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Examiners' report

GCSE

GATEWAY SCIENCE BIOLOGY A

OCR Level 1/Level 2 GCSE (9-1) in Biology A (Gateway Science)

J247

For first teaching in 2016

J247/04 Summer 2025 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 responses 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 Teach Cambridge.

Paper 4 series overview

J247/04 is the second paper candidates take for the Higher Tier GCSE Biology A (Gateway Science) suite. It assesses content from specification topics B4-6 and B7 practical skills with synoptic questions linked to B1-3. Therefore, for candidates to perform well on this paper they will need to have sound knowledge of the theory covered in B1- B6 and be able to apply this to novel situations. The J247/04 component includes a multiple-choice section and a short response section that also includes a Level of Response question. The Level of Response question assesses the quality of communication as well as knowledge and understanding.

Candidates need to apply the skills and understanding that they have developed through practical activities covered in B7. There are also questions that involve the assessment of key mathematical requirements from Appendix 5f of the specification.

It is important that candidates understand the command words and what is expected when a particular command word is used. In some cases, responses were given when explanations were needed and so not all marks were accessed. In other case responses were given that did not have the scientific terminology required for the higher-level responses.

In some cases, it was clear candidates were not reading the question carefully. In others candidates did not gain marks due to not using the information provided or not answering in enough specific depth to demonstrate a sound knowledge and understanding of key scientific concepts and skills.

Candidates are attempting more of the paper and gaining more marks due to maths calculations. Showing workings out is essential in this process.

Candidates may need further development of their scientific enquiry skills (AO3) which candidates can have less familiarity with.

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:

• demonstrated knowledge and understanding in:
  ○ Question 16 (b) (ii) in the role of antibiotics.
  ○ Question 20 (a) light and photosynthesis and minerals in plants.
  ○ Question 21 (c) in the formation of cancerous tumours.
  ○ Question 22 (b) (i) gaining full marks on culturing bacteria and antibiotic resistance
• successfully applied knowledge and understanding in:
  ○ Question 19 (c) (iv) the immune response and stem cells
  ○ Question 20 (d)* - gaining level 3 on the Level of Response question on genetic engineering.
	• could not state the name given to an organism that causes disease in Question 16 (a)
	• found it difficult to describe how to extend an experiment to test pH of the soil in Question 17 (d)
	• could not apply their knowledge of scientific techniques in their calculation in Question 18 (b)
	• only gained 1 mark or did not score using ideas to make judgements from information on food security in Question 18 (c)
	• did not gain full marks for explaining how you can tell from the family tree that the allele for SIOD is recessive in Question 19 (a)
	• did not gain full marks explaining why stem cells can produce large numbers of white blood cells in Question 19 (c) (iii)

Candidates who did well on this paper generally:	Candidates who did less well on this paper generally:
○ Question 22 (c) role of prokaryotic bacteria as in antibiotic resistance. ○ Question 22 (a) the role of infection and the consequences on the xylem being blocked • analysed information: ○ Question 22 (b) (ii) ideas to evaluate data extracted from a bar chart in antibiotic use ○ Question 23 (c) (iii) ideas to interpret data extracted from a bar chart on temperature and bacteria survival ○ Question 18 (c) ideas to make judgements from information on food security.	• could not apply their knowledge and understanding of introduction of an invasive species in Question 20 (b) • did not gain more than level 2 (3 marks) on the Level of Response Question 20 (d)* on genetic engineering

Section A overview

Candidates responded well to Section A; all multiple-choice responses were attempted. Most candidates selected upper case responses to make sure the desired letter is easily distinguishable.

Candidates responded well to Section A and made sure they selected a multiple-choice response for Questions 1-15. The multiple-choice questions concentrated on Assessment Objectives 1 and 2 (AO1 and AO2).

All candidates attempted all the questions.

Questions 9,14 and 15 discriminated well on the knowledge and understanding of chromosomes numbers, monoclonal antibodies and non-coding DNA.

Questions 3, 11, 12 and 15 were the most challenging in this section on their knowledge of white blood cell adaptations; sperm cells; biomass transfer through a food chain and role of non-coding DNA.

Question 1

1 A student is investigating variation by collecting data on shoe sizes.
These are the shoe sizes of six members of their family.

10	5	6	7	8	6

Which of these statements about the data is **correct**?

A The mean shoe size and the modal shoe size are the same.

B The mean shoe size is 6.

C The mean shoe size is larger than the modal shoe size.

D The modal shoe size is 7.

