlus
Examiner Comments

This answer gained two marks for giving the idea of closer increments and giving a suitable range for them.

(iv) Explain how the student could modify the investigation to give a more accurate measure of the temperature at which the amylase activity is fastest.

repeat, and
set temperatures at smaller division of ~~centigrade~~ temperatures between 40°C to 50°C (2) repeat at the temperature of 41°C, 42°C, 43°C, 44°C, 45°C, record the time and make comparisons.

ResultsPlus
Examiner Comments

This excellent answer gained both marks. The idea of closer increments is given and there is a correct range that would enable the optimal temperature to be identified.

(iv) Explain how the student could modify the investigation to give a more accurate measure of the temperature at which the amylase activity is fastest.

(2)

Continue the experiment in ~~much~~ different temperatures or in smaller intervals.
Use a water bath and have a blockage on top so that it won't be affected by the atmosphere.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of smaller temperature increments but did not give a range.

(iv) Explain how the student could modify the investigation to give a more accurate measure of the temperature at which the amylase activity is fastest.

(2)

They could repeat the experiment at least 3 more times to remove any anomalies from the results.

ResultsPlus
Examiner Comments

This answer did not gain any credit. The candidate has confused accuracy with reliability.

ResultsPlus
Examiner Tip

Make sure that you know the differences between terms such as accuracy, reliability, and validity.

Question 5 (a)(ii)

This question required candidates to identify two organisms in the food web that can feed as tertiary consumers. Most candidates were able to correctly identify two organisms.

(ii) Name two organisms in this food web that can feed as tertiary consumers.

(1)

1 Polar Bear

2 Plankton-eating fish

ResultsPlus
Examiner Comments

This answer gained no marks as plankton-eating fish are not a tertiary consumer.

(ii) Name two organisms in this food web that can feed as tertiary consumers.

(1)

1 grey whale

2 polar bear

ResultsPlus
Examiner Comments

This answer gained the mark for correctly identifying two tertiary consumers.

Question 5 (a)(iii)

This question required candidates to draw out the longest food chain within the web. Most candidates were able to correctly draw the longest food chain. Common errors included placing the arrows in the wrong direction, drawing a pyramid of numbers instead of a food chain, and selecting the wrong food chain.

(iii) Draw the food chain with the most trophic levels in this food web.

(2)

phytoplankton → plankton-eating fish → predatory fish → seal → polar bear.

ResultsPlus
Examiner Comments

This answer gained one mark. The food chain given is not the longest one but the arrows are pointing in the correct direction.

(iii) Draw the food chain with the most trophic levels in this food web.

(2)

Phytoplankton → Zooplankton → plankton-eating fish → predatory fish → seal → Polar bear

ResultsPlus
Examiner Comments

This answer gained both marks for selecting the correct food chain and having the arrows in the correct direction.

Question 5 (b)(i)

This calculation required candidates to calculate a percentage change. Many candidates were able to correctly complete the calculation to gain both marks. Some candidates were able to calculate the change in plankton but did not divide the number by the correct denominator.

(b) Scientists measure the changes in the biomasses of phytoplankton and zooplankton in one year.

(i) During a month in spring, the scientists found that the biomass of phytoplankton in the water increased from 1.2 mg per dm^3 to 12.6 mg per dm^3.

Calculate the percentage increase of these phytoplankton in this month.

(2)

$\frac{12.6 - 1.2}{1.2}$ ## $\times 100\% = 950\%$

percentage increase = 950 %

ResultsPlus
Examiner Comments

This answer gained both marks. The candidate has shown their working clearly.

(b) Scientists measure the changes in the biomasses of phytoplankton and zooplankton in one year.

(i) During a month in spring, the scientists found that the biomass of phytoplankton in the water increased from 1.2 mg per dm^3 to 12.6 mg per dm^3.

Calculate the percentage increase of these phytoplankton in this month.

(2)

$$\frac{12.6 - 1.2}{12.6} \times 100 = 90.47619$$

percentage increase = 90 %

ResultsPlus
Examiner Comments

This answer gained one mark. The candidate has correctly stated that the difference would be 12.6-1.2 in the working but divided by the wrong number.

Question 5 (b)(ii)

This longer, discussion question generated a wide range of answers. Many excellent answers were seen that described the changes in phytoplankton and zooplankton populations and then linked them to light intensity, photosynthesis and the predator-prey relationship. The strongest answers also went on to explain that the phytoplankton would take up nitrates and use them to make amino acids. Weaker answers tended to focus exclusively on descriptions of the data. Candidates should give descriptions of patterns in data, identify any correlations and go on to use their own knowledge to give explanations.

Discuss the reasons for the changes in the biomasses of phytoplankton and zooplankton during the year.

(5)

Phyto

^Plankton biomass increases the most in spring season, as the phyto ^plankton biomass increases so the biomass of zooplankton also increases as they have more food to feed on. As the nitrate concentrations are high so the biomass ~~number~~ of both phytoplankton and zooplankton decreases it could be due to eutrophication. When there are highest number of hours of light per day so the biomass of phytoplankton increases as they have more exposure to sunlight and they can photosynthesize for longer, which happens in spring. In summer, the biomass of phytoplankton decreases due to the increase in biomass of zooplankton as more feed on them. The nitrate concentration varies around the year but it is least in summer. Biomass of phytoplankton increases again in autumn when nitrate concentration is less and the biomass of zooplankton is also less, so they have less predators that feed on them.

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

This is a good answer that gained four marks. The candidate gives a good description of the increase in phytoplankton in the spring and links this to photosynthesis. The candidate also explains the predator-prey relationship between the phytoplankton and zooplankton.

Discuss the reasons for the changes in the biomasses of phytoplankton and zooplankton during the year.

(5)

phytoplankton thrives ~~in~~ during the spring because nitrate levels ~~go down~~ decrease during spring. And there's more light so phytoplankton can respire and grow. whereas zooplankton thrives during ~~an~~ summer ~~as~~ when temperatures are ~~more~~ hotter. Both phytoplankton and zooplankton see increases in biomass during warmer climates with longer daylight hours. when ~~nitrogen~~ nitrate concentration levels down zooplankton and phytoplankton biomass increases.

ResultsPlus
Examiner Comments

This answer gained one mark. The candidate has identified the increase in phytoplankton in spring but does not give any further detail or explanation.

Discuss the reasons for the changes in the biomasses of phytoplankton and zooplankton during the year.

(5)

The phytoplanktons biomass was low at winter raised up by a lot at middle of spring as the nitrate concentration started to drop down and when hours of light per day also hit its top for the years Meaning the biomass of phytoplankton will increase with low nitrate concentration and high hours of light per day. With later on, rising again due to the drop of nitrate concentrate, but not as high due to less light per day. The zooplankton only raised in biomass when nitrate concentrate was the lowest in the year, meaning only with minium nitrate concentration could increase the biomass.

ResultsPlus
Examiner Comments

This answer gained two marks for recognising that phytoplankton population is low in Winter and rises in Spring. No explanations for the changes in biomass are given so no further credit is awarded.

Discuss the reasons for the changes in the biomasses of phytoplankton and zooplankton during the year.

(5)

~~-> When there is a high concentration of nitrate the less phytoplankton and zooplankton.~~

-> As the number of hours of ~~light~~ light per day increases the number phytoplankton also increases. More photosynthesis.

-> When there are a high biomass of zooplankton the less phytoplankton there are. ~~The~~ This might be due to The phytoplankton are a food source to the zooplankton. The less zooplankton the more phytoplankton since there isn't anything eating them.

-> When there is less nitrate concentration there are more phytoplankton and zooplankton. This might be due to phytoplankton is a plant that needs nitrate. More zooplankton due to the increase of ~~pla~~ phytoplankton.

ResultsPlus
Examiner Comments

This is a good answer that gained four marks. The candidate describes the increase in phytoplankton and links this to photosynthesis. The candidate also explains the predator-prey relationship between phytoplankton and zooplankton.

Discuss the reasons for the changes in the biomasses of phytoplankton and zooplankton during the year.

(5)

The ~~number~~ zooplankton biomass increases in the beginning of summer and the phytoplankton biomass increases in spring. The number of hours of light increases the most in spring and summer. And the level of nitrates is highest in winter and half of spring. The phytoplankton biomass increases most in spring as the ~~the~~ hours of ~~sun~~ sunlight increases and the ~~the~~ concentration of nitrates are high so this allows the biomass to increase as the plant uses the light to photosynthesise and the nitrates are used by the plant to make amino acids and DNA so it grows more. And the biomass of zooplankton increases when the biomass of the phytoplankton increases, as there is more food and the zooplanktons eat more ~~and so their biobiomass~~ increases.

(Total for Question 5 = 11 marks)

ResultsPlus
Examiner Comments

This is an excellent answer that gained all five marks. The candidate describes the patterns and explains them in terms of predator-prey relationships, nitrate uptake and photosynthesis.

Question 6 (a)

This question was well answered by many candidates and most clearly have an excellent knowledge of the components in a reflex arc. Most candidates knew the names of the sensory and motor neurones and many others went on to describe the roles of the receptors and effectors. Strong candidates also described the role of neurotransmitters in synapses.

6 A reflex is a rapid response to a stimulus.

(a) The withdrawal of a hand when a finger touches a hot object is an example of a reflex.

Describe the pathway of a nerve impulse in the reflex arc involved in this response.

(4)

a nerve impulse is released by the CNS in response to a stimulus such as a hot object by the receptor cells. the nerve impulse travels through synapses and briefly become converted into electrical impulses in order to travel to effector cells that carry out response which removes finger from hot object.

ResultsPlus
Examiner Comments

This answer gained three marks for correct references to receptors, effectors and synapses.

6 A reflex is a rapid response to a stimulus.

(a) The withdrawal of a hand when a finger touches a hot object is an example of a reflex.

Describe the pathway of a nerve impulse in the reflex arc involved in this response.

(4)

Stimulus of hot object interacts with finger, continues to receptor through sensory neurone then relay neurone continue to reach CNS, then ~~passed~~ passes neurotransmitters to diffuse through ~~the synapse~~ synapse between neurones, ~~from~~ to motor neurone then an effector which will lift finger from hot object.

