Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2025

Double Award Science
Biology

Unit B2

Higher Tier

[GDW42]

GDW42

MONDAY 9 JUNE, MORNING

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page or on blank pages.
Complete questions in black ink and use a dark HB pencil for drawings and graphs.
Do not write with a gel pen.
Answer **all ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 80.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You may use a scientific calculator.
Quality of written communication will be assessed in Question **4**.

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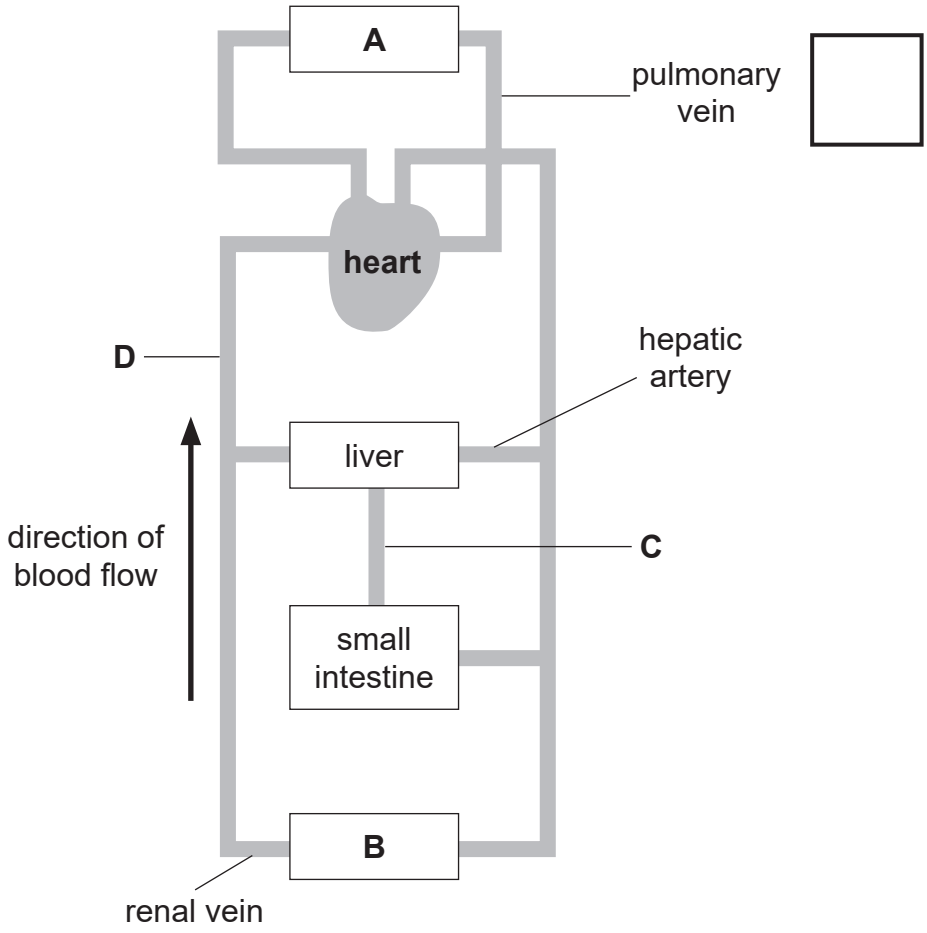
32GDW4201

1 The diagram shows part of the circulatory system in the body.



(a) **(i)** Name organs **A** and **B**.

A _____

B _____ [2]

(ii) Draw an arrow in the empty box on the diagram to show the direction of blood flow in the **pulmonary vein**. [1]

(iii) Name blood vessels **C** and **D**.

C _____

D _____ [2]

(b) Which **type** of blood vessel:

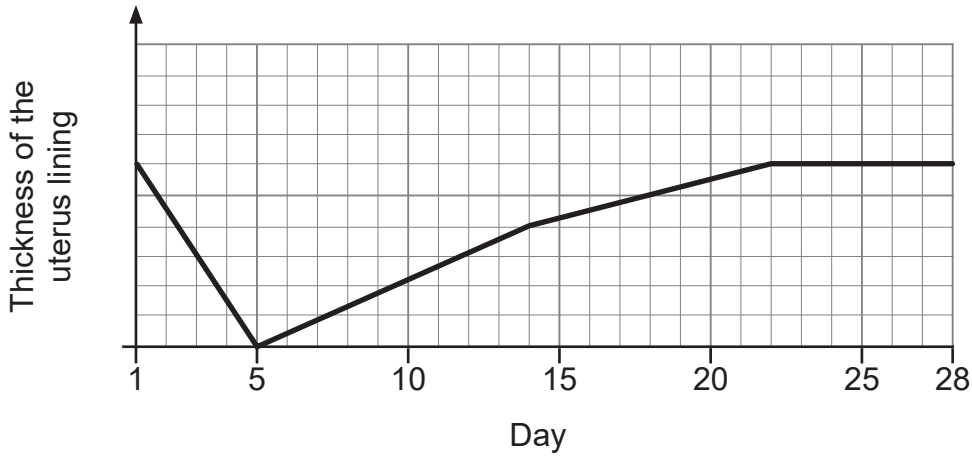
- has thin walls that are one cell thick?

  _____

- has valves?

  _____ [2]

2 The graph shows changes in the thickness of the uterus lining during a 28-day menstrual cycle.



(a) **(i)** Between which days in the menstrual cycle, shown above, does menstruation occur?

Between days _____ and _____ [1]

(ii) Give the day when ovulation usually occurs in a 28-day menstrual cycle.

Day _____ [1]

(iii) Describe what happens to the uterus lining after day 28 if **fertilisation does not occur**.

_____

_____ [1]

(b) Contraception can be used to prevent pregnancy.

(i) Suggest **one** ethical reason why people may choose **not** to use contraception.

_____

_____ [1]

One method of contraception is the contraceptive pill.

The contraceptive pill does not prevent the spread of sexually transmitted infections (STIs).

(ii) Name **one** STI caused by bacteria.

_____ [1]

(iii) Name **one** STI caused by viruses.

_____ [1]

3 The body defends itself against disease-causing microorganisms, including bacteria, in several ways.

(a) Complete the sentences about some of the ways the body defends itself against bacteria.

The skin provides a _____ against bacteria.

Mucous membranes in the nose and throat _____

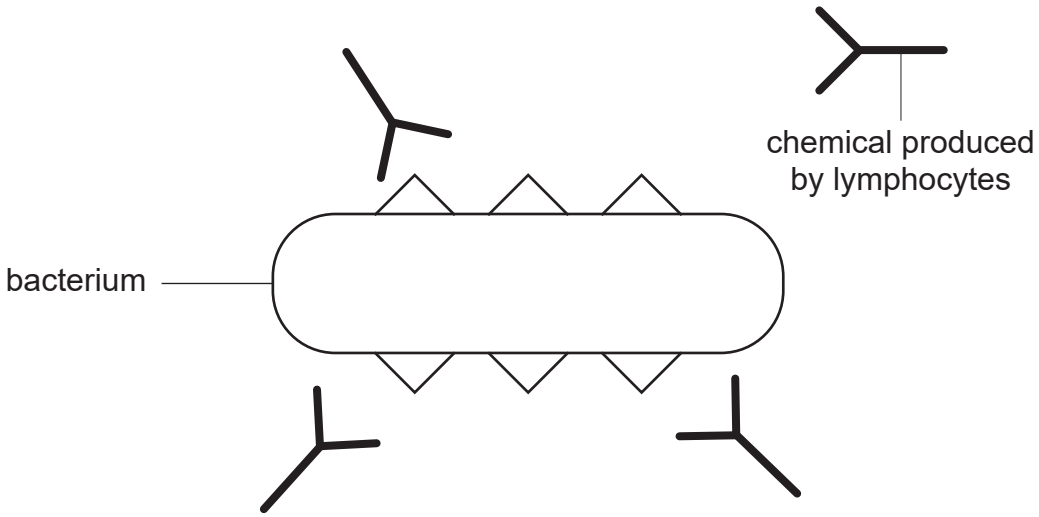
bacteria.

Blood _____ stops the loss of blood and prevents

the entry of bacteria. [3]

(b) Another type of defence against bacteria involves lymphocytes.

The diagram shows a bacterium and the chemicals produced by lymphocytes after infection by this bacterium.



(i) Name the chemicals produced by lymphocytes.

_____ [1]

If a person is infected again with the **same** type of bacteria, a secondary response is produced.

Therefore, this person does not develop any symptoms.