Your answer ☐ **[1]**

Nearly all candidates could calculate that the mean shoe side is larger than the model shoe size.

Question 3

3 What is an adaptation of **white** blood cells?

A They can change shape to squeeze out of blood vessels into tissues.

B They have many ribosomes to produce antibiotics.

C They lack a nucleus so that they can engulf bacteria.

D They produce enzymes to make blood clot.

Your answer ☐ **[1]**

Candidates found this question the most challenging on the multiple-choice section. The most common no-scoring response was white blood cells lacked a nucleus to engulf bacteria mixing up phagocytes (which is a type of white blood cell) and red blood cells.

Question 4

4 What is the **correct** definition of hydroponics?

A A process for growing plants in a mineral solution

B A process in the water cycle

C The movement of sweat out of sweat glands in the skin

D The movement of water in xylem vessels

Your answer ☐ **[1]**

Nearly all candidates knew the correct definition of hydroponics. The most common no-scoring response was that it was a process in the water cycle.

Question 9

9 A muscle cell in a horse has 64 chromosomes.

Which of these statements is **correct**?

A A horse egg cell has 64 chromosomes and is haploid.

B A horse liver cell has 32 chromosomes and is haploid.

C A horse neurone has 64 chromosomes and is diploid.

D A horse sperm cell has 32 chromosomes and is diploid.

Your answer ☐ **[1]**

This multiple-choice question discriminated well, with candidates applying their knowledge and understanding on chromosome numbers in body and gametes. The most common response which did not score the mark was that sperm cells have 32 chromosomes, which is correct, but mixed up the terms of diploid and haploid and thought it is diploid.

Question 11

11 Which description is **correct** for human sperm cells?

A They always contain an X chromosome.

B They always contain a Y chromosome.

C They contain an X and a Y chromosome.

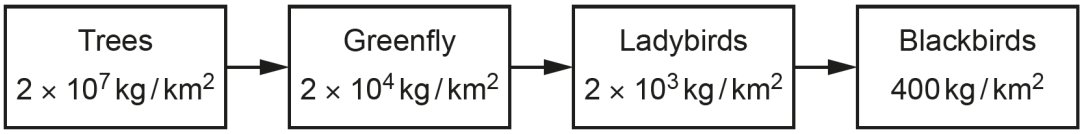
D They contain either an X or a Y chromosome.

Your answer ☐ **[1]**

Just under half of candidates were credited this mark for the correct description of sperm cells. The most common no-scoring response that it is diploid and carries an X and Y chromosome.

Question 12

12 The diagram shows the flow of biomass through a food chain.



What is the combined biomass of all the predators in this food chain?

A 400 kg / km^2

B 2400 kg / km^2

C 22400 kg / km^2

D 20 022 400 kg / km^2

Your answer ☐ **[1]**

This multiple-choice question candidates found challenging on calculating the combined biomass of all the predators in the food chain. The most common error was adding up the total biomass of all the animals including the greenfly in their response. However, the greenfly is not a predator of the tree.

Question 14

14 What is **not** a proven use for monoclonal antibodies?

A Gene therapy

B Pregnancy tests

C Targeting cancer cells

D Testing for cancer

Your answer [ ] **[1]**

This question discriminated well on monoclonal antibodies. Incorrect responses ranged across all the other options equally.

Question 15

15 How may a mutation in non-coding DNA result in a change in phenotype?

A It changes the amino acid sequence of a protein.

B It changes the shape of the active site of a protein.

C It prevents mRNA binding with ribosomes.

D It prevents transcription occurring.

Your answer [ ] **[1]**

This multiple-choice question discriminated and proved challenging for the candidates on non-coding DNA. The most common incorrect response was mixing up non-coding and genes by changing the amino acid sequence of a protein.

Section B overview

This section assesses AO1, AO2 and AO3 and includes a selection of questions where candidates choose between options provided (by ringing a word or by ticking a box), plus short response responses and a Level of Response question. The overlap questions were Question 16 and Question 17 in this paper.

Candidates generally scored well on the questions which did not require open responses to avoid the tendency to repeat the stem of the question or write an answer which does not hit the key terminology required. The candidate knowledge and understanding on random sampling and Punnett square genetic outcomes has been mastered the most in the paper.

Nearly all questions were attempted with a zero omit rate. The exception were the questions on not knowing the term biological control.

Knowledge gaps have been identified and the key misconceptions where centres could focus and revisit more often throughout the GCSE course were in culturing microbes and techniques; role of the immune response; abiotic factors on plants and extracting data and information from bar charts to make judgements and conclusions.