This is an excellent answer that shows all the mark points. The candidate clearly refers to the receptor, sensory neurone, synapse, neurotransmitters, motor neurone and effector.

6 A reflex is a rapid response to a stimulus.

(a) The withdrawal of a hand when a finger touches a hot object is an example of a reflex.

Describe the pathway of a nerve impulse in the reflex arc involved in this response.

(4)

When the finger touches a hot object, the sensory nueron in the hand detect this. The sensory nueron sends electrical impulses to the CNS. The CNS then passes the impulse to the relay nueron which relays the impulse to the motor nueron. When the motor nueron reaches the muscles in the hand, it causes the muscles to contract and move the finger away. This all happens in a matter of seconds.

ResultsPlus
Examiner Comments

This answer gained three marks for correct references to the sensory neurone, motor neurone and muscles.

Question 6 (b)(i)

This question was a standard graph plotting question. Most candidates drew very good quality graphs. Very few incorrectly drew bar charts and most candidates joined the points with straight lines. Candidates should be careful to label axes fully and not to extrapolate lines beyond the first and last point.

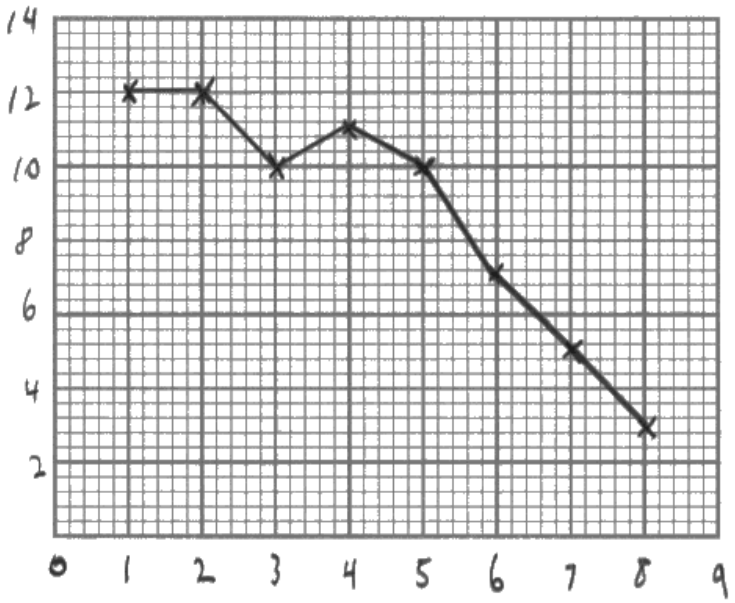
The student's results are shown in the table.

Stimulus number	Time snail remains in its shell in seconds
1	12
2	12
3	10
4	11
5	10
6	7
7	5
8	3

(i) Plot a graph to show the effect of stimulus number on the time the snail remains in its shell.

Join your points with ruled, straight lines.

(5)

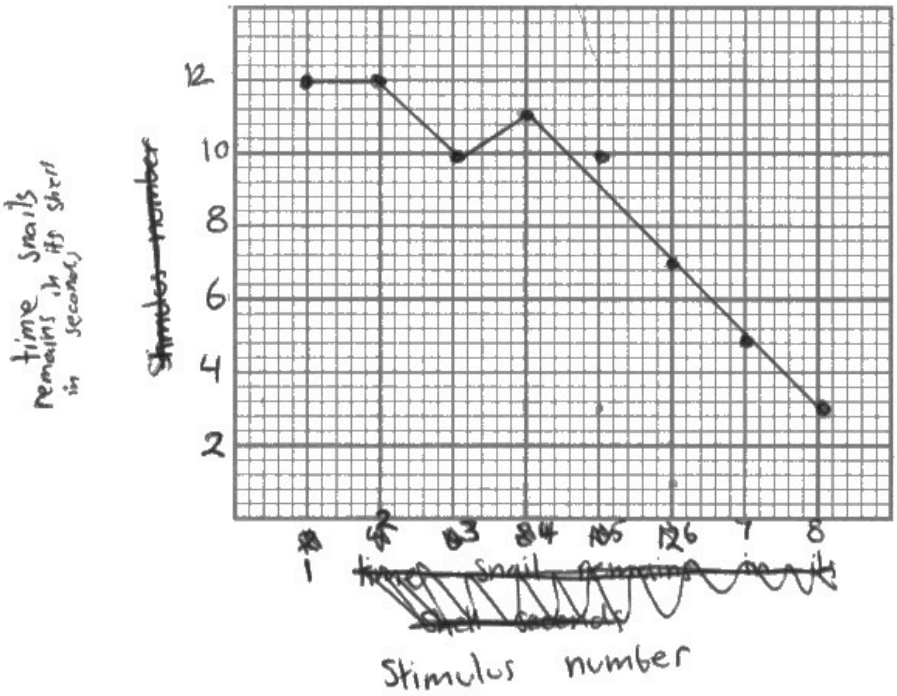


ResultsPlus
Examiner Comments

This graph gained four marks. The candidate did not label the axes so did not gain all five marks.

ResultsPlus
Examiner Tip

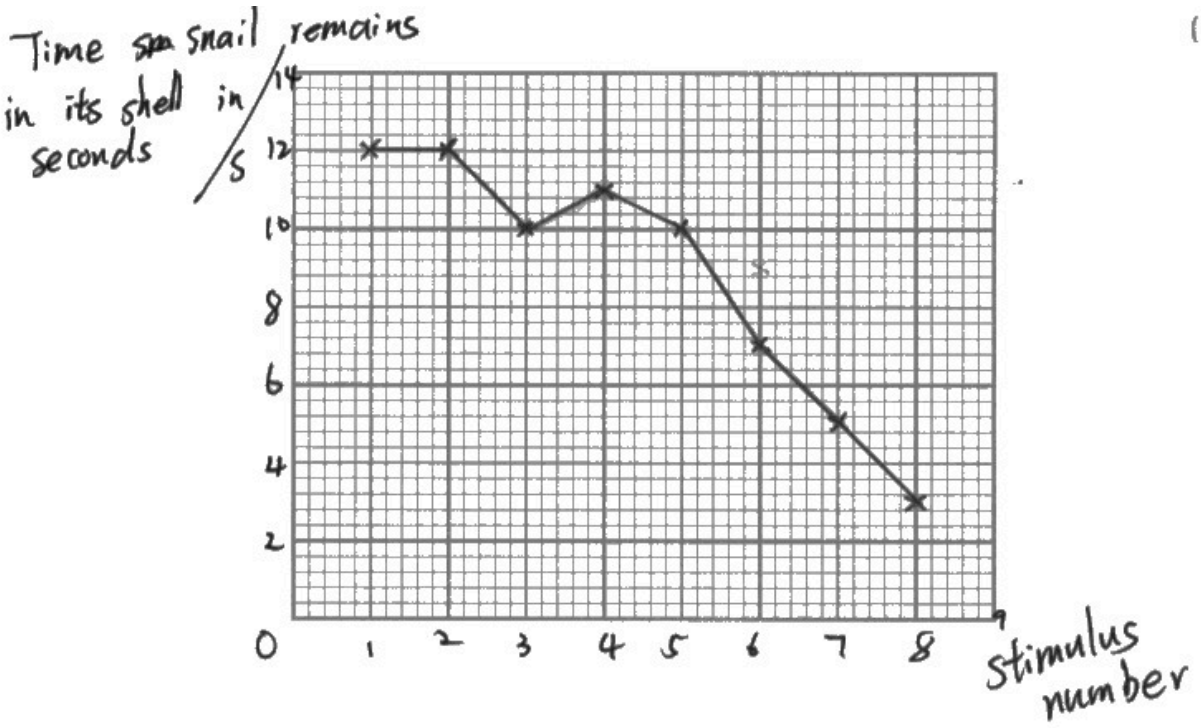
Always label axes.



ResultsPlus
Examiner Comments

This graph gained four marks. All the points have not been correctly joined by straight lines.

(5)



ResultsPlus
Examiner Comments

This graph gained all five marks. The axes are labelled, the points are plotted correctly and the lines are straight and join all the points.

ResultsPlus
Examiner Comments

This graph gained three marks. The candidate has not labelled the axes and the line has been extrapolated to the origin.

ResultsPlus
Examiner Tip

Do not extrapolate beyond the first and last points.

Question 6 (b)(ii)

This question required candidates to describe the effect of increased stimulation of the snail on the time spent within the shell. Strong answers described the decrease and identified the turning point after which the decrease is continuous. Candidates should always look for turning points in data series if a description is allocated more than one mark.

(ii) Describe the effect of increasing stimulus number on the time the snail remains in its shell.

(2)

Increase the stimulus number overall let the time snail remains in it's shell become shorter.
At the forth time the time taken of snail in shell increase 1 second.

ResultsPlus
Examiner Comments

This answer gained two marks for identifying the decrease and the fourth response causing an increase in time.

(ii) Describe the effect of increasing stimulus number on the time the snail remains in its shell.

(2)

Increasing stimulus number decreases the time the snail remains in its shell. However, ~~when~~ until the stimulus number is 2, there is no change in time the snail remains in the shell, and it fluctuates at stimulus number 3~5. It shows a consistent decrease after.

ResultsPlus
Examiner Comments

This is a very strong answer that describes the decrease and identifies that turning point at the fifth stimulus.

Question 6 (b)(iii)

This question required candidates to suggest benefits to the snail of the changes in response to repeated stimulation. Strong answers stated that the long responses to early stimulus would enable the snail to escape from danger such as predators but that increasing stimulation leads to a reduced response as the stimulus may not represent a danger. Strong answers also went on to state that by reducing the response to a harmless stimulus, the snail could spend longer eating.

(iii) Suggest a benefit to the snail of the difference in response to the repeated stimulus.

(2)

the snail stays in its shell for the longest time for the first and 2nd stimulus as to protect its self and by the 3rd stimulus the snail realises its not in danger and stays in its shell for less time as to save energy and time.

(Total for Question 6 = 13 marks)

ResultsPlus
Examiner Comments

This excellent answer gained two marks for stating that the snail recognises that the stimulus is not dangerous and that this enables the snail to save energy and time.

