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Examiners' Report
June 2023

GCSE Biology 1BI0 1F

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June 2023

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Introduction

The Pearson Edexcel GCSE (9-1) Biology Paper 1 (Foundation Tier) is the first 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. The qualification follows a linear assessment model whereby candidates must complete the two papers in the same single year of certification.

Biology Paper 1 (Foundation Tier) is awarded a total of 100 marks and is assessed by a variety of question types. These include, multiple-choice, short answer questions, calculations and extended open response questions. Candidates should answer all questions in a time period of 1 hour and 45 minutes. The extended open response questions marks 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 eight mandatory core practicals in the specification, which candidates must complete during the course. Candidates need to use their knowledge and understanding of these practical techniques and procedures in the written assessments.

Biology Paper 1 (Foundation tier) contains questions assessing the content of topics 1 to 5 as identified in the specification. In this examination series, candidates were required to respond to questions that tested their knowledge and understanding of microscopy, the structure of cells, stone tools, domesticating animals, stem cells, non-communicable diseases, antibiotics, aseptic techniques, simple genetics, biological control, genetic modification and eye defects.

In general, most candidates could access questions throughout the paper. Questions where marks could be gained by extracting and interpreting information, such as from tables and graphs, were answered well. Relatively few candidates scored full marks on the ‘explain’ questions because they did not give the extra scientific information needed to support their answers. Most candidates made a good attempt at answering the two extended open response questions, especially the one asking candidates to describe the similarities and differences of a bacterial cell and a plant cell.

Questions designed to assess practical work included devising a method to find the optimum pH of an enzyme, improving the results of an investigation and working safely with microorganisms. The assessment of maths skills included stating a trend in a graph, calculating the area of a zone of inhibition, calculating a ratio of the offspring from a genetic cross to the nearest whole number, calculating the number of bacteria in a colony and calculating the magnification of a biological drawing.

Question 1 (a)(iii)

This question was well answered with most candidates correctly naming mitochondria as the part of an animal cell where respiration occurs.

Question 1 (b)(i)

A large proportion of candidates simply repeated the stem of the question, so no credit could be given for their answers. Many responses also referred to using a microscope to 'zoom in' on a cell, which is not a creditworthy answer.

(b) A microscope can be used to observe the structure of a cell.

Figure 2 shows a microscope.

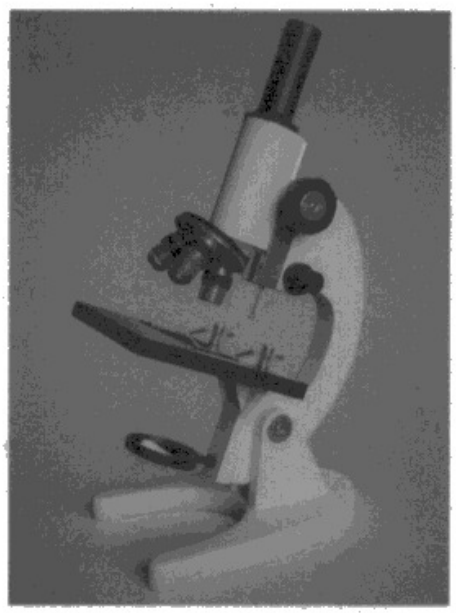

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Figure 2

(i) Give **one** advantage of using a microscope to look at cells.

(1)

a better more zoomed in perspective of the cell

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Examiner Comments

References to 'zooming in' or being able to see cells more clearly are insufficient for the mark. We are looking for the idea of cells appearing larger or more magnified, or that they can be seen in more detail.

(b) A microscope can be used to observe the structure of a cell.

Figure 2 shows a microscope.

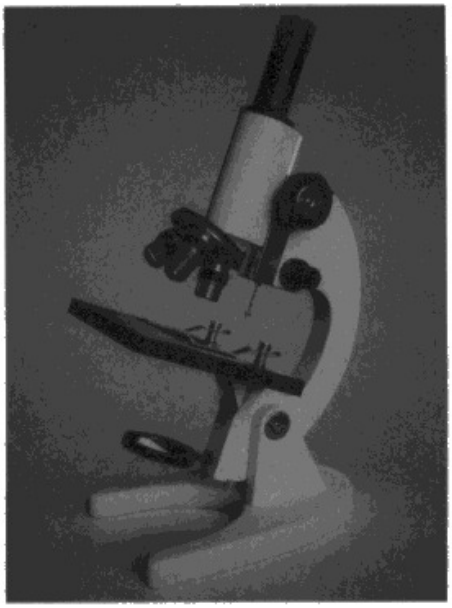

Figure 2

(i) Give **one** advantage of using a microscope to look at cells.

(1)

You are able to clearly see sub-cellular structures.

ResultsPlus
Examiner Comments

Being able to see sub-cellular structures scored one mark.

(b) A microscope can be used to observe the structure of a cell.

Figure 2 shows a microscope.

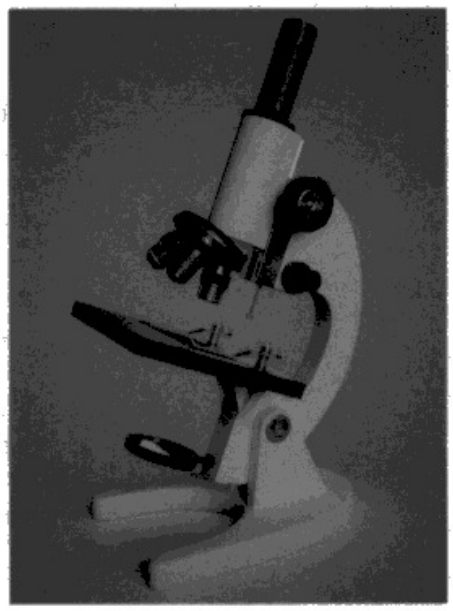

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Figure 2

(i) Give **one** advantage of using a microscope to look at cells.

(1)

You can see part of cells in more details, magnify part of cells

ResultsPlus
Examiner Comments

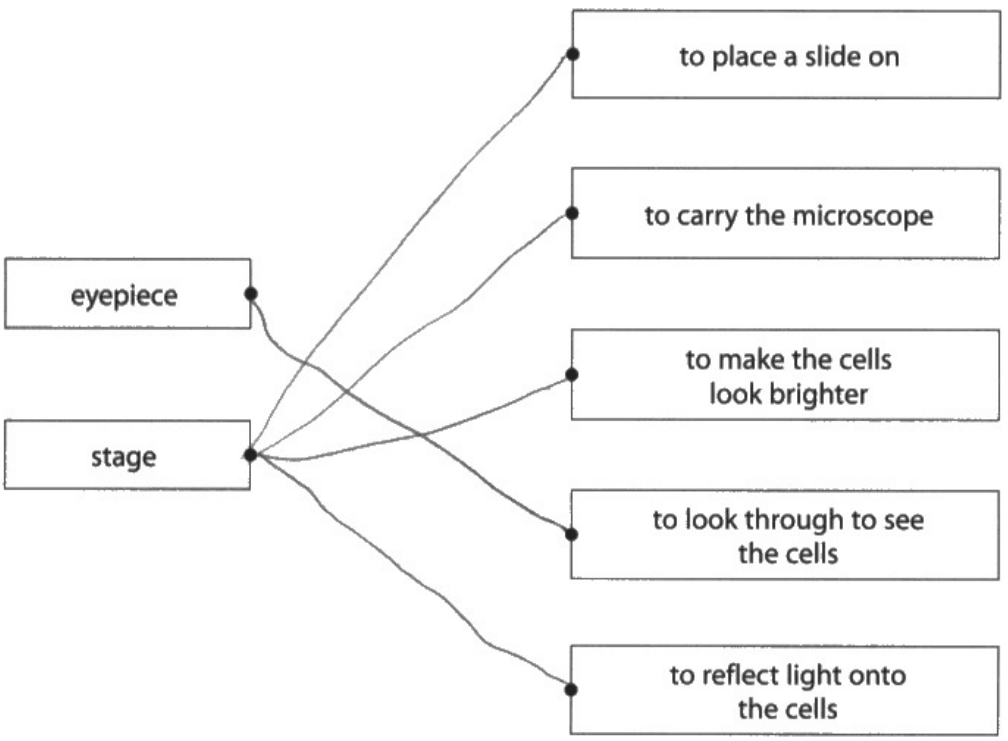
The candidate has given two points that could score the mark – see parts of cells in more detail and the reference to magnifying parts of a cell.

Question 1 (b)(ii)

A 'matching boxes' question is a common feature of the Foundation Tier paper. This question was answered correctly by the vast majority of candidates, although some did not follow the instruction to draw one straight line from one box to another.

(ii) Draw **one** straight line from each part of the microscope to its function.

(2)



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Examiner Comments

This scored one mark for correctly drawing a line from the eyepiece box.

More than one line has been drawn from stage to the remaining boxes, so a second mark cannot be awarded.

ResultsPlus
Examiner Tip

Always follow the instructions given in the question. In this case you should only draw one line from each box.

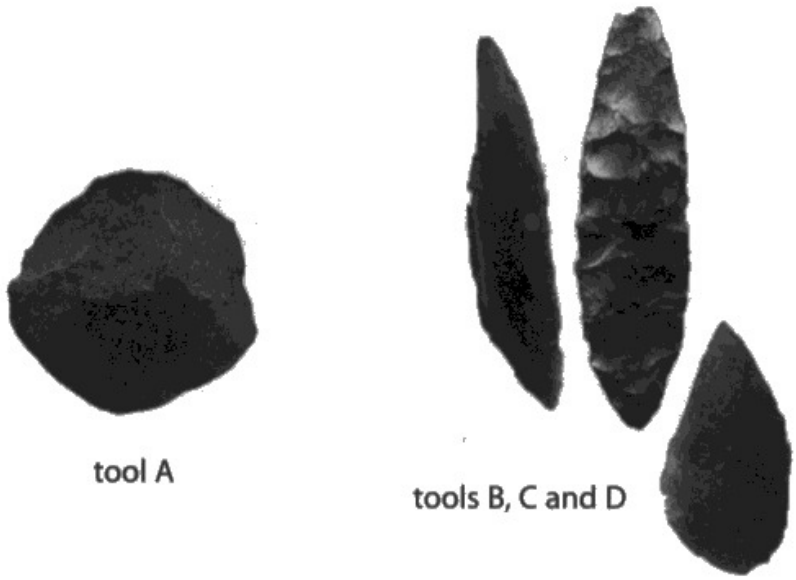
Question 1 (c)

Most candidates could give picometre as the smallest unit in the list.

Question 2 (a)(ii)

Most candidates were able to give a difference between tool A and tools B, C and D. A common response that scored one mark was a reference to the difference in the shape of these tools. Fewer candidates scored a second mark by giving an explanation for the difference, such as tool A was made by earlier humans.

Figure 5 shows some stone tools from two different periods of time.



(ii) Explain **one** difference between tool A and tools B, C and D.

(2)

Tool A has no point and is round whereas Tools B, C and D are sharper, have a more spear head like shape and have a point

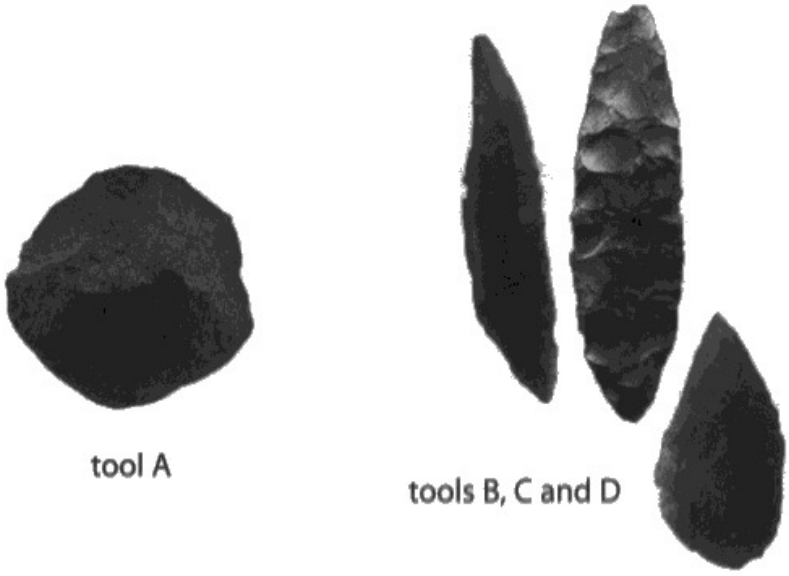
ResultsPlus
Examiner Comments

Describing a difference between tool A and tools B, C and D scores one mark. There is no explanation of the difference, so no further marks are awarded.

ResultsPlus
Examiner Tip

This is an 'explain' question, so scientific detail is required in the answer, such as tools B, C and D were made by more evolved humans.

Figure 5 shows some stone tools from two different periods of time.



tool A

tools B, C and D

Figure 5

(ii) Explain **one** difference between tool A and tools B, C and D.

(2)

Tool A is round and blunt whereas the other tools are long and sharp and would have been used to efficiently hunt. Tool A is older than tools B, C & D so people who used A would not have hunted efficiently.

ResultsPlus
Examiner Comments

The candidate has given one difference between tool A and tools B, C and D. The difference has been explained by referring to the age of the stone tools, so this answer scores two marks.

ResultsPlus
Examiner Tip

Always avoid writing below the answer lines.

Question 2 (b)(i)

The vast majority of candidates could correctly select the missing words to complete the sentences.

Question 2 (b)(iii)

This question was not answered particularly well. Many candidates were unfamiliar with the domestication of animals and a large number of responses simply repeated information from the stem of the question, such as keeping animals as pets. However, candidates who added information such as pets provide companionship for humans, scored the mark.

(iii) Give **one** advantage of domesticating animals.

(1)

One advantage of domesticating animals is that we can keep them as pets.

ResultsPlus
Examiner Comments

This answer repeats the stem of the question and does not give an advantage of domesticating animals, so zero marks scored.