Where candidates did not score, it was due to a lack of use of scientific subject-specific terminology and vague responses.

Candidates that did require the extra pages provided at the end of the exam booklet clearly linked their answers to the question so not to cause confusion and make full use of the space provided in the answer booklet.

Question 16 (a)

16 Many different bacteria can cause disease.

(a) State the name given to any organism that causes disease.

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

Most candidates were able to state pathogens cause disease. The most common non-scoring response was vector or a named pathogen such a virus.

Question 16 (b) (i)

(b) A patient in hospital has a bacterial disease.
A doctor tells the patient:

> 'Some time ago, bacteria entered your body.
>
> Your body detected chemicals on the surface of the bacteria.
>
> This made your body produce protein molecules to help kill the bacteria.
>
> I will give you a tablet containing a medicine that will also kill the bacteria.
>
> You should not get this disease again because cells in your body will now provide you with immunity.'

(i) The boxes contain descriptions used by the doctor and some biological terms.

Draw **four** lines to connect each **description** to its correct **biological term**.

Description	Biological term
chemicals on the surface of the bacteria	antibiotics
proteins produced by the body	antibodies
medicine given by the doctor to kill the bacteria	antigens
cells that provide immunity	antiseptics
	white blood cells

[4]

This was a high scoring question, with most candidates able to achieve full marks by linking the correct description with biological term. The most common errors were mixing up proteins produced by the body with antiseptics and medicines to kill bacteria as antibodies.

Question 16 (b) (ii)

(ii) The doctor would change the type of medicine given to the patient if the disease was caused by a virus.

State the change the doctor would make.

Give a reason for your answer.

Change .....

Reason .....

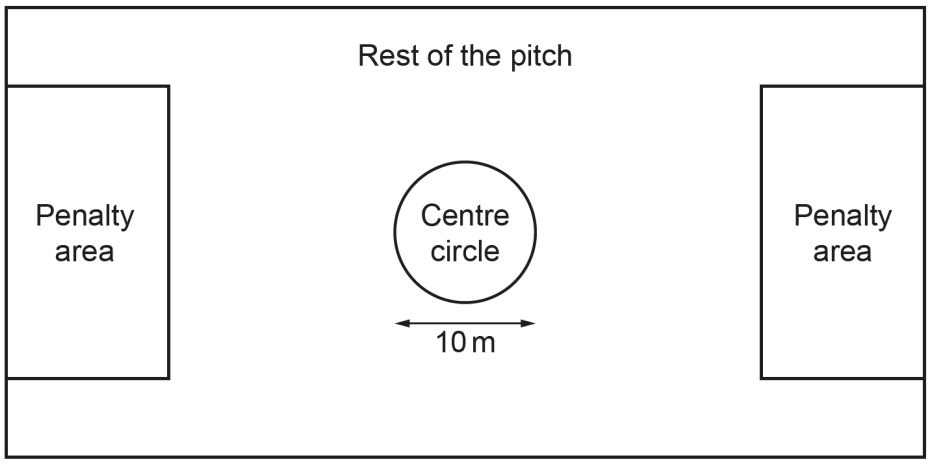
.....

[2]

Half of all candidates achieved one mark here for correctly identifying the correct change. Half of candidates were able to further correctly give the reason in enough specific detail of how antibiotics wouldn't kill bacteria.

Question 17 (a)

17 Some students investigate the number of dandelion plants growing in three different parts of a football pitch.



(a) The students sample the pitch to find the mean number of dandelion plants per m^2 in each part.

Explain how the students use a quadrat to find the mean number of dandelion plants per m^2 in a part of the pitch.

.....

.....

.....

.....

.....

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

Most candidates were credited 2 or full marks on this question about random sampling around the football pitch. Candidates who did not score full marks did not state how to work out the mean, just answered about how to estimate the whole population across the whole football pitch.

Question 17 (b)

(b) The table shows some of the students' results.

Part of the pitch	Area (m^2)	Mean number of dandelions per m^2	Total number of dandelions
Both penalty areas	1300	4.0	5200
Centre circle	.....	3.0	.....
Rest of the pitch	5500	2.0	11 000

Calculate the area of the centre circle and the total number of dandelions in the centre circle.

Use the equation: area of a circle = πr^2

Use $\pi = 3.14$

Write your answers in the table.

[3]

Almost all the candidates were credited maximum marks for correctly calculating the area of the central circle and then using this to work out the total number of dandelions. Those minority of candidates who did not achieve maximum marks used $\pi \times 10^2$ instead of $\pi \times 5^2$.