(iii) Suggest a benefit to the snail of the difference in response to the repeated stimulus. decreases

(2)

To protect from further harm or prevent predators and from eating the snail and is rapid and involuntory. The stimilus helps to sense danger.

ResultsPlus
Examiner Comments

This answer gained one mark for recognising that the initial responses enable escape from danger or predators.

(iii) Suggest a benefit to the snail of the difference in response to the repeated stimulus.

(2)

AS the snail gets used to the stimulus, it will know that the stimulus is not causing any harm/danger and that it is safe to remain outside of the shell. So as snail gets used to the stimulus it spends less time in its shell. It can differenciate between dangerous and non-dangerous stimuli. **(Total for Question 6 = 13 marks)**
It can adapt to a change in environment

ResultsPlus
Examiner Comments

This answer gained both marks for recognising that the initial response is to escape danger but after repeated stimulation, there is clearly no danger.

(iii) Suggest a benefit to the snail of the difference in response to the repeated stimulus.

(2)

Snail is eventually aware that there is no danger so comes out faster

ResultsPlus
Examiner Comments

This answer gained one mark for stating the repeated response shows that there is no danger.

Question 7 (a)(i)

This question generated a range of responses. Many excellent answers were seen that identified the thicker muscle, thicker elastic and absence of valves in arteries and went on to explain the purpose of these. Few candidates explained that muscle enables the regulation of blood flow. Many candidates simply referred to the thicker wall linked to blood pressure (which did gain credit) but did not mention elasticity or muscle. Most candidates recognised that arteries carry blood at higher pressure than veins with only a minority suggesting that veins have higher pressure. Some candidates stated that the lumen size would be different – this is not a feature of the blood vessel wall.

7 Coronary heart disease (CHD) is caused by damage to the walls of the coronary artery.

(a) (i) Explain two differences between the structure of the wall of an artery and the wall of a vein.

(4)

1 wall of artery is thicker to witstand high pressure of blood flow

2 wall of artery is more elastic to withstand high pressure of blood flow

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that arteries are more elastic due to the higher pressure. The candidate also states that the wall is thicker – this mark was only awarded if there were no other references to thicker muscle or thicker elastic.

7 Coronary heart disease (CHD) is caused by damage to the walls of the coronary artery.

(a) (i) Explain two differences between the structure of the wall of an artery and the wall of a vein.

(4)

1 The artery has a thicker wall so it can withstand and maintain a high pressur as it pumps ~~blood~~ oxygenated blood to the body. Veins have a thinner wall; carry blood at a lower pressure.

2 Veins have a larger lumen while the the artery has a smaller lumen allowing for a high pressure as it carriyes blood for a longer distance. (veins have valves) to prevent backflow.

ResultsPlus
Examiner Comments

This answer gained four marks for the thicker wall linked to high blood pressure and the presence of valves in veins linked to backflow. No credit is awarded for thickness of the lumen as the question is focused on the wall.

7 Coronary heart disease (CHD) is caused by damage to the walls of the coronary artery.

(a) (i) Explain two differences between the structure of the wall of an artery and the wall of a vein.

(4)

1 the artery has thick walls in order to be able to maintain the blood pressure throughout the body

2 the vein has a wide lumen so that there is less resistance while delivering deoxygenated blood.

ResultsPlus
Examiner Comments

This answer gained two marks for the thicker wall linked to the high pressure. Marks for the thicker wall were awarded if no marks had already been awarded for the idea of thicker muscle or thicker elastic.

7 Coronary heart disease (CHD) is caused by damage to the walls of the coronary artery.

(a) (i) Explain two differences between the structure of the wall of an artery and the wall of a vein.

(4)

1 Artery is thicker than vein. the blood pressure is higher in the artery so the muscle wall is thicker.

2 Artery is more elastic than vein. The blood pressure is higher in artery which means there more blood flow through so the artery wall have to be elastic to prevent exploded.

ResultsPlus
Examiner Comments

This answer gained three marks for the idea of thick elastic linked to high pressure and thick muscle. There is no link of the muscle with the regulation of blood flow.

Question 7 (a)(ii)

This question presented candidates with stimulus material of a diagram of a section of partially blocked coronary artery. Candidates needed to explain why the heart would be less able to respond during exercise. Strong answers explained that there would be less blood flow and so less transfer of oxygen leading to reduced respiration. Weaker answers simply described the diagram rather than linking it to an explanation. Candidates should always link oxygen to respiration and energy release in these types of question.

(ii) The diagram shows a cross-section of a coronary artery from a healthy person and from a person with CHD.

Artery from a healthy person

Artery from a person with CHD

The heart needs to respond to extra demands during exercise.

Explain why, during exercise, the heart of a person with CHD would not respond as efficiently as the heart of a healthy person.

(3)

Due to the blockage the amount of pumped oxigenated blood will be decrease and can cause tiredness fast and cramps due to blood not having the right mass to oxigenate the muscles.

ResultsPlus
Examiner Comments

This answer gained two marks for the idea of reduced blood flow and reduced oxygen supply.

(ii) The diagram shows a cross-section of a coronary artery from a healthy person and from a person with CHD.

Artery from a healthy person

Artery from a person with CHD

The heart needs to respond to extra demands during exercise.

Explain why, during exercise, the heart of a person with CHD would not respond as efficiently as the heart of a healthy person.

(3)

Artery is more narrow and block by things.
Less blood transport, less oxygen, less respiration, and inefficient of producing glucose and ATP for muscle.

ResultsPlus
Examiner Comments

This answer gained all three marks. The candidate clearly describes the reduced blood flow and links it to the reduced circulation of oxygen and reduced respiration.

(ii) The diagram shows a cross-section of a coronary artery from a healthy person and from a person with CHD.

Artery from a healthy person

Artery from a person with CHD

The heart needs to respond to extra demands during exercise.

Explain why, during exercise, the heart of a person with CHD would not respond as efficiently as the heart of a healthy person.

(3)

During exercise, a person's ~~body~~ heart needs more oxygen and glucose to respire and create ATP for ~~the~~ cardiac ~~heart~~ muscle to contract, body muscles also need oxygen. CHD artery is not as wide as a healthy artery, so less amount of blood is carried per unit time, so less oxygen is supplied. This will cause one to get tired more easily. Muscles will start to respire anaerobically which produce lactic acid and cause muscle soreness.

ResultsPlus
Examiner Comments

This is a strong answer that gains all three marks. The candidate clearly explains the effect of the reduced blood flow linked to reduced respiration and oxygen.

Question 7 (b)(i)

This question was generally well answered. Most candidates were able to suggest other risk factors for coronary heart disease. The most common correct suggestions included high fat diet, stress and lack of exercise. A few candidates gave vague suggestions such as bad diet – candidates should qualify what is meant by a term such as 'bad'.

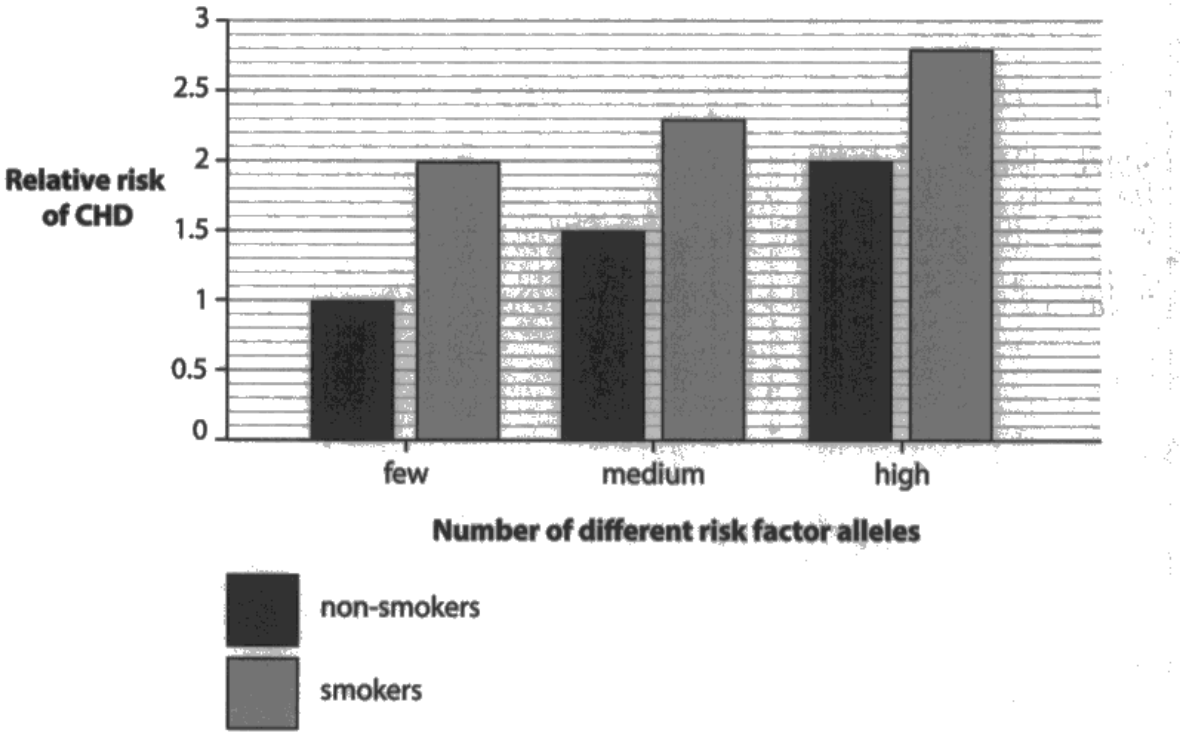
(b) Genetics and smoking are two risk factors for CHD.

The alleles of some genes increase the risk of developing CHD in people. These are known as risk factor alleles.

Scientists compared the relative risk of developing CHD in people with different numbers of these risk factor alleles.

The scientists also compared the risk of developing CHD for non-smokers and smokers.

The graph shows the scientists' results.



(i) Give one risk factor for CHD, other than genetics and smoking.

(1)

obesity

ResultsPlus
Examiner Comments

Obesity is an example of a common, correct answer.

(b) Genetics and smoking are two risk factors for CHD.

