OCR
Oxford Cambridge and RSA

Friday 9 June 2023 – Afternoon

GCSE (9–1) Combined Science (Biology) A (Gateway Science)

J250/08 Paper 8 (Higher Tier)

Time allowed: 1 hour 10 minutes

H

You must have:
- a ruler (cm/mm)

You can use:
- a scientific or graphical calculator
- an HB pencil

Please write clearly in black ink. **Do not write in the barcodes.**

Centre number | | | | | | Candidate number | | | | |

First name(s) _____

Last name _____

INSTRUCTIONS
- Use black ink. You can use an HB pencil, but only for graphs and diagrams.
- Write your answer to each question in the space provided. If you need extra space use the lined pages at the end of this booklet. The question numbers must be clearly shown.
- Answer **all** the questions.
- Where appropriate, your answer should be supported with working. Marks might be given for using a correct method, even if your answer is wrong.

INFORMATION
- The total mark for this paper is **60**.
- The marks for each question are shown in brackets **[ ]**.
- Quality of extended response will be assessed in questions marked with an asterisk (*).
- This document has **24** pages.

ADVICE
- Read each question carefully before you start your answer.

Section A

You should spend a **maximum** of **20 minutes** on this section.

Write your answers to each question in the box provided.

1 Which is a **true** statement about artificial classification?

A It is based on the observation of only one or a few characteristics.

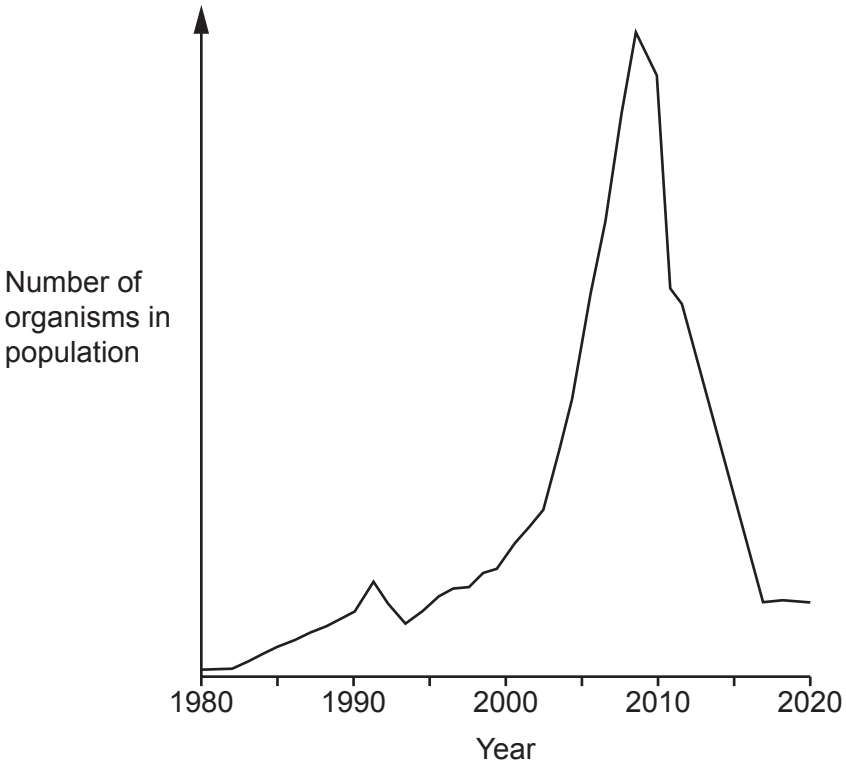
B It involves the use of DNA sequencing.

C It relies on the use of phylogenetics.

D It uses the fossil record to link common ancestors.

Your answer ☐ **[1]**

2 The graph shows the changing population of one species in a habitat.



Predict the years when this species had the **highest** availability of their food source.