Question 17 (c)

(c) The students write a conclusion for their experiment.

Complete the students' conclusion.

Use words from the list.

community	**compete**	**differently**	**efficiently**	**equally**
habitat	**mutate**	**population**	**respire**	

The football pitch contains a ..... of different plant species, mainly grass and dandelions.

The part of the pitch that has the most players running on it has the most dandelions.

This is because it is more difficult for plants to grow there.

The dandelions successfully ..... with the grass in these areas.

We can only make this conclusion if abiotic factors affect each area ..... .

[3]

Nearly all candidates scored full marks on this gap fill question on populations and competition. The most common incorrect response was mixing up community with population.

Question 17 (d)

(d) Describe how the pupils could extend their experiment to show that soil pH was the same in each part of the pitch.

.....

.....

.....

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

Most candidates gained credit on this question about extending the investigation (an AO3 skill) and over half of candidates were given full marks. The marking point which was least given was the idea to test using a pH probe (or alternative wording).

Question 18 (a)

18 Locusts are insects that live in many parts of Africa.

They eat many different types of plants.

One female locust can lay 50 eggs and they take 10 days to hatch.

A large group of locusts is called a swarm and contains one thousand million locusts.

A swarm can fly 80 km in a day.

(a) Give the number of locusts in a swarm in standard form.

Number of locusts = ... **[1]**

Most candidates achieved this mark, converting a number into standard form. The minority of candidates who did not achieve this mark multiplied another 1000 locusts onto the answer in standard form, so instead of 1×10^9 the answer became $1 \times 10^{12.}$

Question 18 (b) (i)

(b) Some students want to find out how long it would take a swarm of locusts to eat all the grass in a field.

This is the method they use:

- Keep one locust in a cage in their laboratory.
- Give the locust grass to eat.
- Measure the mass of grass that the locust eats in one hour.
- Find the mass of grass in the whole field.

These are the students' results:

Mass of grass eaten by one locust in one hour = 0.001 kg
Mass of grass in a field = 5000 kg

(i) Calculate how long it would take for a swarm of locusts to eat all the grass in the field.

Time taken = ...hours **[3]**

Over half of all candidates achieve full marks on this calculation question. The most common error was instead of dividing the mass of grass in a field by mass of grass eaten by the swarm of locusts in one hour, they did the reverse.

Question 18 (b) (ii)

(ii) Suggest **one** way that the students could improve their method to get a more accurate estimate of the time.

.....

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

Most candidates were able to give an improvement to the method. The most common given mark was using more than one locust. The most common non-given response was to decrease the time tested.

Question 18 (c)

(c) Explain why locusts are a major risk to food security in Africa.

Use information from all of question 18.

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.....

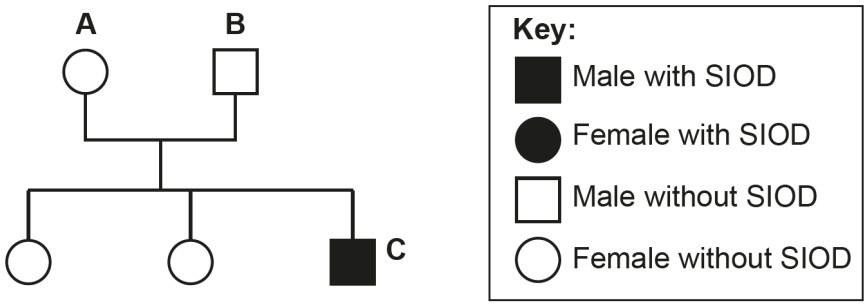
..... **[3]**

This open short response question discriminated well with a range of marks given. All candidates attempted this question and the most common given mark was the idea locusts eat crops. The second most common given mark was for the locusts reproduced quickly. The non-given responses just rewrote the information from the question and did not expand any further.

Question 19 (a)

19 SIOD is an inherited genetic disorder.

The diagram shows a family tree with a person who has SIOD.



(a) SIOD is caused by a recessive allele.

Explain how you can tell from the family tree that the allele for SIOD is recessive.

.....

.....

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

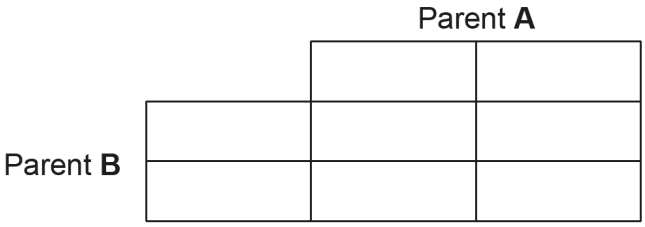
Over half of candidates achieved full marks on their ability to apply their knowledge and understanding of genetic inheritance and use the information from the family tree to identify why the allele for SIOD is recessive. The candidates who did not receive any marks made general comments about most family members not having the disorder.