The alleles of some genes increase the risk of developing CHD in people. These are known as risk factor alleles.

Scientists compared the relative risk of developing CHD in people with different numbers of these risk factor alleles.

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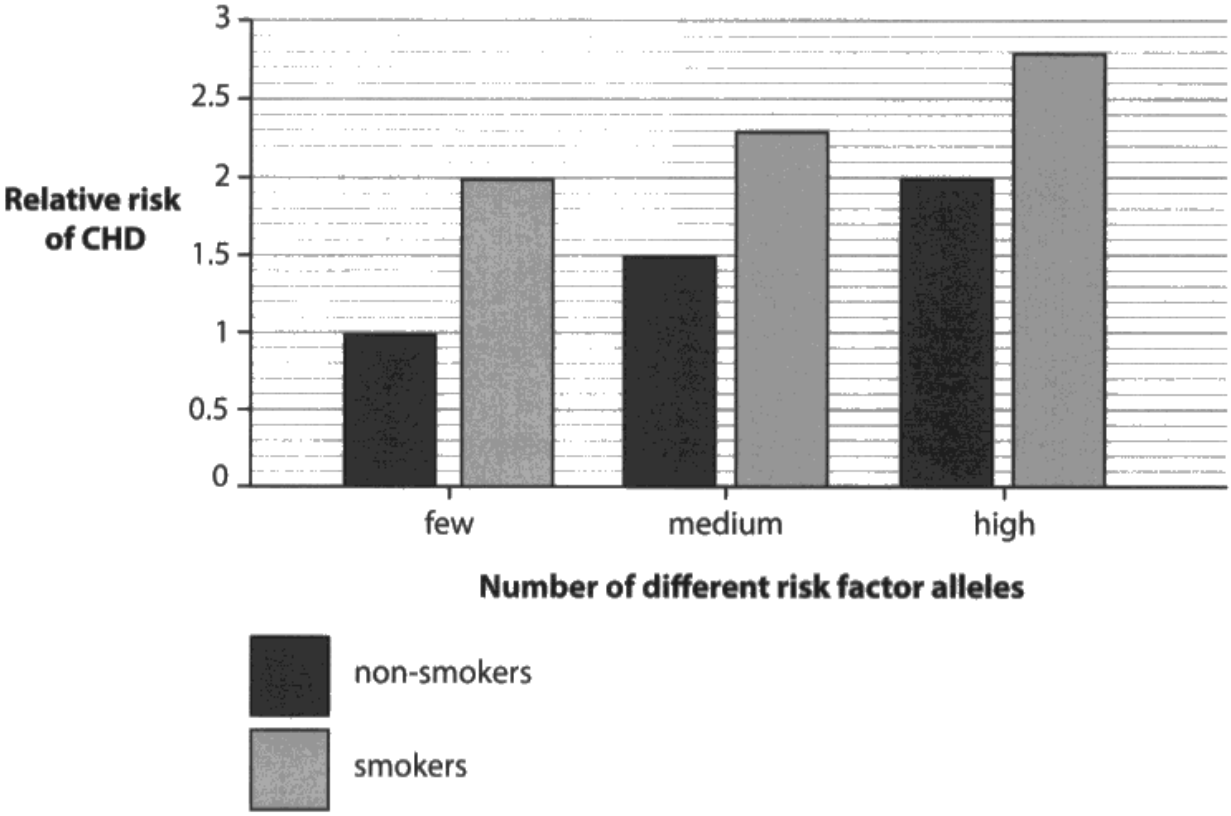


(i) Give one risk factor for CHD, other than genetics and smoking.

(1)

diet

ResultsPlus
Examiner Comments

This answer was not awarded any marks. Diet was insufficient – the candidate needed to refer to a 'high fat diet'.

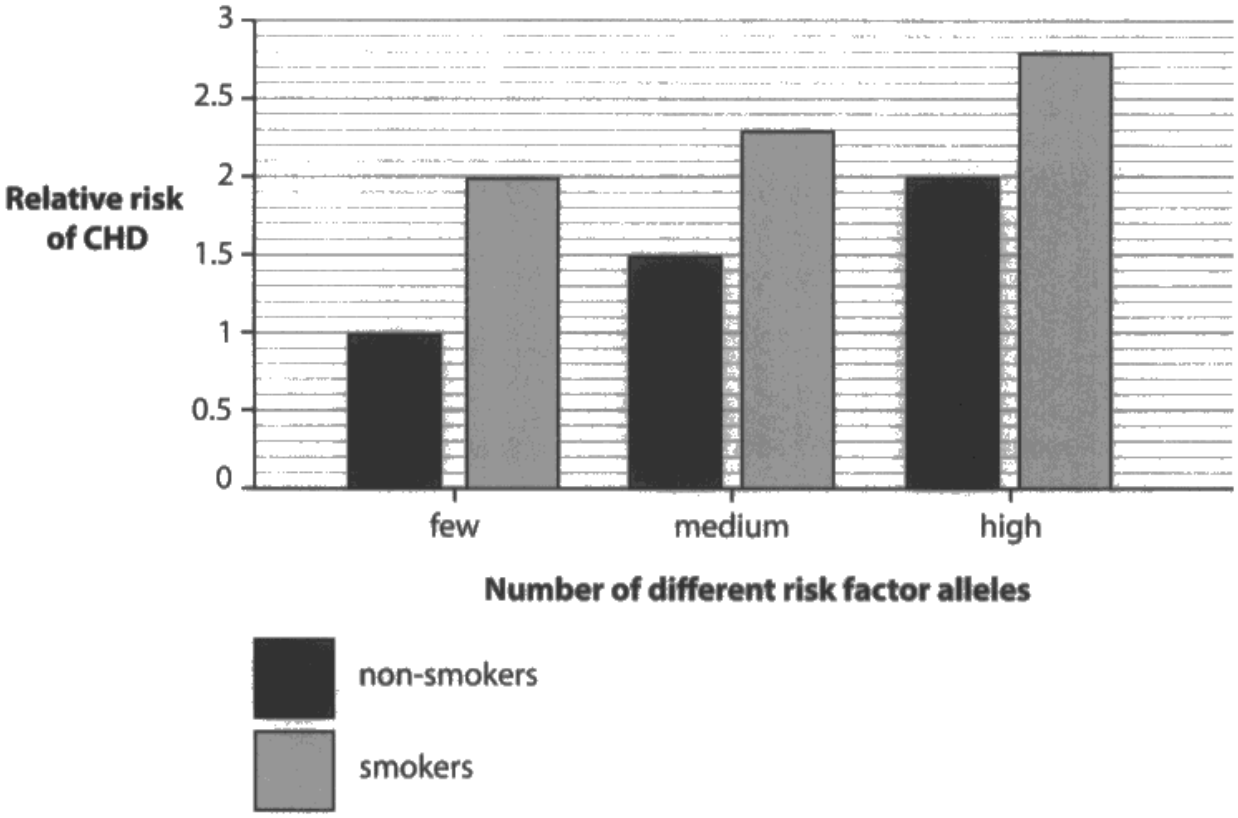
(b) Genetics and smoking are two risk factors for CHD.

The alleles of some genes increase the risk of developing CHD in people. These are known as risk factor alleles.

Scientists compared the relative risk of developing CHD in people with different numbers of these risk factor alleles.

The scientists also compared the risk of developing CHD for non-smokers and smokers.

The graph shows the scientists' results.



(i) Give one risk factor for CHD, other than genetics and smoking.

(1)

High A cholesterol diet

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of high cholesterol diet.

Question 7 (b)(ii)

This question was a longer, extended answer question that presented candidates with the effects of increasing number of heart disease alleles and the effects of smoking. Many candidates gained at least one mark with a significant number going on to gain at least three. Most candidates recognised that increasing smoking and the number of alleles both increase the risk. Strong answers used manipulated numerical data and / or identified the highest or lowest risk group. Strong answers also gave explanations for the effect of smoking due to carbon monoxide. Strong answers also discussed the experimental data in terms of information about other factors and the lack of a sample size.

(ii) Comment on the relationship between the number of risk factor alleles and smoking on the risk of developing CHD.

Use data from the graph to help your answer.

(5)

- Non-smokers with few risk factor allele has the lowest relative risk of CHD, while smokers with high factor alleles has the highest relative risk of CHD.
- Smokers with high risk factor alleles: smoking increase the risk on development of CHD as it contains carbon monoxide which deprives a person's blood from carrying oxygen. The smoke and chemicals on the smoke and some fatty substance could also block the walls of some coronary arteries, so oxygen won't reach them and won't be able to respire and contrad with the muscles as less blood reached. Alleles increase the factors as the people inherit genes or genetic predisposition on inheriting the disease. So the higher the shared genes, the higher risk people develops CHD. This is supported as they have the highest rate of 2.8 relative risks on the data.
- On the other hand non-smokers contains less risks due to less harmful chemicals and few alleles has least genetic predisposition. They have the least risk of only 1
- No data on peoples age, mass, gender or medical record.

(Total for Question 7 = 13 marks)

ResultsPlus
Examiner Comments

This excellent answer gained all five marks. The candidate describes the increased risk from smoking and more alleles. They also state that smokers with high numbers of alleles have the highest risk. The candidate also goes on to explain the effect of carbon monoxide and the lack of controls in the data.

(ii) Comment on the relationship between the number of risk factor alleles and smoking on the risk of developing CHD.

Use data from the graph to help your answer.

(5)

people who smoke and have few risk ~~factor~~ factor alleles have a relative risk of 2, while people who don't smoke have a risk of 1. This shows smoking increases the risk of CHD. people who have ~~[illegible]~~ medium risk factors and smoke have a risk of 2·3, while people who don't smoke have a risk of 1·5. People with high risk factors ~~[illegible]~~ and smoke have a risk factor of 2·8, while people who don't smoke have a risk of 2. This shows that the risk of developing CHD increases in people who smoke compared to people who don't.

ResultsPlus
Examiner Comments

This answer only gained one mark. The candidate has simply quoted the data and not described how the factors increase the risk, apart from at the end where they state that smoking increases the risk.

ResultsPlus
Examiner Tip

Don't just quote data, refer to patterns and also carry out manipulations of data to support your answers.