A Between 1980 and 1990

B Between 1990 and 2000

C Between 2000 and 2010

D Between 2010 and 2020

Your answer ☐ **[1]**

3 Which process in the water cycle returns water to the land from the atmosphere?

A Condensation

B Evaporation

C Precipitation

D Transpiration

Your answer ☐ **[1]**

4 Which would help to maintain biodiversity in the rainforest?

A Building large hotels for ecotourism in the rainforest

B International agreements to reduce climate change

C Making it legal to remove large areas of forest for wood

D Using large areas of forest to grow crops

Your answer ☐ **[1]**

5 Which sub-cellular structure from a prokaryotic cell is used in genetic engineering?

A Mitochondrion

B Nucleus

C Plasmid

D Ribosome

Your answer ☐ **[1]**

6 Which row correctly describes human stem cells?

	They are only found in human embryos	One risk of their use as a treatment is rejection	They can divide by mitosis	They differentiate to form cancer cells
A	✓		✓	
B		✓		✓
C	✓			✓
D		✓	✓	

Your answer ☐ **[1]**

7 Lions hunt and eat antelopes.

Which row correctly describes lions in this relationship?

	Type of factor	Type of relationship
A	abiotic	predator
B	abiotic	prey
C	biotic	predator
D	biotic	prey

Your answer ☐ **[1]**

8 There are practical and ethical issues when using gene therapy to treat people.

Which statement is **only** a practical consideration with **no** ethical issues?

A Choosing which person should benefit from the treatment.

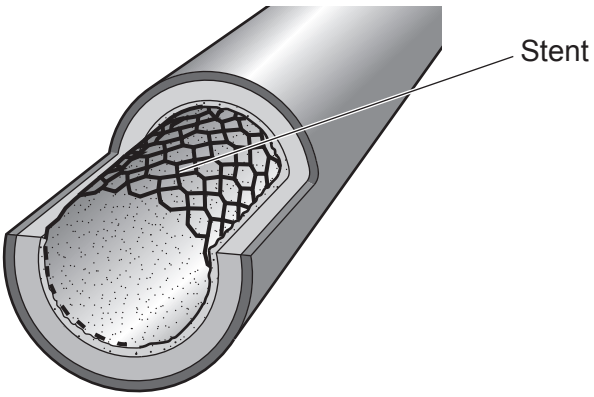
B How to insert the modified allele into a target cell.

C Religious beliefs of the patient.

D Who should pay for the treatment.

Your answer ☐ **[1]**

9 A stent is a small wire structure. It is placed inside the artery that supplies the heart muscle with oxygen.



Why would someone need a stent fitting?

A A high-fat diet has resulted in fatty deposits inside their arteries.

B Drinking too much alcohol has caused cirrhosis.

C Lack of exercise has reduced the strength of their heart muscles.

D Smoking has damaged the blood vessels in their lungs.

Your answer ☐ **[1]**

10 What is the function of restriction enzymes in genetic engineering?

A To act as a vector and carry the DNA into the host.

B To cut the required gene from the DNA.

C To identify which cells have taken up the gene.

D To stick the gene into the DNA of the host.

Your answer ☐ **[1]**

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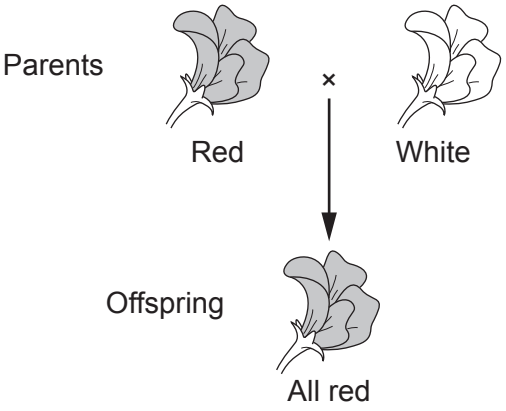
Section B

11 A gardener grows a species of plant that has either red or white flowers. The colour of the flowers is controlled by a single pair of alleles, R and r.

The gardener crosses a plant that is homozygous for red flowers with a plant that is homozygous for white flowers.
The diagram shows the results.



(a) (i) Explain why the offspring in the diagram are **all** red.

.....

.....

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

(ii) The offspring are all heterozygous for flower colour.

What is meant by the term **heterozygous**?

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

(b) The gardener crosses one of these offspring plants with a plant that is homozygous for white flowers.

Predict the probability that the next generation of plants will have white flowers.

Complete the genetic diagram to explain your answer.