ResultsPlus
Examiner Tip

Always check that your answer is not just repeating the information given in the question.

(iii) Give **one** advantage of domesticating animals.

(1)

One advantage to domesticating animals is that they are less dangerous

ResultsPlus
Examiner Comments

Domesticating animals to make them less dangerous was a common response that scored the mark.

(iii) Give **one** advantage of domesticating animals.

(1)

They can be used to work, ~~cu~~ as they could be better at pulling ploughs in farming for example

ResultsPlus
Examiner Comments

This a suitable example of domesticated animals being used as working animals. The candidate has done more than just restate part of the question. One mark awarded.

Question 3 (a)(i)

The majority of candidates found this question challenging. Candidates who gave a similarity between the limbs, such as similar bone patterns or five digits, scored the mark. Stronger candidates were awarded the mark for recognising that these are pentadactyl limbs.

3 (a) Figure 6 shows the bones in the limbs of a bird and a whale.

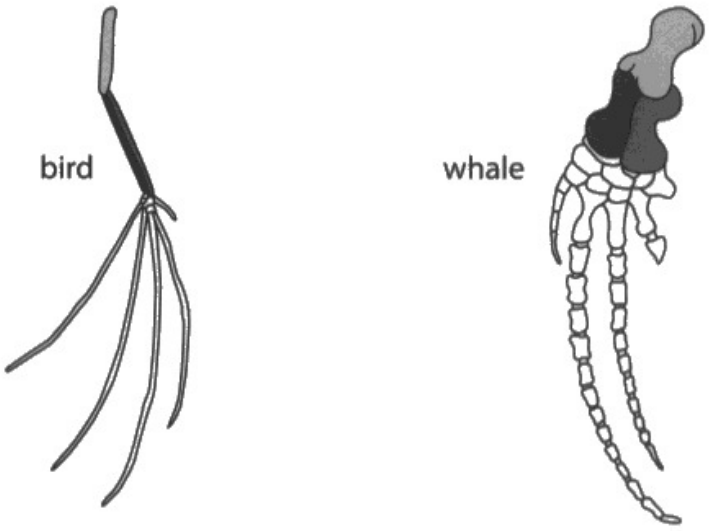


Figure 6

(i) The bird and the whale have evolved from a common ancestor.

Give **one** way the structure of these limbs provides evidence for this evolution.

(1)

The same amount of limbs (5)

ResultsPlus
Examiner Comments

The stem of the question states that they are limbs, so this response scored zero marks. A reference to similar bone structure would have gained the mark.

3 (a) Figure 6 shows the bones in the limbs of a bird and a whale.

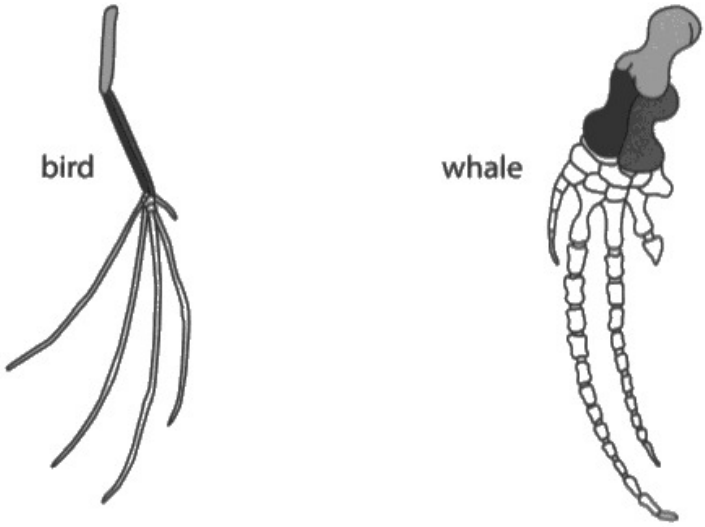


Figure 6

(i) The bird and the whale have evolved from a common ancestor.

Give **one** way the structure of these limbs provides evidence for this evolution.

(1)

There are 5 digits in each pentadactyl limb

ResultsPlus
Examiner Comments

This is a very clear response that scored one mark.

3 (a) Figure 6 shows the bones in the limbs of a bird and a whale.

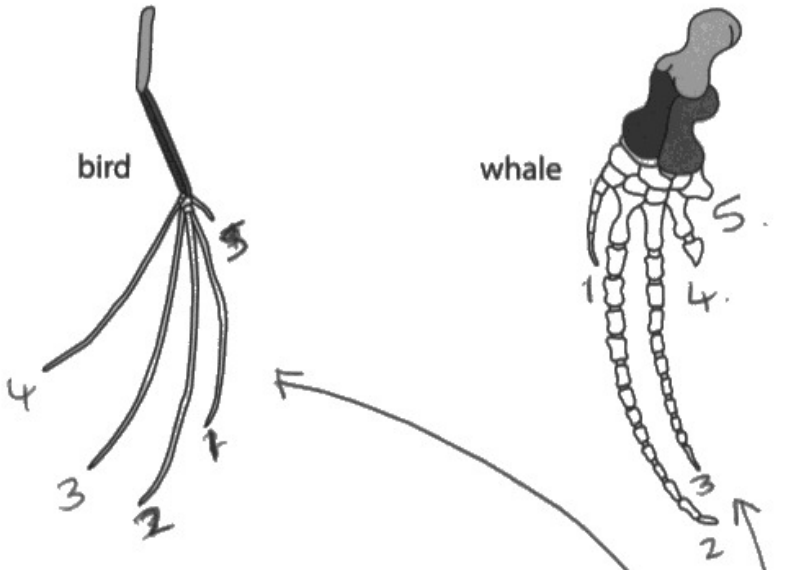


Figure 6

(i) The bird and the whale have evolved from a common ancestor.

Give **one** way the structure of these limbs provides evidence for this evolution.

(1)

They both have the same bones (5 each) The structure is similiar.

ResultsPlus
Examiner Comments

The candidate has annotated the diagram to reinforce the point that the bone structure of the limbs is similar, so this scored the mark.

Question 3 (b)(i)

This question was not answered well by the majority of candidates. In general, they did not link the presence of DNA in bones to cells, nuclei or mitochondria. A common correct response was a reference to cells being found in bone marrow.

(b) DNA is found in bones and stem cells.

(i) Suggest **one** reason why DNA is found in bones.

(1)

(blank) DNA is found in bones because you have cells in your bones and cells have DNA

ResultsPlus
Examiner Comments

This is a detailed response that scored the mark.

(b) DNA is found in bones and stem cells.

(i) Suggest **one** reason why DNA is found in bones.

(1)

The bone marrow in bones contains stem cells which also have DNA inside.

ResultsPlus
Examiner Comments

This is a good response that has linked information from the stem of the question.

Question 3 (b)(ii)

This was a very challenging question for most candidates. Only a small proportion of candidates demonstrated good knowledge of stem cells and scored two marks. References to stem cells being undifferentiated but having the ability to differentiate were the marking points most frequently awarded. Responses describing that stem cells divide by mitosis, thus helping animals to grow, were seen much less often.

(ii) Describe how stem cells help animals to grow.

(2)

Stem cells allows ~~plant~~ animal to grow by dividing them through mitosis. Stem cells ~~also~~ are is a type of cells that ~~can~~ divide to produce any type of cells. Animal grow through stem cells by and then differentiate into specialised cells. e.g bone cells, egg cells.

ResultsPlus Examiner Comments

This detailed response scores full marks. The candidate has included three creditworthy points: dividing by mitosis scores two marks and differentiating into specialised cells is a third marking point.

(ii) Describe how stem cells help animals to grow.

(2)

They divide and differentiate to become specialised cells

ResultsPlus Examiner Comments

This concise response scores two marks. 'They divide' is one mark and 'differentiate (to become specialised cells)' is a second mark.

Question 3 (b)(iii)

It was surprising that only a small proportion of candidates could name rods or cones as types of cell found in the retina.

Question 3 (b)(iv)

Many candidates struggled to apply their knowledge of stem cells to this unfamiliar situation. A large number of responses were vague and just referred to the transplanted stem cells improving vision, without giving an explanation, such as the transplanted cells could correct blindness.

(iv) Explain **one** reason for transplanting stem cells into the retina.

(2)

to replace rods and cones which dont work well, help with vision.

ResultsPlus
Examiner Comments

Replacing rods and cones was awarded one mark. To score a second mark, the candidate needed to say why rods and cones might need to be replaced, for example, because the retina has been damaged.

(iv) Explain **one** reason for transplanting stem cells into the retina.

(2)

To fix an damage in the retina as stem cells adapt to the job it is put there to do for example helping someone's eyesight and improving it.

ResultsPlus
Examiner Comments

Fixing damage to the retina scored one mark. 'Stem cells adapt to the job' is insufficient to be awarded the first marking point; there needs to be a clear reference to stem cells developing into or replacing retinal cells.

(iv) Explain **one** reason for transplanting stem cells into the retina.

(2)

the subject person could have a lack of cones or rods in the eye, leading to (semi) blindness. Stem cells can be inserted, where they will Differentiate into the needed cells, to repair the function of their eye

ResultsPlus
Examiner Comments

This is a good response that scored both marks. 'Differentiate into the needed cells' and 'repair the function of the eye' (there is an earlier reference to blindness) scored the marks.

Question 4 (b)(i)

It was pleasing to note that many candidates could use the table to deduce that the person with a BMI of 39.0 is obese, thus scoring one mark. A large proportion of candidates could also explain that the person has a high risk of developing cardiovascular disease because they are obese; this scored them two marks. However, it was not uncommon for some candidates to go beyond what the question asked and write about the effect of obesity on the body.

(b) Several factors affect the risk of developing cardiovascular disease.

Figure 7 shows different BMI ranges and their weight descriptions.

BMI range	weight description
18.5 to 24.9	healthy weight
25.0 to 29.9	overweight
30.0 to 39.9	obese
40 or more	severely obese

Figure 7

(i) A person has a BMI of 39.0

Explain the risk of this person developing cardiovascular disease.

(2)

A person with a BMI of 39.0 is likely to be at high risk of cardiovacular disease. This is because they are obese, therefore, their body and its organs will be unhealthy which includes unhealthy lungs. This will lead to a build up of mucus because their bodies cannot clean itself properly or function properly.

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Examiner Comments

The candidate has explained that because the person is obese they are at high risk of developing cardiovascular disease. Two marks awarded. The last three lines of the answer are an attempt to explain the effects of obesity on the body, which is unnecessary.

(b) Several factors affect the risk of developing cardiovascular disease.

Figure 7 shows different BMI ranges and their weight descriptions.

BMI range	weight description
18.5 to 24.9	healthy weight
25.0 to 29.9	overweight
30.0 to 39.9	obese
40 or more	severely obese

Figure 7

(i) A person has a BMI of 39.0

Explain the risk of this person developing cardiovascular disease.

(2)

This person is obese which can damage the heart because fat in the body can press down on the organs. Normal movement is hard for obese people as they carry extra mass.

ResultsPlus
Examiner Comments

This scored one mark for recognising that the person is obese. The comments about how obesity affects the body are not creditworthy.

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Examiner Tip

Always read the question carefully. Do not include information in your answer that does not link to the question.

Question 4 (b)(ii)

A surprisingly large proportion of candidates struggled with this question. It was not uncommon for candidates to ignore the information in the stem of the question and to write about lifestyle factors. Knowledge of lifelong medication and surgical procedures was quite limited.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State **two** other treatments for cardiovascular disease.

(2)

1 stents can be used to open up the arteries and let blood pass through

2 Medication can be used to control Cholestrol ~~and~~ ~~levels~~ blood pressure levels

ResultsPlus Examiner Comments

One mark was awarded for stents and one mark for medication. Candidates were not expected to describe how each treatment works.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State **two** other treatments for cardiovascular disease.

(2)

1 Heart transplant

2 ~~Exerci~~ ~~Exercise~~ Medication

ResultsPlus Examiner Comments

Heart transplant and medication are correct treatments for cardiovascular disease, so this response scored two marks.

(ii) Changes in lifestyle can reduce the risk of cardiovascular disease.

State **two** other treatments for cardiovascular disease.

(2)

1 stents, to widen arteries.

2 statin * pills, to reduce cholesteral.

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Examiner Comments

This response scored two marks for stents and statin pills – named medicines were accepted for medication.

Question 4 (c)(i)

The vast majority of candidates scored the mark for stating the trend shown in the graph.

Question 4 (c)(ii)

This question was answered well. Most candidates were able to give at least one reason for the change in the number of people who smoke cigarettes. People being more aware of the dangers or being better educated about the dangers of smoking cigarettes were frequent answers. Alternatives to cigarettes, such as vapes, were other common answers.

(ii) Give **two** reasons for this change in the number of people smoking cigarettes.

(2)

1 People are more aware of the health implications

2 vapes started to become more popular and so people transitioned to them.

