Pearson Edexcel

Examiners' Report June 2025

GCSE Biology 1BI0 2H

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June 2025

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Introduction

The Pearson Edexcel GCSE (9-1) Paper 2 Biology (Higher tier) paper is the second of two papers taken as part of the GCSE (9-1) Biology qualification. This is the sixth assessment of the GCSE (9-1) Biology specification, and the qualification follows a linear assessment model whereby candidates must complete the two papers in the same single year of certification.

Paper 2: Biology (Higher tier) is awarded a total of 100 marks, and it is assessed by a variety of question types, including, multiple-choice questions, short answer questions, calculations, and extended open-response questions. Candidates should answer all questions in a time of 1 hour and 45 minutes. The extended open-response questions are identified by an asterisk (*) in the question paper to indicate that marks are also awarded for the ability to structure a response logically.

In addition, the GCSE (9-1) Biology qualification assesses practical knowledge and maths skills; the requirements of which are given in the specification. Furthermore, there are 8 mandatory core practical tasks that candidates must complete prior to the examination, as aspects of working scientifically are also assessed in questions throughout the paper.

Paper 2: Biology (Higher tier) paper contains questions assessing the content from topics 1 and topics 6 to 9 as identified in the specification. In this examination series, candidates were required to respond to questions that tested their knowledge and understanding of ciliated epithelial cells, aerobic respiration, osmosis, diffusion, the movement of sucrose through a plant, biological control, global food security, structure and function of the urinary system and hormonal regulation in the body.

Questions designed to assess practical work included food testing, respiration in maggots, reaction times and the use of a microscope. The maths skills assessment in this paper related to questions requiring the interpretation of graphical information, conversion of units, magnification calculations and rate calculations including putting answers into standard form and correct rounding.

There are now many past papers with mark schemes and examiner's reports available as well as practical support booklets for this qualification and it is clear that these resources are being utilised as part of the revision process. The use of scientific terminology in responses continues to improve, not just in higher ability candidates. Improvements were seen in responses to questions on osmosis, magnification calculations and the analysis of data from a graph. Most candidates were able to access the extended writing responses. The responses to practical questions on use of a microscope were varied but many candidates scored all three marks. The respiration of maggots was answered well but there was some confusion regarding the use of soda lime. Diffusion was well understood and candidates are better at using correct terminology for controlling variables using volume and mass rather than amount. Candidates showed a good degree of understanding for both the open response questions on control of blood glucose and the role of ADH on water levels in the blood.

In general, maths questions showed a good level of understanding. Although some candidates did not give answers to the correct order of magnitude when calculating the magnification used and some candidates did not correctly apply percentage calculations.

Question 1(a)

The candidates were asked to describe the food test for starch in the context of using bananas for testing. The expected answers included the use of iodine changing colour to blue/black for the 2 marks. Black and dark blue were also accepted as positive outcomes for the starch test. There was some confusion where candidates chose the incorrect test, naming Benedict's or Biuret reagent but they could still gain the mark for the correct colour change as these were independent marks. The starting colour was not required to attain the mark.

1 (a) As bananas ripen, they change colour and taste sweeter.

Figure 1 shows two bunches of bananas.

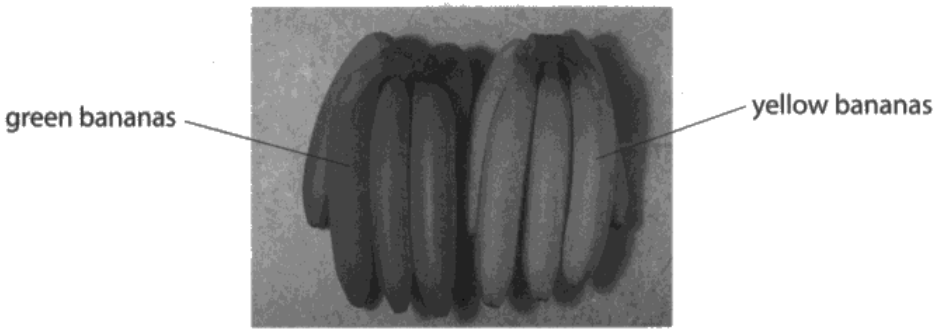

Figure 1

Unripe bananas contain more starch.

Describe the chemical test for starch.

(2)

The chemical test involves cutting away a piece of the banana and placing it into Benedicts solution if starch is present it will turn black.

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Examiner Comments

This is awarded 1 mark as they have correctly identified the colour change to black. Note they do not need to say from orange to black. The reagent is incorrect so the first mark point cannot be awarded. The respose needs to state iodine for the mark.

1 (a) As bananas ripen, they change colour and taste sweeter.

Figure 1 shows two bunches of bananas.

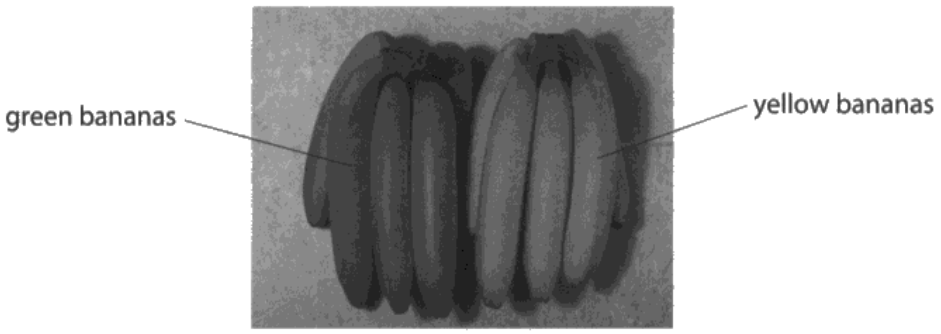


Figure 1

Unripe bananas contain more starch.

Describe the chemical test for starch.

(2)

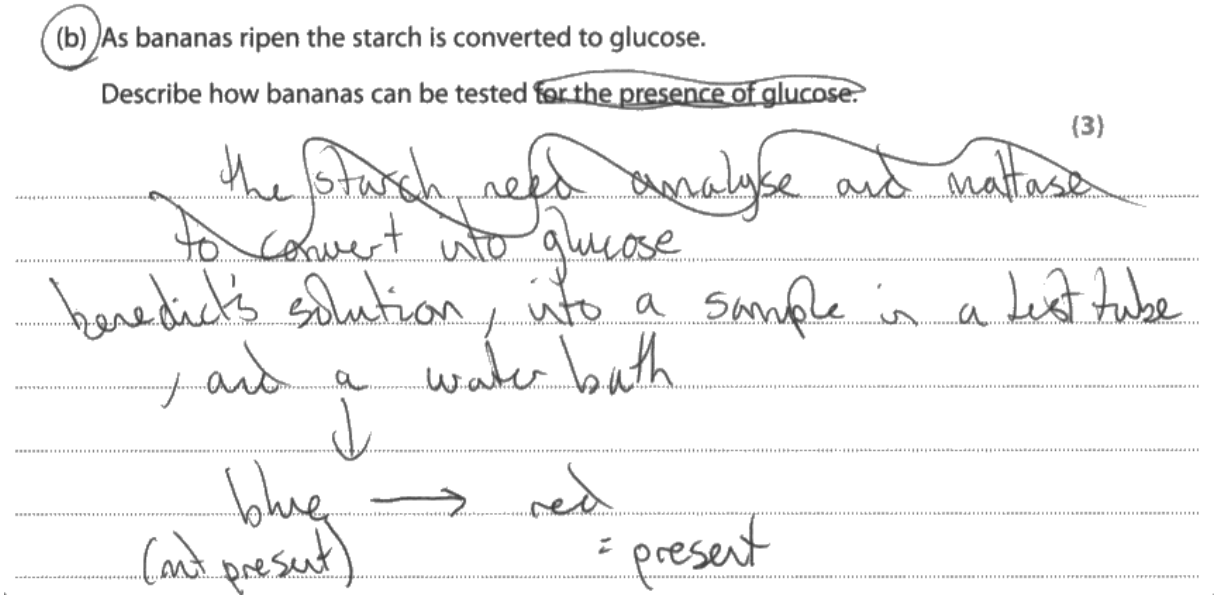
Iodine on the sample will change from brick red to blue-black if starch is present.

ResultsPlus
Examiner Comments

This is awarded 2 marks, we do not penalise candidates for the starting colour. 1 mark for iodine, 1 mark for turning black.

Question 1(b)

The question asks candidates to describe the test for reducing sugars for 3 marks. Benedict's reagent added to the sample then heated (in a water bath) and the correct colour outcome which could be a range from yellow, green, brown or brick red dependent upon the concentration of reducing sugar in the sample. There was some confusion with other common food tests and colour changes but each mark point was independent so candidates could still be awarded marks for the correct colour change even if the incorrect test was given. The most common error was that they placed the test tube in the water bath but did not mention heating, so could not be awarded the heating the sample mark.


(b) As bananas ripen the starch is converted to glucose.

Describe how bananas can be tested for the presence of glucose.

(3)

the starch need amalyse and maltase to convert into glucose benedict's solution, into a sample in a test tube, and a water bath

↓

blue → red

(not present) = present

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Examiner Comments

2 marks awarded for MP1 for Benedict's solution, we cannot award the second mark just for place in a water bath as it must state heat or give a temperature above room temperature of 25 degrees to gain this mark. The final mark point can be awarded for red (brick) is in smooth brackets so gives context but does not have to be seen in the answer. We ignore the starting colour even though this is correct so no mark is awarded for starting colour.

ResultsPlus
Examiner Tip

Learn the food tests for all starch, reducing sugar (glucose), fats and protein.

(b) As bananas ripen the starch is converted to glucose.

Describe how bananas can be tested for the presence of glucose.

(3)

Glucose can be tested in the same method using Biurets solution to test for the least starch and if it is on the blues side, it means starch concentration has decreased therefore glucose has increased

ResultsPlus
Examiner Comments

This is 0 marks. Biuret is the incorrect answer. The response discusses the solution being blue there is no mark for the starting colour of the solution.

Question 1(c)

For this question candidates were asked to apply their knowledge to explain why there was more glucose in ripe bananas than in unripe bananas. The idea that starch was converted to glucose by enzymes was required. Named enzymes such as carbohydrases or amylase were credited but not if the incorrectly put lipases or proteases. Most candidates were able to score at least 1 mark for this item.

(c) A banana with green skin tested positive for starch and negative for glucose.

A banana with yellow skin tested positive for both starch and glucose.

Explain why there was glucose in the yellow banana.

(2)

Amylase enzyme broke down starch into sugar. In green, this hasn't taken place but it has in yellow because it's ripe.

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Examiner Comments

2 marks awarded. Amylase enzyme is MP2, we could just accept enzymes or named correct enzymes such as carbohydrases for this mark. If incorrect enzymes such as proteases or lipases are given we cannot award the enzyme mark. Mp1 can be awarded for converting starch to sugar. Sugar is an acceptable alternative to glucose.

(c) A banana with green skin tested positive for starch and negative for glucose.

A banana with yellow skin tested positive for both starch and glucose.

Explain why there was glucose in the yellow banana.

(2)

- bananas had ripened , began to photosynthesise
- photosynthesis creates glucose in the banana

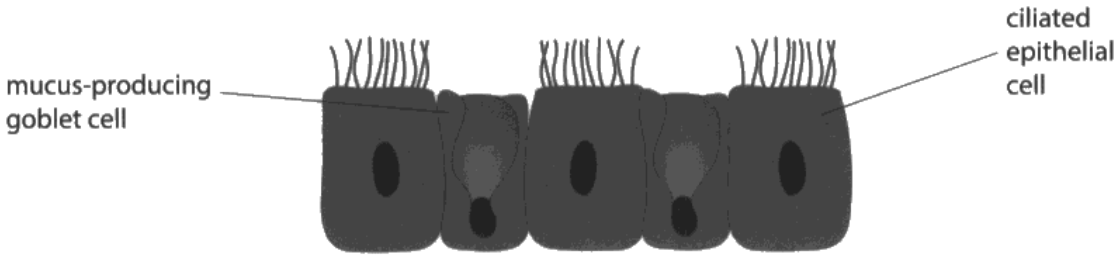
ResultsPlus
Examiner Comments

0 marks awarded. There are no marks awarded for references to photosynthesis or the role of ethene. However this is an ignore so if correct answers are there we could award the marks for the correct response given.

