Qualification Accredited

OCR
Oxford Cambridge and RSA

GCSE (9-1)

Examiners' report

TWENTY FIRST CENTURY SCIENCE BIOLOGY B

J257

For first teaching in 2016

J257/02 Summer 2024 series

Version 1

ocr.org.uk/science

Contents

Introduction

Our examiners' reports are produced to offer constructive feedback on candidates' performance in the examinations. They provide useful guidance for future candidates.

The reports will include a general commentary on candidates' performance, identify technical aspects examined in the questions and highlight good performance and where performance could be improved. A selection of candidate answers is also provided. The reports will also explain aspects which caused difficulty and why the difficulties arose, whether through a lack of knowledge, poor examination technique, or any other identifiable and explainable reason.

Where overall performance on a question/question part was considered good, with no particular areas to highlight, these questions have not been included in the report.

A full copy of the question paper and the mark scheme can be downloaded from OCR.

Paper 2 series overview

There are four examination components for GCSE (9-1) Twenty First Century Science Biology B. Papers 2 and 4 (Depth in Biology) provide candidates with the opportunity to demonstrate the depth of their knowledge and understanding in biology.

Paper 2 assesses knowledge from across the specification, including some synoptic questions. Therefore, to do well on Paper 2, candidates need to demonstrate their understanding of ideas from across the whole specification, including Ideas about Science.

On the whole, candidates rose to the challenges of this foundation tier examination well, and candidates are to be commended for attempting most questions. The number of candidates who did not attempt questions was generally very low, except for the following questions which also usually proved to have a low facility (indicating that those candidates who did attempt them found them challenging): Questions (b), (b) (iv), 6 (c), 8 (a) and 8 (f).

Candidates seemed to have been well prepared for most questions. The following questions were answered particularly well. Some questions don't receive comment outside this section as there were no noticeable pattern of errors or misconceptions seen:

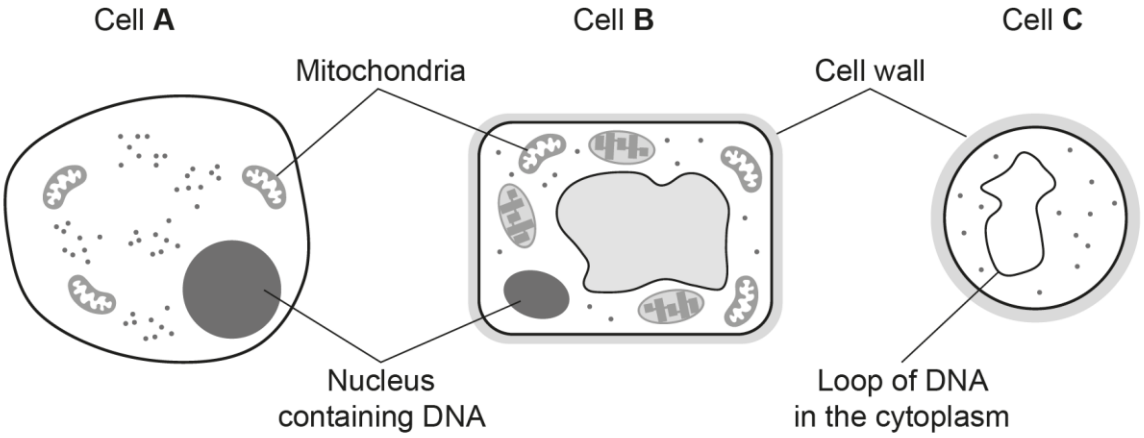
- 1 (b) – demonstrate practical knowledge of steps in setting up a light microscope to observe microorganisms
- 1 (d) – apply understanding of how communicable diseases are spread and how the spread may be reduced
- 2 (a) (i) – apply understanding of the differences between the trophic levels in an ecosystem
- 2 (a) (iii) –apply understanding of interdependence within a community to explain why killing one population within a food chain could affect another population in the same chain
- 4 (c) – demonstrate practical knowledge of how to measure pulse rate
- 4 (e) (i) – candidates are asked to demonstrate their ability to read a value from a line graph
- 6 (a) –demonstrate knowledge of substances transported into plants and how they are used to support the requirements of the plants including photosynthesis and cellular respiration
- 8 (b) and (d) – demonstrate mathematical skills to process data from a fieldwork investigation

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
• attempted every question, including questions that may have looked challenging as they assessed tricky concepts and required candidates to synthesise a multi-mark written answer; for example, Question 3 (b) about hormone contraceptives; Question 6 (b) (iv) and Question 6 (c) • looked for ways to apply their knowledge and understanding to answer questions asked in unfamiliar contexts; for example, in Question 5 (b) (v) they suggested a good range of arguments for and against the use of genetically modified wheat • demonstrated good practical (disciplinary) knowledge in questions assessing practical work, suggesting strong familiarity with practical methods such as using a light microscope in Question 1 (b), measuring pulse rate in Question 4 (c), and fieldwork sampling methods in Question 8 (a) • demonstrated confidence in applying their mathematical skills to solve multi-step calculations in practical contexts, such as in Question 8 (b), (c) and (d) • showed their working for calculations, which allowed marks to be given for correct working even when the final answer was incorrect, for example in Question 4 (e) (iii), Question 5 (a) and Question 8 (b).	• used up time and answer lines by copying out or re-writing the question before beginning their answer or constructed an answer by rearranging phrases from the question without adding any additional knowledge or understanding; for example, in Question 6 (b) (iv) they stated that ATP is used to move nitrate ions into the root hair cell, and in Question 6 (c) they stated that the root would not be able to grow or produce any more specialised cell without its meristem • produced answers that suggested they may not have taken enough time to read the question carefully; for example, in Question 2 (b) (iii) they explained effects of removing *hedgehogs* rather than *hedges*, and in Question 4 (d) they suggested factors about the *method* that should be kept the same (e.g. "use the same stopwatch") rather than factors about the two *people* (e.g. age) • relied upon imprecise, everyday language rather than specific scientific vocabulary and concepts, such as in Question 2 (b) (iii), Question 6 (b) (ii) and (iv) and Question 8 (a); for example, in Question 2 (b) (iii) they wrote "home" instead of "habitat". • relied upon rote learned, common phrases without demonstrating any understanding; for example, in Question 6 (b) (iv) they referred to mitochondria as "the powerhouse of the cell" without making any reference to their role in cellular respiration and providing ATP or energy.