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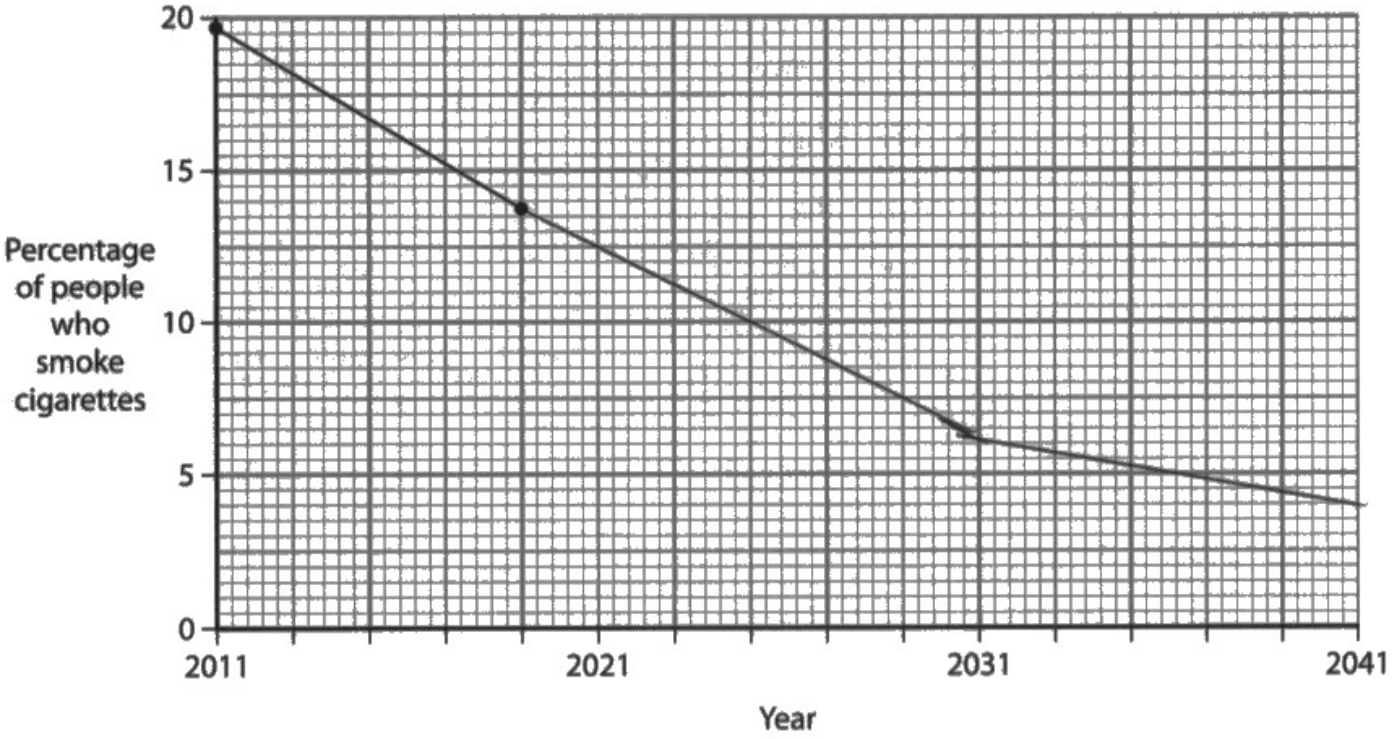
Examiner Comments

This response scored two marks. Being more aware of the health implications (of smoking cigarettes) and people using vapes instead of smoking cigarettes are the creditworthy points.

Question 4 (c)(iii)

In this question, candidates had to draw a line on a graph to show the likely trend in the percentage of people smoking cigarettes from 2019 to 2041. Any line showing a downward trend to 2041 was awarded the mark. Extending the line already drawn on the graph down to the x axis meant that 2041 was not reached, so no mark could be awarded.

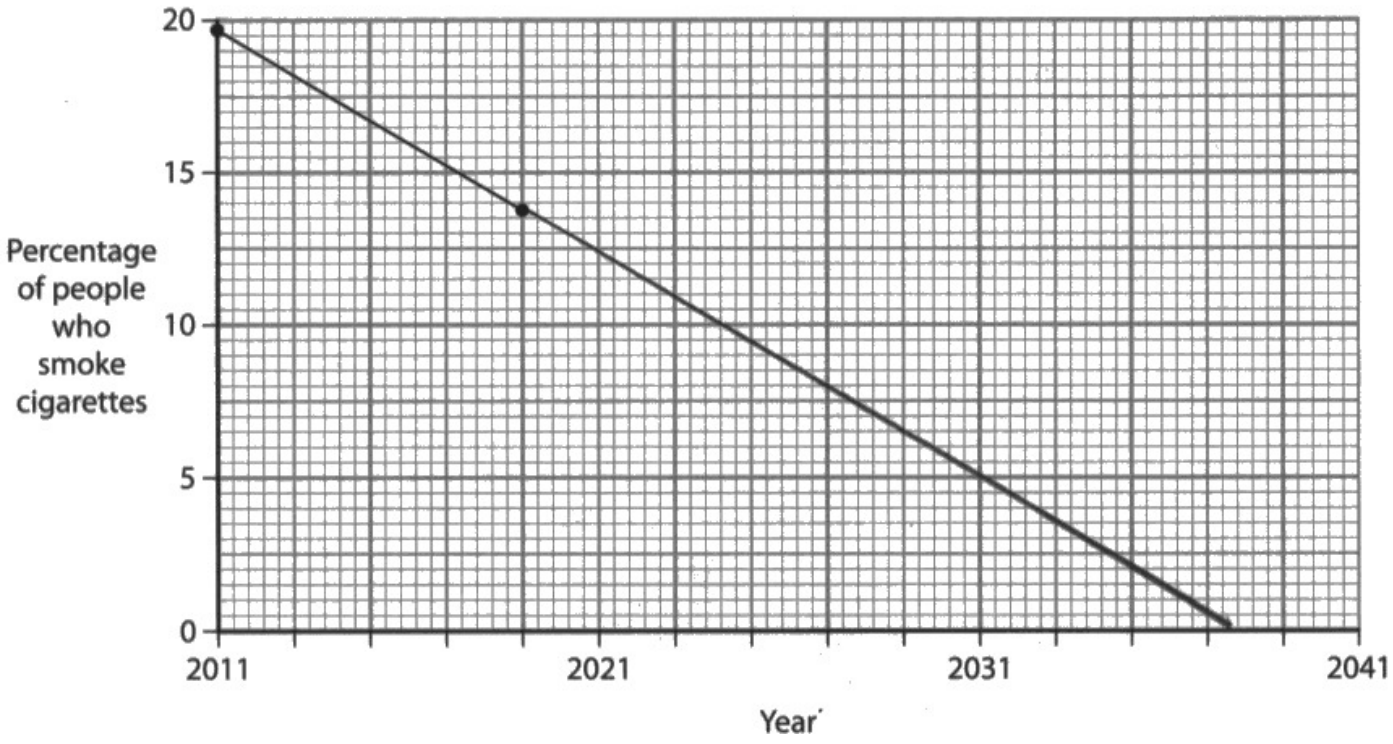
(c) Figure 8 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.



ResultsPlus
Examiner Comments

This response was awarded one mark because the line drawn shows a downward trend and ends at 2041.

(c) Figure 8 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.



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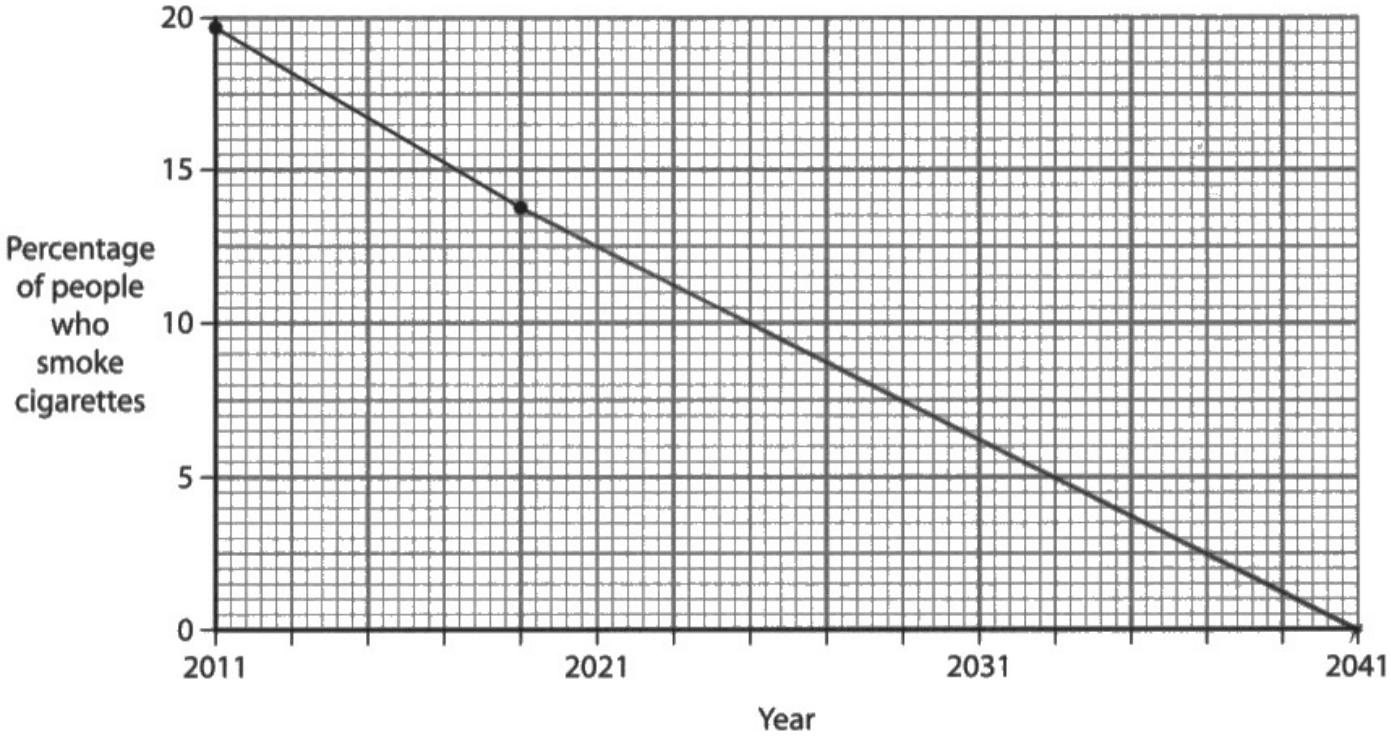
Examiner Comments

The candidate has extended the line that was already drawn on the graph. The new line ends between 2037 and 2038, so zero marks scored.

(c) Figure 8 shows the percentage of people who smoked cigarettes in England from 2011 to 2019.



ResultsPlus
Examiner Comments

This scored one mark because the new line ends at 2041.

Question 5 (a)(i)

Many candidates found this question difficult and often wrote far more than necessary in their answers. The candidates who read the stem of the question carefully and had some knowledge of this core practical usually scored the mark. The prevention of bacterial growth by the garlic extract was an acceptable answer.

5 A student investigated the antibiotic properties of garlic.

Bacteria were spread on an agar plate.

A paper disc was soaked in garlic extract and placed on this agar plate.

Figure 9 shows the agar plate after 24 hours.

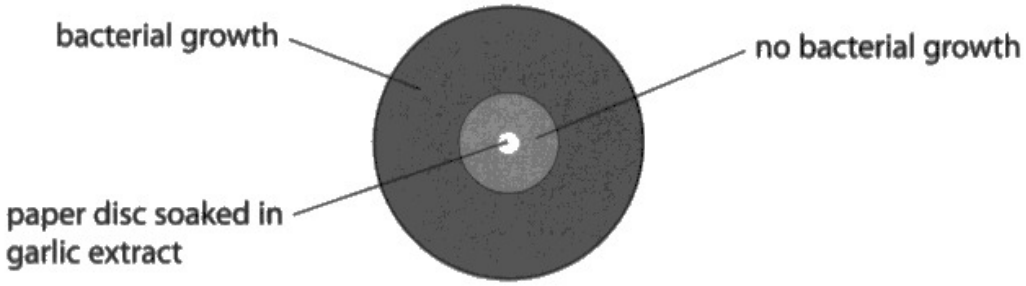


Figure 9

(a) (i) Suggest why there is an area with no bacterial growth.

(1)

because the garlic extract was able to kill the bacteria

ResultsPlus
Examiner Comments

This answer scored one mark for the garlic extract killing the bacteria.

5 A student investigated the antibiotic properties of garlic.

Bacteria were spread on an agar plate.

A paper disc was soaked in garlic extract and placed on this agar plate.

Figure 9 shows the agar plate after 24 hours.

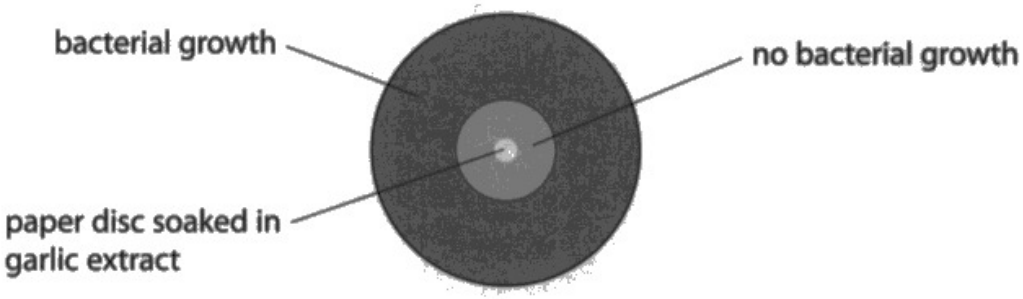


Figure 9

(a) (i) Suggest why there is an area with no bacterial growth.

(1)

Garlic extract prevents bacterial growth.

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Examiner Comments

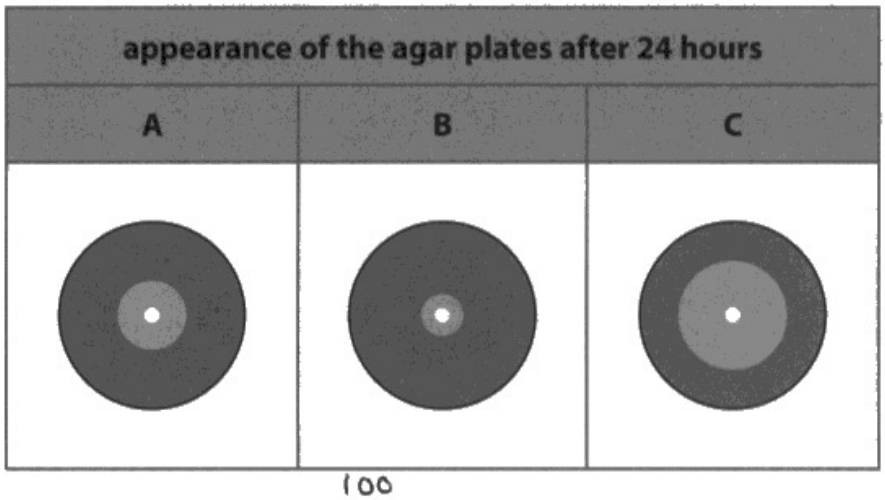
This response was awarded one mark for the garlic extract preventing bacterial growth.