Question 19 (b)

(b) The parents **A** and **B** are expecting another child.

Predict the probability that this child will have SIOD.

Complete the genetic diagram to explain your answer using **D** for the dominant allele and **d** for the allele for SIOD.



Probability = ... **[3]**

This question had the most candidates scoring full marks, demonstrating mastering of Punnett squares and genetic inheritance probability.

Question 19 (c) (i)

(c) One of the symptoms of SIOD is kidney failure.

People with the disorder often need a kidney transplant.

(i) After receiving a kidney transplant from a donor, a person needs to take drugs to reduce the activity of their immune system.

Explain why it is necessary to reduce the activity of their immune system after a transplant.

.....

.....

.....

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

Over half of candidates were credited one mark on this application of knowledge and understanding of the immune system. However very few candidates were credited both marks, demonstrating in depth knowledge of the immune response of foreign antigens and the production of antibodies.

Question 19 (c) (ii)

(ii) Give a possible disadvantage of having to take drugs to reduce the activity of the immune system.

.....

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

Most candidates knew that people would be immunocompromised and more susceptible to infections/diseases if their immune system was reduced. The most non-scoring response by candidates was about a description of the immune response.

Question 19 (c) (iii)

(iii) The first person to receive stem cell treatment for SIOD was in 2023.

This person received stem cells from a donor.

These stem cells reached the bone marrow and produced large numbers of white blood cells.

Explain why stem cells can produce large numbers of white blood cells.

.....

.....

.....

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

This question on stem cells and differentiation was well answered by candidates with over half credited full marks. This demonstrated centres had responded well to the previous year paper which did not have such a high achieving response with a similar question.

Question 19 (c) (iv)

(iv) Six months later, the person received a kidney transplant from the same donor.

Why would this person **not** need to take drugs to reduce the activity of their immune system?

.....

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

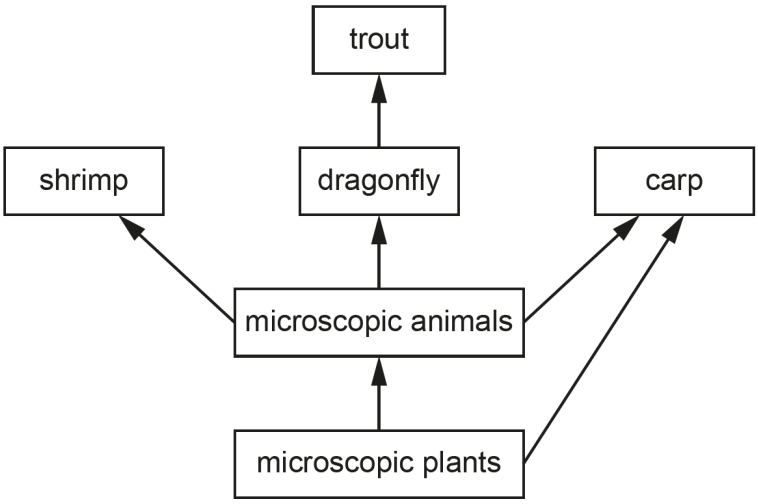
This was one of the most challenging questions on Section B, again applying their knowledge and understanding of the immune response in relation of foreign antigens and antibodies.

Assessment for learning

Key process in the immune response has been identified as a knowledge gap. Candidates may benefit from revisiting the role of antibody production in response to foreign antigens in the immune response to embed this key fundamental knowledge.

Question 20 (a)

20 The diagram shows a food web from a lake in North America.



(a) Explain why carp are described as feeding at **two** different trophic levels.

Use details from the food web.

.....

.....

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

Most candidates were credited at least one mark on this question, demonstrating the ability to apply their knowledge and understanding on food webs. Nearly half of all candidates gained both marks. Those candidates who were not credited both marks gave a general response that carp ate both the microscopic plants and animals. Those very few candidates who did not achieve any marks gave responses that were too general about eating two different food sources.

Question 20 (b)

(b) Carp are large fish that have been introduced into America from Asia.

Their numbers in lakes have increased and they are becoming pests.

Suggest a reason why the population of a species often increases rapidly after they are introduced into a new area.

.....