Question 1 (a)

1 Some types of bacteria can make us unwell.

(a) Here is a diagram of three cells.



Which cell is a bacteria cell?

Tick (✓) **one** box.

A ☐

B ☐

C ☐

Use the diagram to explain your answer.

.....

..... **[2]**

This opening question was well answered, making for a strong start to the paper for many candidates. Answers citing the lack of a nucleus, the presence of a loop of DNA in the cytoplasm, and the lack of mitochondria were all commonly seen. A few candidates missed out on the 'explain' mark because they gave reasons why cell **A** or cell **B** were animal and plant cells, respectively, without saying anything about cell **C**.

Question 1 (d)

(d) Explain why washing your hands before making a sandwich can help stop you from getting unwell.

.....

.....

.....

.....

.....

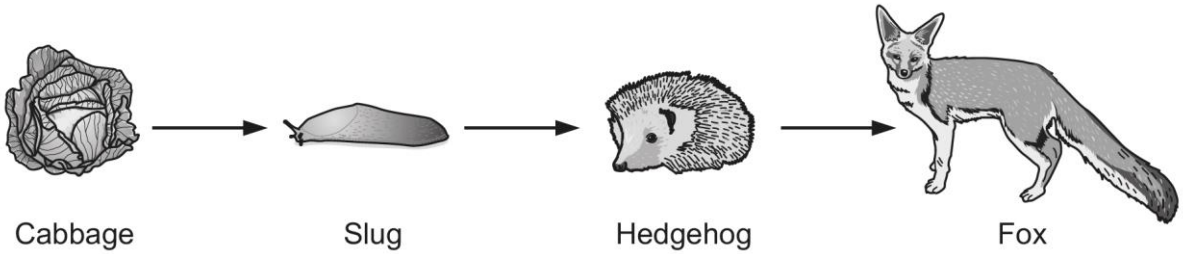
..... **[3]**

Continuing the strong start to the paper for many candidates, this question was well answered. Most candidates were very familiar with the reasons why washing your hands before preparing food could reduce the spread of communicable diseases and were well able to communicate the links between pathogens on the hands leading to contamination of the food, leading to the pathogens entering the body when the sandwich was consumed. There was some evidence of reliance upon everyday language rather than specific scientific vocabulary, with some candidates referring to "germs" when it would have been better to say "pathogens" or referring to them being "digested" rather than "ingested" or "consumed".

Question 2 (a) (i), (ii) and (iii)

2 Hedgehogs are found all over Great Britain.

(a) Here is a food chain that includes hedgehogs:



(i) Which organism in the food chain is a producer?

..... **[1]**

(ii) Which organism in the food chain is a primary consumer?

..... **[1]**

(iii) Foxes can be considered pests and are sometimes killed by humans.

Explain why killing foxes could cause the size of the **slug** population to decrease.

.....

.....

.....

.....

.....

..... **[3]**

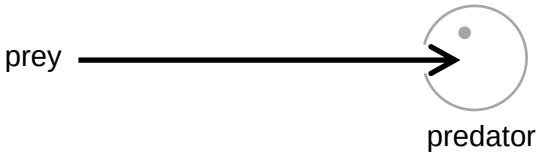
This set of three questions on the food chain was generally very well answered. Many candidates were adept at explaining the knock-on effects that killing the foxes would have on the populations of hedgehogs and slugs in part (iii). Almost all candidates were able to identify the cabbage as the producer in part (i), suggesting that they are confident in their understanding of the term producer. However, some candidates incorrectly suggested that the fox was the producer in part (i), and some also suggested in part (iii) that killing foxes would mean that other animals in the food chain would have nothing to eat; this suggests that perhaps they are reading the food chain the wrong way around and assuming that the fox is the first organism in the chain. Part (ii) was the least well answered of the three parts, with fox the most common incorrect answer, perhaps suggesting conflation of the term primary consumer with terms such as apex/top predator.

Misconception

Reading the arrows in a food chain the wrong way around or reading them to mean "eats".

Assessment for learning

It may be helpful for candidates to use the "Pac-Man predator" aide-mémoire to remind them that the arrows mean "is food for" or "is eaten by".



Once secure in this understanding, it will be easier for them to progress on to understanding that the arrows show the direction in which biomass is transferred through a food chain or web.

Question 2 (b) (i)

(b) The table shows the size of the hedgehog population in Great Britain.

Item removed due to third party copyright restrictions

(i) Describe the change in hedgehog population size shown in the table.

.....

.....

.....

..... **[2]**

This data analysis question required candidates to demonstrate their ability to interpret data (AO3) and identify trends. It was generally well answered. Almost all candidates scored a mark for recognising the general trend that the size of the hedgehog population had decreased. Far fewer went beyond this general comment by saying anything more specific, but those who did often scored a second mark for recognising that the size of the decrease was much greater between 1955 and 1995 than between 1995 and 2018. It was pleasing to see some candidates quantifying the decreases between these pairs of years as 34.94 and 0.68 million, respectively.

Assessment for learning

One candidate had written "GCSE = general comment, specific example" next to their answer – an indication of a potentially useful route to multiple marks when asked to describe data!

Question 2 (b) (ii)

(ii) Assume the trend in the change in population continues.

Which of these is the best prediction of the hedgehog population in 2025?

Put a (ring) around the correct answer.