Question 5 (a)(ii)

This question was well answered. Most candidates were able to interpret the results shown in the diagrams to correctly explain which agar plate has the paper disc containing the highest concentration of garlic extract. Some candidates misinterpreted the diagrams, resulting in no marks being awarded.

(ii) The student repeated the investigation using three separate agar plates with different concentrations of garlic extract.

Figure 10 shows the results.



100

Figure 10

The concentrations of garlic extract used were 10 mg/cm^3, 40 mg/cm^3 and 100 mg/cm^3.

Explain which agar plate, shown in Figure 10, has the paper disc containing the 100 mg/cm^3 garlic extract.

(2)

* Agar plate B, because there is the ~~most bacteria~~ Largest growth of bacteria On plate B. And there is ~~a~~ the smallest mass of non bacteria growth.

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Examiner Comments

This answer scored zero marks because the candidate has misinterpreted Figure 10. The explanation confuses the area with bacterial growth and the area with no bacterial growth.

ResultsPlus
Examiner Tip

Read the labels on diagrams carefully before using that information to answer a question.

(ii) The student repeated the investigation using three separate agar plates with different concentrations of garlic extract.

Figure 10 shows the results.

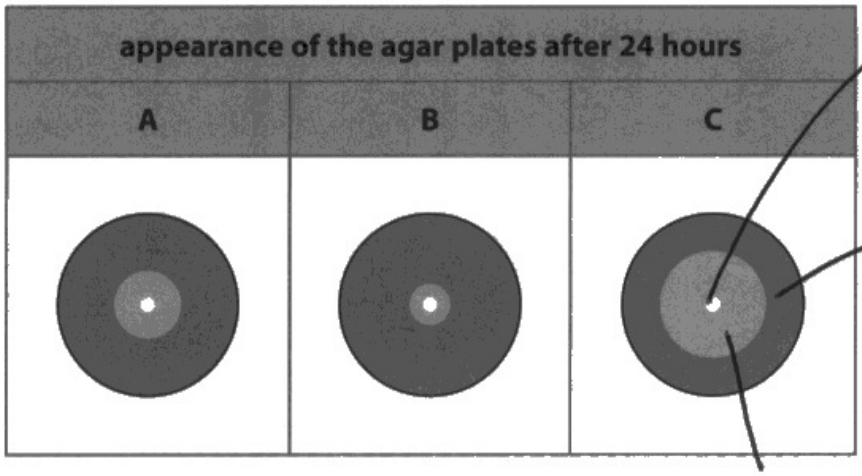


Figure 10

The concentrations of garlic extract used were 10 mg/cm^3, 40 mg/cm^3 and 100 mg/cm^3.

Explain which agar plate, shown in Figure 10, has the paper disc containing the 100 mg/cm^3 garlic extract.

(2)

Plate C has the disc containing the 100 mg/cm^3 garlic ~~extract~~ extract I know this because it has the least bacterial growth meaning the concentration is the highest as the garlic extract prevents Bacterial growth.

ResultsPlus
Examiner Comments

This candidate has annotated the diagram using information from Figure 9. Agar plate C has been correctly identified and there is a reference to least bacterial growth (on agar plate C), so two marks were awarded.

Question 5 (a)(iii)

This question was linked to practical skills and it was surprising that many candidates found it challenging. Repeating the investigation (for each concentration) was the response seen most frequently, but candidates with a better understanding of the task gave the use of a control, incubating the agar plates at the same temperature, or measuring the diameter of the clear zone.

(iii) Give **one** way the student could improve their results.

(1)

Repeat again using regular intervals of the concentrations. For example, 15 mg/cm³, 30 mg/cm³, 45 mg/cm³ etc.

ResultsPlus
Examiner Comments

Repeating the investigation with a wider range of concentrations was acceptable for the mark. This candidate has specified a suitable range of garlic extract concentrations that could be used.

(iii) Give **one** way the student could improve their results.

(1)

Having a dish with no garlic extract so they can compare the dishs.

ResultsPlus
Examiner Comments

This scored the mark for giving a suitable control.

(iii) Give **one** way the student could improve their results.

(1)

The student could do the experiment another 3 times using the same concentration of garlic extract

ResultsPlus
Examiner Comments

Repeating the investigation for each concentration was awarded the mark.

Question 5 (a)(iv)

This question was answered well. The majority of candidates could use the equation given in the question to calculate the area with no bacterial growth on an agar plate. An error commonly made by some candidates was to square pi, then to multiply that answer by five.

(iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2.

Use $\pi = 3.14$

$5mm \times 3.14^2$ (2)

area = 49.298 mm^2

ResultsPlus
Examiner Comments

This candidate has given incorrect working. The radius should be squared, not pi. Zero marks awarded.

ResultsPlus
Examiner Tip

Always check that you have used an equation correctly. In this case, check that you have squared the correct number.

(iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2.

Use $\pi = 3.14$

(2)

$\pi \times 5 = 5\pi$

$5\pi = 15.70$

area = 15.70 mm²

ResultsPlus Examiner Comments

This candidate has given incorrect working. They have forgotten to square the radius, so zero marks awarded.

(iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2.

Use $\pi = 3.14$

(2)

$3.14 \times 5 = 15.7$

$15.7^2 = 246.49$

area = 246.49 mm²

ResultsPlus Examiner Comments

The candidate has multiplied the two numbers given in the question and then squared the answer. This is not a creditworthy response.

(iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2.

Use $\pi = 3.14$

(2)

$= 3.14 \times (5^2)$ 4

$= 3.14 \times 25 = 78.5$

area = 78.5 mm²

ResultsPlus
Examiner Comments

Full marks awarded. The candidate has shown their working and has correctly calculated the area.

(iv) The area with no bacterial growth for agar plate B has a radius of 5 mm.

Calculate the area with no bacterial growth for agar plate B.

The area of a circle is πr^2.

Use $\pi = 3.14$

3.14×5^2

(2)

area = 246.6 mm²

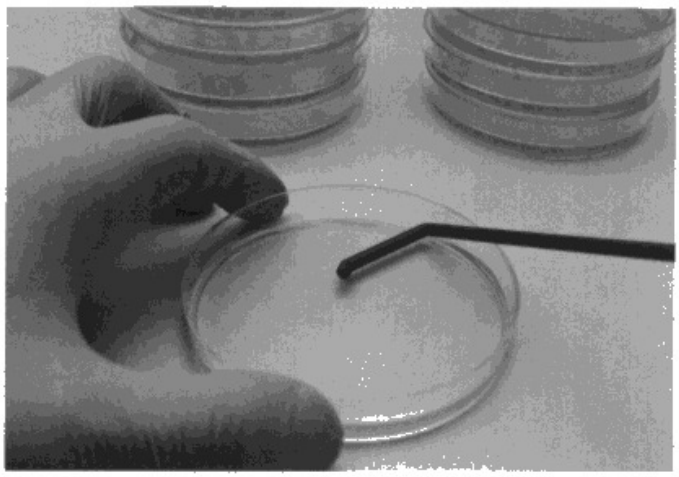
ResultsPlus
Examiner Comments

The correct working has been shown, so this scored one mark. Unfortunately the candidate has performed the final calculation incorrectly, so the second mark is not awarded.

Question 5 (b)(i)

The majority of candidates could give a suitable reason for heating the spreader in the flame of a Bunsen burner, such as sterilising it. Only candidates who were unfamiliar with this type of practical work were confused by the question and thought that heating the spreader would melt the agar or help the bacteria to grow.

(b) Figure 11 shows bacteria being spread on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 11

(i) State the reason for heating the spreader in the flame of a Bunsen burner before use.

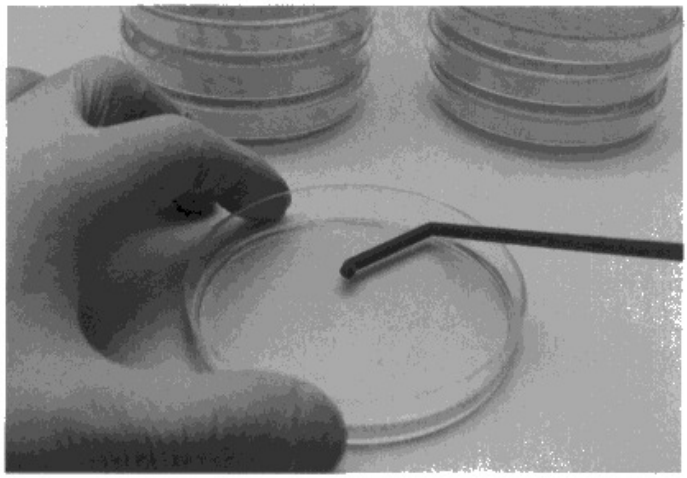
(1)

This makes the agar into a liquid, making it easy to spread all over.

ResultsPlus
Examiner Comments

This is not the correct reason for heating the spreader in a flame. We are looking for the idea that the spreader will be sterilised.

(b) Figure 11 shows bacteria being spread on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 11

(i) State the reason for heating the spreader in the flame of a Bunsen burner before use.

(1)

To kill any bacteria so the spreader is sterile.

ResultsPlus
Examiner Comments

This answer contains two creditworthy points; kill any bacteria and so the spreader is sterile. Either point scores the mark.

Question 5 (b)(ii)

This question was about ways of working safely with microorganisms. The vast majority of candidates scored one mark. The most common responses were wearing gloves or a face mask; eye protection was also credited in this instance since it was not just a generic safety precaution. Candidates who had clearly experienced working with microorganisms were usually able to give other ways of working safely, such as disinfecting work surfaces or working close to a Bunsen burner flame.

(ii) Give **two** other ways of working safely with microorganisms.

(2)

1 Clean the surfaces around the working area

2 Always make sure to wear goggles

ResultsPlus
Examiner Comments

This scored one mark for wearing goggles. Clean the surfaces is insufficient; we need the idea that work surfaces are disinfected.

(ii) Give **two** other ways of working safely with microorganisms.

(2)

1 wear gloves.

2 after Seal the container sono Spread outside agar.

ResultsPlus
Examiner Comments

This response scored two marks for wear gloves and seal the container (agar plate).

(ii) Give **two** other ways of working safely with microorganisms.

(2)

1 use an bunsen burner to create an unsafe

2 wipe work surface with antiseptic spray

ResultsPlus
Examiner Comments

This response shows good practical knowledge. Both of the points are creditworthy, so two marks were awarded.

Question 6 (b)(i)-(ii)

This question required candidates to complete a Punnett square using information provided in the stem of the question. After completing the Punnett square candidates then had to state the percentage of offspring that will produce round seeds. Many candidates completed both parts of the question correctly, but some failed to read the question carefully and used the incorrect genotype for wrinkled seeds. However, an error carried forward was credited if the correct offspring were shown in the Punnett square from the incorrect gametes.

(b) A scientist crossed a pea plant that produced round seeds (Rr) with a pea plant that produced wrinkled seeds (rr).

(i) Complete the Punnett square.

(2)

round seeds \ wrinkled seeds	R	r
R	RR	Rr
r	Rr	Rrr

(ii) State the percentage of the offspring that will produce round seeds.

(1)

percentage = 75 %

ResultsPlus
Examiner Comments

The gametes for wrinkled seeds are incorrect (should be r and r). However, the candidate has completed the Punnett square correctly from these gametes and has stated the correct percentage of offspring that will produce round seeds based on this Punnett square. Each part of the question was awarded one mark.

ResultsPlus
Examiner Tip

Read questions carefully so that you choose the correct information to use in your answer.

(b) A scientist crossed a pea plant that produced round seeds (Rr) with a pea plant that produced wrinkled seeds (rr).

(i) Complete the Punnett square.

(2)

		wrinkled seeds	
		r	r
round seeds	R	Rr	Rr
	r	rr	rr

(ii) State the percentage of the offspring that will produce round seeds.

(1)

percentage = 50 %

ResultsPlus
Examiner Comments

All aspects of the question have been completed correctly, so full marks were awarded.

Question 6 (c)(i)

This question tested the maths skill of calculating a ratio and giving an answer to the nearest whole number. This skill has been tested on previous papers and the majority of candidates calculated the ratio correctly, although some forgot to round their answer to the nearest whole number.

(c) The scientist crossed **two** purple flowering pea plants.

The offspring were:

- 133 plants with purple flowers
- 46 plants with white flowers

(i) Calculate the ratio of offspring with purple flowers to offspring with white flowers.

Give your answer to the nearest whole number.

(2)

133 ÷ 46 = 2.89

ratio ..3.. : 1

ResultsPlus
Examiner Comments

This response scored full marks. The candidate has shown their working and the correct answer is on the answer line.

(c) The scientist crossed **two** purple flowering pea plants.

The offspring were:

- 133 plants with purple flowers
- 46 plants with white flowers

(i) Calculate the ratio of offspring with purple flowers to offspring with white flowers.

Give your answer to the nearest whole number.

(2)

$\frac{133}{46} = 2\frac{41}{46} = \frac{133}{46} = 2.9$

ratio 2.9 :1

ResultsPlus
Examiner Comments

This scored one mark. The candidate has shown their working, but they have forgotten to round their answer to the nearest whole number.

Question 6 (c)(ii)

In this question, candidates had to explain why a cross between two purple flowering pea plants could produce some offspring with white flowers. Most candidates found the question very challenging, possibly because they did not deduce that the purple flowering pea plants must be heterozygous. Many candidates were also unable to use relevant scientific terminology correctly.

(ii) Explain why it was possible for this cross to produce some offspring with white flowers.