(ii) Comment on the relationship between the number of risk factor alleles and smoking on the risk of developing CHD.

Use data from the graph to help your answer.

(5)

The higher number of different risk factor alleles, the higher relative risk of CHD. The ~~smoek~~ smokers are always have higher risk of CHD than non-smokers with similar condition. The smokers with high risk ~~of~~ factor alleles has the biggest risk of CHD. The smoking on the risk is higher than number of risk factor alleles.

ResultsPlus
Examiner Comments

This answer gained three marks. The candidate clearly states that both smoking and number of alleles increase the risk and that smokers with many alleles have the highest risk. There is no manipulation of data, explanation or comment about the quality of the investigation.

(ii) Comment on the relationship between the number of risk factor alleles and smoking on the risk of developing CHD.

Use data from the graph to help your answer.

(5)

Base on the graph, non-smokers with a different amount of risk factors are less likely to have the risk of CHD compare to smokers. ~~With 1 relative risk for more~~ The risk of having CHD increase for people who have a lot of risk factor alleles for both smokers and non smokers. It can be presented by the data that for non-smokers with few risk factor alleles, the relative risk is 1. But for non-smokers which have high risk factor alleles, the relative risk increase to 2. For smokers who have few risk factors, the relative risk is 2, but for those who have a high risk factor, the risk increase to 2.8. Overall, the relationship is that as the number of different risk factor allels increase, the likelyhood for the relative risk to get CHD for both smokers and non-smokers. But in comparision, smokers have a greater risk for getting CHD even though they have same number of different factor alleles.

ResultsPlus
Examiner Comments

This answer gained two marks for correctly stating that smokers with few alleles have the lowest risk and that smoking increases the risk.

Question 8 (a)(i)

This question assessed candidates' ability to interpret a pedigree diagram and go on to generate a genetic cross. Many candidates were able to correctly deduce the genotypes of the parents and go on to give the probability of producing a lactose intolerant offspring. Many excellent Punnett squares were seen and it is clear that many candidates have an excellent understanding of this aspect of genetics. A few candidates gave the incorrect parental genotypes. Some candidates suggested that the inheritance was sex-linked – candidates should remember that sex-linkage is **not** on the specification.

8 Lactose is the sugar found in milk.

The lactose needs to be digested in humans by an enzyme called lactase so the products can be absorbed.

All human babies produce lactase in their intestines.

People who are lactose intolerant stop producing lactase and are unable to digest lactose sugar as adults.

Lactose intolerance is a genetic condition caused by a recessive allele, **d**.

The ability to digest lactose is caused by a dominant allele, **D**.

(a) (i) The diagram shows a family pedigree.

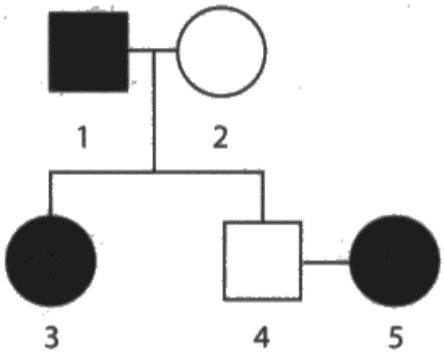
Key

male with lactose intolerance

male without lactose intolerance

female with lactose intolerance

female without lactose intolerance



Use a genetic diagram to determine the probability of individuals 4 and 5 having a child with lactose intolerance.

(4)

Draft

	X^d	Y
X^D	X^DX^d	X^DY
X^d	X^dX^d	X^dY

	X^D	Y
X^d	X^DX^d	X^dY
X^d	X^DX^d	X^dY

Parent gamete

offspring genotype X^DX^d X^dY X^DX^d X^dY

phenotype ♀ without lactose intolerance : ♀ with lactose

probability = 50%

ResultsPlus
Examiner Comments

This is an example of where a candidate has suggested that the inheritance pattern is sex-linked. One mark was awarded as an error carried forward mark. Sex-linkage will not be asked for in examinations as it is not on the specification.

ResultsPlus
Examiner Tip

Remember that sex-linkage is not on the specification.

8 Lactose is the sugar found in milk.

The lactose needs to be digested in humans by an enzyme called lactase so the products can be absorbed.

All human babies produce lactase in their intestines.

People who are lactose intolerant stop producing lactase and are unable to digest lactose sugar as adults.

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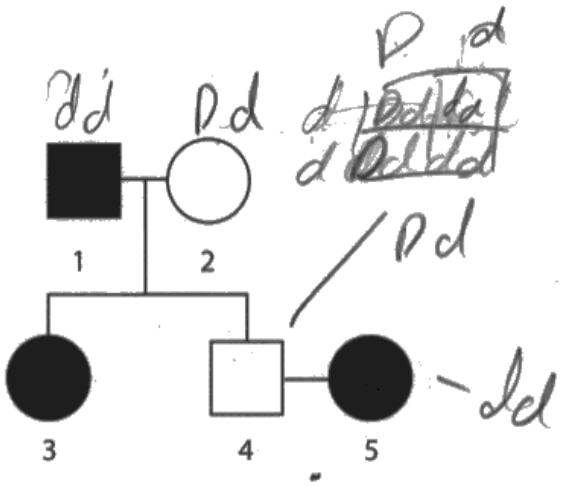

Use a genetic diagram to determine the probability of individuals 4 and 5 having a child with lactose intolerance.

(4)

Parents phenotype ~~intolerant x tolerant~~ tolerant x intolerant

genotype D d dd

gametes (D) (d) x (d)

Punnett square

	D	d
d	Dd	dd
d	Dd	dd

Child

genotype 2/4 ~~50%~~ Dd, 2/4 ~~50%~~ dd

phenotype 1/2 ~~50%~~ tolerant

1/2 ~~50%~~ intolerant

probability = 5 1/2

ResultsPlus
Examiner Comments

This answer gained all four marks. The candidate has set out the genetic cross clearly and clearly shows the gametes and genotypes of both parents and offspring.

ResultsPlus
Examiner Tip

Use letters that are given to you in the question, in this case, D and d.

8 Lactose is the sugar found in milk.

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All human babies produce lactase in their intestines.

People who are lactose intolerant stop producing lactase and are unable to digest lactose sugar as adults.

Lactose intolerance is a genetic condition caused by a recessive allele, **d**.

The ability to digest lactose is caused by a dominant allele, **D**.

(a) (i) The diagram shows a family pedigree.

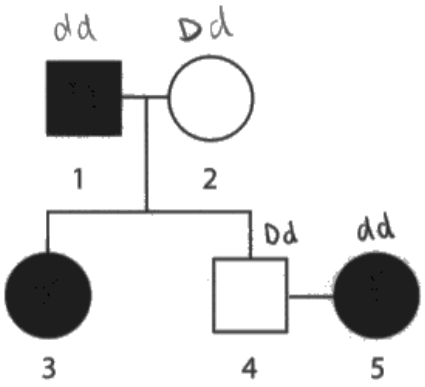
Key

male with lactose intolerance dd

male without lactose intolerance Dd

female with lactose intolerance dd

female without lactose intolerance Dd



Use a genetic diagram to determine the probability of individuals 4 and 5 having a child with lactose intolerance.

(4)

parents — Male — Female

genotype — Dd — dd

gametes — D, d — d

punnet diagram

	D	d
d	Dd	dd
d	Dd	dd

50% lactose tolerant
50% lactose intolerant

50% Homozygous recessive
50% Heterozygous

1 : 1

probability = $\frac{1}{2}$

ResultsPlus
Examiner Comments

This is an excellent example of an answer that gained all four marks. The cross is set out clearly and the candidate shows the gametes and all other genotypes.

8 Lactose is the sugar found in milk.

The lactose needs to be digested in humans by an enzyme called lactase so the products can be absorbed.

All human babies produce lactase in their intestines.

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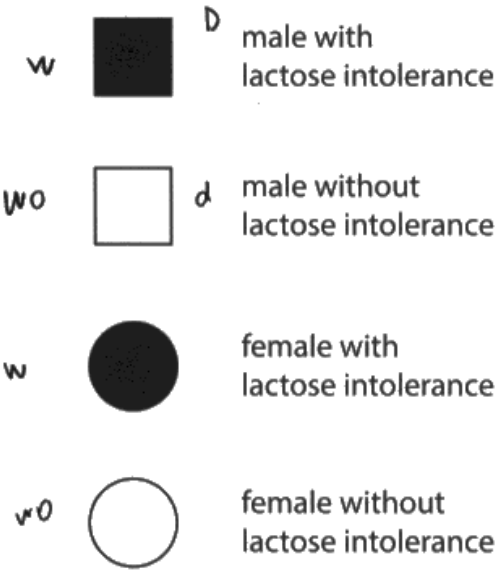
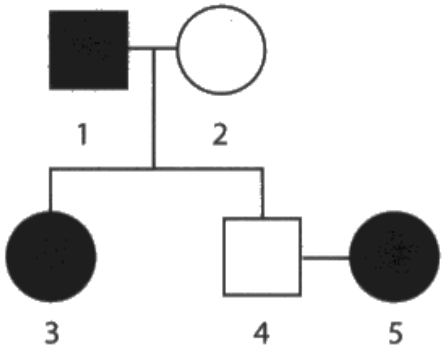
Lactose intolerance is a genetic condition caused by a recessive allele, **d**.

The ability to digest lactose is caused by a dominant allele, **D**.

(a) (i) The diagram shows a family pedigree.

Key





Use a genetic diagram to determine the probability of individuals 4 and 5 having a child with lactose intolerance.

(4)

D = w
d = wo

	D	d
D	DD	Dd
d	Dd	dd

probability = 75/100 → 3/4

This answer gained one mark for error carried forward. The parental genotypes are incorrect but the candidate has correctly used these in the Punnett square.

8 Lactose is the sugar found in milk.

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All human babies produce lactase in their intestines.

People who are lactose intolerant stop producing lactase and are unable to digest lactose sugar as adults.

Lactose intolerance is a genetic condition caused by a recessive allele, **d**.

The ability to digest lactose is caused by a dominant allele, **D**.

(a) (i) The diagram shows a family pedigree.