2.44 million **0.88 million** **0.85 million** **0.01 million**

[1]

In part (i), most candidates recognised the decreasing trend, but far fewer recognised that the decrease – while continuing – was tailing off. This was reflected in part (ii), with very few candidates opting for the incorrect answers of 2.44 and 0.88 million (which would represent an increase and a plateau, respectively). The majority selected one of the other two answers (both of which represent a decrease), with just over half opting for the correct answer of 0.85 million (representing the smaller decrease of the two).

Question 2 (b) (iii)

(iii) In the countryside, hedgehogs live and hide from predators underneath hedges.

Since 1955, many hedges have been removed by farmers.

Explain how this could have caused the data in the table.

.....

.....

.....

..... **[2]**

Many candidates scored 1 mark for this question, most often for recognising that hedgehogs would be more likely to be eaten by foxes.

Assessment for learning

Remind candidates that they're more likely to score marks by using specific scientific vocabulary when they can, rather than relying on imprecise, everyday language. For example, some said that foxes would be able to "find", "get" or "catch" hedgehogs, when it would have been better to say "eat", "consume" or "prey upon"; and some referred to the loss of "homes" instead of "habitat". Also remind candidates that, even though they feel under pressure to answer all the questions in the time allowed for the examination, it's always worth reading the question carefully and perhaps underlining key words; some candidates lost out on scoring marks because they explained effects of removing *hedgehogs*, rather than effects of removing *hedges*.

Question 2 (c)

(c) People who live in some towns have created 'hedgehog highways'.

These are small holes in garden fences that hedgehogs can fit through, but foxes cannot.

Suggest how this could cause an increase in the hedgehog population size in these towns.

.....

.....

.....

..... **[2]**

Candidates engaged very well with this question set in a contemporary, real-world context. Many candidates scored 1 mark for suggesting that hedgehogs would be protected from predators and/or fewer would be eaten (which would enable the hedgehog population size to stop *decreasing*). Around half of these candidates went on to score a second mark for pointing out that this would allow more hedgehogs to reproduce (which would enable the population size to *increase*). As in part (b) (iii), some candidates relied upon imprecise, everyday language rather than using specific, scientific vocabulary. This included a noticeable number of candidates who said hedgehogs could "repopulate", when it would have been better to say "reproduce".

Question 3 (a)

3 Hormones and nerve impulses help to control the human body.

(a) Which of these statements are **true** for hormones, nerve impulses or both?

Tick (✓) **one** box in each row.

	Only true for hormones	Only true for nerve impulses	True for both
Are secreted by glands			
Travel along neurons			
Travel in the blood			
Usually cause slower, longer-lasting responses			

[4]

This tick box question was generally well answered, with most candidates scoring 3 marks out of 4. There was no noticeable pattern in the incorrect answers that would suggest a prevalent misconception about hormones and nerves.

Question 3 (b)

(b) Explain how hormones can be used as a contraceptive to prevent pregnancy.

.....

.....

.....

.....

.....

..... **[3]**

This question was one of the ones most frequently omitted by candidates. Even so, most candidates did attempt it – for which they are to be commended. They clearly found this question challenging, though over half of candidates scored (most commonly) 1, 2 or (least commonly) 3 marks, for which they should also be commended. All the marking points in the mark scheme were seen across candidates' answers, though perhaps the simplest idea that hormones can be taken as a pill, implant or injection was not seen as commonly as might have been expected. Candidates were credited for Higher Tier ideas about specific effects related to progesterone, oestrogen, FSH and LH where these were included in their answers, though the mark scheme ensured it was possible to score full marks without these. Many candidates scored marks for the general idea that the menstrual cycle and/or the hormones that control it would be disrupted in some way, and for the idea that an egg would not be released.

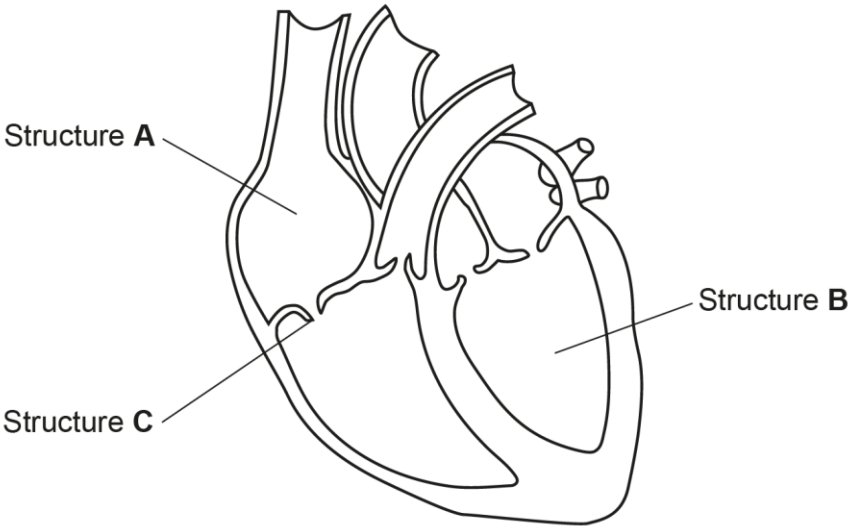
Assessment for learning

It was common for candidates to say that an egg would not be "produced", when "released" would be more scientifically accurate.

Question 4 (a) and (b)

4 The heart, blood vessels and blood make up the circulatory system.

(a) The diagram shows a human heart.



Draw lines to connect each **structure** with its correct **name**.

Structure	Name
A	Atrium
B	Valve
C	Ventricle

[2]

(b) Which diagram correctly describes the route followed by blood through the circulatory system?

Tick (✓) **one** box.

- Heart → Heart → Body → Lungs ☐
- Heart → Lungs → Body → Heart ☐
- Heart → Lungs → Heart → Body ☐

[1]

Part (a) was well answered, with most candidates scoring 1 or more commonly 2 marks. Part (b) was less well answered, with less than half of candidates getting it correct.