(2)

~~there~~ is the purple pea plants were heterozygous meaning that is some instances the 2 recessive alleles could pair to make ~~a~~ homozygous recessive white flowers

ResultsPlus
Examiner Comments

This response shows a good understanding of genetic crosses and makes good use of relevant terminology. The candidate has recognised that the purple flowering plants are heterozygous. They have gone on to explain that offspring with a combination of two recessive alleles will produce white flowers.

(ii) Explain why it was possible for this cross to produce some offspring with white flowers.

(2)

This is because both purple flowers had the recessive allele of the white flowers so & using a punnet square you will be able to see that some of the offspring will have white flowers.

ResultsPlus
Examiner Comments

This answer scored one mark for stating that the plants with purple flowers have the recessive allele. The candidate has referred to a Punnett square, but they have not fully explained how offspring with white flowers can be produced.

(ii) Explain why it was possible for this cross to produce some offspring with white flowers.

(2)

Because the purple flowering pea plants must contain the recessive allele for whik flowers.

	R	r
R	RR	Rr
r	rR	(rr)

← there is a 25% chance that a whik Pea Plant is

ResultsPlus
Examiner Comments

This candidate has chosen to use a Punnett square to help with their explanation. The first marking point has been scored for understanding that the purple flowering pea plants have a recessive allele for white flowers. The choice of letters representing alleles in the Punnett square could have been better, such as P and p, but a second mark can be awarded for the annotation and highlighting which of the offspring will produce white flowers.

Question 6 (d)(i)

This question was about the formation of gametes by meiosis. Many candidates could state that the gametes are haploid, thus scoring one mark. However, far fewer knew that gametes are formed as a result of meiosis. Candidates who scored two marks on this question often did so because they explained that two haploid gametes would fuse to form diploid cells, thus scoring the marking point in additional guidance.

(d) The cells in pea plants are diploid.

These cells have 14 chromosomes.

(i) Explain why pea plant gametes have only seven chromosomes.

(2)

gametes are haploid which means they only have half the amount of chromosomes as a diploid cell.

ResultsPlus
Examiner Comments

This answer was awarded one mark for referring to haploid gametes. There is no reference to meiosis or the fusion of haploid gametes.

(d) The cells in pea plants are diploid.

These cells have 14 chromosomes.

(i) Explain why pea plant gametes (haploid.) have only seven chromosomes.

(2)

gamets are produced by meiosis which are 4 haploid cells. They only have 7 chromosomes because they're haploid and haploid 'n' cells have half the chromosomes diploid cells do.

ResultsPlus
Examiner Comments

This response scored two marks. The candidate understands that gametes are produced by meiosis and that gametes are haploid.

Question 6 (d)(ii)

This question was not answered well by the majority of candidates. There was often some confusion between fertilisation in the context of male and female gametes fusing and the use of fertilisers. A simple statement such as male and female gametes (or egg and sperm) fuse together would have scored one mark. A reference to the formation of a zygote or a diploid cell would have secured a second mark.

Question 7 (a)

This question required candidates to interpret information from a graph. Many candidates found the task difficult, but those awarded the mark usually stated that the mass of the grains would be greater (as a result of using fertiliser). Simply stating that the grains would be bigger also scored the mark, but bigger yield was not credited, because the question is about the effect of fertiliser on wheat grains.

7 The growth of crop plants, such as wheat, can be improved by the use of fertilisers and the control of pests.

Figure 13 shows the mass of grains produced by wheat plants grown in soil without fertiliser and in soil with fertiliser.

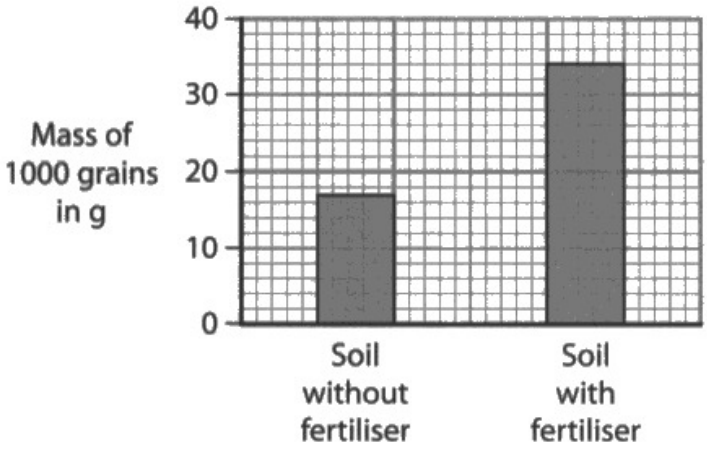


Figure 13

(a) Give **one** effect on the grains produced, when wheat plants are grown in soil with fertiliser.

(1)

you get more grains

ResultsPlus
Examiner Comments

There is no information about the number of grains in the question, so this answer is not creditworthy. We are looking for the idea that the grains will have a greater mass.

7 The growth of crop plants, such as wheat, can be improved by the use of fertilisers and the control of pests.

Figure 13 shows the mass of grains produced by wheat plants grown in soil without fertiliser and in soil with fertiliser.

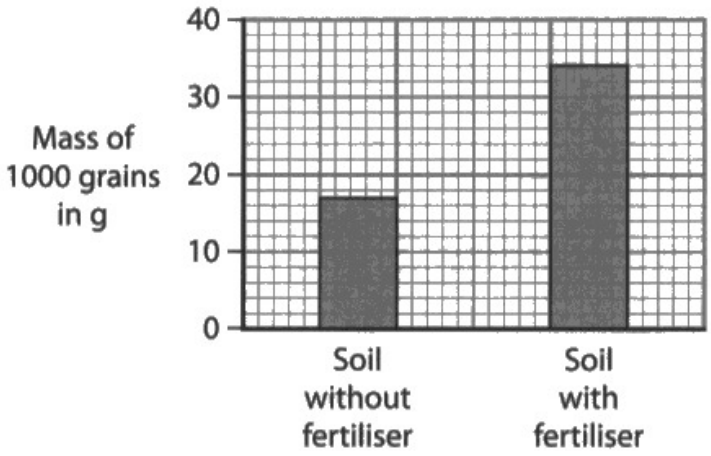


Figure 13

(a) Give **one** effect on the grains produced, when wheat plants are grown in soil with fertiliser.

(1)

Grain grown in soil with fertilizer produces more mass

ResultsPlus
Examiner Comments

This answer was awarded the mark for conveying the idea that the grain will have more mass.

Question 7 (b)

The concept of measuring the mass of 1000 grains was confusing for many candidates and the question was often misinterpreted. Very few candidates scored both marks. For the first marking point candidates had to convey the idea that individual grains would have a small mass or that the mass of individual grains is likely to vary a great deal. To score the second mark, candidates had to explain that measuring the mass of 1000 grains would allow fertiliser treatments or yields to be compared more reliably instead of using the mass of single grains. The idea that the average mass of a wheat grain could be calculated (and compared) if the mass of 1000 grains is measured was another creditworthy point.

(b) Explain why farmers measure the mass of 1000 grains rather than the mass of one wheat grain.

(2)

Because one wheat grain is small and sampling would be biased. As it could have a ~~small~~ very small mass or very large mass.

ResultsPlus
Examiner Comments

This scored one mark for the idea that the mass of individual grains is small and that their mass can vary.

(b) Explain why farmers measure the mass of 1000 grains rather than the mass of one wheat grain.

(2)

its less time consuming to measure 1000 instead of one at a time.

ResultsPlus
Examiner Comments

The candidate has misunderstood the question. The time taken to count out the grains or to measure their mass is not relevant, so zero marks scored.

Question 7 (c)(ii)

Most candidates did not have a secure knowledge of the concept of biological control and as a result this question was not well answered. Marks were awarded for explaining that because the biological control agents are under cover, they cannot escape, so they are more likely to find and eat pests, thus reducing crop damage. Candidates frequently explained that the plastic cover would improve the conditions needed for growth, such as increasing the temperature, instead of linking their answer to biological control.

(ii) Figure 14 shows a crop being grown under a clear plastic cover and a crop being grown in a garden.

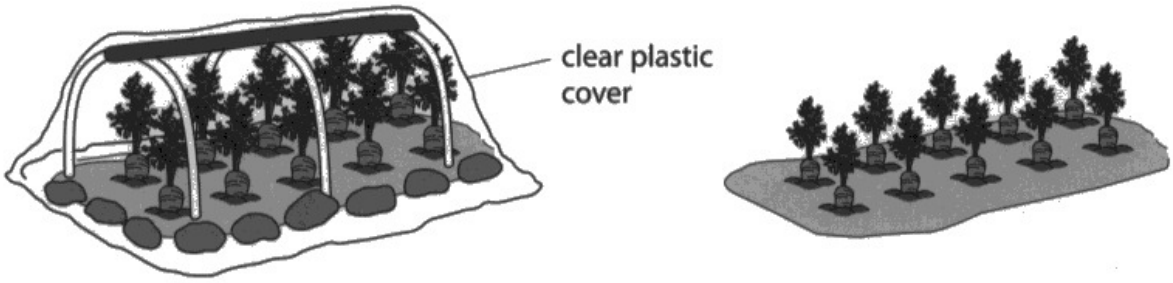


Figure 14

Explain why biological control would be more successful when a crop is grown under a clear plastic cover.

(2)

It will be more successful because the predators and prey can not escape so all of the prey will be eaten by the predators so the plants will no byger be eaten by the prey.

ResultsPlus
Examiner Comments

This is a good answer that scored both marks. Predators were accepted as an example of a biological control agent. The candidate understands that by being trapped inside the cover, the predators will be able to find and eat the pests (prey) and as a result there will be less crop damage (plants not eaten by the prey).

(ii) Figure 14 shows a crop being grown under a clear plastic cover and a crop being grown in a garden.

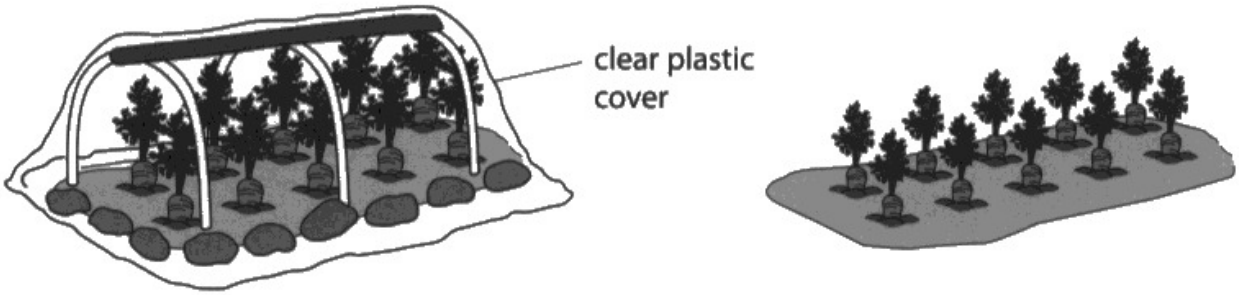


Figure 14

Explain why biological control would be more successful when a crop is grown under a clear plastic cover.

(2)

When the crop is grown under a clear plastic cover it creates a humid environment for the crops to grow

ResultsPlus
Examiner Comments

References to the environment inside the plastic cover are not relevant to the question, so zero marks scored.

Question 7 (d)

This extended open response question asked candidates to explain the advantages and disadvantages of growing GM corn. The information in the stem of the question gave candidates an idea of what to focus on in their answers. Some candidates were very familiar with the concept of GM crops and wrote detailed answers, whereas many others were often confused by the subject. A Level 1 response was awarded for a simple statement of an advantage or a disadvantage of GM crops. For Level 2, candidates had to explain an advantage and a disadvantage of GM crops and make some logical connections between points. A Level 3 response was characterised by the explanation of advantages and disadvantages, with logical connections being made between points. Candidates were able to access all three levels, but they did not always score the top mark in a level, particularly in Levels 2 and 3, because points were not explained.

*(d) Figure 15 shows corn damaged by an insect pest.

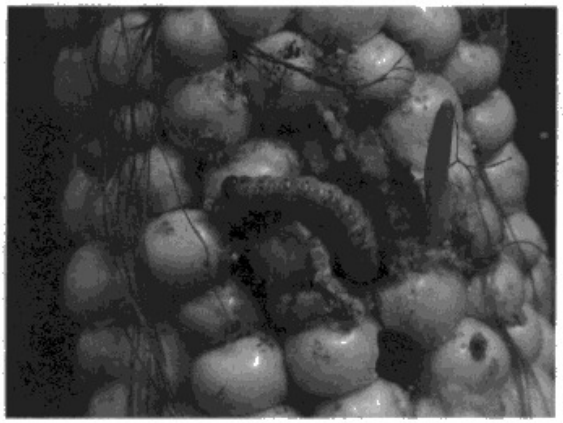


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Figure 15

Scientists have genetically modified (GM) corn plants to be

- resistant to insects
- resistant to weedkillers

Explain the advantages and disadvantages of growing GM corn plants.

(6)

advantages

- no insects to mind ruin food.
- farmer can decide certain characteristics
- Corn lasts longer and stays fresh for a longer time.

disadvantages:

Could be unethical as the corn is not naturally grown

- corn will be full of chemicals, not extremely healthy.

ResultsPlus
Examiner Comments

This answer scores a mark at the bottom of Level 1. The candidate's first advantage is the only point that is creditworthy (less crop damage). If there had been a statement linked to a larger yield or more food being available, then the top mark in Level 1 could be awarded.

ResultsPlus
Examiner Tip

Remember that if the command word is explain, you have to give reasons in your answer.

*(d) Figure 15 shows corn damaged by an insect pest.

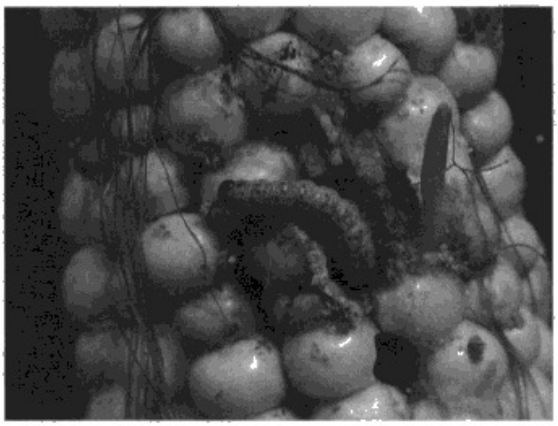

Figure 15

Scientists have genetically modified (GM) corn plants to be

- resistant to insects
- resistant to weedkillers

Explain the advantages and disadvantages of growing GM corn plants.