Question 2(a)

Candidates were asked to explain how ciliated epithelial cells removed pathogens from the airways. This is related to a diagram showing goblet cells and ciliated epithelial cells. The expected response included the idea that the pathogens would get stuck in the glucose and would be moved away from the lungs by the cilia. It was acceptable to state that they were moved so could be swallowed or go to the stomach or even the idea that they were wafted up to the back of the throat or coughed out. Common issues included the idea of the pathogens being stuck in the cilia or hair-like structures rather than the mucus.

2 (a) Figure 2 shows a diagram of mucus-producing goblet cells and ciliated epithelial cells in the airways of the lungs.



(Source: © K.K.T Madhusanka/Shutterstock)

Figure 2

Describe how pathogens are removed from the airways by ciliated epithelial cells.

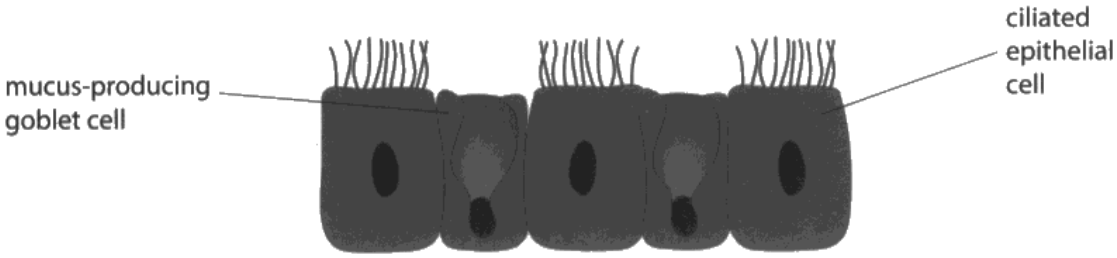
(2)

The epithelial cells are specialised in their function and waft their hair like structures at the top to moves the pathogen out from the airway.

ResultsPlus
Examiner Comments

1 mark awarded. This is awarded for the idea of hair-like structures wafting the pathogens/moving the pathogens is also acceptable, the last marking point cannot be awarded for the idea that it is out of the airways as this is in the stem of the question.

2 (a) Figure 2 shows a diagram of mucus-producing goblet cells and ciliated epithelial cells in the airways of the lungs.



(Source: © K.K.T Madhusanka/Shutterstock)

Figure 2

Describe how pathogens are removed from the airways by ciliated epithelial cells.

(2)

Ciliated epithelial cells move in a synchronised wave to push the mucus to the back of the throat to be swallowed.

ResultsPlus
Examiner Comments

1 mark awarded. Ciliated epithelial cells moving the mucus or pathogens cannot be awarded as this is a repeat of the question, we need specifically cilia or a description of cilia such as hairs. The last mark point is awarded for the idea of the direction to the throat. Note we accepted any idea of the movement away from the lungs/to be swallowed/to go to the stomach/coughed up for this mark point.

ResultsPlus
Examiner Tip

There is no credit for repeating the stem of the question in you answer.

2 (a) Figure 2 shows a diagram of mucus-producing goblet cells and ciliated epithelial cells in the airways of the lungs.

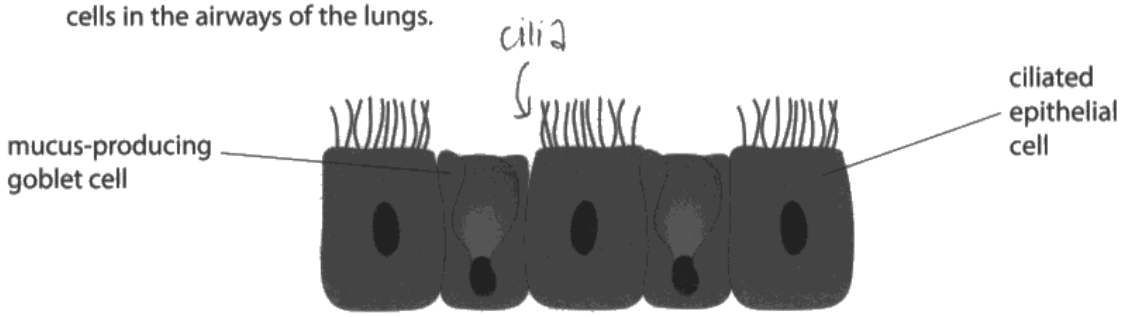


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Figure 2

Describe how pathogens are removed from the airways by ciliated epithelial cells.

(2)

Goblet cells produce mucus → trap pathogens and dirt
Cilia - driven by the mitochondria in the cell, waft the mucus through the airway (trachea), out of the body e.g. coughing or sneezing.

ResultsPlus
Examiner Comments

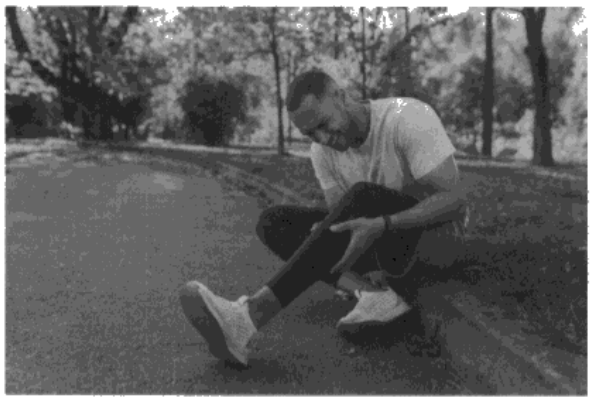
2 marks awarded. A mark can be awarded for the mucus trapping the pathogens, ignore the idea of trapping dirt. We can accept any idea of the pathogens being in the mucus eg die in the mucus. A mark can also be awarded for the idea that the cilia are wafting the mucus. A mark could also be awarded for the idea that it is moving away from the lungs out of the body by coughing.

Question 2(b)

For this question candidates were asked how the athlete gained energy from aerobic respiration. The accepted answer included the idea that glucose and oxygen reacted to form carbon dioxide and water. The equation for respiration was also accepted for the marks. If this was written as a symbol equation the symbols needed to be correctly written. Both reactants and products were required. The idea that this happens in the mitochondria and is an exothermic reaction was also credited. Marks were lost for just stating that oxygen was needed rather than glucose and oxygen.

(b) During a race, athletes respire aerobically and anaerobically.

Figure 3 shows an athlete after a race.



(Source: © voronaman/Shutterstock)

Figure 3

Explain how aerobic respiration provides energy for running.

(2)

glucose + oxygen → carbon dioxide + water

When the athlete runs, they will release energy from their energy stores, so they have the energy for running. Adrenaline can also increase this energy. Aerobic respiration is respiration with oxygen.

ResultsPlus
Examiner Comments

2 marks awarded. The correct equation for respiration is included so 2 marks can be awarded. References to energy in any form can be ignored.

(b) During a race, athletes respire aerobically and anaerobically.

Figure 3 shows an athlete after a race.

(Source: © voronaman/Shutterstock)

Figure 3

Explain how aerobic respiration provides energy for running.

(2)

. aerobic resperation produces energy and water. Oxygen is transported to muscles with glucose so they can respire producing water and energy.

ResultsPlus
Examiner Comments

1 mark awarded. This is for the correct reactants of oxygen and glucose. The response has only given 1 product so the second mark point cannot be awarded.

Question 2(c)iii

Candidates were asked what would happen to the movement if the 4 maggots were replaced with two maggots and this was answered very well with almost all candidates able to state that the drop would move more slowly due to there being fewer maggots respiring.

(iii) The investigation was repeated with two maggots.

Explain how the movement of the drop of coloured liquid would be affected if the investigation was repeated using fewer maggots.

(2)

There is less CO_2 ~~oxygen~~ being produced by respiration therefore the drop of coloured would move less / more slowly.

ResultsPlus
Examiner Comments

2 marks awarded. Less carbon dioxide being produced is an alternative to less oxygen would be used. Less respiration is the same mark point. The second mark is given for the drop moving less so this is acceptable for slower. We could also accept the movement would decrease.

Question 2(c)i-ii

This question asked for the reason for soda lime being used in the respiration experiment. This is a core practical in the specification and it would not work without having something to absorb the carbon dioxide. There were several responses stating the soda lime absorbed moisture or oxygen which is not correct.

For the second part of this question candidates needed to draw on the capillary tubing where the drop of liquid would be after a certain time. The drawing should be with the leading edge at 30 although some benefit of doubt was given where 30 was clearly the centre of the drawn mark. Common issues where moving the bubble in the wrong direction so drawing at 10mm.

(c) The rate of respiration of maggots was investigated using the equipment shown in Figure 4.

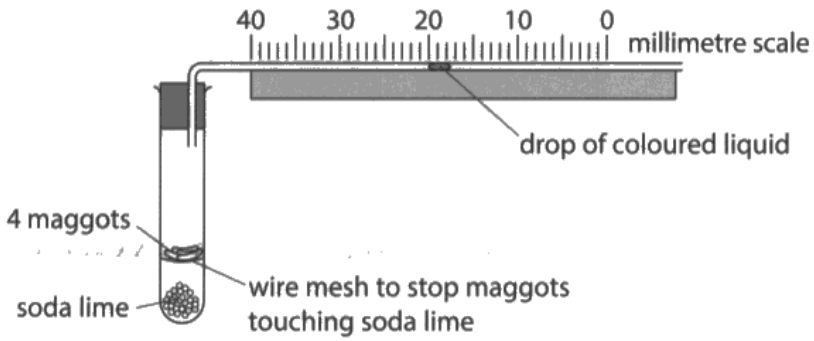


Figure 4

(i) State the reason why the soda lime is placed in the test tube.

(1)

To remove the carbon dioxide so shows the gas is used

(ii) The drop of liquid in Figure 4 is at 20 mm.

The drop of coloured liquid moved at a mean rate of 2 mm per minute.

Draw, on Figure 5, the new position of the bubble after the five minutes.

(1)

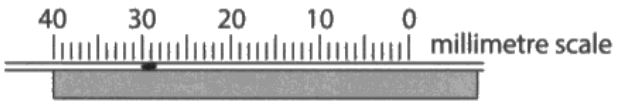


Figure 5

2 × 5 = 10 mm

20 + 10 = 30 mm

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2 marks are awarded for carbon dioxide is removed by soda lime and the line is drawn at the correct place on the capillary tubing.

(c) The rate of respiration of maggots was investigated using the equipment shown in Figure 4.

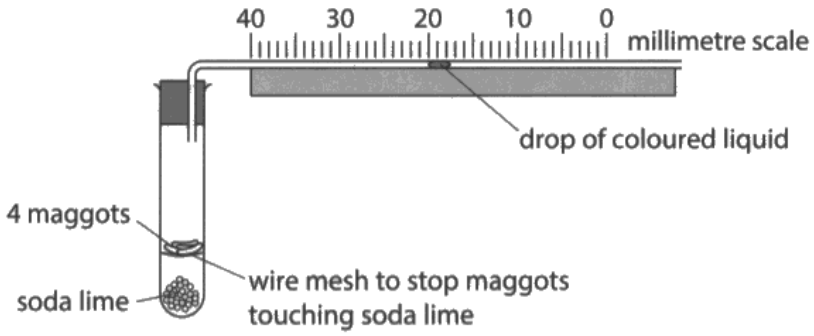

Figure 4

(i) State the reason why the soda lime is placed in the test tube.