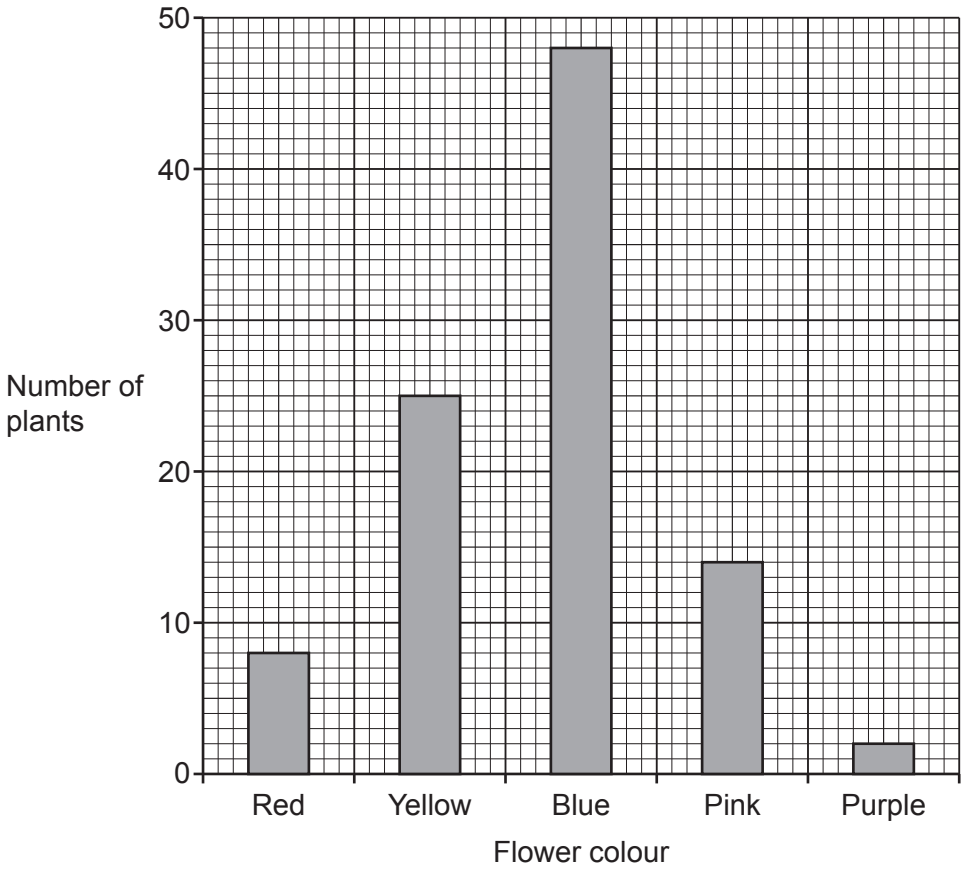
		Homozygous white flower	
Heterozygous red flower			

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

(c) The gardener grows another species of plant that can produce flowers of five different colours.

The gardener counts the number of plants for each flower colour.

The graph shows their results.



(i) The gardener counted 97 plants.

Calculate the percentage of these plants that have blue flowers.

Give your answer to the nearest whole number.

Percentage of plants with blue flowers = ... % **[3]**

(ii) What evidence is there in the graph that flower colour is an example of discontinuous variation in this species?

.....

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

(d) The male gametes of a plant are called pollen.