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

Just under half of all candidates were not credited this mark by stating that there was no competition but did not qualify why. The most common response was there were no natural predators or more food available.

Question 20 (c)

(c) Carp feed at the bottom of lakes and this stirs up mud into the water.

The mud contains minerals but makes the water cloudy.

Explain **two** different effects that this could have on the microscopic plants living in the lake.

1 .....

.....

.....

2 .....

.....

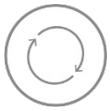
.....

[4]

This question on the effect of changing abiotic factors on plants discriminated well but also was a challenging question. There was a good range of marks given, and the most common given marks were for the effect of lack of light on photosynthesis and the ability for plants to produce glucose/grow.

Fewer candidates were able to demonstrate their knowledge that there would be more minerals available for numerous biological processes.

Assessment for learning



Key process in the effect of abiotic factors on plants has been identified as a knowledge gap. Candidates may benefit from revisiting the role of various effects of a range of abiotic factors to embed this key fundamental knowledge.

Question 20 (d)*

(d)* Carp embryos develop into male or female fish depending on the level of female hormone they produce.

If carp embryos produce high levels of the female hormone, oestrogen, they will become females.

Scientists are trying to reduce the numbers of carp in lakes by using genetic engineering.

This is their plan:

- introduce a gene into some early carp embryos that will stop the production of oestrogen
- release the genetically modified carp into the lakes.

Describe how the gene could be introduced into carp cells and explain how the scientists' plan could decrease the number of carp in the lake.

.....

.....

.....

.....

.....

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

The Level of Response extended writing question discriminated well. It was based on the process of genetic engineering and applying their knowledge and understanding on explaining why the introduction of this GM gene into carp could decrease the number of carp in the lake. Half of all candidates achieved a Level 3 with a detailed description of genetic engineering and the effect on the population of carp.

Those who only accessed Level 2 generally did not provide a detailed description of genetic engineering.

Most candidates who did not gain more than a Level 2 score only wrote about the effect on the population of carp and did not mention the process of genetic engineering.

There was some mix up between genetic engineering and cloning.

Exemplar 1

The gene that codes for a step in production of oestrogen is isolated from a carp. The gene is cut with restriction enzymes and have the sticky ends joined with a DNA ligase enzyme in a new genetically modified carp embryo. The embryo will form a male carp who will then reproduce with another female with low oestrogen levels. The desired gene will be passed to their offspring. Overtime, the number of female carps will decrease leaving less to reproduce. This will overall decrease the population of carp.

Exemplar 1 shows a Level3, 6 mark, response which gives a detailed description of how the gene can be introduced into carp cells including the use of sticky ends and the enzymes involved. In addition, there is an explanation how the number of the carp in the lake decreases.

Question 21 (a)

21 People can have their DNA tested.

The table shows five different types of DNA test and the purpose of each test.

Type of DNA test	Purpose of test
A	identifying which part of the world a person's ancestors came from
B	identifying the best drug to treat a genetic disorder
C	identifying genes that might increase the chance of developing a disease
D	identifying any recessive alleles that are not being expressed
E	finding DNA that has come from a cancerous tumour

(a) Which type of test, **A**, **B**, **C**, **D** or **E**, is identifying risk factors?

.....

[1]

Question 21 (b)

(b) Which type of test, **A**, **B**, **C**, **D** or **E**, will **not** affect the person being tested but might be useful if they are planning to have children?

.....

[1]

Questions 21 (a) and (b) were answered well by candidates, with both resulting in nearly full marks by all candidates, by extracting the purpose of different DNA tests.

Question 21 (c)

(c) Test **E** can test for a cancerous tumour.

Describe how cancerous tumours form.

.....

.....

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

Most candidates were credited at least one mark here on how cancerous tumours are formed. The most common marking point was uncontrolled cell division. The most common none given marking point was mutation. Responses which did not receive any marks wrote about cells reproducing out of control.

Question 21 (d)

(d) Deciding whether to take test **C** can be a difficult decision for some people.

Suggest **one** possible reason why.

.....

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

In this question most candidates gave a response which credited the mark. The most common response was the idea of the impact on their mental well-being. The most common non-scoring response given was just stating the outcome of the result, not the reasons why.

Question 22 (a)

22 Farmers sometimes give their farm animals antibiotics even if the animals only have harmless bacteria living in their body.

This is to increase the growth rate of the animals.

(a) Suggest why harmless bacteria living in the digestive system of animals could **decrease** the growth rate of the animals.

.....