(1)

Absorbs carbon dioxide

(ii) The drop of liquid in Figure 4 is at 20 mm.

The drop of coloured liquid moved at a mean rate of 2 mm per minute.

Draw, on Figure 5, the new position of the bubble after the five minutes.

(1)

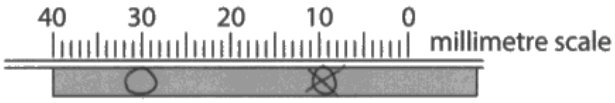

Figure 5

ResultsPlus
Examiner Comments

1 mark awarded for absorbs carbon dioxide. No marks can be awarded for the capillary tubing line as two have been drawn. The line is also not drawn in the capillary tubing.

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Examiner Tip

If you are asked to draw one bubble or line do not do more than one.

(c) The rate of respiration of maggots was investigated using the equipment shown in Figure 4.

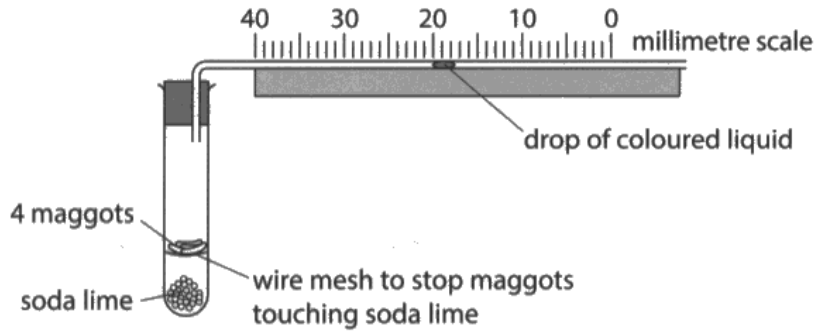

Figure 4

(i) State the reason why the soda lime is placed in the test tube.

(1)

To absorb the carbon dioxide

(ii) The drop of liquid in Figure 4 is at 20 mm.

The drop of coloured liquid moved at a mean rate of 2 mm per minute.

Draw, on Figure 5, the new position of the bubble after the five minutes.

(1)

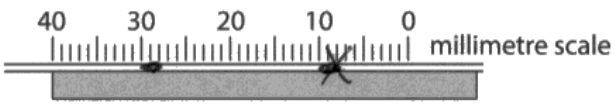

Figure 5

ResultsPlus
Examiner Comments

1 mark awarded for absorbng carbon dioxide. The mark can be awarded for the correct line drawn in the capillary tubing as the first mark has been clearly crossed out.

Question 2(c)iv

This question asked how to improve the results to make them more reliable. We accepted just repeating the experiment or repeating to obtain a mean. It was also important that none of the variables were changed if we want the results to be reliable.

(iv) State **one** way this investigation can be improved to obtain more reliable results.

(1)

Add a control tube with no living organisms inside.

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No mark was awarded for using a control as this would not affect the reliability of this experiment.

(iv) State **one** way this investigation can be improved to obtain more reliable results.

(1)

Repeat using a scale with smaller intervals.

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1 mark is awarded for repeat; we can ignore the scale with smaller intervals. We could also accept do it again or calculate a mean/average.

Question 3(a)i

This question asked to state what the term indigenous meant. The mark scheme included the idea of them being native species or species from the country of origin. We also accepted an idea of the fact that they have always grown there. Some answers were given describing non-indigenous species but these were not credited.

3 (a) In 2018, all the plants were removed from the soil in a 1000 m^2 area.

A wall was built around this area to keep people out.

In 2019, three species of plants were recorded growing in this area.

Two of these species were indigenous.

(i) State what is meant by the term 'indigenous'.

(1)

Native to the area, where they grow were ~~born there~~ are adapted/born from.

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Examiner Comments

We accepted native to the area or just native for 1 mark.

3 (a) In 2018, all the plants were removed from the soil in a 1000 m^2 area.

A wall was built around this area to keep people out.

In 2019, three species of plants were recorded growing in this area.

Two of these species were indigenous.

(i) State what is meant by the term 'indigenous'.

(1)

They are not from the area

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This is a description of non-indigenous so no marks can be awarded.

Question 3(a)ii

This question asked for a piece of sampling equipment to measure plant species and we required a quadrat for the answer. Other acceptable answers included a belt or line transect or a grid. Some responses stated a square. This was not awarded a mark although if it was qualified with a measurement we accepted the answer for 1 mark.

(ii) Name **one** piece of equipment that could be used to sample the number of indigenous plants in this area.

(1)

a Square that you place on the floor

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This is not enough for the mark as the square must have some dimensions included for us to award the mark.

(ii) Name **one** piece of equipment that could be used to sample the number of indigenous plants in this area.

(1)

a ~~grass~~ quadrat sample

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This is acceptable for 1 mark, we also accepted quadrant as a miss spelling of quadrat but did not accept quadratic.

Question 3(b)i

Candidates were asked to describe the trend in the data and the data showed that the species were increasing. Some responses included that the species were increasing but at a decreasing rate which was credited as it was an accurate description of the data.

Question 3(b)iii

The question asked about how a species could be outcompeted so there was no mark for talking about competition in the answer. We wanted the idea that the plants were taller or bigger or had larger leaves/roots for the first mark followed by why this gave them an advantage, including access to more light or more photosynthesis could be done or more water/mineral ions could be taken in. We did accept nutrients for mineral ions.

(iii) Explain **one** way that this species could have out-competed species B.

(2)

They ~~increased~~ experienced a large increase in pop'n which meant that they had a more food which allowed them to ~~grow~~ survive, grow and reproduce which increased their population.

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We awarded 1 mark here for the idea that the plants are growing/reproducing more as this is inferred. We could also award this for a large increase in population.

(iii) Explain **one** way that this species could have out-competed species B.

(2)

The species may have took more shelter or been more advanced at adapting to retain food. Competed for soil, which species A had more of, and light.

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In this case a mark can be awarded for species (A) had more of the light. We ignored references to other species as long as they did not state species C.

Question 3(b)iv

The question asked reasons why plants had grown in the area when humans could not get in as there was a wall surrounding it. Any reasonable answer stating how seeds may have got in, such as on animals, birds or overhanging trees was acceptable. We also accepted roots or shoots growing under or through the wall for a mark.

(iv) Give **one** way that species H could have moved into the area.

(1)

mutation of another plant species

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No marks awarded for genetic differences as the question is about how the species could have moved into the area. In the stem of the question it states that all plants were removed and a wall is built to keep humans out.

(iv) Give **one** way that species H could have moved into the area.

(1)

~~on an animal~~ seed on an animal

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Examiner Comments

Seed on an animal is a good answer that we would just accept animals / birds / insects etc. We did not accept pollinators unless they were carrying seeds.

Question 3(c)

This question asked how the plants got water from the soil. Through root hair cells or roots by osmosis across a partially permeable membrane down to a concentration gradient was also acceptable for the marks. The most common response was through the roots by osmosis for the 2 marks.

(c) Plants also need water to grow.

Explain how water is absorbed into the plant.

(2)

Through Osmosis into the root hair cells, from an area of high concentration (soil) to an area of low concentration (root hair cell) along a concentration gradient.

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Osmosis gets a stand alone mark point, root hair cells/roots is the first mark point and from high to low concentration is in the additional guidance and could also be awarded a mark. 2 marks awarded.

(c) Plants also need water to grow.

Explain how water is absorbed into the plant.

(2)

Water is absorbed through roots and moves in the plant through transcription through the xylem which then travels up the plant.

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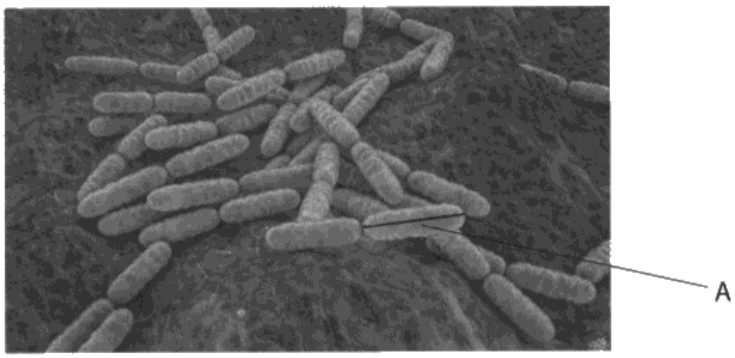
Examiner Comments

1 Mark awarded for roots here. Transcription is incorrect and we also did not award transpiration as it is how the water gets into the roots not through the plant.

Question 4(a)

This question required the measurement of a bacterium cell from a photomicrograph and some candidates measured 2 cells rather than 1. This then needed to be substituted into the equation and the answer put into standard form. A range of measurements were allowed for the cell from 15mm to 16mm for full marks if applied correctly. Most candidates were able to put their answer into standard form correctly although a few measured in cm and therefore were out by an order of magnitude.

4 (a) Figure 7 shows a type of bacteria (*Lactobacillus acidophilus*) that is found in cow's milk.



(Source: © Kateryna Kon/Shutterstock)

Figure 7

The magnification of this image is ×18 000.

Measure the length of the bacterium labelled A.

Use your measurement to calculate the actual length of this bacterium in millimetres.

Give your answer in standard form.

(3)

15 mm - length in image

$\frac{15\text{ mm}}{18000} = 8 \cdot 33 \times 10^{-4}$

A M

$8 \cdot 33 \times 10^{-4}$ mm

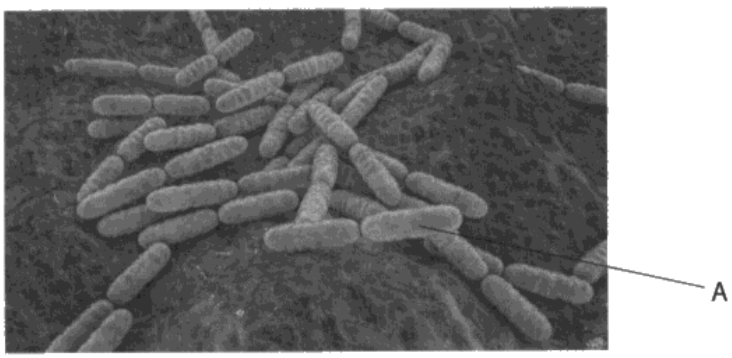
ResultsPlus
Examiner Comments

15 mm is the correct measurement for 1 mark. We would accept just 15 by itself but 1.5 must have cm, to qualify the measurement mark, ie 1.5cm. The candidate has correctly divided by 18 000 for mark point 2. We can accept standard form to 2 or more decimal places. Standard form is correct so 3 marks can be awarded.

ResultsPlus
Examiner Tip

Make sure you follow the instructions in the question especially for a maths question as it is easy to lose marks by missing the fact that the answer is required in a specific form.

4 (a) Figure 7 shows a type of bacteria (*Lactobacillus acidophilus*) that is found in cow's milk.



(Source: © Kateryna Kon/Shutterstock)

Figure 7

The magnification of this image is ×18 000.

Measure the length of the bacterium labelled A.

Use your measurement to calculate the actual length of this bacterium in millimetres.

Give your answer in standard form.

(3)

I

A m

$\frac{16}{18000} = 8.8 \times 10^{-4}$

m = 18000

I = 16 mm

A .

8.9×10^{-4} mm

ResultsPlus
Examiner Comments

The measurement can be 15mm or 16mm for the first mark point or 1.5cm / 1.6cm. This candidate has used 16mm correctly divided by 18000 and put the answer correctly into standard form for 3 marks (this is shown in the additional guidance column of the mark scheme).

Question 4(b)i

This response required a reading of pH from the given graph. A range of responses were acceptable for this question from 5.0 – 5.4 with all increments in between as the graph was quite small.