Key

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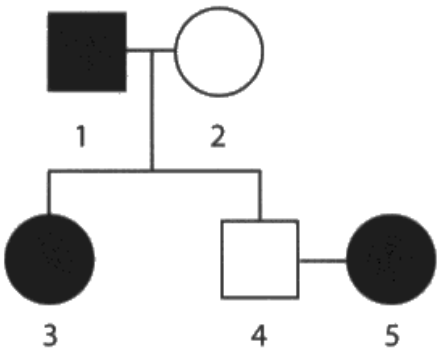


Use a genetic diagram to determine the probability of individuals 4 and 5 having a child with lactose intolerance.

(4)

= dd

= Dd

	d	d
D	Dd	dd
d	dd	dd

probability = 75%

ResultsPlus
Examiner Comments

This answer gained two marks. The candidate has the correct parental genotypes and gametes but has not completed the cross correctly.

Question 8 (a)(ii)

This challenging question required candidates to use their knowledge to suggest why lactose intolerance causes diarrhoea. Strong answers referred to the inability of the intestines to absorb the sugar leading to a lowering of water potential so that water would not be absorbed. Weaker answers simply restated the question stem, stating that lactose cannot be digested.

(ii) People with lactose intolerance often get diarrhoea (production of faeces with high water content) if they drink milk.

Suggest why people who cannot digest lactose get diarrhoea if they drink milk.

(2)

This is because lactose cannot be broken down by the enzyme lactase this means the products aren't absorbed causing diarrhoea.

ResultsPlus
Examiner Comments

This gained one mark for the idea that the products of lactose digestion would not be able to be absorbed.

(ii) People with lactose intolerance often get diarrhoea (production of faeces with high water content) if they drink milk.

Suggest why people who cannot digest lactose get diarrhoea if they drink milk.

(2)

because the milk is undigested (milk) there is more undigested waste in the large intestine, milk also has very high water content so the faeces will have higher water content

ResultsPlus
Examiner Comments

This example gained one mark for correctly identifying that the large intestine is the site of water uptake.

(ii) People with lactose intolerance often get diarrhoea (production of faeces with high water content) if they drink milk.

Suggest why people who cannot digest lactose get diarrhoea if they drink milk.

(2)

The sugar, lactose cannot be digested (or absorbed), so it is instead egested along with the liquid in milk, therefore the faeces would have high water content.

ResultsPlus
Examiner Comments

This answer gained one mark for stating that the lactose cannot be absorbed.

(ii) People with lactose intolerance often get diarrhoea (production of faeces with high water content) if they drink milk.

Suggest why people who cannot digest lactose get diarrhoea if they drink milk.

(2)

Because ~~they cannot digest lactose,~~ large intestine absorbs less water

ResultsPlus
Examiner Comments

This answer gained two marks for stating that water is not absorbed in the large intestine.

Question 8 (a)(iii)

This question about natural selection was well answered by many candidates. Many candidates recognised that a mutation would have occurred that led to genetic variation. Most also explained that lactose tolerance would be a survival advantage leading to higher reproduction and the passing on of the allele. Weaker answers often did not refer to mutations or the idea of a survival advantage.

(iii) Milk is a nutritious substance that provides several food groups.

In areas of the world where milk is a main part of the diet, fewer people are lactose intolerant.

Explain how natural selection has resulted in fewer people being lactose intolerant in areas of the world where milk is a main part of the diet throughout their lives.

(4)

There is a ~~terie~~ variation among the people due to mutation. People who ~~are no~~ don't have lactose intolerance can survive better since they get more nutrition and are more adapted to the diet from their area of the world. ~~People~~ So these people without lactose intolerance reproduce to pass their gene to the offsprings. So there are more people without lactose intolerance. People with lactose intolerance decrease in number as some die from diarrhoea. So there are fewer people with lactose intolerance.

ResultsPlus
Examiner Comments

This is a strong answer that gained all four marks. The candidate refers to the mutation and explains how this leads to a survival advantage, reproduction and the passing on of the gene for lactose tolerance.

(iii) Milk is a nutritious substance that provides several food groups.

In areas of the world where milk is a main part of the diet, fewer people are lactose intolerant.

Explain how natural selection has resulted in fewer people being lactose intolerant in areas of the world where milk is a main part of the diet throughout their lives.

(4)

There is a genetic mutation among the human population. They People with the ability to digest lactose, they become environmentally fit for and can get the nutritions of milk. People with lactose intolerance, cannot obsorb the nutrients of milk. They become enviromentally against and die, from lack of nutrition. People with ability to digest lactose survive and reproduces to pass on their genes to offspring.

ResultsPlus
Examiner Comments

This is another well-structure answer that explains how a mutation leads to survival advantage and the passing on of an allele to the offspring.

(iii) Milk is a nutritious substance that provides several food groups.

In areas of the world where milk is a main part of the diet, fewer people are lactose intolerant.

Explain how natural selection has resulted in fewer people being lactose intolerant in areas of the world where milk is a main part of the diet throughout their lives.

(4)

This is because they changed ~~and~~ since they drink milk a lot of their DNA starts to change and natural selection happens. This is because ~~if natural~~ the body starts getting more used to the lactose. More parents also produce more offspring that don't have have lactose intolerance. Therefore fewer people have it.

ResultsPlus
Examiner Comments

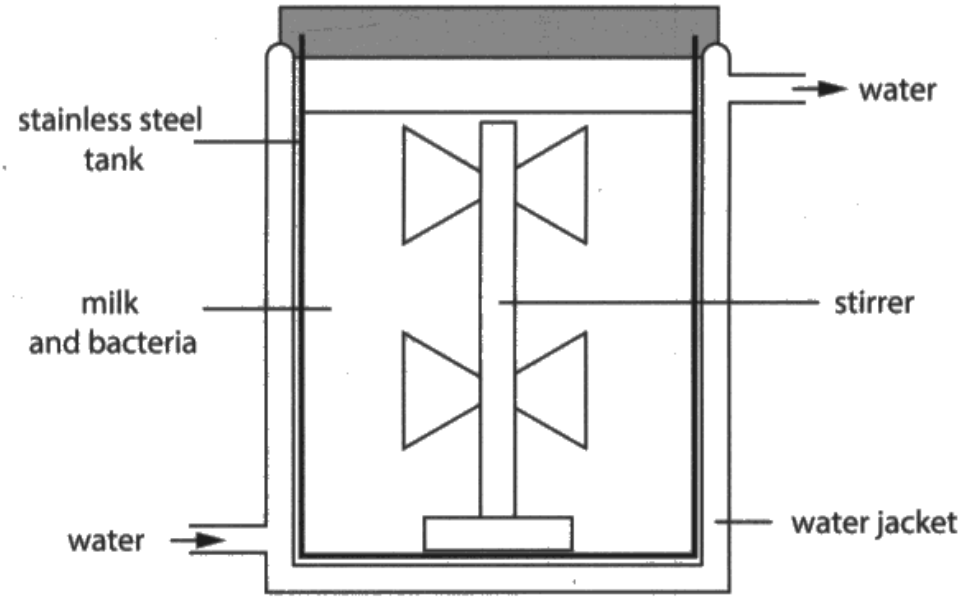
This answer gained only one mark for the idea of reproduction.

Question 8 (b)(i)

This question assessed candidates' understanding of the role of stirrers in fermenters. Most candidates recognised that the purpose of the stirrer is to agitate the mixture so that there is good contact between microbes and nutrients. Strong answers also explained how the stirrer maintains an even temperature. Weaker answers often gave descriptions of the process of fermentation.

(b) Milk can be used to produce yoghurt.

The diagram shows a fermenter that can be used to produce yoghurt in industry.



(i) Explain the role of the stirrer in the fermenter.

(2)

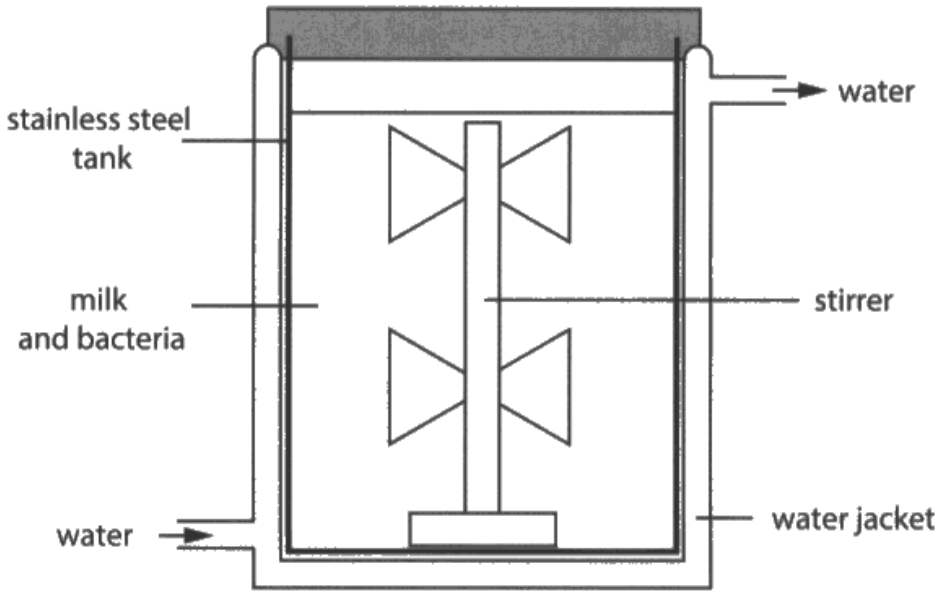
Ensure that temperature and nutrients are evenly distributed throughout the fermenter. This would allow increased rate of production of yoghurt.

ResultsPlus
Examiner Comments

This strong answer gained both marks for correctly explaining that the stirrer maintains even distribution of temperature and nutrients.

(b) Milk can be used to produce yoghurt.

The diagram shows a fermenter that can be used to produce yoghurt in industry.



(i) Explain the role of the stirrer in the fermenter.