(6)

Advantages -

- All corn can be eaten or sold.
- Easily get rid of weeds by spraying a larger amount over a larger are (will not damage corn)
- Insects will not ruin the corn.

Disadvantages -

- Might contain less nutrient so will take longer to grow.
- Could taste different so people might not eat/buy.
- Takes longer to make, trial and error to find what weeds genetically modifying.

(Total for Question 7 = 12 marks)

ResultsPlus
Examiner Comments

This response scores a mark at the top of Level 1. None of the disadvantages are creditworthy, so the answer cannot progress into Level 2. However, the candidate has gone beyond the minimum expected for Level 1; there is a comment about insects not ruining the corn (less crop damage), an implied reference to greater yield and a relevant point about the corn not being damaged by weedkillers. Therefore, a mark at the top of Level 1 can be awarded.

*(d) Figure 15 shows corn damaged by an insect pest.

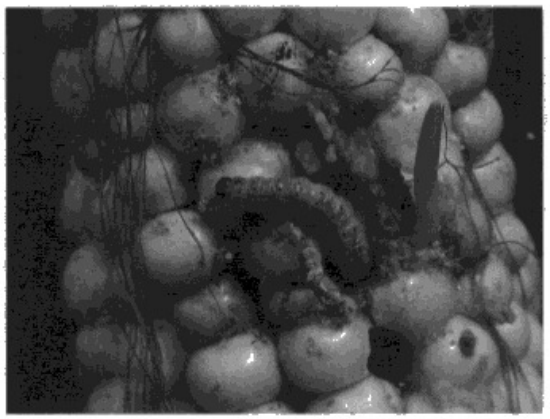

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Figure 15

Scientists have genetically modified (GM) corn plants to be

- resistant to insects
- resistant to weedkillers

Explain the advantages and disadvantages of growing GM corn plants.

(6)

Advantages:

- Higher yeild
- Easier to grow
- Dont have to worrie about pests

Disadvantages:

- Some people dont trust genetically -lly modified plants
- More expensive to buy

ResultsPlus
Examiner Comments

This is a concise answer. A relevant advantage (higher yield) and disadvantage (more expensive to buy) has been given, but there is no explanation of either point. Therefore, a mark at the bottom of Level 2 can be awarded.

*(d) Figure 15 shows corn damaged by an insect pest.

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Figure 15

Scientists have genetically modified (GM) corn plants to be

- resistant to insects
- resistant to weedkillers

Explain the advantages and disadvantages of growing GM corn plants.

(6)

GM corn plants will be able to not be as eaten by any pests and grow to their full potential. Also when weed killer is applied it wont effect them so the farmer will be able to do apply as much as he likes. But it has its disadvantages ~~such as~~ like it ~~is very time~~ takes a long time to genetically modify these corn plants and also cost more money. But also over time insects will evolve and eventually became resitant to the corn therefore be able to eat the corn.

ResultsPlus
Examiner Comments

This is a well-structured answer. The candidate has given two advantages and two disadvantages, with explanations of both. This puts the answer at the top of Level 3. The reference to insects becoming resistant to (toxins in) the corn shows good knowledge and understanding of the topic.

Question 8 (a)(i)

This question asked candidates to state one possible cause of genetic variation in the context of apple trees. The question proved to be very difficult for the vast majority of candidates, with a large number citing an environmental factor in their answers. A significant number of candidates seemed to misunderstand the question and referred to the colour of apples. Candidates who gave a correct response usually stated mutation or sexual reproduction as their answer.

8 (a) Apple trees show genetic variation.

(i) State **one** possible cause of genetic variation in apple trees.

(1)

Different colour apples throughout the apple tree.

ResultsPlus
Examiner Comments

This answer refers to an aspect of variation in apples, not the cause of genetic variation. Zero marks scored.

8 (a) Apple trees show genetic variation.

(i) State **one** possible cause of genetic variation in apple trees.

(1)

where the apples are growing on the branches. in the sunlight/ in the shade

ResultsPlus
Examiner Comments

This response refers to variation caused by an environmental factor, not a cause of genetic variation, so zero marks scored.

8 (a) Apple trees show genetic variation.

(i) State **one** possible cause of genetic variation in apple trees.

(1)

A mutation in a gene.

ResultsPlus
Examiner Comments

Mutation is a creditworthy answer. One mark awarded.

Question 8 (b)

This question required candidates to name the type of reproduction that produces genetically identical organisms. The majority of candidates who scored the mark usually gave asexual reproduction as their answer, with only a small minority giving cloning. Mitosis was a very common response, but since mitosis is not a type of reproduction, it cannot be credited.

(b) Name the type of reproduction that produces genetically identical organisms.

(1)

Mitosis

ResultsPlus
Examiner Comments

Mitosis is not a type of reproduction, so this answer was not awarded a mark.

(b) Name the type of reproduction that produces genetically identical organisms.

(1)

cloning?

ResultsPlus
Examiner Comments

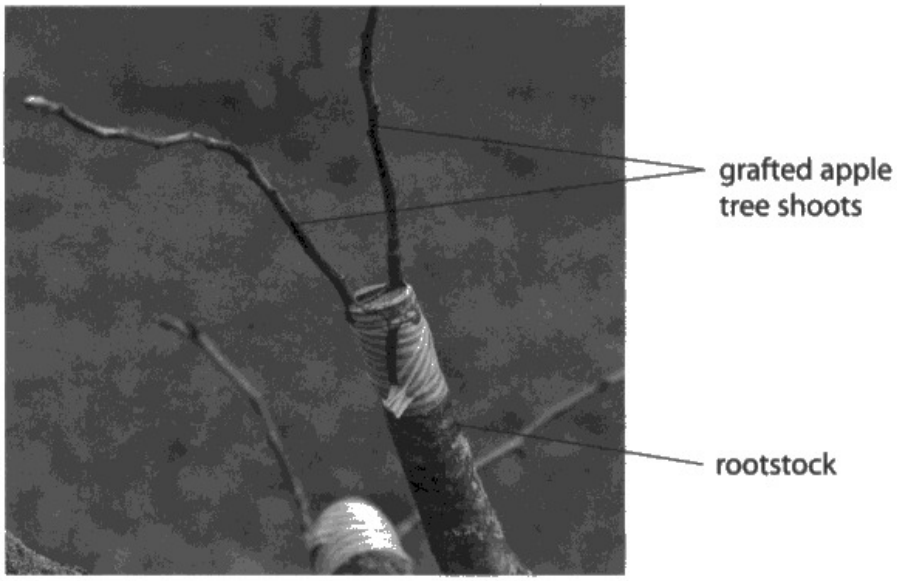
This response scored one mark for cloning. Asexual reproduction was the answer expected.

Question 8 (c)

This question asked candidates to give one advantage and one disadvantage of growing genetically identical apple trees. A large proportion of candidates ignored genetically identical in the question and went on to state, as an advantage, that the apples trees would all be the same. However, stating that the fruit would all have the same taste, for example, was an acceptable response. Correct disadvantages, such as all the trees would be susceptible to a disease, were seen more frequently than advantages.

(c) Grafting is a technique used to grow some varieties of apple tree.

Figure 16 shows apple tree shoots grafted on to a rootstock.



(Source: © ATTILA Barsan/Shutterstock)

Figure 16

Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

All the apples will be the same

disadvantage

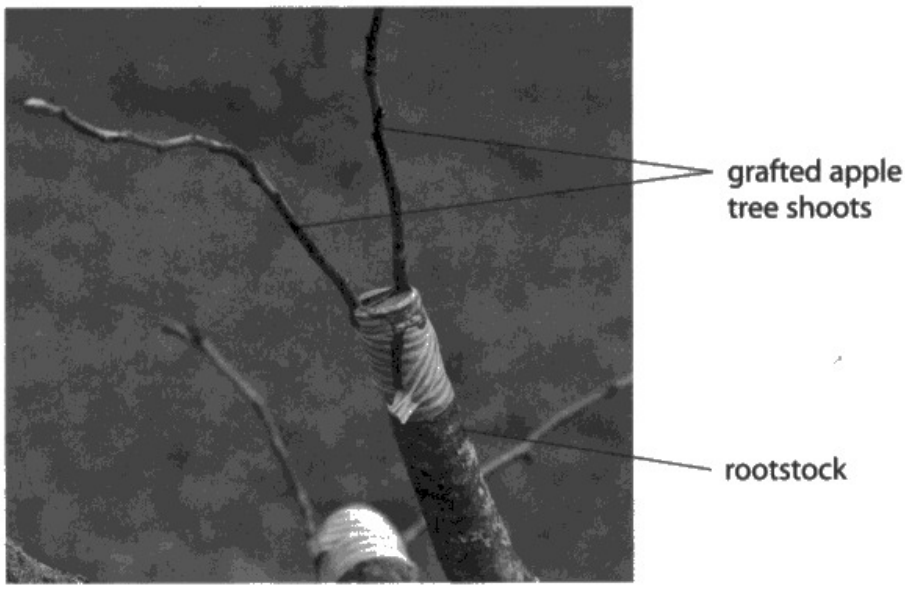
can't reproduce on their own.

ResultsPlus
Examiner Comments

The stated advantage and disadvantage are not creditworthy. If the candidate had referred to a particular characteristic of apples being the same, such as taste, then one mark would have been awarded. The reference to reproduction is not relevant.

(c) Grafting is a technique used to grow some varieties of apple tree.

Figure 16 shows apple tree shoots grafted on to a rootstock.



Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

Produces a larger yield of the same Apples.

disadvantage

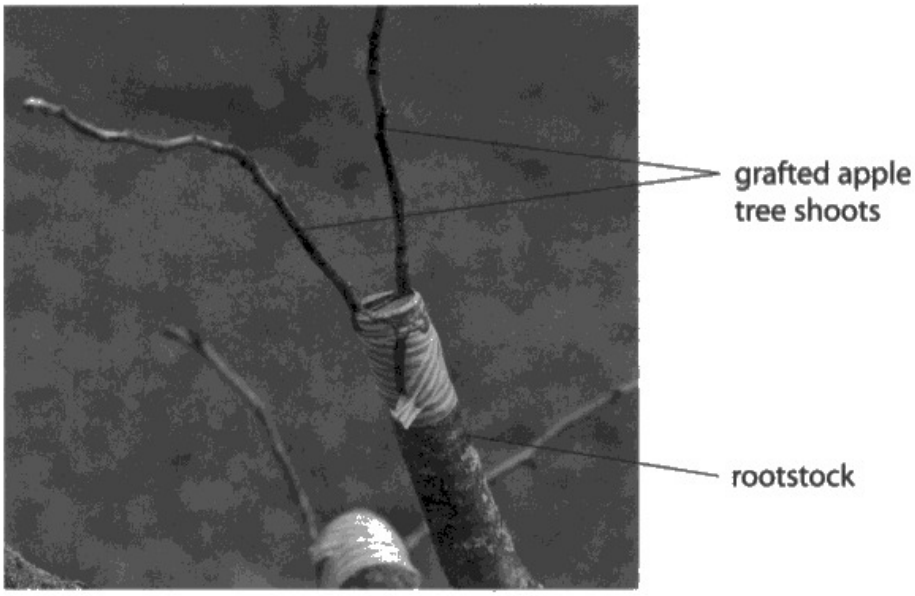
They will all be effected by the same disease if they get it. This is because there's no variation and can't survive it.

ResultsPlus
Examiner Comments

The reference to a larger yield is not a creditable advantage of growing genetically identical apple trees, since environmental factors could impact on the yield. However, the description of a disadvantage is detailed and scored one mark.

(c) Grafting is a technique used to grow some varieties of apple tree.

Figure 16 shows apple tree shoots grafted on to a rootstock.



(Source: © ATTILA Barsan/Shutterstock)

Figure 16

Grafting can be used to produce apple trees that are genetically identical.

Give **one** advantage and **one** disadvantage of growing genetically identical apple trees.

(2)

advantage

They could have a more desirable characteristic
now and yeild a higher yeild

disadvantage

One disease could wipe out all the trees
as they are genetically the same.

ResultsPlus
Examiner Comments

The candidate has given a relevant advantage and disadvantage, so this response was awarded two marks.

Question 8 (d)

This question really challenged a large proportion of candidates, which was disappointing since this style of question has been a feature of the examination papers since 2018. Candidates were asked to devise a method to find the optimum pH of an enzyme that breaks down starch. They were provided with a list of solutions that could be used, but this did not always prove to be very helpful. Some candidates referred to using Benedict's solution to test for reducing sugars and some discussed testing for starch in the apple. Few candidates specified a variable to control, such as the volume of a solution.

(d) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box.

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

to find Starch you need Iodine Solution

ResultsPlus
Examiner Comments

This response was awarded one mark for the use of iodine solution to test for starch.

(d) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box.

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

- set out a range of different pH solutions, each in a series of test tubes.
- Add each solution to a series of test tubes. (starch / enzyme / iodine)
- add an acidic PH, an neutral PH and an alkaline PH to each of the solutions.
- observe the test tubes for the solution in which breaks down starch quickest.

ResultsPlus
Examiner Comments

This response scored two marks. The answer conveys the idea of mixing pH solution, starch solution and enzyme solution together, so this scored one mark. The fact that iodine solution has also been added can be ignored here; the use of iodine solution was only credited in the context of testing for starch. There is also a description of a range of pH values (acidic, neutral and alkaline), so this scored a second mark.

(d) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box.