Question 4(b)ii

Candidates were asked to describe the trend in the data for *Staphylococcus aureus* from the graph. It is important to quote numbers when asked to do this style of question so increasing from pH5 to pH7, pH 7 being the optimum and decreases from pH 7 to pH 8.5. If no figures were quoted no marks were awarded. This was answered well showing that candidates have learned from previous examiners reports.

(ii) Describe the relationship between pH and the growth of *Staphylococcus aureus*, as shown in Figure 8.

(2)

from pH 1-5 and 9+, staphylococcus aureus doesn't grow. from pH 5-7, it begins to increase growth rate, with a maximum rate at pH 7, before slowly decreasing growth rate again

ResultsPlus
Examiner Comments

This can be awarded 1 mark for grows from pH 5 to pH 7. No mark is awarded for decreasing as the figures are not given. For the second mark point we want 7 being the optimum not just the best or fastest. 1 mark awarded.

(ii) Describe the relationship between pH and the growth of *Staphylococcus aureus*, as shown in Figure 8.

(2)

below 5 it is 0 growth and above 8.5 there is no growth

~~Increases~~ growth increases from pH 5 to 7 the optimum pH is 7 then past 7 to 8.5 it decreases directly proportional

ResultsPlus
Examiner Comments

This response covers all three mark points so can be awarded the maximum of 2.

Question 4(c)ii

For this question candidates were asked to pick from a table of data what the overall trend was for the change in pH over time. The overall trend showed a decrease in pH or that the solution became more acidic. The second mark was awarded for the calculated decrease of 1.8 or decreasing to pH 4.8. Credit was also given for the incremental decrease of 0.8, 0.8 and 0.2.

(ii) Describe the changes in the pH of the milk at 30 °C from 0 hours to 72 hours, as shown in Figure 9.

(2)

- The pH starts semi-neutral at 30° for 0 hours
- over the course of 3 days, it slowly decreases to a pH of 4.8
- changes pH faster than any other temperature.

ResultsPlus
Examiner Comments

The pH decreases to 4.8 is for 2 marks and we would also accept the pH decreases by 1.8 for 2 marks.

(ii) Describe the changes in the pH of the milk at 30 °C from 0 hours to 72 hours, as shown in Figure 9.

(2)

It decreases by ~~0.8 pH~~ pH 0.8 until ~~to~~ 72 ~~hours~~ 48 hours when it then decreases by 0.2 pH 0.2. It decreases by pH 1.8 over the 72 hours going down from pH 6.6 to a pH 4.8

ResultsPlus
Examiner Comments

This response gives the incremental decreases, which is acceptable for MP2, but then states it decreases by 1.8 over the 72 hours anyway. It also has pH decreases so can be awarded both marks.

(ii) Describe the changes in the pH of the milk at 30 °C from 0 hours to 72 hours, as shown in Figure 9.

(2)

The pH decrease by 0.6 ~~for~~ ~~the first~~ ever 24H for the first 2 times. For the 3rd time it decreases by 0.2.

ResultsPlus
Examiner Comments

We can award the pH is decreasing for the first mark point but 0.6 +0.6 + 0.2 is not equivalent to 1.8 so the amount of decrease cannot be given. We could award this if the individual numbers were correctly calculated as 0.8 + 0.8 + 0.2 for the second mark point. 1 mark awarded.

Question 4(c)iii

This question was a calculation of a rate decrease. The candidates had to work out the change in pH as 1.4 then divide by the time of 72 hours giving an answer of 0.019.

Correctly rounded answers to 0.02 were also acceptable as were answers to a greater number of decimal places such as 0.0194. Common misconceptions were the calculated decrease being out by an order of magnitude giving the answer as 0.194, which was not creditable for the second mark point.

(iii) Calculate the rate of decay of the milk at 20 °C for the 72 hours of this investigation.

Use the equation:

$$\text{rate of decay} = \frac{\text{change in pH}}{\text{time taken}}$$

pH = 6.6
pH = 5.2

(2)

$\frac{5.2 - 6.6}{72} = -0.194$

-0.19
or
-0.194 change in pH per hour

ResultsPlus
Examiner Comments

We can ignore the minus sign but this candidate appears to have done all the correct things however, the answer is not correct. They haven't calculated a pH of 1.4 so cannot be awarded the first mark point. The division is incorrect as the answer should be 0.0194 so no marks awarded.

(iii) Calculate the rate of decay of the milk at 20 °C for the 72 hours of this investigation.

Use the equation:

$$\text{rate of decay} = \frac{\text{change in pH}}{\text{time taken}}$$

(2)

$\frac{6.6-5.2}{72} = \frac{1.4}{72} = 0.0194$

$= 0.019444\ldots$

$= 0.0194$

0.0194 change in pH per hour

The correct answer is on the answer line for 2 marks. As working is shown we could have awarded 1 mark for 14 even if the answer was incorrect.

Always show working in mathematical questions to ensure you maximise your marks.

Question 5(a)i

Diffusion was the correct answer so no other answers were acceptable. Common misconceptions included osmosis and dilution.

Question 5(a)ii

Candidates were asked to give two variables to control during the diffusion experiment. These included volume of water, beaker (type/size), temperature of the water, volume or concentration of the food colouring, volume or size of the drop or size of the pipette used. Candidates are still on occasion using the term amount rather that the correct scientific measurement which is not accepted.

(ii) A student asked if different food colourings spread evenly in the same amount of time.

Give **two** variables that would need to be controlled if the investigation was repeated with different food colourings.

(2)

1 Volume of water

2 Number of drops of food colouring

ResultsPlus
Examiner Comments

Volume of water is mark point one therefore please note, as always, we do not accept amount of water. Number of drops of food colouring is acceptable for the last mark point. Note again we would not accept amount of food colouring. 2 marks awarded.

Question 5(b)i

This question involved drawing a graph from supplied data. The marks were awarded for the correct axes labelled with units, for the independent variable being plotted on the x axis and the time on the y axis. A liner scale on both axes and finally correctly plotted points and line drawn. If there was no labelling on the axis neither of the first two points could be awarded. Generally this was answered well with clear plotting and the correct plotting. Common ways to lose marks were not including units and not using the correct axes. A linear scale should be shown throughout so if there was a 0 at the origin then the scale started at 20 but went up in 5s, this was not accepted.

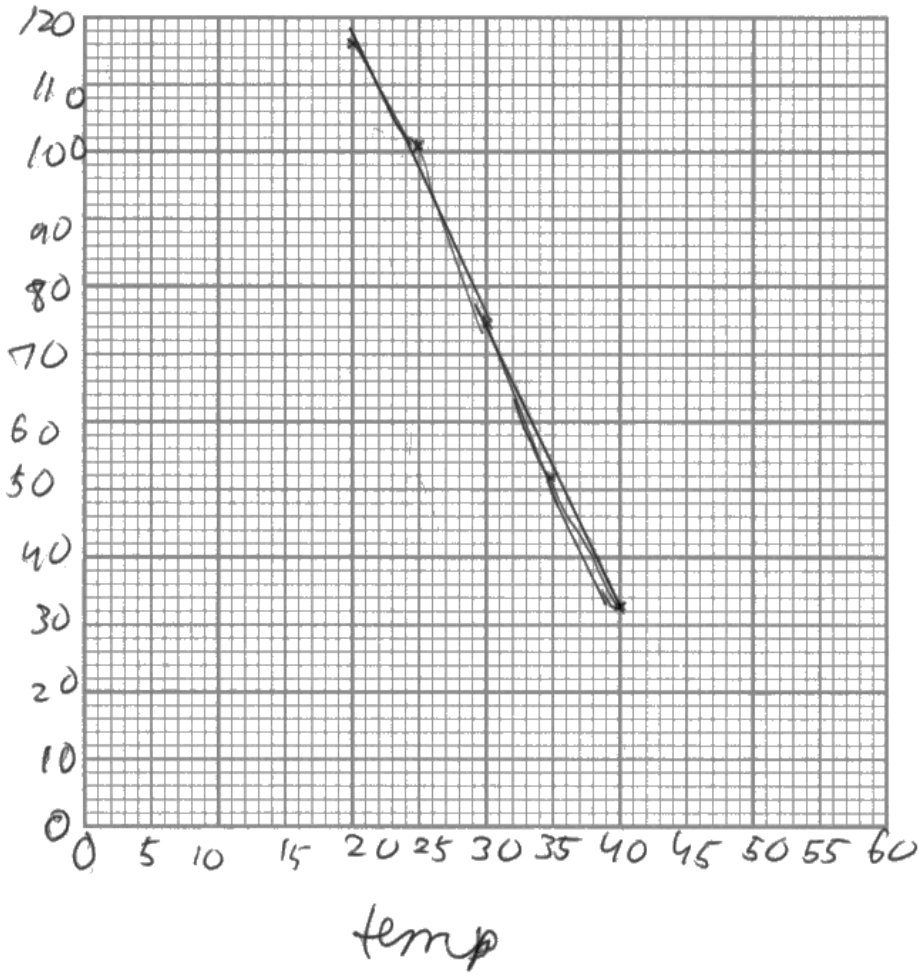
(b) The teacher repeated this process with water at different temperatures. Figure 11 shows the results of this experiment.

water temperature in °C	time taken for food colouring to spread evenly through the water in seconds
20	116
25	101
30	75
35	52
40	33

Figure 11

(i) Draw a line graph to show the results in Figure 11.

(4)



ResultsPlus
Examiner Comments

Axes not labelled with units, only temperature is labelled so mark point 1 cannot be awarded. Temperature is on the X axis so we can infer that time is on the Y axis so mark point 2 can be awarded. There is a linear scale so we can award the third mark. Plotting is correct to within half a small square so the last mark point could be awarded but there are two clear lines so this mark cannot be awarded.

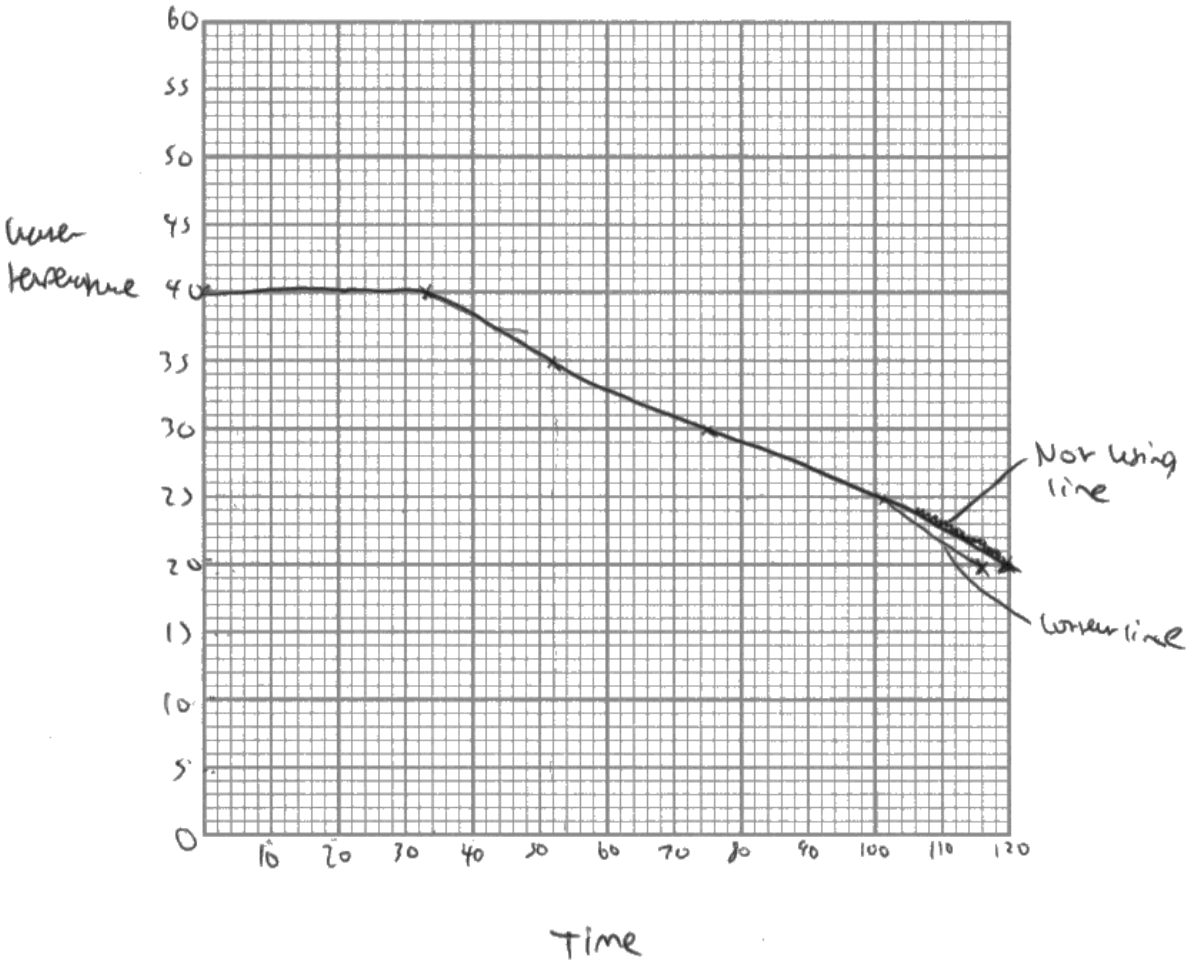
(b) The teacher repeated this process with water at different temperatures. Figure 11 shows the results of this experiment.