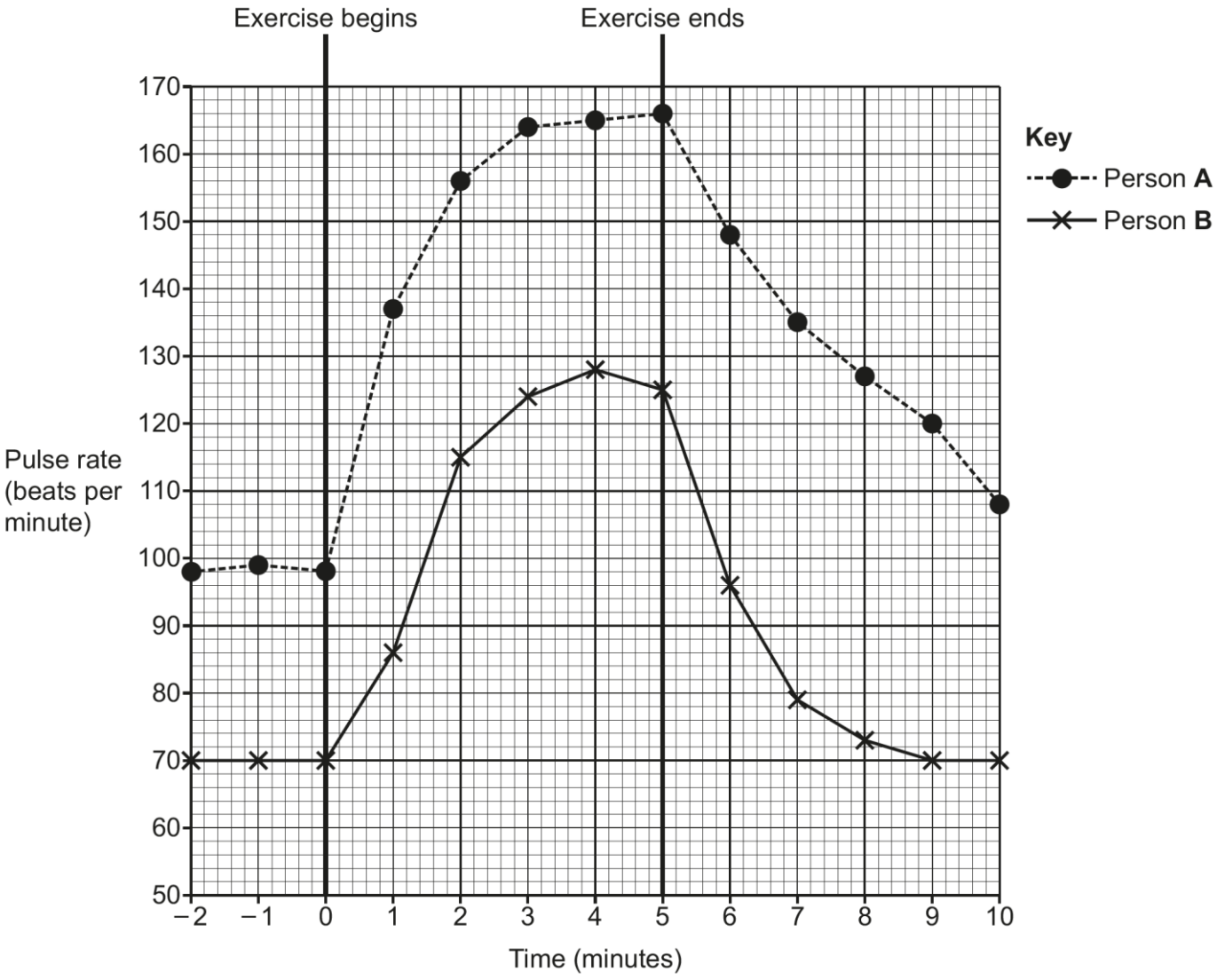
Misconception

Of those who did not get part (b) correct, the majority ticked the middle box. This suggested they may not be secure in their understanding that humans have a double circulatory system in which oxygenated blood returns from the lungs to the heart before being pumped to the rest of the body.

Question 4 (e) (i), (ii) and (iii)

(e) The graph shows the results.

Person **A** and person **B** are resting from time = –2 until exercise begins at time = 0.



(i) What was person **B**'s resting pulse rate?

Resting pulse rate = ... beats per minute **[1]**

(ii) How long after exercise ends did it take for person **B**'s pulse rate to return to its resting value?

Time = ... minutes **[1]**

(iii) By how many beats per minute did person **B**'s pulse rate increase from their resting pulse rate to their highest recorded pulse rate?

Increase = ... beats per minute **[2]**

This trio of questions requiring candidates to demonstrate their mathematical skills was generally well answered. This suggested candidates had been well prepared to interpret, extract and calculate with data from a line graph.

The vast majority of candidates were able to read the correct answer of 70 from the graph in part (i). There were few incorrect answers, with the most common being 98 (the resting pulse of person **A** rather than person **B**).

Well over half of candidates also got part (iii) correct. The most commonly seen incorrect answer was 128 (the highest recorded pulse rate for person **B**, obtained by directly reading the value from the graph without doing the calculation to subtract the resting pulse rate).

Part (ii) proved to be the most challenging for candidates. Just under half of candidates answered it correctly. The most common incorrect answer was 9 minutes (the number of minutes, read directly from the x-axis, at which person **B** returned to their resting pulse rate, but to correctly answer the question it was necessary to calculate how long after the end of exercise this was).

Question 4 (e) (iv)

(iv) Charlie concludes that person **B** is fitter than person **A**.

Describe **three** reasons why Charlie is correct.
Use evidence from the graph.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

Most candidates engaged well with this question that required them to evaluate a claim and identify supporting evidence from the graph. Well over half of candidates achieved 2 or (slightly more commonly) 3 marks for this question. All of the marking points on the mark scheme were commonly seen across candidates' answers. A noticeable minority of candidates appeared to mix up pulse rate with blood pressure by referring to the latter even though no data on blood pressure were provided. This mix up was also apparent in part (c), where some candidates talked about placing fingers on a "pressure point" rather than a "pulse point".