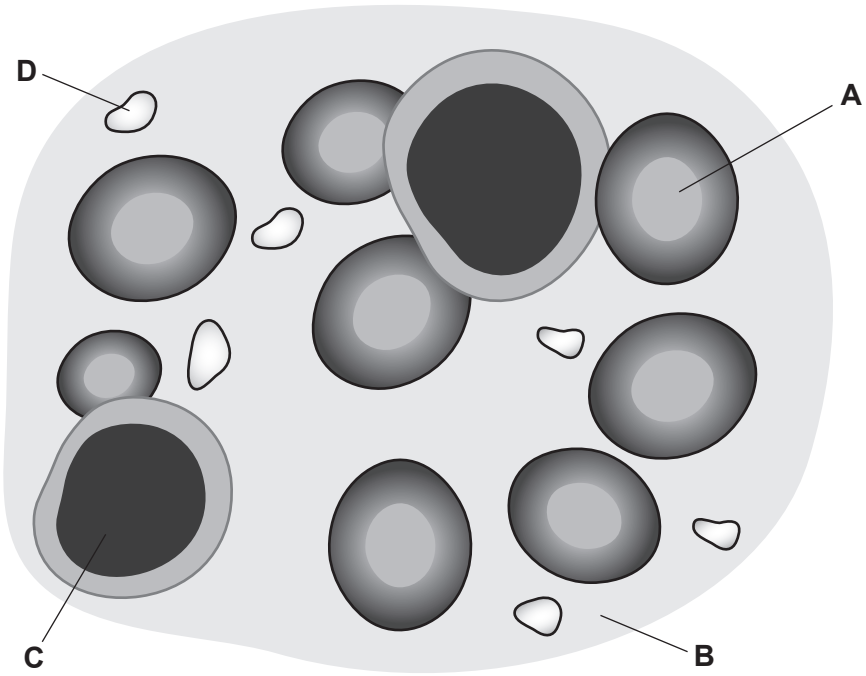
The sentences in the text box are about pollen.
There are two words in the sentences that are **not** correct.

Put (rings) around the **two** words that are **not** correct.

Pollen cells are haploid. This means that the pollen cells of a plant have twice the number of chromosomes as the leaf cells of the plant. Pollen cells are formed by a type of cell division called mitosis.

[2]

12 **(a)** The diagram shows the four main components of the blood.



Draw lines to connect each **letter** to the **component** that they are labelling.
Then draw lines from each **component** to their correct **function**.

Two lines have been drawn for you.

Letter	Component	Function
A	plasma	clump together during blood clotting
B	platelet	defence against pathogens
C	red blood cell	transport dissolved nutrients
D	white blood cell	transport oxygen

[3]

(b) White blood cells are adapted to their function.

Explain **two** adaptations of white blood cells.

1 .....

.....

2 .....

.....

[2]

(c) Read the information in the text box.

Prevent the spread of HIV
• Use protection during sexual intercourse
• Don't share needles to inject drugs
• Avoid contact with blood from an infected person
• Get tested

Use your knowledge of HIV as a communicable disease to answer these questions.

(i) Why can HIV be spread by sharing needles?

.....