water temperature in °C	time taken for food colouring to spread evenly through the water in seconds
20	116
25	101
30	75
35	52
40	33

Figure 11

(i) Draw a line graph to show the results in Figure 11.

(4)



ResultsPlus
Examiner Comments

Axes are not labelled with units so the first mark point cannot be awarded. Axes are incorrect as temperature should be on Y and time on X, so mark point 2 cannot be awarded. The scale is linear so we can award the third mark point. Plotting is incorrect as there is no reading for 0 at 40 degrees, so mark point 4 cannot be awarded also the line draw is incorrect as there should be no line from 0 to 33. 1 mark awarded.

Question 5(b)ii

This question was answered well by the majority of the candidates. They were asked to explain why the time taken for diffusion decreased. Answers should include - as temperature increases the particles move faster due to more kinetic energy. Also accepted was particles diffuse faster or spread out faster or even more collisions. It was good to see many of the candidates able to reference more collision due to more kinetic energy.

(ii) Explain why the time taken decreased.

(2)

Higher temp = higher energy of particles.
Food colouring spread faster due to higher energy of water particles.

ResultsPlus
Examiner Comments

Higher temperature is mark point 1. Food colouring spreads faster is the equivalent of diffuses faster for mark point 2. Higher energy must be kinetic energy for mark point 3. 2 marks.

(ii) Explain why the time taken decreased.

(2)

The warmer it is the easier it is to spread evenly

ResultsPlus
Examiner Comments

The warmer it is is acceptable for the higher temperature for mark point 1. It spreads out/evenly is not acceptable for mark point 2 as it must be - particles are spreading out or named particles. 1 mark.

(ii) Explain why the time taken decreased.

(2)

higher temp means more energy to fuel decomposers

ResultsPlus
Examiner Comments

Higher temperature scores 1 mark to gain mark point 1. More energy to fuel decomposers is incorrect because we need to qualify the energy mark as Kinetic energy for mark point 3. We would not accept the reverse answer for this item (ie temperature decreases as the particles have less energy) as the question is about why time taken decreases.

Question 6(a)i

The question related to the diagram and asked for the number of guard cells present which was 8. The most common misconception was an answer of 4 which would have been the number of stomata. A few candidates counted all the cells visible instead of just the guard cells.

Question 6(a)ii

This question asked for the gases entering and leaving the stomata. Those leaving the stomata were either oxygen or water vapour. Those entering the stomata was carbon dioxide. Chemical formulae were accepted if they were correctly written.

Question 6(a)iii

The question asked why the stomata close and the response expected was to prevent water loss or to prevent the plant drying out or to prevent transpiration. Some responses outlined the idea that it was to stop photosynthesis from occurring which was not credited.

(iii) State why the stomata close.

(1)

To only allow carbon dioxide in during photosynthesis during daytime with sunlight for energy.

ResultsPlus
Examiner Comments

This is about stomata closing rather than opening, so no mark was awarded. We would allow a mark for preventing pathogens from entering the plant. 0 marks.

(iii) State why the stomata close.

(1)

Photosynthesis does not occur, so to stop transpiration

We can accept stop transpiration as an alternative to prevent water loss but we would also accept reduce transpiration. We can also accept common statements like conserve water or keep water in the plant for a mark.

Question 6(b)

This question asked how to view a prepared slide using a light microscope. Many candidates described how to prepare a slide rather than how to view it so this was not credited. It is vital that candidates read the question carefully to prevent this type of error. Expected answers included place the slide on the stage, select the lowest objective lens, use the focusing wheel, then select a higher objective lens. We did accept coarse or fine focus for the focusing wheel and increasing the magnification against using a higher objective lens.

(b) A student wanted to view the cross-section of a leaf on a prepared slide.

Describe how a light microscope would be used to observe this slide.

(3)

→ put the cross section of the slide

→ dye it with a dye

→ put on the cover slip

→ put on stage

→ open light

→ adjust objective lens and ~~magnifying lens~~ focus wheel until you get a clear image of the cross section.

ResultsPlus Examiner Comments

Put it on the stage is for mark point 1. Focus adjusted for use focusing wheel for mark point 3. No further marking points are included. 2 marks awarded.

(b) A student wanted to view the cross-section of a leaf on a prepared slide.

Describe how a light microscope would be used to observe this slide. *

(3)

- Firstly cut out a small sample of a leaf.
- Place this on a slide on the stage.
- Firstly start on the lowest magnification.
- Then, slowly increase the magnification of the objective lens until you can see the sample.
- Finally slowly increase the fine focusing wheel until you can clearly see the cell structures.
- Make sure the light is on

ResultsPlus
Examiner Comments

Start on the lowest magnification is for mark point 1. Use the fine focusing wheel is mark point 3. Note we would also accept just adjust the fine or coarse wheel. Increase the magnification is mark point 4. 3 marks awarded.

Question 6(c)

This question asks how sugars were moved through the plant, and it was well answered by the majority of candidates. Expected responses included sugars move as sucrose, through the phloem, by translocation, using active transport, for bidirectional flow. We did reject xylem and transpiration against phloem and translocation. There were some excellent responses to this question going well beyond the specification and these were of course credited.

(c) Sugars are transported from the leaves to the rest of the plant.

Explain how sugars are moved through the plant.

(2)

sugars move from the leaves into the stems, then travel downwards towards the roots through the phloem tubes with other minerals. sugars are then transported through the roots of the plant, before being transported to the soil

(Total for Question 6 = 9 marks)

ResultsPlus Examiner Comments

The direction of the flow only seems to be downwards so mark point 5 cannot be awarded. Phloem is for mark point 2. 1 mark awarded. Note references to diffusion in any answer was ignored.

(c) Sugars are transported from the leaves to the rest of the plant.

Explain how sugars are moved through the plant.

(2)

Sugars are moved by the phloem cell. This moves sugar from the leaves to the rest of the plant.

ResultsPlus
Examiner Comments

Just the one mark for Phloem for mark point 3. From leaves to the rest of the plant is not enough for mark point 5, it must be a clear description of bi-directional flow. Source to sink is perfectly acceptable for this. 1 mark awarded.

(c) Sugars are transported from the leaves to the rest of the plant.

Explain how sugars are moved through the plant.

(2)

by translocation which uses the xylem to make sugars pass through it. (can move in both directions)

ResultsPlus
Examiner Comments

Translocation is mark point 3. Xylem is a reject against phloem so does not affect the score here. Can move in both directions is a description of bidirectional flow for mark point 5. 2 marks awarded.

Question 7(a)i

This was a maths question asking to calculate the percentage of energy transferred between ladybirds and aphids. The most common error was candidates selecting the incorrect organisms. If they did this, 2 marks could still be awarded if they substituted correctly into the equation and gave the answer to the nearest whole number. The calculation expected gave 10.3% which should be rounded to 10%.

7 (a) Figure 13 shows the biomass of each population of organisms in a food chain.

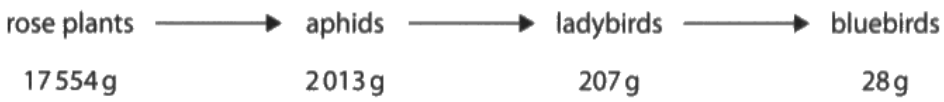


Figure 13

(i) Calculate the percentage efficiency of biomass transfer from the aphids to the ladybirds.

Use the equation:

$$\text{percentage efficiency} = \frac{\text{biomass in higher trophic level}}{\text{biomass in previous trophic level}} \times 100$$

Give your answer to the nearest whole number.

(3)

$\frac{28}{207} \times 100$

14 %

ResultsPlus
Examiner Comments

This candidate has picked the incorrect values but they have substituted into the equation. They have correctly multiplied by 100 so can be awarded that mark and rounded correctly to a whole number so can be awarded 2 marks.

7 (a) Figure 13 shows the biomass of each population of organisms in a food chain.

rose plants	→	aphids	→	ladybirds	→	bluebirds
17554 g		2013 g		207 g		28 g

Figure 13

(i) Calculate the percentage efficiency of biomass transfer from the aphids to the ladybirds.

Use the equation:

$$\text{percentage efficiency} = \frac{\text{biomass in higher trophic level}}{\text{biomass in previous trophic level}} \times 100$$

Give your answer to the nearest whole number.

(3)

$\frac{207}{2013} = 0.1023$

$0.103 \times 100 = 10.3$

10.3 %

ResultsPlus Examiner Comments

The calculation has been completed correctly and correctly multiplied by 100 for 2 marks. The answer is not given to the nearest whole number so 2 marks awarded.

7 (a) Figure 13 shows the biomass of each population of organisms in a food chain.

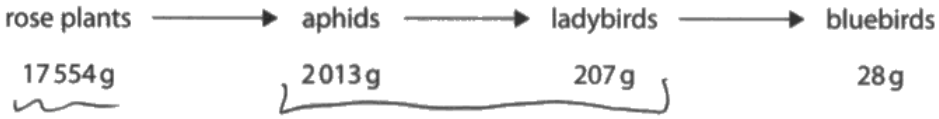


Figure 13

(i) Calculate the percentage efficiency of biomass transfer from the aphids to the ladybirds.

Use the equation:

$$\text{percentage efficiency} = \frac{\text{biomass in higher trophic level}}{\text{biomass in previous trophic level}} \times 100$$

Give your answer to the nearest whole number.

(3)

% = 207 / 17554 x 100

% = 11.467478

11 %

ResultsPlus
Examiner Comments

This response used the incorrect data but they have correctly multiplied by 100 and correctly rounded to a whole number so it can be awarded 2 marks.

Question 7(a)ii

This question asked why not all the energy was transferred from the aphids to the ladybirds. Expected answers included energy needed to keep warm, respiration, excretions, movement or the idea that not all the aphid was eaten or digested. This answer was also accessed well by candidates.

(ii) Give **two** reasons why the biomass of ladybirds is lower than the biomass of aphids in this food chain.