Assessment for learning

Remind candidates that when they're asked to compare two things they should try to make comparative statements whenever they can. In this case, candidates were asked not for evidence that person **B** was fit, but for evidence that person **B** was *fitter than person **A***. Giving an answer such as "Person **B**'s pulse rate is low" is not sufficient, as this says nothing about how it compares to person **A**'s. Also remind candidates to try to avoid using imprecise, everyday language, such as saying that person **B**'s pulse rate was "normal" or "healthy". These terms are subjective and not scientific. What is "normal" or "healthy" for one person may not be these things for somebody else.

Question 5 (b) (i)

(b) Parts of the world where crops are grown are getting warmer and drier because of climate change.

A gene called HB4 enables plants to grow in warmer, drier conditions.

Sunflowers have this gene.

(i) Which statement explains what a gene is?

Tick (✓) **one** box.

A characteristic of an organism. ☐

A section of DNA that contains instructions. ☐

Part of a cell that contains chromosomes. ☐

The entire genetic material of an organism. ☐

[1]

The vast majority of candidates attempted this question assessing their understanding of some terminology from section B1 of the specification. Candidates seemed to find it challenging, with fewer than half of them picking the correct answer. There was no noticeable pattern in the incorrect responses, implying that candidates may have found all three distracters roughly equally plausible.

Question 5 (b) (ii)

(ii) Cells need genes to make which substances?

Put a (ring) around the correct answer.

carbohydrates **fats** **mineral ions** **proteins**

[1]

This question was well answered. Almost two thirds of candidates selected the correct answer of proteins.

Misconception

Of the candidates who selected an incorrect answer, the vast majority chose "mineral ions". The other two answers were rarely chosen.

Question 5 (b) (iii)

(iii) Wheat does **not** grow well in warmer, drier conditions.

Scientists have transferred the HB4 gene from sunflowers into wheat.

Describe the effects on the wheat of modifying it in this way.

.....

.....

.....

..... **[2]**

Candidates engaged well with this question on a cutting-edge, real-world application of science by applying their knowledge and understanding of gene technology from section B1.3 of the specification. Almost two thirds of candidates scored 1 mark, most often for recognising that transferring the gene would enable wheat to grow in warmer, drier conditions. Some also described the general idea that a new characteristic would be introduced. Some suggested other characteristics that might be changed, such as the taste of the wheat. Most of the effects described were at the phenotype level. Very few candidates described changes at the genetic level (i.e. that the wheat's genome, DNA or base sequence, or genotype, would be changed).

Question 5 (b) (iv)

(iv) Which term describes the process scientists used to transfer the gene from sunflowers to wheat?

Tick (✓) **one** box.

- Genetic engineering ☐
- Natural selection ☐
- Selective breeding ☐
- Translocation ☐

[1]

Over two thirds of candidates selected the correct answer of genetic engineering. There was no noticeable pattern in the incorrect responses with all three regularly selected by candidates who did not select genetic engineering. This suggested that candidates may have found all three distracters roughly equally plausible – including translocation.

Question 5 (b) (v)*

(v)* Some people support the growing of this modified wheat and some people do not.

Explain why.

Include in your answer:
- benefits of growing the modified wheat
- risks and objections related to growing the modified wheat.

.....

.....

.....

.....

.....