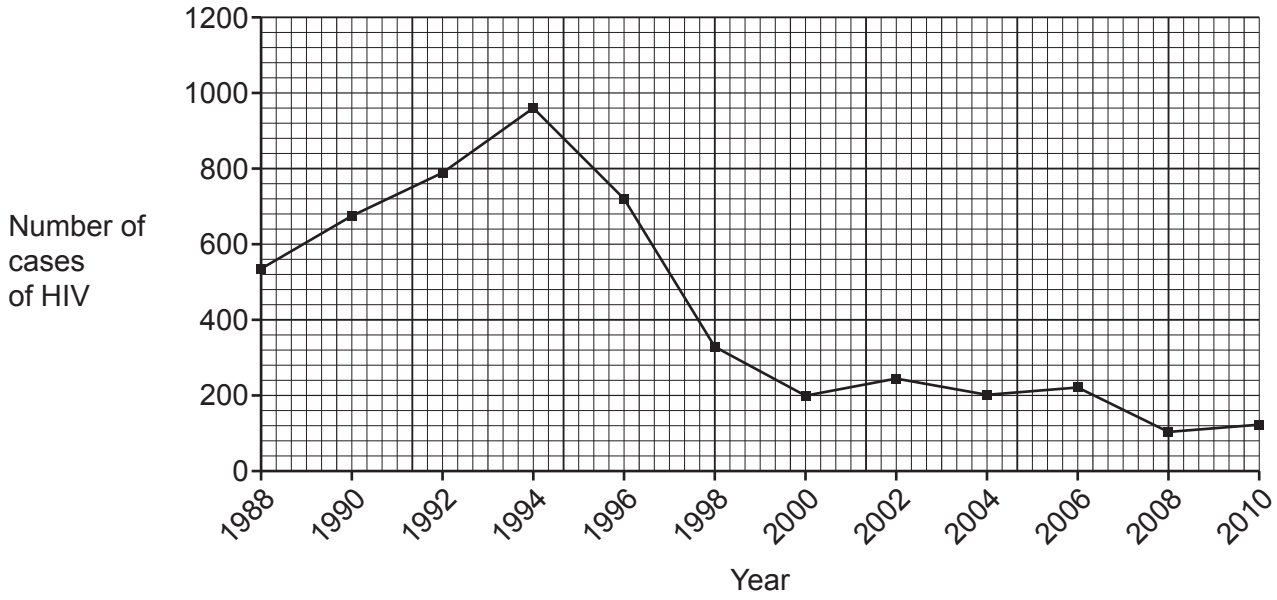
..... **[1]**

(ii) Suggest how testing will help prevent the spread of HIV.

.....

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

(d) The graph shows the number of HIV cases for one country between 1988 and 2010.



Calculate the percentage decrease in cases of HIV between **1995** and **2000**.

Give your answer to **2** significant figures.

Percentage decrease = ... % **[3]**

13* The pH of a soil will affect the crops that grow in the soil.
When the soil pH is suitable, more crops will grow. This results in a higher yield (mass of crops).

The table shows data about the yield of four different crops, **A**, **B**, **C** and **D**, when grown in soils of different pH.

pH range of soil	Yield as a percentage of the highest yield obtained (%)			
	crop A	crop B	crop C	crop D
4 – 4.9	25	3	14	65
5 – 5.9	74	8	34	75
6 – 6.9	100	98	100	100

A farmer measures the pH of the soil in their field. The soil is pH 4.5.

Which crop should the farmer grow in the field?

Explain your choice **and** give reasons why pH 4.5 prevents growth in some crops.
Include ideas about enzymes and their function in plants.

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

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14 A student investigates the population of snails in a habitat.

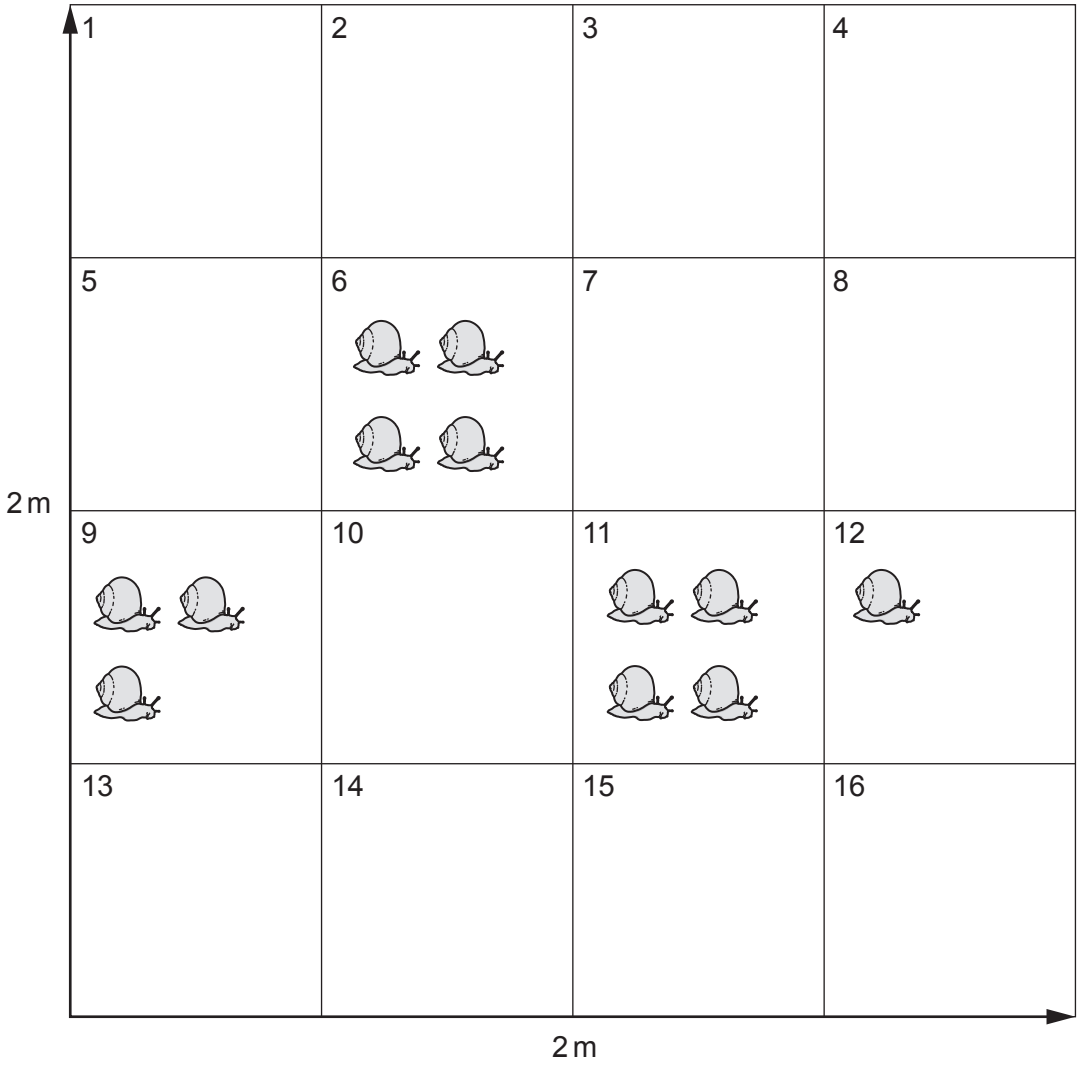
This is the method they follow:

- Mark out a grid 2 m × 2 m: each square of the grid is 0.25 m^2.
- Write numbers 1 to 16 on pieces of paper and put them in a bag.
- Take one piece of paper out of the bag to select the square number.
- Record the number of snails in that square.
- Choose three more squares in the same way.

(a) Why does the student use the pieces of paper to choose the squares in the grid?

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

(b) The diagram shows the grid they use and the number of snails in the **four** squares they count.



(i) Each square has an area of 0.25 m^2. The total area of the habitat is 900 m^2.

Estimate the population of snails in the habitat.

Estimated population = ... snails **[2]**

(ii) The student thinks the estimate is much larger than they would expect.

Suggest **two** ways the student could improve their investigation to get a more accurate estimate.

1 .....

.....

2 .....

.....

[2]

(c) The student uses a transect to investigate the plants in the habitat.

Explain how to use a transect to investigate the distribution of different plant species in a habitat.

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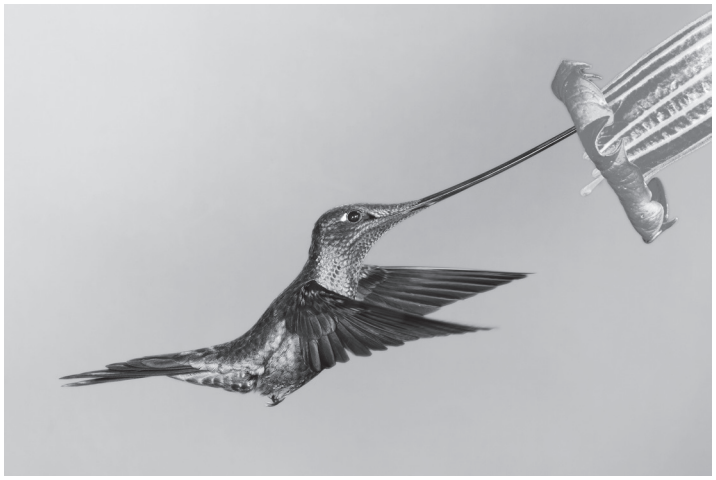
..... **[4]**

15 The picture is of a sword-billed hummingbird feeding on a flower.



- The hummingbird feeds on nectar from the flower.
- The flower benefits because the hummingbird transfers pollen from one flower to the next.
- This helps the flower to reproduce and develop seeds.

(a) What word describes the interdependence between the hummingbird and the flower?

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

(b) The long beak of the sword-billed hummingbird is an adaptation that helps the bird to feed. The bird's ancestors had shorter beaks.

Explain how the sword-billed hummingbird may have evolved to have a long beak. Include ideas about natural selection.