(2)

1 There are less ladybirds than aphids in the food chain

2 The ladybirds ~~don't eat the whole aphid~~ excrete some of the aphids biomass ★

ResultsPlus
Examiner Comments

1 mark awarded for excretion. We can assume if it is not stated that the answer is in the context of the ladybirds. 1 mark awarded.

(ii) Give **two** reasons why the biomass of ladybirds is lower than the biomass of aphids in this food chain.

(2)

1 ~~eve~~ some energy is lost due to excretion decreasing mass to the next organism.

2 the energy taken isn't 100% used as about 90% is lost.

ResultsPlus
Examiner Comments

Excretion is enough for mark point 3. The second statement is just stating that energy is lost so is not enough for any further marks. 1 mark awarded.

(ii) Give **two** reasons why the biomass of ladybirds is lower than the biomass of aphids in this food chain.

(2)

1 aphids use energy in moving, which lowers biomass

2 ~~aphids don't fully decompose which lowers biomass.~~
aphids lose energy in their wee and poo which lowers biomass.

ResultsPlus
Examiner Comments

The question asks why ladybird's biomass is lower than the aphids but this answer is in the context of the aphid so cannot be awarded the marks.

Question 7(a)iii

This question asked why releasing ladybirds near the rose plants would reduce the number of aphids. No marks were awarded for saying the number of aphids went down as this is in the stem of the question. Marks were awarded for; ladybirds eat aphids, alternatives would be ladybirds are predators or prey on aphids. They did this so there was less damage to the rose plants was awarded a mark as was identification that this is a type of biological control.

(iii) Aphids are a problem for rose growers as they damage the leaves of rose plants.

Explain how ladybirds could be used to reduce the number of aphids.

(2)

Increasing the ladybird population could decrease the aphid population in the area as ladybirds consume/eat aphids.

ResultsPlus Examiner Comments

Ladybirds eat aphids is mark point 1 so we could also accept ladybirds get rid of aphids or ladybirds are predators of aphids. 1 mark awarded.

(iii) Aphids are a problem for rose growers as they damage the leaves of rose plants.

Explain how ladybirds could be used to reduce the number of aphids.

(2)

- plant ladybird eggs near where aphids are
- when ladybirds hatch & grow, they will kill the aphids
- ladybirds get food & they kill aphids
- aphids are killed, so they cannot damage the leaves of roses anymore

ResultsPlus
Examiner Comments

Ladybirds eat aphids is mark point 1. So they cannot damage the roses is mark point 2. 2 marks awarded.

Question 7(b)

This question was about the things that threaten global food security. The opening sentence also stated that human population was increasing which threatens global food security, so this was not credited as an answer. The mark scheme for this is extensive and not just limited to the specification points as we needed to credit the correct biology answers to this question. Mark points included increased meat/fish consumption, increased animal farming including the idea of overfishing, climate or environmental change including pollution or global warming, introduction of pests, pathogens or new diseases, biofuel production or growing crops for animals, less land available for farming due to house building, solar farms or deforestation. The idea of drought, famine or floods and finally the idea of war or conflict. Overall, this was accessed better than questions on food security on previous papers.

(b) As human population rises, food security is an increasing problem throughout the world.

Give three factors that reduce the amount of food available for humans throughout the world.

(3)

1 Climate change - more extreme environments (eg higher temp) reduces crop yields. = less food

2 over farming - by overfarming certain land or animals the ground becomes unable to support more crops the next year = less food.

3 increasing population - more people consuming food means less to go around

ResultsPlus Examiner Comments

The question asks for three factors that reduce the amount of food available for humans. Climate change is mark point 3 and we could also accept extreme weather events for this mark point. Over farming is the equivalent of overfishing in the additional guidance column against mark point 2. Increasing human population is in the stem of the question and therefore cannot be credited. 2 marks awarded.

(b) As human population rises, food security is an increasing problem throughout the world.

Give **three** factors that reduce the amount of food available for humans throughout the world.

(3)

1 large population

2 crop diseases

3 pests

ResultsPlus
Examiner Comments

Crop diseases and pests are the same marking point for mark point 4. Large population needs to be qualified with large population of what, for a mark. 1 mark awarded.

(b) As human population rises, food security is an increasing problem throughout the world.

Give **three** factors that reduce the amount of food available for humans throughout the world.

(3)

1 Global warming, weather too hot / cold for crops to grow.

2 Drought not enough water for crops to grow / flooding too much water for crops to grow.

3 ~~not enough farm land?~~, Invasive Indigineus species may ate crop land reducing crop yield.

ResultsPlus
Examiner Comments

Global warming is for mark point 3. Drought is for mark point 7 and we could also accept famine and flooding for this mark point. Invasive species is the equivalent of pests for mark point 4. 3 marks awarded.

Question 8(a)ii

Candidates were asked to explain the role of the bicuspid valve in the left side of the heart. Expected answers included to prevent the backflow of blood or to allow blood to flow into the left ventricle or so blood flows in one direction. For the second mark point, they had to state that blood will not flow back into the left atrium or into Q as labelled on the diagram of the heart. Most candidates accessed at least 1 mark for this question.

(ii) The heart has a valve called the bicuspid valve between chamber Q and chamber R.

Explain the role of this valve.

(2)

The valve stops blood from falling into chamber R as it is only ~~allows blood to~~ opens to allow blood to flow from R to Q

ResultsPlus
Examiner Comments

Stops the blood falling into chamber R is incorrect, we would not accept the term falling either. Allows blood flow from R to Q is also incorrect. 0 marks awarded.

(ii) The heart has a valve called the bicuspid valve between chamber Q and chamber R.

Explain the role of this valve.

(2)

this valve prevents backflow of the blood stopping oxygenated blood from entering the right atrium and travelling back to the lungs where it will mix with deoxygenated blood

ResultsPlus
Examiner Comments

Prevent the backflow of blood is mark point 1. They have stated to the right atrium this is incorrect and it should be the left atrium so the second mark cannot be awarded the mark. 1 mark awarded.

Question 8(b)

This question was answered exceptionally well with the majority of candidates gaining all three marks. The question asked why the heart rate increased during exercise. The expected answers included the heart pumps blood faster, to provide more oxygen/glucose, for increased respiration, to get more energy to the muscles and to remove more carbon dioxide.

(b) Explain why heart rate increases during exercise.

(3)

during exercise the demand for oxygen increases to the muscles so the heart pumps faster to keep pumping oxygenated blood and deoxygenating blood

ResultsPlus
Examiner Comments

Oxygen demand increases is for mark point 2. Faster to keep pumping oxygenated blood is mark point 1 and 2 for 2 marks. MP1 is awarded twice so only 2 marks awarded.

(b) Explain why heart rate increases during exercise.

(3)

Increased respiration during exercise requires more oxygen. The heart rate increases to increase cardiac output, so more oxygen can travel to the working muscles. Carbon dioxide is used in respiration) more blood must be pumped.

ResultsPlus
Examiner Comments

For this question we only need to see the word more or increased or faster once in the answer therefore, it is then implied all the way through. Increased respiration is mark point 3. More oxygen needed is mark point 2. More blood pumped is mark point 1. We can ignore references to cardiac output. 3 marks awarded.

Question 8(c)i

This question was aimed at candidates who are achieving a grade 7 or above. It was a percentage calculation from data given in the table. They were then asked to give their answer to 3 significant figures. Most marks were lost by leaving the answer as 123.5 rather than 124, so only scored 2 of the 3 available marks.

(c) (i) Every person has a maximum heart rate.

Figure 15 shows how different types of activity affect a person's heart rate and the type of respiration they are using during that activity.

	walking	jogging	cross-country running	running fast (sprinting)
percentage of maximum heart rate	50%	65%	75%	90%
type of respiration	aerobic	aerobic	aerobic and anaerobic	aerobic and anaerobic

Figure 15

A person had a maximum heart rate of 190 beats per minute.
Calculate the heart rate of this person when they are jogging.

Give your answer to 3 significant figures.

(3)

190 ÷ 10 = 2.111 x 65 = 137.222

137

..... beats per minute

ResultsPlus
Examiner Comments

The calculation completed is incorrect but the candidate has given their answer to 3 significant figures so 1 mark can be awarded.

(c) (i) Every person has a maximum heart rate.

Figure 15 shows how different types of activity affect a person's heart rate and the type of respiration they are using during that activity.

	walking	jogging	cross-country running	running fast (sprinting)
percentage of maximum heart rate	50%	65%	75%	90%
type of respiration	aerobic	aerobic	aerobic and anaerobic	aerobic and anaerobic

Figure 15

A person had a maximum heart rate of 190 beats per minute.
Calculate the heart rate of this person when they are jogging.

Give your answer to 3 significant figures.

(3)

190 bpm

65% of 190 =
10% = 19
60% = 114
5% = 9.5

114 + 9.5

= 123.5

12 4 ..... beats per minute

ResultsPlus Examiner Comments

The correct answer is on the answer line for 3 marks.

(c) (i) Every person has a maximum heart rate.

Figure 15 shows how different types of activity affect a person's heart rate and the type of respiration they are using during that activity.

	walking	jogging	cross-country running	running fast (sprinting)
percentage of maximum heart rate	50%	65%	75%	90%
type of respiration	aerobic	aerobic	aerobic and anaerobic	aerobic and anaerobic

Figure 15

A person had a maximum heart rate of 190 beats per minute.
Calculate the heart rate of this person when they are jogging.

Give your answer to 3 significant figures.

(3)

190 x 065 = ~~12.35~~ 123.5

123.5 beats per minute

ResultsPlus
Examiner Comments

The correct calculation has been carried out but the answer is not given to three significant figures. 123.5 is 2 marks

Question 8(c)ii

This targeted the higher grades and required the candidates to explain how the structure related to the function of erythrocytes. The lower targeted mark was given for no nucleus to carry more oxygen. Other marks included biconcave shape to increase the surface area or to allow more diffusion, flexible or this to fit through capillaries, haemoglobin to bind oxygen and thin so a short diffusion pathway.

(ii) Erythrocytes (red blood cells) transport oxygen to respiring cells.

Explain how erythrocytes (red blood cells) are adapted to carry and release oxygen.

(3)

- no ~~neutrophils~~ nucleus to carry more oxygen
- have haemoglobin to stick to oxygen
- Concaved shape to carry more oxygen.
- Large surface area to volume ratio to tissue and absorb oxygen quickly

ResultsPlus
Examiner Comments

No nucleus to carry more oxygen is for mark point 1. Haemoglobin to stick to oxygen is acceptable for bind oxygen for mark point 4. Concaved shape is acceptable for biconcave but to carry more oxygen is not enough for mark point 2 but large surface area to volume ratio is in the additional guidance column against mark point 2 so 3 marks awarded.

(ii) Erythrocytes (red blood cells) transport oxygen to respiring cells.

Explain how erythrocytes (red blood cells) are adapted to carry and release oxygen.

(3)

+ no nucleus

Large SA → to allow more oxygen + haemoglobin to be carried

Biconcave shape → easier to squeeze through blood vessels

rate of respiration occurs faster

ResultsPlus
Examiner Comments

No nucleus to allow more oxygen is for mark point 1. Biconcave shape is not linked to increasing surface area or diffusion so cannot be awarded that mark. No further creditable content. 1 mark awarded.

Question 9(a)i

The question gave a table of data and asked for candidates to compare and contrast the data before and after the menopause. This question was answered well with many candidates gaining all three marks. One mark was awarded for the idea that all the hormones named decreased after the menopause. Other marks were given for calculating the reduction in each of the hormones oestrogen down by 10pg/mL, progesterone down by 10.6ng/mL and testosterone down by 19ng/dL. Calculated percentages for these values were also accepted for the mark points.

9 (a) The menopause occurs when the menstrual cycle stops.