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

Use a diffgarent range of pH solutions, mix together starch and enzyme solution, put out a tray all filled with iodine solution. Dip your starch-enzyme solution into one of the pH solutions and put it in the different iodine slots until the colour no longer changes, repeat until optimum pH is found

ResultsPlus
Examiner Comments

Use a different range of pH solutions was awarded one mark; this is more than just repeating information from the question. Mixing starch, enzyme and pH solutions scored another mark, although the methodology can be questioned. There is also a clear implication that iodine solution is being placed on a spotting tile, so this was awarded a mark. Overall, this response was awarded three marks.

(d) As apples ripen, enzymes convert starch into sugars.

Devise a method to find the optimum pH of an enzyme that breaks down starch.

You may use standard laboratory equipment and the solutions listed in the box. orange + Blue/Black

starch solution	enzyme solution	iodine solution
a range of pH solutions		

(4)

Get ~~orang~~ a range of enzyme PH solutions between 1-10, so PH1 solution, PH2 solution etc. ~~Get a pipette~~ ~~and get some buffer solution~~ In a conical flask there should be a shallow amount of iodine ready. Mix the enzyme solution with the starch for each PH level. Once done ~~individually~~ get a pipette and withdraw some mixture in the pipette. Put a couple drops in the iodine. If the iodine ~~doesn't~~ does not change colour your starch has been broken down this is a favourable PH level. If it turns blue/black there is still starch present and the enzyme could not break it down.

ResultsPlus
Examiner Comments

This is a good response. The identification of a suitable range of pH values scored one mark. Mixing enzyme and starch solutions with a pH solution scored a second mark. Using iodine solution to test for starch was awarded a third mark and the description of a positive test with iodine solution scored a fourth mark.

Question 8 (e)

This question was about the enzyme activity of an enzyme at pH 10. Candidates with a good understanding of this topic had no problem giving concise answers, such as the enzyme denatures, so the active site changes shape. However, many candidates failed to score marks, often because their use of scientific language was vague.

(e) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

Ph 10 is to acidic and will cause the enzyme to denature meaning the active site will change shape and the substrate will no longer be able to fit ~~[illegible]~~ into the active sute as it is specific.

(Total for Question 8 = 11 marks)

ResultsPlus
Examiner Comments

This is a good answer that scored both marks. The explanation actually includes all three marking points.

(e) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

- because the ph would be to high which would cause the enzymes to denature

ResultsPlus
Examiner Comments

This response was awarded one mark for the reference to the enzyme denaturing.

(e) The optimum pH of an enzyme is pH 6.

Explain why this enzyme would not work at pH 10.

(2)

it is too acidic, therefor couldn't perform properly as a biological catalyst.

ResultsPlus
Examiner Comments

The candidate is aware that enzymes are biological catalysts, but they are confused about the pH scale and have not explained why the enzyme would not work.

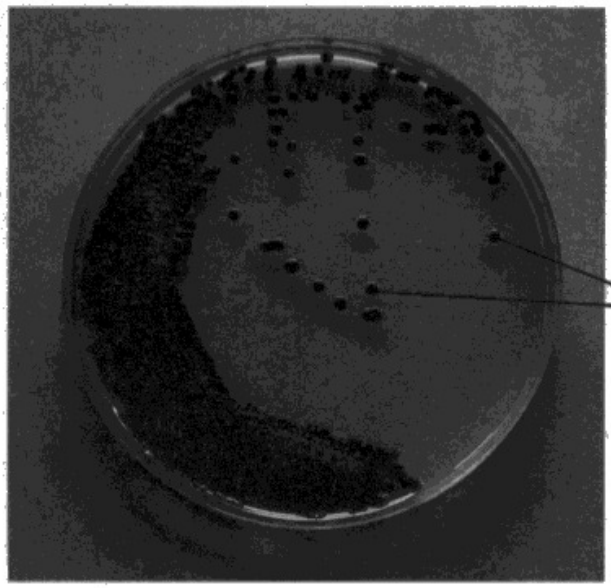
ResultsPlus
Examiner Tip

Always learn the correct scientific terms related to particular topics, such as denature and active site linked to enzymes.

Question 9 (a)

Candidates had to calculate the number of bacteria in a colony originating from one bacterium after five hours. Some candidates scored one mark for showing that if the bacterium divided once every 30 minutes, there would be 10 divisions in five hours. Many other candidates scored one mark for giving 512 as their answer. This was accepted for one mark because these candidates had used a starting point of one bacterium after 30 minutes but had worked through the rest of the calculation correctly.

9 Figure 17 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 17

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.

(2)

30 min × 8 = 5 hours

1 2 4 8 16 32 64 128 256

256 bacteria

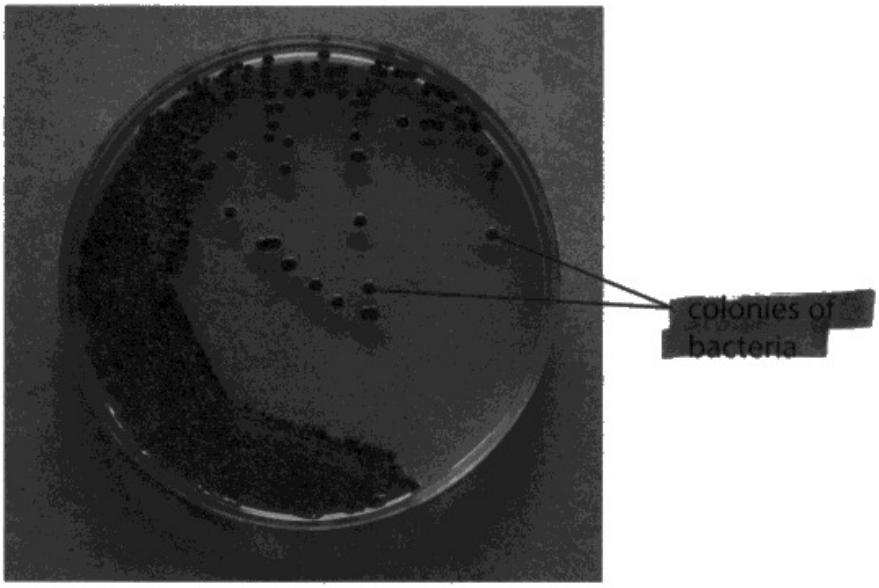
ResultsPlus
Examiner Comments

This response scored zero marks. Working has been shown, but the candidate has miscalculated the number of divisions that would take place in five hours.

ResultsPlus
Examiner Tip

Always checking your working.

9 Figure 17 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 17

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours if each bacterium reproduces every 30 minutes.

(2)

5 hours → 10 - reproduces 10 x

30 mins 2
30
30

2h 4

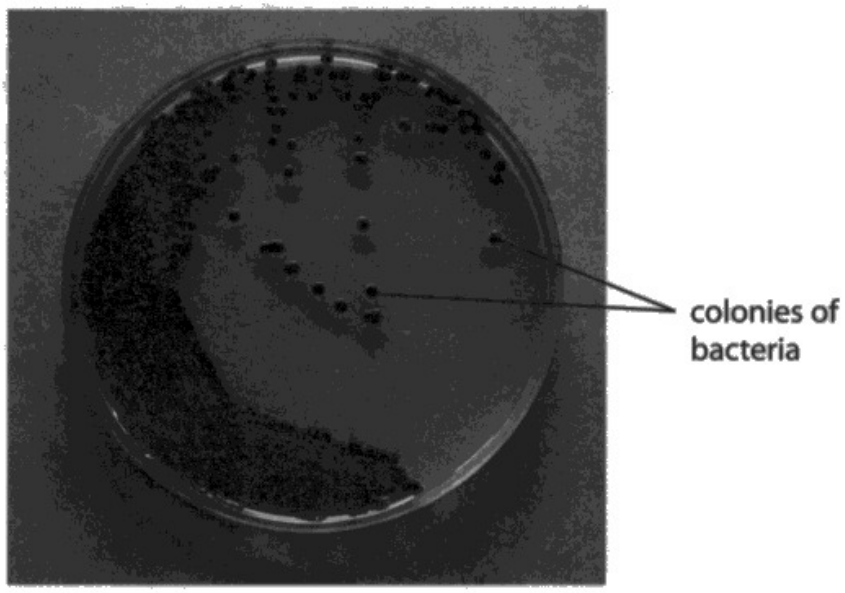
30 30
30 30

..... bacteria

ResultsPlus
Examiner Comments

This scored one mark for indicating that there would be 10 divisions in five hours.

9 Figure 17 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 17

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.

(2)

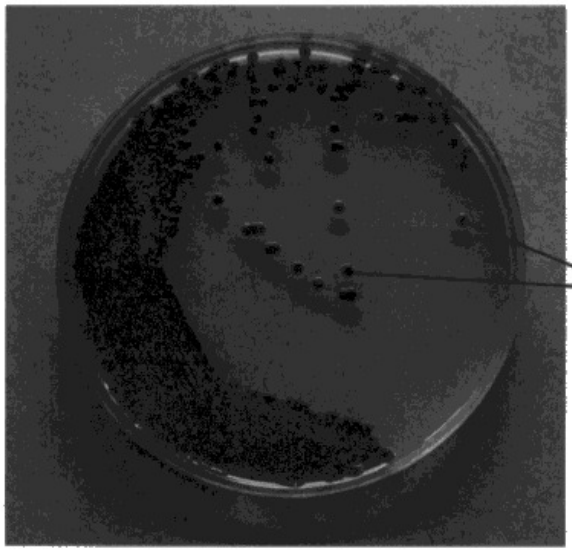
1 2 4 8 16 32 64 128 256 512

512 bacteria

ResultsPlus
Examiner Comments

512 was a common response. This was accepted for one mark.

9 Figure 17 shows colonies of bacteria growing on an agar plate.



(Source: © Chatchouliya/Shutterstock)

Figure 17

Each colony starts as one bacterium.

Every time bacteria reproduce, the number of bacteria in each colony doubles.

(a) Calculate the number of bacteria in a colony after five hours, if each bacterium reproduces every 30 minutes.

5 hours 5 × 60 = 300
300 ÷ 30 = 10
2 4 8 16 32 64 128 256 512 (2)

1024 bacteria

ResultsPlus
Examiner Comments

This response scored two marks. The candidate has shown their working and 1024 is on the answer line. The correct answer would also score full marks with no working shown.

ResultsPlus
Examiner Tip

It is good practice to show your working in case you make a mistake when calculating a final answer.

Question 9 (b)(i)

The vast majority of candidates attempted to answer this question, but most were unable to give a clear meaning of the term pathogen. Straightforward answers such as pathogens are disease causing organisms were rarely seen and most candidates failed to score.

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

A disease causing organism

ResultsPlus
Examiner Comments

This was awarded one mark for disease causing organism.

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

Something that can cause an illness or infections.

ResultsPlus
Examiner Comments

Causing illness or infections was accepted for causing disease, so this response scored one mark.

(b) Some bacteria are pathogens.

(i) State the meaning of the term pathogen.

(1)

A bacteria, virus or fungi that can easily spread.

ResultsPlus
Examiner Comments

This answer was awarded zero marks. The candidate has listed some examples of pathogens, but they have not stated that pathogens cause disease.

Question 9 (b)(ii)

This question about the use of antibiotics to treat bacterial infections proved to be very challenging for a large proportion of candidates. Many responses confused antibiotics with antibodies and the immune system. Most candidates who gained credit were usually awarded one mark for the idea that bacteria are destroyed or killed by antibiotics. Answers including the inhibition of processes in bacteria and host cells not being affected by antibiotics, were rarely seen.

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

Because it inhibits the process of cell ~~diggi~~ division stopping the bacteria from growing and reproducing

ResultsPlus
Examiner Comments

This answer scored two marks for inhibiting cell division and stopping bacteria growing and reproducing.

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

because antibiotics kill bacteria and they also work really well.

ResultsPlus
Examiner Comments

This response was awarded one mark for antibiotics kill bacteria.

(ii) Explain why antibiotics can be used to treat bacterial infections.

(2)

It kills the pathogens ~~using~~ and protects the immune system using lymphocytes

ResultsPlus
Examiner Comments

Zero marks scored. To be awarded the second marking point, candidates must refer to bacteria. Pathogens is a broader term and includes viruses, against which, antibiotics would be ineffective.

Question 9 (b)(iii)

This was an accessible calculation question, with the majority of candidates scoring two marks. It was pleasing to see that many candidates began by writing down the equation used to calculate magnification; the figures given in the question were usually then divided correctly to determine the magnification. Multiplying the numbers or dividing 0.005 by 80 were the main reasons why some candidates failed to score marks. It should be noted that similar questions to this sometimes involve unit conversion, such as millimetres to micrometres.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

80
0.005 =

80 ÷ 0.005 = 1600

magnification = 1600

ResultsPlus
Examiner Comments

The substitution is correct, but the final answer is incorrect by a power of 10, so just one mark was awarded for this response.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

0.005 x 80 = 0.4

magnification = 0.4

ResultsPlus
Examiner Comments

Instead of dividing, the candidate has multiplied the figures together, so zero marks scored.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

1 a×m $\frac{0.005}{80} = m$ 6.25×10^{-5}

magnification = 6.25×10^{-5}

ResultsPlus
Examiner Comments

This was a fairly common incorrect response that scored zero marks. The numbers have been incorrectly substituted into the equation, so the magnification calculation is incorrect.

(iii) A rod-shaped bacterium is 0.005 mm long.

A student draws the rod-shaped bacterium.

The bacterium in the drawing is 80 mm long.

Calculate the magnification of this drawing.

(2)

$$\frac{80}{0.005}$$

$$= 16000$$

magnification = 16000

ResultsPlus
Examiner Comments

The correct answer on the answer line scored full marks.

Question 9 (c)

This extended open response question was answered extremely well by the majority of candidates across the ability range. Candidates were asked to describe the similarities and differences of a bacterial cell and a plant cell. Many candidates sensibly labelled the diagrams given in the question to help them structure their answers. Level 1 responses required simple statements identifying either similarities or differences between the cells. For Level 2, candidates had to make simple statements describing a similarity and a difference. Level 3 required candidates to give a detailed description of similarities and differences between a bacterial cell and a plant cell.