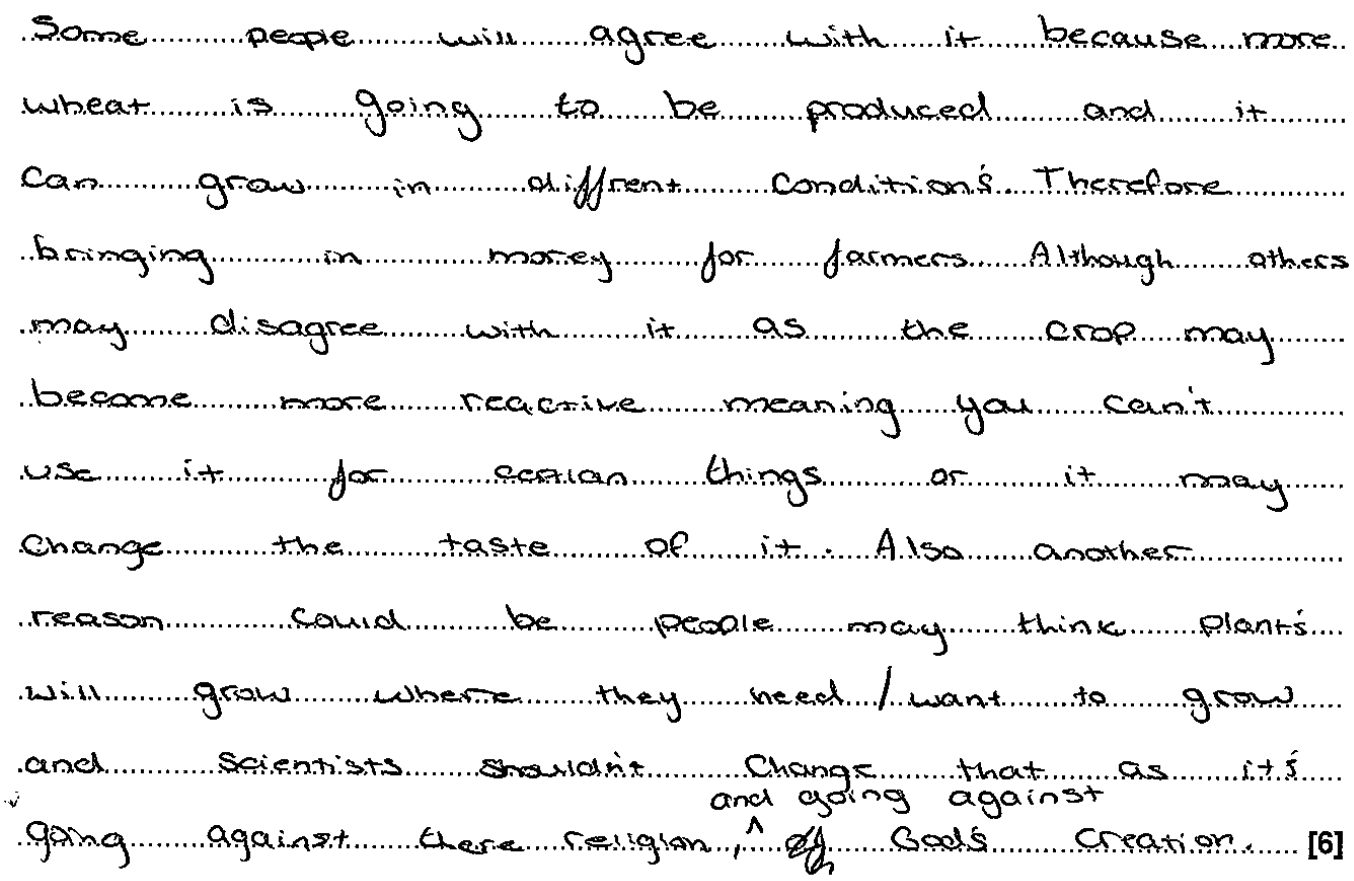
..... **[6]**

Candidates continued to engage well with this question on a real-word application of gene technology. This final part challenged them to discuss the associated societal issues in a balanced piece of extended writing. It was marked using a level of response mark scheme.

The majority of candidates were able to suggest at least one possible benefit and at least one possible risk or objection. All the examples of benefits and risks given in the guidance column of the mark scheme were seen across candidates' answers, with the exception of the idea that the modified wheat might out-compete other species or become invasive.

The phrase "it's playing God" can be rote learned and historically has often been seen in candidates' answers to questions on this sort of issue. This year the use of that phrase without any further explanation was very rarely seen. Most of the candidates who made this point able to explain in more detail why some people might have religious or ethical objections.

Exemplar 1



This is a balanced response that scored Level 3, 5 marks. It develops both sides of the argument by including several benefits and several risks/objections. This response was not awarded 6 marks as it includes some irrelevant ideas (such as the wheat becoming "more reactive"), there is some vagueness (such as the wheat being able to grow in "different" conditions), and not quite enough development on the benefits side.

Question 6 (a), (b) (i), (ii) and (iii)

6 Plants take in substances to help them stay alive.

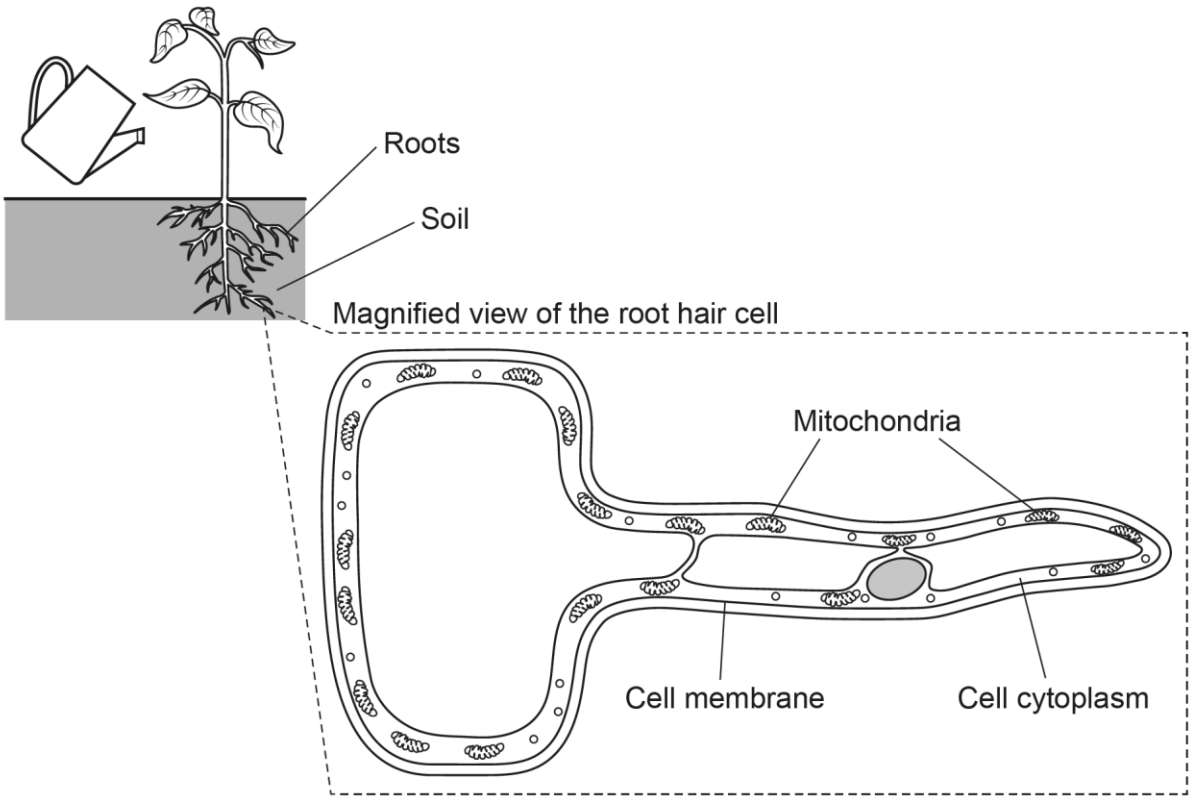
(a) Draw a line from each **substance** to its **use** in plants.

Substance	Use
Carbon dioxide	Cellular respiration
Nitrogen (from nitrate mineral ions)	Making proteins
Oxygen	Photosynthesis

[2]

(b) A student waters a plant with a mixture of fertiliser and water.

Some substances in the mixture are taken into the plant through the cell membrane of a root hair cell.