(2)

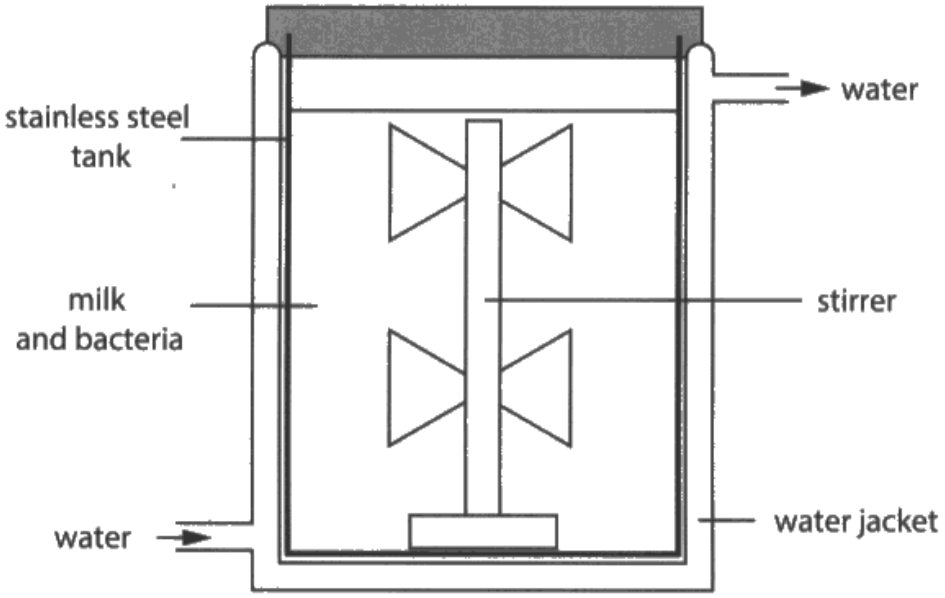
mix around the nutrients and microorganisms and temperature so that everything is distrobuted evenly and this allows the lactobacillies to carry out its functions with a optimum temperature and pH.

ResultsPlus
Examiner Comments

This excellent answer also explains that the stirrer distributes the nutrients and keeps an even temperature.

(b) Milk can be used to produce yoghurt.

The diagram shows a fermenter that can be used to produce yoghurt in industry.



(i) Explain the role of the stirrer in the fermenter.

(2)

The stirrer will evenly distribute the bacteria through the milk to ensure they have contact with the milk at all times to ensure fermentation can occur equally throughout the milk to produce yoghurt.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of maintaining an even distribution of nutrients but did not make any mention of even temperature.

Question 8 (b)(ii)

This question tested candidates' understanding of the role of the water jacket. Many excellent answers were seen that explained its role in removing heat released by fermentation in order to maintain an optimum temperature and so prevent enzymes denaturing and / or microbes dying. Some weaker candidates had an understanding of the roles of enzymes and bacteria but often confused the effects of high temperature, incorrectly stating that high temperature 'kills enzymes' or 'denatures bacteria'.

(ii) Explain the role of the water jacket in the fermenter.

(2)

keeps the fermenter at the optimum temperature for enzymes as respiration produces heat the jacket of cool water lowers it.

ResultsPlus Examiner Comments

This is a strong answer that gains both marks for correctly stating that the water jacket cools the fermenter and maintains an optimal temperature.

(ii) Explain the role of the water jacket in the fermenter.

(2)

to maintain the optimum temperature for enzymes and cool down the fermenter when it gets too hot to avoid denaturing.

ResultsPlus Examiner Comments

This strong answer gained two marks for stating that the water jacket maintains an optimal temperature and prevents enzymes from denaturing.

(ii) Explain the role of the water jacket in the fermenter.

(2)

Controls the temperature of the fermenter by cooling it down when the ~~temperature~~ temperature gets too high. Remain optimum temperature for yeast, high temperature cause ezyme denature.

ResultsPlus
Examiner Comments

This is an excellent answer that illustrates all three mark points – the candidate explains that the water jacket cools the fermenter, maintains an optimal temperature and prevents enzymes denaturing.

(ii) Explain the role of the water jacket in the fermenter.

(2)

Water Jacket has cold water inside to cooldown temprature in fermenter incase temperature is too high for enzymes to operate, so can continue to make yoghurt.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea of cooling. The candidate has almost considered the idea of optimal temperature but has not quite used that phrase.

ResultsPlus
Examiner Tip

Always use key scientific vocabulary.

Question 9 (a)

This question was well answered by many candidates with a significant number gaining at least two marks. Many candidates understood that restriction enzymes cut DNA and ligase sticks DNA together. Fewer candidates referred to the role of plasmids. Weaker answers confused the roles of the two enzymes, did not name the enzymes, or referred to the fusing of genes with tomatoes rather than with DNA. Candidates should always try to give as much detail as possible, using key words that are listed in the specification.

9 Transgenic varieties of tomato plants have been produced that can photosynthesise more efficiently than natural varieties.

(a) To make the transgenic tomato plants, a gene is inserted into a vector that is then placed into tomato plant cells.

Describe how a recombinant vector containing a gene can be produced.

(3)

Cut out the gene of normato plant cells then stick it at the end of the gene and then place back into tomato plant cells.

ResultsPlus
Examiner Comments

This answer gained no marks. There is no mention of either restriction enzymes, ligase or plasmids. The candidate has mentioned the fact that genes are cut out but does not explain how this is performed.

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(a) To make the transgenic tomato plants, a gene is inserted into a vector that is then placed into tomato plant cells.

Describe how a recombinant vector containing a gene can be produced.

(3)

A recombinant vector containing a gene can be produced by using restriction enzymes that cuts and join the DNA of a gene and inserted to the other gene.

ResultsPlus
Examiner Comments

This answer gained one mark for the idea that restriction enzymes cut DNA.

9 Transgenic varieties of tomato plants have been produced that can photosynthesise more efficiently than natural varieties.

(a) To make the transgenic tomato plants, a gene is inserted into a vector that is then placed into tomato plant cells.

Describe how a recombinant vector containing a gene can be produced.

(3)

A restriction enzyme is used to cut open and remove the desired gene and is placed inside a plasmid. ~~inside the~~ This is then glued together with ligase and ~~results in~~ is placed inside the vector. This is ~~then a~~ called a recombinant vector.

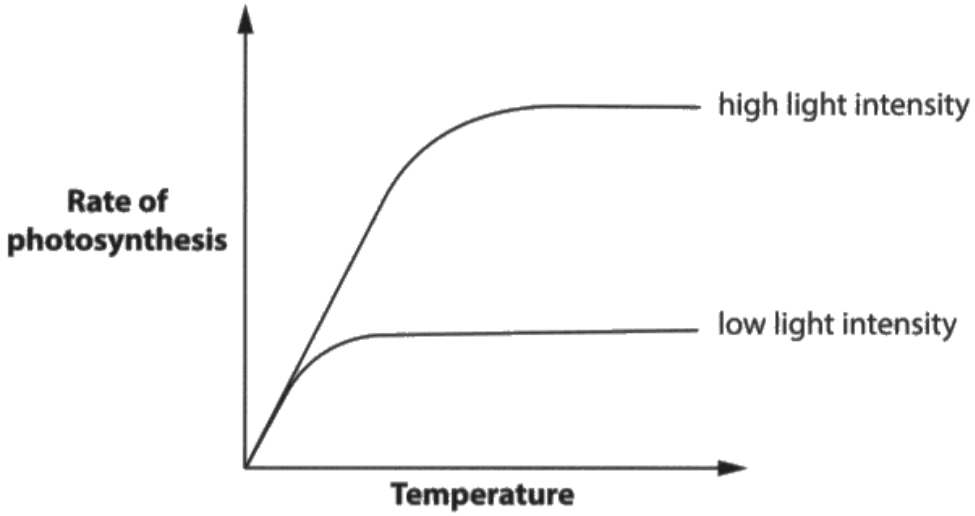
ResultsPlus
Examiner Comments

This answer gained all three marks for correctly explaining the roles of restriction enzymes, ligase and plasmids.

Question 9 (b)

Many candidates gained at least one mark for this question but few went on to gain all three. Most were able to describe how increasing temperature increased the rate of photosynthesis, but fewer candidates explained why this occurred. Strong answers explained how at higher temperatures there would be more enzyme-substrate collisions, and that at low light intensity eventually light is the limiting factor. Some excellent answers went on to suggest that at high light intensities, factors such as carbon dioxide concentration would limit the rate. Weaker answers often gained one mark for stating that the rate increases with increasing temperature but did not give any explanation.

(b) The graph shows the effect of temperature on the rate of photosynthesis of tomato plants at two different light intensities.



Explain the effect of temperature on the rate of photosynthesis of the tomato plants at high and low light intensity.

(3)

~~write~~ with higher temperatures the photosynthetic rate increases as the kinetic energy of particles increases collisions.

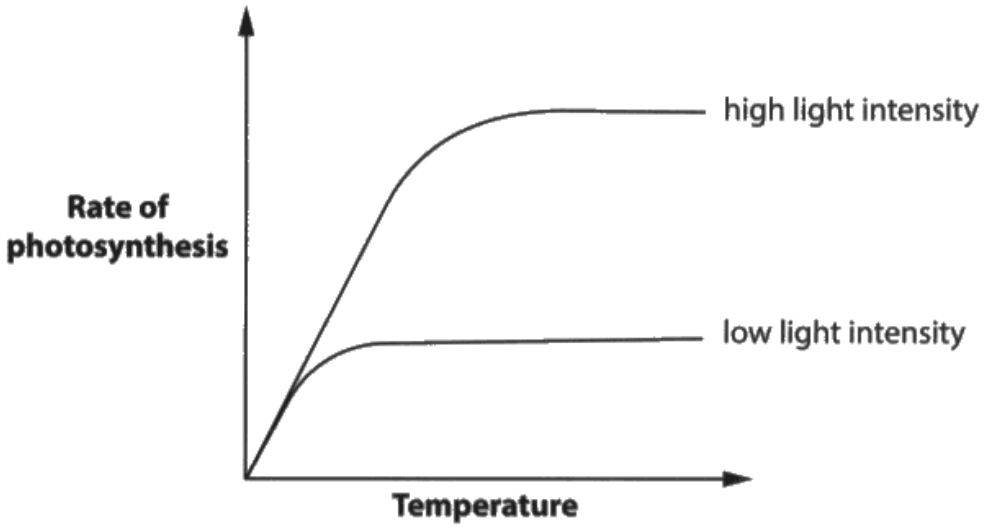
At higher light intensities the rate of photosynthesis is even greater as light is needed for the reactions. Due to other limiting factors the graph levels off soon.