*(c) Figure 18 shows a bacterial cell and a plant cell.

bacterial cell

plant cell

Figure 18

Describe the similarities and differences of a bacterial cell and a plant cell.

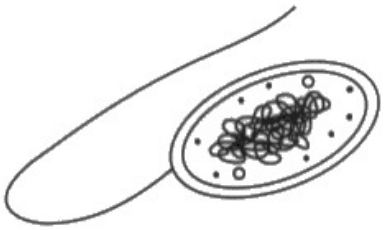
(6)

They both have ~~Cell~~ cell membrane to controll what ~~go~~ go

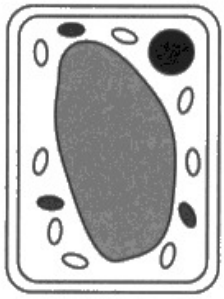
ResultsPlus
Examiner Comments

This is a Level 1 response, that scored one mark for giving a similarity between the two cells.

*(c) Figure 18 shows a bacterial cell and a plant cell.



bacterial cell



plant cell

Figure 18

Describe the similarities and differences of a bacterial cell and a plant cell.

(6)

A plant cells has a neclews and a bacteriel cell dosent.

A bacterial cell has tail which helps it move and a plant cell dosent.

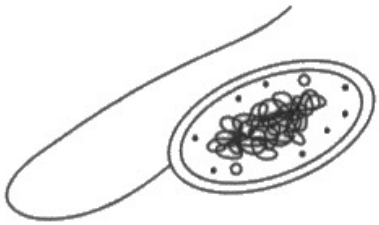
ResultsPlus
Examiner Comments

In this response the candidate has described two differences between the cells. This is a Level 1 response that scored two marks. A similarity and a difference is needed to move a response into Level 2.

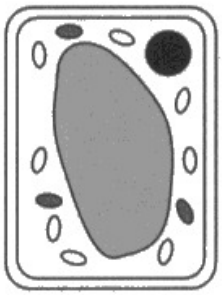
ResultsPlus
Examiner Tip

Always follow the instructions in the question so that you can access the full range of marks.

*(c) Figure 18 shows a bacterial cell and a plant cell.



bacterial cell



plant cell

Figure 18

Describe the similarities and differences of a bacterial cell and a plant cell.

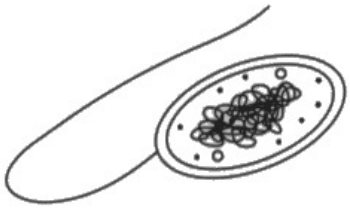
(6)

one difference is ~~[illegible]~~ a bacterial cell doesn't have a nucleus also ~~they~~ both have mitochondria and a cell membrane they also both contain vacuoles and a plant cell has a cell wall and a bacterial cell doesn't.

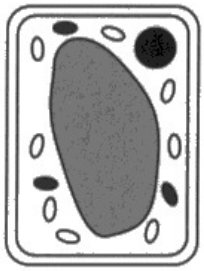
ResultsPlus
Examiner Comments

This response scored a mark at the bottom of Level 2. Although there are errors in the response, a correct similarity (both have a cell membrane) and a correct difference (no nucleus in a bacterial cell) have been given.

*(c) Figure 18 shows a bacterial cell and a plant cell.



bacterial cell



plant cell

Figure 18

Describe the similarities and differences of a bacterial cell and a plant cell.

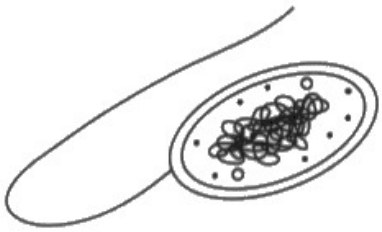
(6)

The Similarities between bacterial cell and Plant cell are that the both contain cell walls ,which control what go in and out of the cell. It also shows that both contain a cytoplasm, where reactions in cell take Place. They also ~~differences between these cells are that a bacteria cell~~ have a cell Membrane. The differences are that bacteria cell doesn't contain ~~P~~ Chloroplasts

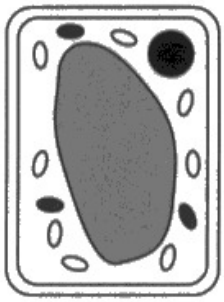
ResultsPlus
Examiner Comments

This Level 2 response scored four marks. Several similarities have been described and just one difference. There is a brief comment about the role of cytoplasm. To move into Level 3, the response needs to include more than one difference between the cells.

*(c) Figure 18 shows a bacterial cell and a plant cell.



bacterial cell



plant cell

Figure 18

Describe the similarities and differences of a bacterial cell and a plant cell.

(6)

Both of these cells, have a cell wall for stability and cell membrane to let thing in and out. ~~the also has~~. But, the Bacteria cell does not have a nucleus instead, it has plasmids(s) which is loops of DNA. It ~~also~~ also has a flagellum, so it ~~can~~ can move. The plant cell, it has a vacuole to store sap whereas the Bacteria cell doesn't need that.

ResultsPlus
Examiner Comments

This is a Level 3 response. Similarities and differences have been described and additional detail has been given, such as a vacuole in plants to store sap. A mark at the top of Level 3 was awarded.

Question 10 (a)(i)

This maths skills question involved manipulating percentages. The question was answered very competently by the vast majority of candidates, with most scoring full marks.

10 Figure 19 shows a chart used by opticians to test a person's vision.

The person's vision is judged by the lowest row of letters they can read.

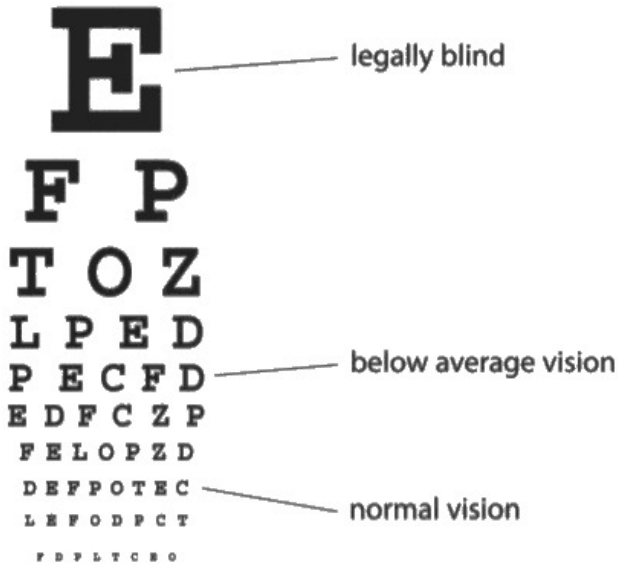


Figure 19

(a) (i) An optician tested the eyesight of 240 people.

35% of these people could read the normal vision row without wearing glasses.

The rest of the people need glasses to correct their vision.

Calculate the number of people who need glasses to correct their vision.

(3)

240 ÷ 10 = 24
10% = 24
30% = 72
5% = 17

84 can read
240 − 84
72 + 12 = 84

156 people

ResultsPlus
Examiner Comments

This candidate has shown the stages of their working and the correct answer is on the answer line, so full marks scored.

10 Figure 19 shows a chart used by opticians to test a person's vision.

The person's vision is judged by the lowest row of letters they can read.

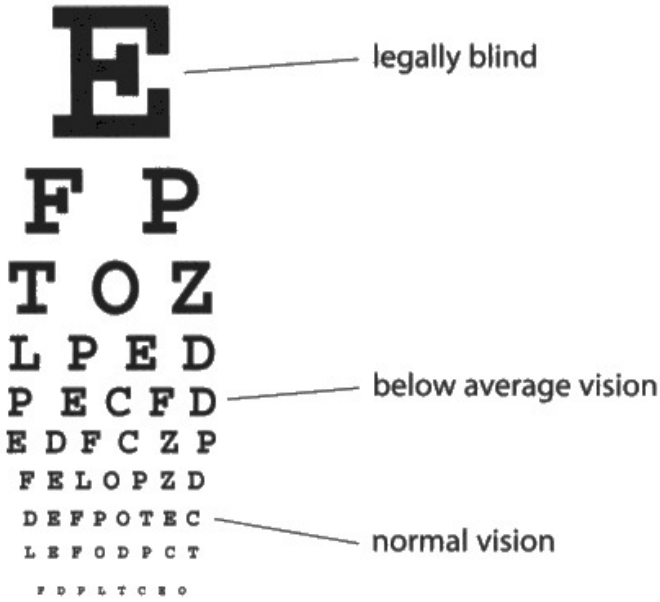


Figure 19

(a) (i) An optician tested the eyesight of 240 people.

35% of these people could read the normal vision row without wearing glasses.

The rest of the people need glasses to correct their vision.

Calculate the number of people who need glasses to correct their vision.

(3)

35% x 240

84 people

ResultsPlus
Examiner Comments

This candidate has only completed the first step of the calculation, so one mark was awarded for 84 on the answer line.

Question 10 (a)(ii)

The majority of candidates found it very difficult to give one reason why people are short-sighted. Although names of structures within the eye were routinely given in answers, candidates were usually unable to identify a specific cause of short-sightedness, such as the cornea is too curved.

(ii) An optician can use the chart to diagnose short-sightedness.

Give **one** reason why people are short-sighted.

(1)

Eye ball is too long

ResultsPlus
Examiner Comments

This was one of the most common correct answers that scored one mark.

(ii) An optician can use the chart to diagnose short-sightedness.

Give **one** reason why people are short-sighted.

(1)

because the light rays dont reach the retina.

ResultsPlus
Examiner Comments

This was a common response, but it did not score a mark. Candidates need to state that light rays focus in front of the retina. Back of the eye was not accepted for retina.

(ii) An optician can use the chart to diagnose short-sightedness.

Give **one** reason why people are short-sighted.

(1)

Cornea is too curved

ResultsPlus
Examiner Comments

This response scored one mark. Stating that the lens is too thick or too curved would also score the mark.

Question 10 (b)(i)

Only a small number of candidates scored both marks on this question. Very few candidates could specifically state that protein builds up in the lens, or that cataracts results in light being dispersed. Stating that the lens becomes cloudy was the most common mark scored by a small proportion of candidates.

(b) Cataracts can affect a person's vision.

Figure 20 shows what a person with normal vision and a person with cataracts can see for the top letter on the optician's chart.

person with normal vision person with cataracts

Figure 20

(i) Describe why a person with cataracts would see the image shown in Figure 20.

(2)

because the cataracts blurs the vision meaning the patient wont be able to see as clearly as someone who has normal vision

ResultsPlus
Examiner Comments

This candidate has recognised that vision is blurred, but this is not a creditworthy answer. There needs to be a description of why vision is blurred.

(b) Cataracts can affect a person's vision.

Figure 20 shows what a person with normal vision and a person with cataracts can see for the top letter on the optician's chart.

person with normal vision person with cataracts

Figure 20

(i) Describe why a person with cataracts would see the image shown in Figure 20.

(2)

because cataracts is caused by a build up of Protein on the Pupil of the eye which would make what they are looking at blury

ResultsPlus
Examiner Comments

This candidate knows that cataracts are due to a build of protein, but this does not occur in the pupil, so just one mark was awarded for this answer.

(b) Cataracts can affect a person's vision.

Figure 20 shows what a person with normal vision and a person with cataracts can see for the top letter on the optician's chart.

person with normal vision person with cataracts

Figure 20

(i) Describe why a person with cataracts would see the image shown in Figure 20.

(2)

There is a high amount of protein build up on their lens therefore blurring their vision

ResultsPlus
Examiner Comments

A build-up of protein in the lens scores both marks. Blurring vision can be ignored.

Question 10 (b)(ii)

Most candidates were unable to clearly state the treatment for cataracts. Laser eye surgery or removing the lens were common incorrect answers. Giving additional detail to these responses, such as replacing the lens or using an artificial lens, would have made them creditworthy.

(ii) State the treatment for cataracts.

(1)

Retina Removal of the lense

ResultsPlus Examiner Comments

This answer is insufficient to score a mark. The idea that the lens will be replaced is important.

(ii) State the treatment for cataracts.

(1)

replace the eye lens with a plastic one (surgery)

ResultsPlus Examiner Comments

This is a good answer that clearly states how cataracts can be treated. One mark awarded.

Question 10 (c)(ii)

It was surprising how few candidates could describe how messages are sent from the brain to muscles. Descriptions of the relevant part of the reflex arc were often confused, with the incorrect names of neurones being given.

(ii) When a person reacts to a stimulus, messages from the brain are sent to their muscles.

Describe how messages are sent from the brain to muscles.

(2)

• sent by impulses along sensory neurons

ResultsPlus
Examiner Comments

Impulses is insufficient; electrical impulses was needed to score a mark. In addition, the name of neurone is incorrect.

(ii) When a person reacts to a stimulus, messages from the brain are sent to their muscles.

Describe how messages are sent from the brain to muscles.

(2)

They are sent via electrical impulses in neurones via the motor neurone to the effector which in this case is a muscle

ResultsPlus
Examiner Comments

This is a concise answer. Two marks were awarded for electrical impulses and motor neurone.

Paper Summary

Based on their performance on this paper, candidates should:

- Recognise that the word 'explain' means additional scientific information is needed that is linked to the answer given.
- Use all of the information given in the question to help them construct their answer but avoid repeating the information which has already been given and giving vague responses which will not gain credit.
- Consider the context of the question to ensure they apply their scientific knowledge to the situation they are being asked about.
- Develop their practical skills knowledge to ensure they understand the difference between the factors being investigated and controlled variables.
- Check the number of marks given for the question and ensure that they have included enough facts to match the marks available.
- Use scientific terminology accurately, where possible, in responses.
- Always show their working when doing calculations, as a mark can be awarded for errors carried forward in this case.
- Think about the structure of the answer before starting to write, especially when tackling the extended questions, to ensure that the answer shows clarity of writing and that it flows, while also remembering that accurate spelling and grammar in these questions is important.

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