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

Over half of candidates were able to identify why bacteria living in the digestive system could decrease the growth rate of the animals. The most common non-scoring response was the bacteria slows down digestion.

Question 22 (b) (i)

(b) Scientists have been studying the bacteria found in different farm animals.

They took samples from different farm animals and tested them to see if bacteria in the samples were killed by different antibiotics.

(i) Describe how bacteria can be tested in the laboratory to see if they are killed by an antibiotic.

.....

.....

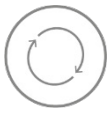
.....

.....

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

This question on culturing bacteria and testing the effectiveness of antibiotics was a good discriminator with a range of marks given to candidates. The most given marking point was the idea bacteria are placed onto agar/petri dish. The least given mark was the area/zone of inhibition. Candidates who did not score on this question talked about genetic engineering or monoclonal antibodies techniques.

Assessment for learning

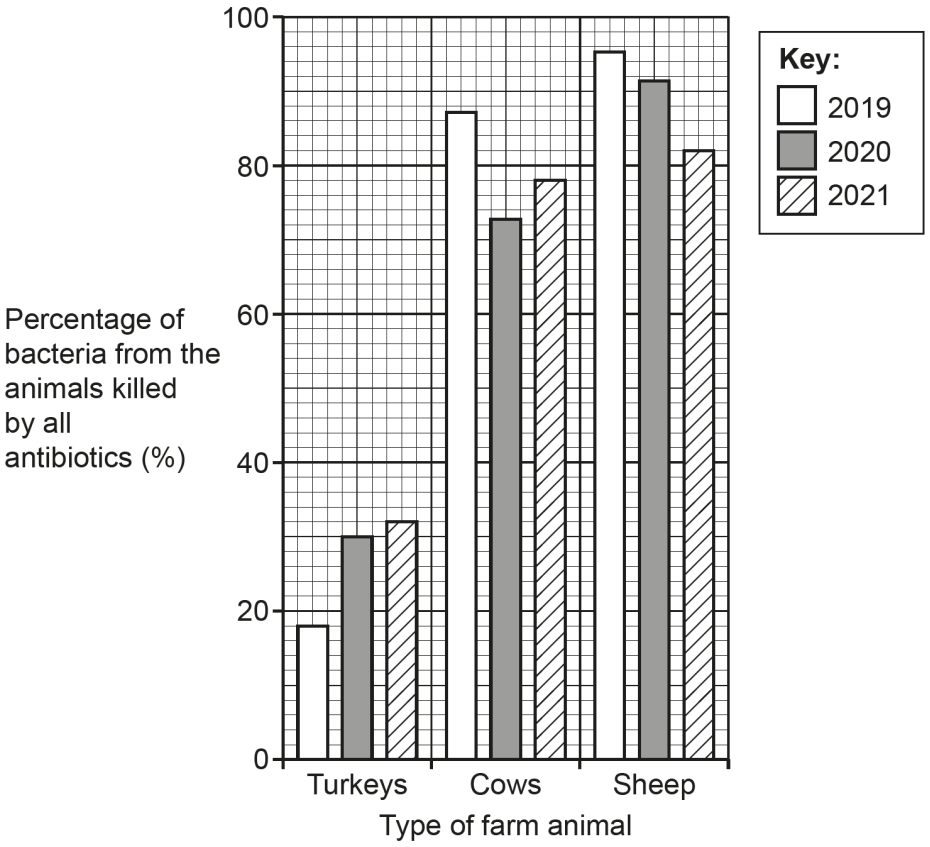


Knowledge and understanding of culturing bacteria and effectiveness of antibiotics has been identified as a knowledge gap. Candidates may benefit being able to revisit this over time to embed this key fundamental knowledge.

Question 22 (b) (ii)

(ii) The scientists' tests were done in 2019, 2020 and 2021 on three types of farm animals.

The bar chart shows the percentage of bacteria from the animals that were killed by all the antibiotics that they tested.



Scientists think that the use of antibiotics in farm animals might be increasing the number of populations of bacteria that are resistant to antibiotics.

Farmers have agreed to reduce the use of antibiotics.

Discuss if the figures in the bar chart support the idea that farmers are reducing the use of antibiotics.

.....

.....

.....

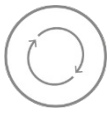
.....

.....

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

This question was challenging for the candidates. This is an AO3 skill (working scientifically WS1.3e) and candidates should be demonstrating the skill of interpretation of data. The most common non-given response was just stating data without analysis or getting the support of the reduction of use of antibiotics the wrong way round, e.g. sheep support and turkeys do not support.