ResultsPlus
Examiner Comments

This is a very strong answer that gained all three marks. The candidate has correctly stated that the rate increases with increasing temperature and goes on to explain this in terms of kinetics. The candidate also goes on to explain that other factors must limit the rate of reaction as temperature increases.

offspring can also effectively photosynthesise. Because of the recombinant vector.

(b) The graph shows the effect of temperature on the rate of photosynthesis of tomato plants at two different light intensities.



Explain the effect of temperature on the rate of photosynthesis of the tomato plants at high and low light intensity.

(3)

In low light intensity, first temperatures increase the rate of photosynthesis, but the light intensity is a limiting factor so the rate of photosynthesis is constant. After the light intesity increases, the rate of photosynthesis increases even more because the limiting factor is taken care of. However, a new limiting factor appears and it's carbon dioxide or the temperature because it is already in high light, because the rate of photosynthesis goes constant.

ResultsPlus
Examiner Comments

This is an excellent answer that describes the effect of temperature and goes on to explain that low light limits the rate and that other factors such as carbon dioxide limit the rate at high light intensity.

Question 9 (c)

This longer discussion question generated a wide range of answers. The question presented candidates with a glasshouse that produces tomatoes sustainably. Many excellent answers were seen that gained at least four marks. Strong answers explained how the glasshouse system optimised carbon dioxide, temperature, light for maximal photosynthesis and yields. Strong answers also went on to explain how wood is a sustainable fuel and that the capture of carbon dioxide would reduce greenhouse effects. Weaker answers tended to focus on one aspect, for example the idea of increased yield or the lack of pollution. When discussing pollution, candidates should give specific examples such as greenhouse gases or sulfur dioxide causing acid rain rather than simply stating that fossil fuel use causes pollution.

Discuss the advantages of growing tomato plants in this glasshouse system.

In your answer include the benefits for farmers and for the environment.

(5)

With the use of a glasshouse system, transparent glass walls allows for sunlight to enter alongside the artificial lighting. This increases photosynthesis as the chlorophyll absorbs the sunlight. The presence of the heater and CO_2 in the glasshouse also speeds up the process of photosynthesis, therefore the growth of tomato plants will be sped up and the farmer can produce more in a limited amount of time, increasing his yield. The glasshouse provides a greater light intensity, higher temperatures and a greater carbon dioxide concentration, all in which speeds up the plants photosynthesis.

ResultsPlus
Examiner Comments

This is a good answer that gained three marks. The candidate has identified how the system maintains the factors needed for photosynthesis and that this maximises yield. No mention, however, is made of how the system benefits the environment.

Discuss the advantages of growing tomato plants in this glasshouse system.

In your answer include the benefits for farmers and for the environment.

(5)

- the CO_2 produced from the heater goes back into the glass house, this increases the rate of photosynthesis and no longer makes CO_2 a limiting factor
- since the CO_2 is being used for photosynthesis by the plants, it is not being emitted into the environment hence the greenhouse effect is limited and decreases global warming.
- The heating increases the speed of the enzymes as particles have more kinetic energy to enter active site, this increases rate of photosynthesis and yield for farmer.
- the glasshouse is transparent to allow light in during the day for photosynthesis
- there is also artificial lighting so the plant can photosynthesise at night for energy
- glasshouses allow farmers to controll all factors of growth

ResultsPlus
Examiner Comments

This is an excellent answer that gained all five marks. The candidate clearly explains how the system maximises the yield in terms of maximal photosynthesis. The candidate also explains how the carbon capture reduces the greenhouse effect.

Discuss the advantages of growing tomato plants in this glasshouse system.

In your answer include the benefits for farmers and for the environment.

(5)

- Transparent glass walls trap heat inside the glass house, this is called green house effect which increases rate of reaction as enzymes collide more frequently with substrates to create more enzyme substrate compexes. This creates higher crop yield for famer.
- carbon dioxide is not let out into atmosphere. carbon dioxide is a green house gas. There will be less slobal warming, which benefit the environment as there will be less heating of surface to melt polar ice caps, create drought etc.
- There is a supply for light, which means light intensity will not be a limiting factor in photosynthesis, so higher yield for farmer, he will have higher profit
- Heating also brins plants at optimum temperature to increase enzyme activity and increase yield.
- High amounts of glucose will be created in plant, so high amounts of energy can be produced in process of respiration which can be used in growth and reproduction.
- uses an electric supply for lighing and heating instead of combustion of fossil fuels, so less combustion of carbon dioxide.

(Total for Question 9 = 11 marks)

ResultsPlus
Examiner Comments

This is another excellent answer that gained five marks. The candidate has clearly explained how the system maximises yield and how burning wood and capturing carbon is better for the environment compared with burning fossil fuels.

Discuss the advantages of growing tomato plants in this glasshouse system.

In your answer include the benefits for farmers and for the environment.

(5)

- Heater have optimum temperature
- Heater produce Carbon dioxide
- Lighting can have longer hours of light for photosynthesis
- Greenhouse traps heat
- water vapour ~~from~~ / water cycle
- Light intensity and time controlled

ResultsPlus
Examiner Comments

This answer gained two marks for correctly explaining how the system maximises the rate of photosynthesis.

Discuss the advantages of growing tomato plants in this glasshouse system.

In your answer include the benefits for farmers and for the environment.

(5)

Firstly, having a glass house will reduce predatory from birds and animals on the crops, the lighting and heating provided by the power station will let a farmer be able to grow tomato plants no matter the season. The transparent glass walls will allow sunlight for the plants to photosynthesise while the lighting can compensate when there isn't sun. Roof an protect crops from not only predators but harsh weather conditions like very heavy rain or winds. This increasing crop yield for the farmers.

There are also benefits to the environment as the greenhouse gas CO_2 from wood burning is used for photosynthesis instead of released into, reducing climate change and green house effect on the environment reducing global warming. As CO_2 traps heat in the environment.

(Total for Question 9 = 11 marks)

ResultsPlus
Examiner Comments

This excellent answer gains five marks and illustrates several mark points. The candidate explains how photosynthesis is maximised and how the greenhouse reduces damage from pests. The candidate also explains how carbon capture reduces the environmental impact of carbon dioxide release.

Question 10

This experimental planning, 'CORMS', question generated many excellent answers. Candidates and centres are preparing well for experimental planning questions. Strong answers described how the colour of the clothing would be changed whilst keeping the structure of the scarecrow the same. Strong answers also gave methods for measuring the effectiveness of the scarecrows, such as counting birds in a stated time and / or mass of crop in a field. Most candidates stated that repeats would be necessary. Many abiotic controls were suggested such as the area of field, types of crops and weather. Weaker answers tended to give vague references to changing dark and bright colours, did not list control variables and / or did not give stated times.

Scarecrows are models of humans placed into fields to stop birds eating crops.

Design an investigation to find out if changing the colour of the clothes the scarecrow is wearing alters how effective the scarecrow is at stopping birds eating crops.

Your answer should include experimental details and be written in full sentences.

(6)

independant variable (IV) : colour of clothes

put a few scarecrows in different areas with different coloured clothing and ~~see~~ put food on the crops to see whether birds would stop eating crops. The area containing the (most) ~~least~~ amount of food left would be the most suitable coloured clothing. repeat the experiment for accurate results. ~~a quadrat can also be used~~

ResultsPlus
Examiner Comments

This answer gained two marks for changing the colour of clothing (C) and doing repeats (R). M was not awarded as amount of food was too vague.

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(6)

Place four scarecrows of different colours after dividing the field into four equal quadrat spaces. Use a red, blue, black and white scarecrow. Ensure that you control the volume of water each zone receives, and the amount of seeds planted, along with sunlight. After a harvest collect all the crops and count the amount collected from each zone. The amount of birds counted at each zone everyday can be recorded for 1 week. The average number of birds per day is calculated, and then compared on a table or graph for each colcured scarecrow. The experiment can be repeated to increase reliability.

ResultsPlus
Examiner Comments

This answer gained six marks. C is awarded for changing the colour of the clothing, R is awarded for repeats, both M marks are awarded for counting birds in a stated time, and two S marks are awarded for growing the same amount of crops and using the same volume of water.

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(6)

C: have 3 or 5 different colour clothes

O: The scarecrow should be the same size, shape and made of same material.

R: Repeat the investigation for reliable results

M1: How many crows will be present to eat the crops.

M2: after a set period of time.

S: control the temperature and ~~tim~~ the time during the day or night.

ResultsPlus
Examiner Comments

This answer gains five marks. C is awarded for changing the colour of the clothes, O is awarded for keeping the scarecrow the same shape, R is awarded for repeats, M is awarded for counting the birds and one S is awarded for the same birds (crows) or temperature. No stated time is given and there is no control (S) linked to the crop.

ResultsPlus
Examiner Tip

Plan your answer using CORMS but make sure that you write an experiment in a correct context. Just writing the word repeat with nothing else will not get a mark.

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Design an investigation to find out if changing the colour of the clothes the scarecrow is wearing alters how effective the scarecrow is at stopping birds eating crops.

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(6)

- Change the colour of the scarecrow.

- Put in the same environment and at same time of the day.

- Count the number of birds in each colour.

- Leave the scarecrow for a stated period of time.

- Repeat the experiment, remove anomalies and calculate the average.

ResultsPlus
Examiner Comments

This answer gained four marks. The marks awarded were: C for changing the colour, M for counting the number of birds, R for repeats and S for the same time of day.

Paper Summary

Based on their performance on this paper, candidates should:

- Always give full practical details such as referring to lime water or appropriate laboratory equipment when asked for experimental methods.
- Make sure that they understand all the required maths skills, such as the use of significant figures and standard form.
- Consider all data patterns, experimental design and use their own knowledge for longer discussion questions.
- Always give precise, accurate scientific vocabulary.

Grade boundaries

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