Figure 16 shows the hormone concentrations in the blood before the menopause and after the menopause.

hormone	mean hormone concentration before the menopause	mean hormone concentration after the menopause
oestrogen	33 pg/mL	23 pg/mL
progesterone	11 ng/mL	0.4 ng/mL
testosterone	35 ng/dL	16 ng/dL

Figure 16

(i) Compare and contrast the hormone concentrations before and after the menopause.

(3)

The levels of oestrogen have decreased by 10pg/mL however progesterone levels have significantly lowered to almost none at 0.4ng/mL and testosterone has almost halfed from 35ng/dL to 16ng/dL

ResultsPlus
Examiner Comments

Levels of oestrogen down by 10pg/mL is for mark point 2. For both progesterone and testosterone they have not calculated the decrease so cannot be awarded mark point 3 or 4. They have stated all three are decreasing so can be awarded MP1. 2 marks awarded.

9 (a) The menopause occurs when the menstrual cycle stops.

Figure 16 shows the hormone concentrations in the blood before the menopause and after the menopause.

hormone	mean hormone concentration before the menopause	mean hormone concentration after the menopause
oestrogen	33 pg/mL	23 pg/mL
progesterone	11 ng/mL	0.4 ng/mL
testosterone	35 ng/dL	16 ng/dL

Figure 16

(i) Compare and contrast the hormone concentrations before and after the menopause.

(3)

be oestrogen progesterone and testosteron all decrease after the menopause. oestrogen goes from before 33 pg/ml to after 23 pg/ml progesteron goes from before 11 ng/ml and after 0.4 ng/ml testosteron goes from before 35 ng/dl and after 16 ng/dl

ResultsPlus
Examiner Comments

The differences have not been calculated for any of the hormones so mark point 2, 3 and 4 cannot be awarded. It is not enough just to quote data from the table. Mark point 1 can be awarded for all of the hormones decreasing after the menopause.

Question 9(a)ii

This question asked for the roles of FSH and LH in the menstrual cycle. This was targeted at the higher grades as the content is complicated. FSH should have been linked to the idea that it stimulated the follicle to mature causing the egg to mature and stimulated the production of oestrogen. LH should have been linked to ovulation and the formation of the corpus luteum. There were some mixed responses mixing up the roles of LH and FSH.

(ii) Explain the roles of FSH and LH in the menstrual cycle.

(3)

both FSH and LH are released from the pituitary gland. ~~FSH stimulates the production of oestrogen and matures~~ LH matures the egg and stimulates release of oestrogen.

ResultsPlus
Examiner Comments

LH does not mature the egg so no marks awarded. We ignored references to being released from the pituitary gland as this does not answer the question. 0 marks

(ii) Explain the roles of FSH and LH in the menstrual cycle.

(3)

FSH Stimulates follicle growth which means eggs are more abundant and ready for sperm.
LH maintains the uterus lining.

ResultsPlus
Examiner Comments

FSH stimulates follicle growth is mark point 1. Follicle Stimulating Hormone can be awarded for mark point 1. No further creditable content. 1 mark awarded.

(ii) Explain the roles of FSH and LH in the menstrual cycle.

(3)

FSH sheds the lining of the uterus wall and stimulates the production of oestrogen. LH ~~Stimulates~~ matures the egg follicle causing it to release and stimulates the production of progesterone.

ResultsPlus
Examiner Comments

Mark point 3 can be awarded for FSH stimulates the production of oestrogen. LH matures the egg follicle is incorrect causing it to release is not clear if this is the egg or the follicle, so mark point 3 cannot be awarded. 1 mark.

Question 9(b)

This question included a graph showing glucose concentrations for a person with type 2 diabetes and for a person who did not have type 2 diabetes. The question asked them to explain how glucose was controlled for a person with type 2 diabetes and a person who did not have type 2 diabetes and to include information from the graph in their answer. The levels were gained by details about how glucose in controlled in the blood by the pancreas releasing insulin to convert glucose to glycogen which is stored in the liver/muscles so lowering blood glucose levels. Or the release of glucagon from the pancreas to convert glycogen back to glucose to raise blood glucose levels for a person without type 2 diabetes. In addition to this the fact that the cells for a person with type 2 diabetes are not responsive to insulin and therefore they have to control their blood glucose with medication and diet and exercise. To get to the top of the level this information had to be linked to data from the graph to illustrate the point. To attain level 3 there needed to be detail about both sets of people and to get to the top of the level this needed to be linked to the graph with insulin and glucagon referenced. For level 2 they could give brief details of both or a detailed of either of them on how glucose is controlled for a person with type 2 diabetes or for a person who does not have type 2 diabetes.

*(b) Figure 17 shows the blood glucose concentrations for a person who has type 2 diabetes and a person who does not have type 2 diabetes.

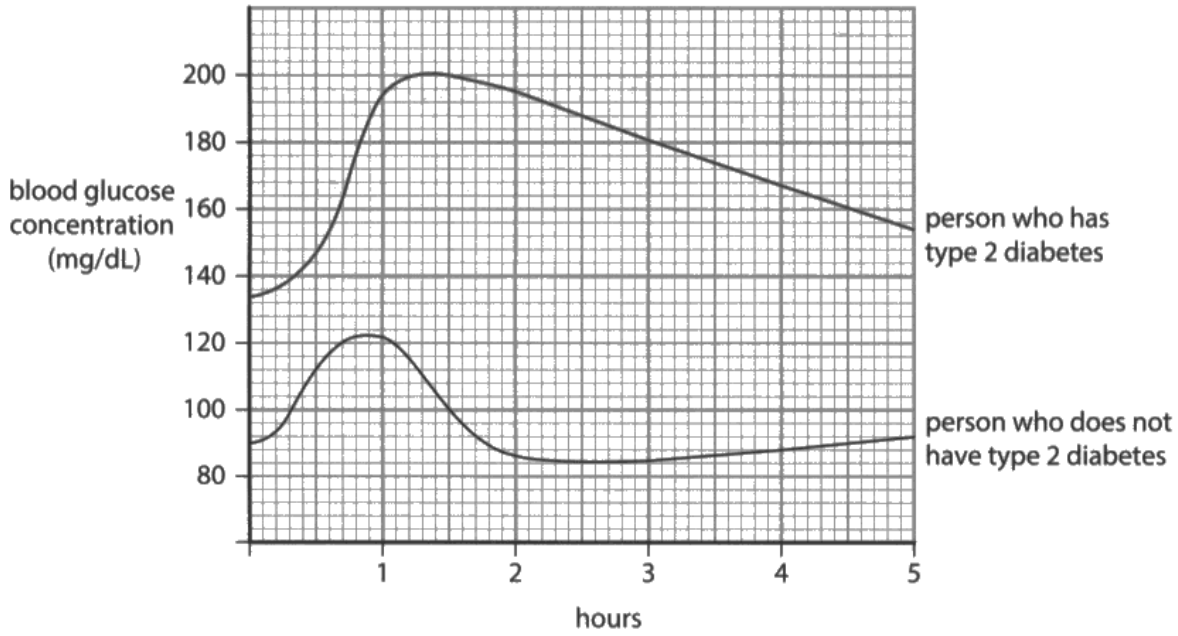


Figure 17

Explain how glucose concentrations are controlled for a person with type 2 diabetes and a person who does not have type 2 diabetes.

Include information from Figure 17 in your answer.

(6)

When a person without diabetes has glucose levels that are too low the body releases glycogen which turns glycerol into glucose to increase level when glucose levels are too high production of glycogen is inhibited Glycogen is secreted in the kidneys Their body produces enough insulin to break down glucose A person with type two diabetes has an insulin resistance meaning it doesn't do what

It needs to. They have to take insulin injections and have a monitor for high or low blood sugar in their arm.

This candidate has given two linked statements for Type 2 diabetes in that they are insulin resistant and can have insulin injections. This is enough to place them into Level 2. Their comments regarding blood glucose regulation are a little confused but we do not negatively mark so we can ignore these. Level 2 can be awarded for 3 marks.

*(b) Figure 17 shows the blood glucose concentrations for a person who has type 2 diabetes and a person who does not have type 2 diabetes.

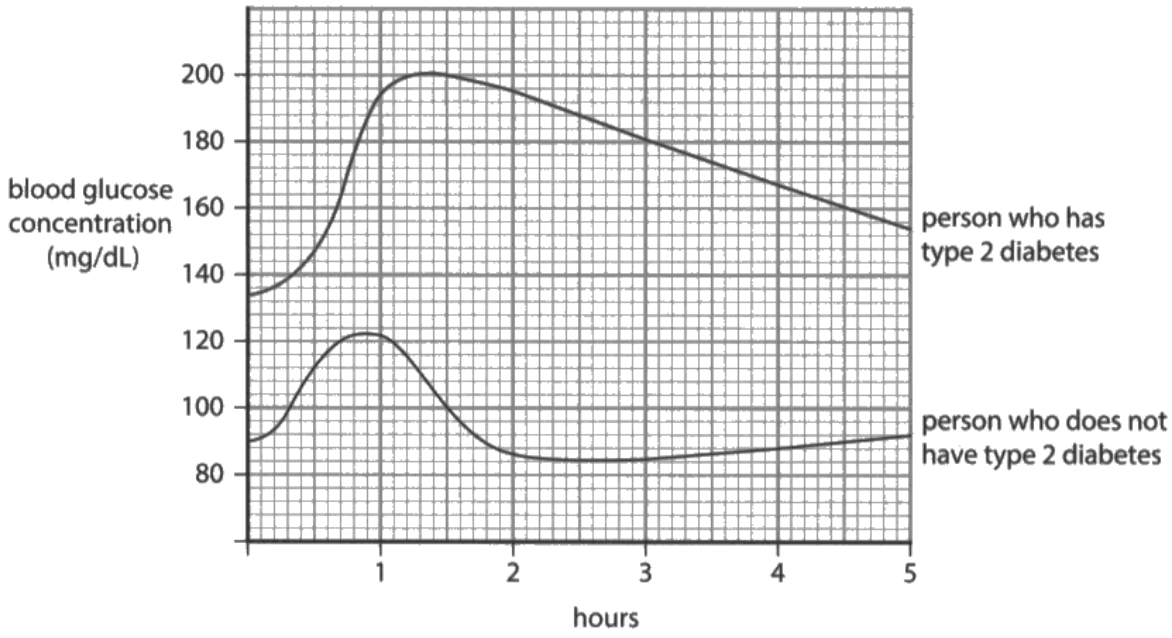


Figure 17

Explain how glucose concentrations are controlled for a person with type 2 diabetes and a person who does not have type 2 diabetes.

Include information from Figure 17 in your answer.

(6)

A person who does not have type 2 diabetes will have a spike in blood glucose after a meal. This is detected and the pancreas releases insulin. Insulin causes cells to remove glucose from the blood, this is then taken to liver and muscle cells where it is converted to glycogen to be stored. This can be seen of Figure 17 between 1 and 2 hours as levels fall. On figure 17 there is a slow rise after 3 hours because low blood glucose is detected and the pancreas

~~produces~~ releases glucagon to convert the glycogen back into glucose so levels rise.
People with type 2 diabetes do not respond to insulin. Therefore, their blood glucose levels only reduce when they use up the glucose. This is because it cannot be stored for later use.
A person with type 2 diabetes must exercise after eating a sugary meal to control their blood glucose levels.* As seen in

(Total for Question 9 = 12 marks)

figure 17 as there is a very slow decrease in blood glucose concentration, taking over 4 hours to return to normal whereas a person without type 2 diabetes took 1 hour to return to normal due to their response to insulin.

* as exercise uses glucose for aerobic respiration and energy release during exercise.

ResultsPlus
Examiner Comments

This response is level 3 as it has a detailed explanation of blood glucose regulation for a healthy person and a person with type 2 diabetes. They have included two comments on the graph quoting time and have stated the role of insulin and glucagon so can be awarded a mark at the top of the band. Level 3 - 6 marks.