(i) Which term best describes the cell membrane of the root hair cell?

Tick (✓) **one** box.

Fully-permeable ☐

Non-permeable ☐

Partially-permeable ☐

[1]

(ii) The shape of the root hair cell from the plant extends out into the soil.

Explain why this shape is helpful to the plant after the student waters it.

.....

.....

.....

..... **[2]**

(iii) The plant takes in water for photosynthesis.

Complete the sentences to explain how water is taken into the root hair cell.

Use words from the list.

active transport	**air**	**cell cytoplasm**
diffusion	**osmosis**	**soil**

The concentration of water molecules is higher in the ..... than

in the ..... .

Water molecules move through the cell membrane due to the process of

..... , which is a type of ..... .

[4]

Question 6 assesses knowledge and understanding of the absorption of substances by plants. This topic explores concepts that are abstract because they take place at the molecular level and includes a lot of specific scientific terminology. Candidates rose to the challenge well across these first four parts, with almost all candidates attempting all four parts. The majority of candidates scored full marks in parts (a) and (b) (i), with no obvious pattern to the few incorrect responses.

Parts (b) (ii) and (iii) proved a little more challenging. There was some evidence that candidates may have lacked confidence in using some of the scientific terminology. For example, in part (b) (ii) most candidates who scored marks were awarded 1 mark for recognising that more water or mineral ions would be absorbed, but few said anything about surface area.

In part (b) (iii), the most common mark was 2, with 1 mark coming in a close second, and 4 the least common mark. "Soil" in the first gap was the most common correct answer. The incorrect answer "air" was seen relatively commonly in the second gap. While it is true that the concentration of water molecules would be higher in the soil than in the air after the plant is watered, this doesn't help to explain how water is taken into the root hair cell.

Misconception

The incorrect answer "active transport" was seen relatively commonly in the final gap, often when the candidate had correctly written "osmosis" in the third gap.

Question 6 (b) (iv) and (6 (c)

(iv) ATP is made during cellular respiration.
ATP is used to move nitrate mineral ions from the fertiliser mixture through the cell membrane into the root hair cell.

Explain why the root hair cell from the plant contains lots of mitochondria.

.....

.....

.....

.....

.....

..... **[3]**

(c) The student cuts the tip off one of the plant's roots.

This removes a tissue called meristem.

Explain why this root will **not** be able to grow or produce any more specialised cells without its meristem.

.....

.....

.....

.....

.....

..... **[3]**

Questions 6 (b) (iv) and (c) proved to be two of the most challenging questions in the examination. They were among the most omitted questions (only Question 8 (a) was omitted by more candidates). However, the majority of candidates did attempt them, for which they are to be commended.

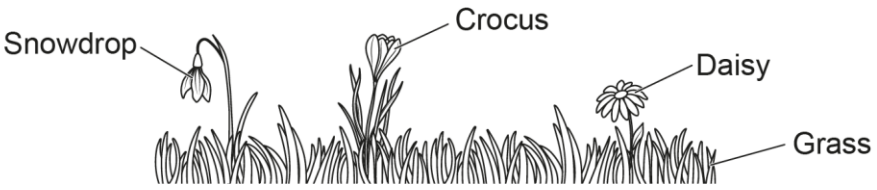
As already noted, "active transport" was often seen as an (incorrect) answer in the fourth gap in Question 6 (b) (iii). Yet very few candidates included that term in their answer to part (b) (iv), where it would have scored marks.

Candidates appeared to find it challenging in part (b) (iv) to apply and draw together their understanding of the role of mitochondria in cellular respiration and the need for ATP (or energy) for active transport of mineral ions into root hair cells to explain why these cells contain many mitochondria. Many used the phrases from the first two sentences of the question without adding anything further to explain the link between these ideas and mitochondria.

Candidates appeared to find it challenging in part (c) to apply their understanding of the function of meristems in plants to explain why a root would no longer grow or produce any more specialised cells after the meristem in its tip had been cut off. Again, many used the phrase "will not be able to grow or produce any more specialised cells" from the question without adding anything further to explain why.

Question 8 (a)*

8 The diagram shows some different species of flowers that grow in a field.



A student wants to estimate the total number of snowdrops in the field.

They collect data from six small squares of the field.

Small square	1	2	3	4	5	6
Number of snowdrops	5	8	2	9	0	6

(a)* Describe a method to collect the data in the table.

Include:
- the apparatus needed
- how to use the apparatus on the field
- how to avoid bias in the data.

.....

.....

.....

.....

.....

..... **[6]**

This question challenged candidates to demonstrate their practical (disciplinary) knowledge of practical fieldwork sampling methods in a piece of extended writing. It was marked using a level of response mark scheme. It was the most skipped question in the examination, perhaps as it is near the end of the paper and some candidates may have felt they'd run out of time to attempt it. However, a majority of candidates did answer it, and of those almost two thirds scored between 1 and 6 marks.

The method steps of placing squares on the field and counting the number of snowdrops in each square were commonly seen. The idea of placing the squares at random was less commonly seen, and an explanation of how to achieve this was only sometimes included.

Many candidates did not seem to be confident in using the scientific term "quadrat". The terms "quadrant" and "quadratic" were occasionally used, but most candidates relied upon everyday language and referred to the apparatus as a "grid" or "square".

Assessment for learning

Remind candidates how important it is to look carefully at what the question is asking them to do – writing more than you have to just eats up valuable time. In Question 8 (a), a number of candidates described in detail how the data would be processed after it had been collected (e.g. by calculating the mean number of snowdrops per square, calculating how many small squares would fit in the field, and then using an equation to estimate the number of snowdrops on the whole field). These steps are covered in Question 8 (b), (c) and (d), but part (a) only asks candidates to describe a method that could be used to *collect* the data in the table (not what would be done next to *process* and draw conclusions from it). The bullet points were provided to make it clear which three aspects candidates should cover in their answer.