Assessment for learning



Candidates' AO3 skill working scientifically WS1.3e, the skill of interpretation of data, has been identified as an area that may benefit from development.

Question 22 (c)

(c) A student writes three sentences about how antibiotic resistance might occur:

1. 'Bacteria mutate when the DNA in their nucleus changes.'
2. 'Antibiotics cause these mutations to occur.'
3. 'These mutations can produce an allele that makes the bacteria immune to antibiotics.'

Identify the mistake the student has made in each sentence.

Sentence 1 .....

.....

Sentence 2 .....

.....

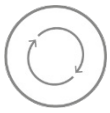
Sentence 3 .....

.....

[3]

This question was challenging for the candidates and just under half were credited one mark only. The most common given marking point was the idea that bacteria do not have a nucleus. Common responses which did not gain any marks were DNA causes mutations or mutations do not produce an allele that makes bacteria immune to antibiotics.

Assessment for learning



Knowledge and understanding of antibiotic resistance and mutations has been identified as a knowledge gap. Candidates may benefit from being able to regularly revisit this over time to embed this key fundamental knowledge.

Question 23 (a)

23 A bacterium causes a disease in cucumber plants called bacterial wilt.

Here are some details of the disease:

- Bacteria causing the disease are found on beetles.
- The beetles feed on cucumber plants.
- Inside the plant, the bacteria produce a sticky substance in the xylem vessels.
- The leaves of the plants then wilt and die.

(a) Explain how a beetle feeding on a cucumber plant causes the leaves of the plant to wilt from this disease.

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..... **[4]**

Most candidates scored on this question, with an equal range between one and three marks. Very few candidates were given the full marks. The most common marking point given was the idea that the beetle transfers the bacteria to the cucumber. Some responses just stated the pathogen or disease without being specific. The least given marking point was the idea of the effect of less water on cells and becoming flaccid or lose turgor pressure.

Question 23 (b)

(b) Spraying the surface of the plant with chemicals that kill bacteria does **not** prevent the disease spreading.

Suggest a reason why.

.....

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

Half of candidates were able to suggest a reason why spraying insecticide would not prevent the bacteria from spreading. Non-scoring responses rewrote the answer to part (a) about beetle's transfer when eating the plant.

Question 23 (c) (i)

(c) Scientists are trying to find a different way of killing the bacteria.

They plan to use another organism to kill the bacteria.

(i) What is the name of this type of control method?

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

This question had the highest omit rate. The most common responses which did not gain a mark were 'predator', 'biotic' or 'parasite control'. Just under half of candidates achieved this mark and knew, and could apply, the term 'biological control'.

Question 23 (c) (ii)

(ii) The organism that the scientists plan to use is a virus.

The virus produces an enzyme that breaks down the bacterial cell wall.

Explain why this may cause the bacteria to swell up and burst.

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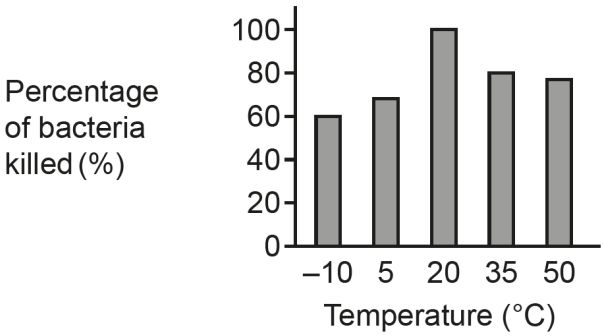
..... **[2]**

Just under half of candidates were credited a mark on this question about osmosis on plant cells. Applying knowledge and understand of the consequences on the cells if the cell wall was broken down proved challenging and most candidates were not credited full marks. Candidates who did not gain marking point one did not link water entry to osmosis. Those candidates who did not get the second marking point just rewrote the question or gave alternative wording for 'swelling up' and 'burst'.

Question 23 (c) (iii)

(iii) The scientists added the virus to the bacteria and measured how effective it was at killing the bacteria. They did this at different temperatures.

Their results are shown in the graph.



The scientists concluded that the virus could be used to treat bacterial wilt throughout the year.

Use the graph to explain why the scientists made this conclusion.

.....

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.....

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

Three quarters of candidates scored a mark on the final question. Most did not achieve full marks. A lot of candidates who did not achieve the first marking point, about bacteria killed over a range of temperatures, just rewrote the data from the bar chart. Those who did not achieve the marking point for over the different seasons just rewrote the question and stated 'throughout the year'.

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