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

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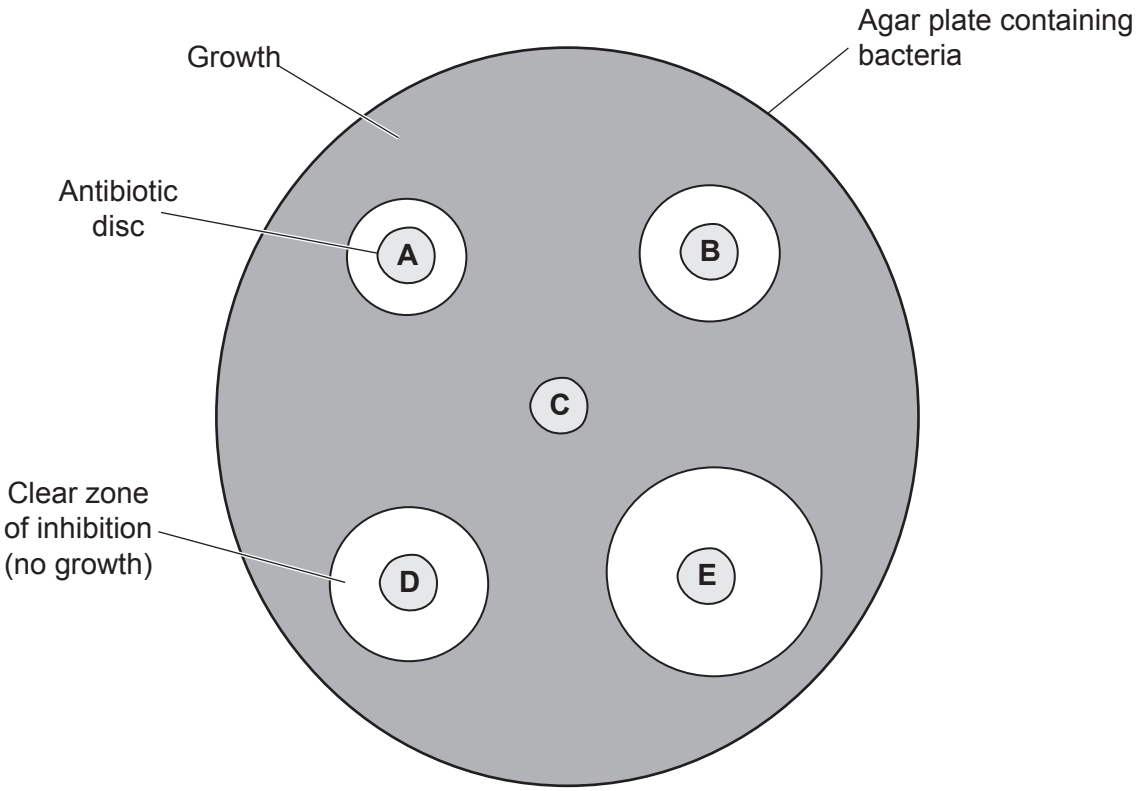
16 (a) A student investigates the effect of antibiotics on the growth of bacteria.

This is the method they follow:

- Place discs of paper containing different antibiotics on an agar plate containing bacteria.
- Leave the agar plate in a warm place.
- Observe the growth of the bacteria after three days.

The diagram shows their results. Clear zones around the antibiotic discs show where the bacteria growth is inhibited.



(i) What are the independent variable and the dependent variable for this investigation?

Independent variable .....

Dependent variable .....

[1]

(ii) The student used a disc of paper with **no** antibiotics.

Which disc had **no** antibiotics on it?

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐ **E** ☐ **[1]**

(iii) Explain why the student uses a disc with **no** antibiotics on it.

.....

.....

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

(iv) Which antibiotic, **A**–**E**, is the **most** effective?

Explain your answer.

Antibiotic .....

Reason .....

.....

[2]

(b) After the student has recorded their results the agar plates are destroyed.

Why should agar plates containing bacteria be destroyed?

.....

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

(c) Suggest how the student could develop their investigation to show the effect of antibiotic **A** on the growth of different bacteria.

.....

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

END OF QUESTION PAPER

ADDITIONAL ANSWER SPACE

If additional space is required, you should use the following lined page(s). The question number(s) must be clearly shown in the margin(s).