Exemplar 2

In a feeld, using a large measuring tape, creeate a square. Then, using a random number generator, create coordinates. Then using the two measuring tapes, find the coordinates. At this grid reference, place a large metal grid. Count all of the snowdrops in this small sqware. Repeat this six times at random for the most reliable results. TO further reliability, compare results with other people and calculate a mean.

This response illustrates the common issue of not using the scientific term "quadrat" and instead referring to the apparatus imprecisely as a "grid". However, it does correctly identify several other pieces of apparatus that would be needed, included measuring tapes and a random number generator. It explains in detail how to generate coordinates to place the squares at random to avoid bias, and how to use the apparatus on the field. This candidate response was awarded L3, 6 marks.

Question 8 (b), (c) and (d)

(b) Use the student's data to calculate the mean number of snowdrops per small square.

Mean number of snowdrops per small square = ... **[2]**

(c) The area of the field is 600 m^2.
The area of each small square is 0.25 m^2.

Calculate the number of small squares that fit in the field.

Number of small squares that fit in the field = ... **[2]**

(d) Estimate the total number of snowdrops in the field.

Use the equation:

total number of snowdrops in the field = mean number of snowdrops per small square × number of small squares that fit in the field

Total number of snowdrops in the field = ... **[1]**

This chain of questions challenged candidates to apply their mathematical skills to process the data presented in the table to reach the outcome of estimating the population size (the reason this type of practical fieldwork is carried out).

Part (b) was very well answered, with most candidates able to correctly calculate the mean. Part (c) was the least well answered of the three parts, with the most commonly seen mistake being to multiply (rather than divide) 600 m^2 by 0.25 m^2. In part (d), many candidates who performed least well on the paper overall achieved the mark because they were awarded "error carried forward" for having correctly used their incorrect answers to parts (b) and (c) in the equation provided.

Assessment for learning

A noticeable minority of candidates in part (b) chose to omit the result of 0 (from small square 5) when calculating the mean. This may be because they assumed it was an outlier and have been trained to exclude outliers when calculating a mean. In the context of this investigation, it is quite possible to have 0 individuals of a particular species in a particular square of the field, so this result should be treated as valid and included in the calculation of the mean. In general, it is best practice to assume a result is valid and include it when processing the data, unless there is convincing evidence that the measurement was an outlier due to random error or a mistake made during the data collection. This evidence may be an observation made during the data collection phase, or that the result is very different to repeat measurements of the same quantity.

OCR support

Our Mathematical skills handbook and accompanying check in can be used with candidates either in lessons or as a revision tool to help familiarise them with the maths skills required in GCSE Biology.

Question 8 (e)

(e) Suggest **one** reason why we can only **estimate** the number of snowdrops in the field from the student's data.

.....

..... **[1]**

Candidates appeared to find this question challenging, with most who attempted it not being awarded the mark.

Many suggested that there would be different numbers of snowdrops in other areas of the field. While this is true, and it could explain why the estimate is not *accurate* (i.e. not close to the true population size), it does not explain why we can only *estimate* the population size from the student's data.

We can only produce an estimate (rather than an exact measurement) because the data are just a sample of the snowdrops in the field. The only way to produce an exact measurement of the population size is to count all the snowdrops.

Supporting you

Teach Cambridge

Make sure you visit our secure website **Teach Cambridge** to find the full range of resources and support for the subjects you teach. This includes secure materials such as set assignments and exemplars, online and on-demand training.

Don't have access? If your school or college teaches any OCR qualifications, please contact your exams officer. You can forward them this link to help get you started.

Reviews of marking

If any of your students' results are not as expected, you may wish to consider one of our post-results services. For full information about the options available visit the OCR website.

Access to Scripts

We've made it easier for Exams Officers to download copies of your candidates' completed papers or 'scripts'. Your centre can use these scripts to decide whether to request a review of marking and to support teaching and learning.

Our free, on-demand service, Access to Scripts is available via our single sign-on service, My Cambridge. Step-by-step instructions are on our website.

Keep up-to-date

We send a monthly bulletin to tell you about important updates. You can also sign up for your subject specific updates. If you haven't already, sign up here.

OCR Professional Development

Attend one of our popular professional development courses to hear directly from a senior assessor or drop in to a Q&A session. Most of our courses are delivered live via an online platform, so you can attend from any location.

Please find details for all our courses for your subject on **Teach Cambridge**. You'll also find links to our online courses on NEA marking and support.

Signed up for ExamBuilder?

ExamBuilder is a free test-building platform, providing unlimited users exclusively for staff at OCR centres with an Interchange account.

Choose from a large bank of questions to build personalised tests and custom mark schemes, with the option to add custom cover pages to simulate real examinations. You can also edit and download complete past papers.

Find out more.

Active Results

Review students' exam performance with our free online results analysis tool. It is available for all GCSEs, AS and A Levels and Cambridge Nationals (examined units only).

Find out more.

You will need an Interchange account to access our digital products. If you do not have an Interchange account please contact your centre administrator (usually the Exams Officer) to request a username, or nominate an existing Interchange user in your department.

Need to get in touch?

If you ever have any questions about OCR qualifications or services (including administration, logistics and teaching) please feel free to get in touch with our customer support centre.

Call us on
01223 553998

Alternatively, you can email us on
support@ocr.org.uk

For more information visit
ocr.org.uk/qualifications/resource-finder
ocr.org.uk
facebook.com/ocrexams
twitter.com/ocrexams
instagram.com/ocrexaminations
linkedin.com/company/ocr
youtube.com/ocrexams

We really value your feedback

Click to send us an autogenerated email about this resource. Add comments if you want to. Let us know how we can improve this resource or what else you need. Your email address will not be used or shared for any marketing purposes.

I like this **I dislike this**

Please note – web links are correct at date of publication but other websites may change over time. If you have any problems with a link you may want to navigate to that organisation's website for a direct search.

CAMBRIDGE
UNIVERSITY PRESS & ASSESSMENT