*(b) Figure 17 shows the blood glucose concentrations for a person who has type 2 diabetes and a person who does not have type 2 diabetes.

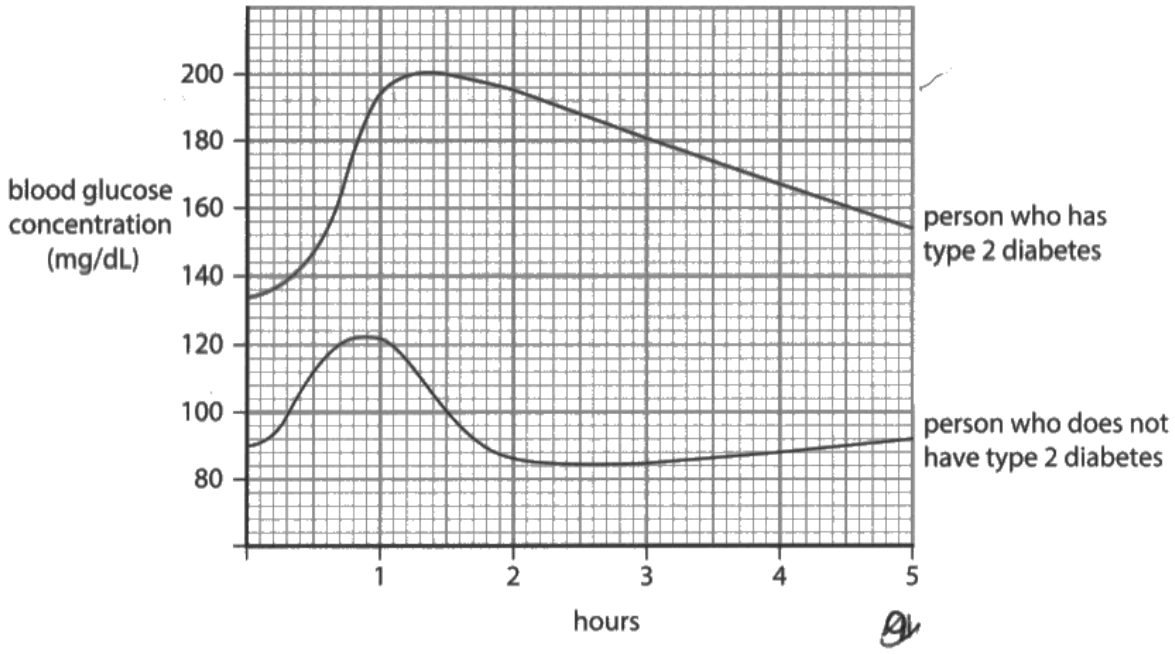


Figure 17

Explain how glucose concentrations are controlled for a person with type 2 diabetes and a person who does not have type 2 diabetes.

Include information from Figure 17 in your answer.

(6)

glucose glucagon glucagen insulin pancreas liver
no type 2
when blood glucose concentrations get high, the pancreas stimulates the release of insulin which breaks down glucose into glucagen which is stored in the liver.

type 2

as type 2 diabetes means that the body fails to release insulin or respond to insulin, the person must consume less glucose as it cannot be broken down.

ResultsPlus
Examiner Comments

This is the minimum required to get into level 3. They have given clear line of reasoning for the control of blood glucose concentrations for a healthy individual and a diabetic. There are no comments on the graph and although glucagon is mentioned there is no comment about its role so it cannot go to the top of the band. 5 marks awarded.

Question 10(a)iii

The question asks what process occurs in the proximal convoluted tubule (PCT) of the kidney. The first mark is the idea of selective reabsorption, the second mark is the idea of the substance being reabsorbed, in this case glucose, but amino acids would be accepted even though this is beyond the breadth of the specification. Finally, a mark for this happening by active transport. The question, despite being targeted quite highly was well answered with many candidates attaining at least 1 mark.

(iii) Describe the process that occurs in the proximal convoluted tubule (PCT).

(2)

- useful minerals are reabsorbed by selective reabsorption like glucose
- waste products like urea are not reabsorbed and passed through nephron.

ResultsPlus
Examiner Comments

We can ignore other things being reabsorbed and mark the selective reabsorption of glucose for 2 marks.

(iii) Describe the process that occurs in the proximal convoluted tubule (PCT).

(2)

Selective Reabsorption - Some water is reabsorbed (needed for eg respiration), this is done via ~~osmosis and~~ osmosis and a partially permeable membrane.

ResultsPlus
Examiner Comments

Selective reabsorption is mark point 1. We are not awarded water as this is reabsorbed throughout the nephron. 1 mark awarded.

Question 10(b)

This question asked for the role of the ureters and the bladder. Whilst most candidates were able to say that the bladder stored urine the role of the ureters was less well known with many confusing ureters and the urethra or believing that ureters formed urine. The expected answer was to move urine from the kidneys to the bladder. We accepted parts of the kidney such as the nephron or the collecting duct for the kidney.

(b) State the role of the ureters and the bladder in the urinary system.

(2)

ureters

the ureters is where the liquid is broken down into nutrients and urine, the urine then sent down to the bladder.

bladder

the bladder stores urine before it is released when you go to the bathroom.

ResultsPlus
Examiner Comments

Sent down to the bladder is not enough for the role of the ureters for mark point 1. We need kidneys and bladder with direction to the bladder for the mark. Bladder stores urine is mark point 2. 1 mark awarded.

(b) State the role of the ureters and the bladder in the urinary system.

(2)

ureters

Altering waste out of blood/water

bladder

~~filtering waste out of blood/water~~

Carrying the waste that ~~was~~ was filtered by ureters

ResultsPlus
Examiner Comments

No marks are awarded for filtering waste in the ureters for mark point 1. Carry waste is not enough for storing urine for mark point 2. 0 marks awarded.

(b) State the role of the ureters and the bladder in the urinary system.

(2)

ureters

Allows Urine to leave body

bladder

Stores Urine

ResultsPlus
Examiner Comments

Allows urine to leave the body is the urethra not the ureter and was a common error so no mark for point 1. Stores urine is enough for mark point 2 for the bladder. 1 mark awarded.

Question 10(c)

This final extended open-response question was to describe how the water content of the blood is controlled in the nephron. In order to achieve level 3 there must be a detailed description of how the nephron controls both high and low water content in the blood correctly, linked to the hormone ADH released from the pituitary gland and the effect on the permeability of the collecting duct. For level 2 this could be a simple description of both high and low water concentration control linked to ADH or a detailed description of either high or low water concentration. Level 2 can also be awarded where the candidate has given a good description of both but has mixed up how ADH affects the nephron. Level 1 can be awarded for linking water regulation to hormonal control.

*(c) Explain how the water content of the blood is regulated when a person has consumed a large volume of water and is now overhydrated.

(6)

When a person consumes toomuch water the ~~hypothalamus~~ hypothalamus signals to the pituitary gland to restrict release of ADH which allows the kidneys not to absorb as much water. Once the blood goes into the ~~glomerulus~~ glomerulus the ~~plasma and minerals and~~ plasma transfers any minerals and water into the bowman's capsule where it then travels into the tubicals ~~water~~ and absorbs whatever the body needs while not reabsorbing water due to the low concentration of ADH and by the time it reaches the collecting duct the water and urea ~~is~~ go to the bladder where it is released. Also the water content can be regulated through respiration ~~there water~~ and also through the skin where water is released through sweating which also helps regulate body temperature. Once the water level has returned to normal the hypothalamus stimulates the pituitary gland to release the ADH hormone to reabsorb water.

(Total for Question 10 = 12 marks)

ResultsPlus
Examiner Comments

This response is a brief explanation of how the body reacts to overhydration. They include details of how the nephron acts to get rid of excess water. Whilst they mention the collecting duct they are not referring to its permeability or it not reabsorbing water so cannot access level 3. They have named ADH and so can be placed at the top of level 2. 4 marks awarded.

*(c) Explain how the water content of the blood is regulated when a person has consumed a large volume of water and is now overhydrated.

(6)

If a person is over hydrated:

- Hypothalamus tells pituitary gland to secrete less/none ADH
- This causes the collecting duct to be permeable so water can easily get through
- ADH is not used so water isn't (or is less) selectively reabsorbed back into the blood
- Water is mixed with urea as it is waste and travels through ureter, into bladder and out urethra
- This gives a large volume of dilute urine (ratio between water and urea is large)
- Water is also lost through respiration and sweating.
- sweat glands open and secrete water out of sweat pores.

- osmoregulation (control of water in body) is an example of negative feedback. Where hypothalamus and pituitary gland secrete hormones to help the control.
- They do this so water doesn't make cells in the body too full / turgid and burst.

ResultsPlus
Examiner Comments

This is a detailed explanation of osmoregulation when overhydrated. They have correctly stated that the collecting duct becomes less permeable so the marks are raised to level 3. They have correctly identified ADH as the hormone and the hypothalamus and pituitary gland so can go to the top of the band 3. 6 marks awarded.

*(c) Explain how the water content of the blood is regulated when a person has consumed a large volume of water and is now overhydrated.

(6)

When the person is overly hydrated, the body will release ADH increasing the permeability of the collecting duct. Therefore more water is absorbed leading to the decrease of urine concentration within the body. Once this is released, the body's level of water will decrease and return to a normal level.

ResultsPlus Examiner Comments

This response is outlining a scenario where the body is dehydrated. They have correctly identified that there is a decrease in urine concentration so can get into level 1. They have correctly identified the hormone ADH so can go to the top of band 1. 2 marks awarded.

*(c) Explain how the water content of the blood is regulated when a person has consumed a large volume of water and is now overhydrated. osmoregulation. (6)

If someone consumed a large volume of water, then they are overhydrated. In the glomerulus, ~~water~~ small molecules, such as water and urine are filtered into the Bowman's capsule. Large particles such as protein cannot pass through, due to the membrane. As the smaller ~~particles~~ molecules enter the loop of Henle, water is absorbed back into the blood, however, only as much as needed. This is called selective reabsorbtion. As the person drank a large volume of water, most of the water would remain in the loop, and only some would undergo diffusion, back into the blood. All of ~~this is~~ that remaining in the "tube" is collected in the collecting duct, before it is excreted from the body.

Since the person consumed a large volume of water, their wee would not be highly concentrated, but would contain urea.

This process is called osmoregulation.

ResultsPlus
Examiner Comments

There is more than one statement about controlling water levels from the indicative content. The response states the water is collected in the collecting duct and that the urine would not be highly concentrated. They have also identified the process as osmoregulation. This is just enough to place the response into level 2. There is no mention of ADH so 3 marks are awarded.

Paper Summary

Based on their performance on this paper, candidates should:

- ensure they answer the actual question in the paper. Written responses to a number of questions indicated that candidates used past papers as part of their revision process, **which is commendable**, but care must be taken to ensure that candidates answer the actual question in the paper, as although the knowledge may be similar the question is rarely identical.
- recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given and the quantity of additional information given should reflect the number of marks awarded for the question.
- read the information given in the introduction to the question but avoid repeating it in the answer as it will not gain credit. Candidates should also read mathematical questions carefully to note whether an answer is required in a specific format, such as number of significant figures. They should ensure they consistently apply rules for rounding up numerical answers.
- ensure that when describing data from graphs and table they identify the trends shown and use data in written responses and using mathematical analysis such as mean calculation is possible. A mathematical manipulation of the data is nearly always likely to be creditworthy. Candidates need to ensure readings from percentile charts are accurate.
- make sure that key scientific terms from the specification are understood including those for glucose regulation such as insulin and glucagon, the idea of biological control and global food security. Also a greater understanding of the core practical tasks is essential to attain higher marks.
- always show the mathematical working when doing calculations as a mark can be awarded for errors carried forward.
- check the number of marks given for the question and ensure that they have included enough facts to match the marks awarded.
- consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.

Grade boundaries

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

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