(ii) Explain why.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____ [3]

4 Chemicals, such as carbon monoxide, in tobacco smoke have harmful effects on the body.

Name the other **two** main chemicals in tobacco smoke and describe the harmful effects of each on the body.

In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

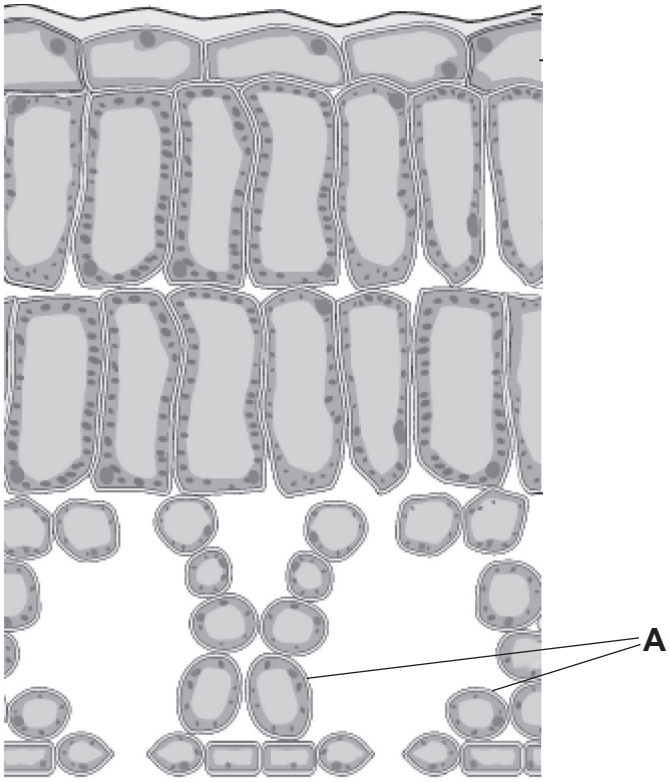
Name and harmful effects of chemical 1

Name and harmful effects of chemical 2

[6]

5 **(a)** Transpiration is the evaporation of water from cells in a leaf followed by diffusion into the atmosphere.

The diagram shows part of a leaf.



Use the diagram to answer the following questions.

Water evaporates from the cells, labelled **A**, in a leaf.

(i) Name the cells labelled **A**.

_____ [1]

(ii) Name the **two** parts of the leaf that water diffuses through after it evaporates from the cells labelled **A**.

1. _____

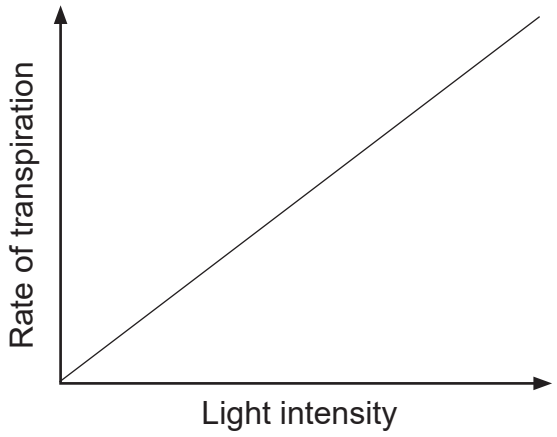
2. _____ [2]

[Turn over

(b) Several environmental factors affect the rate of transpiration.

One of these factors is light intensity.

The graph below shows how light intensity affects the rate of transpiration.



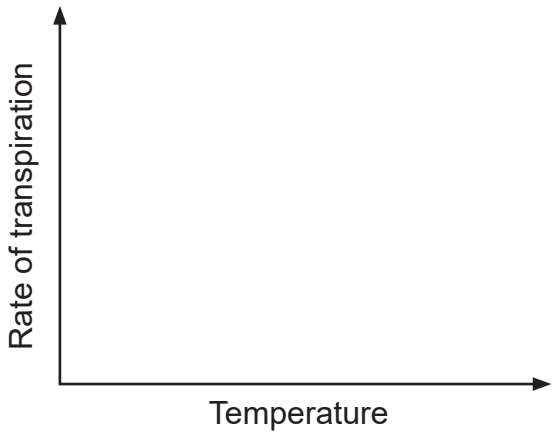
(i) Describe the trend shown by the graph.

_____

_____ [1]

Another environmental factor that affects the rate of transpiration is temperature.

(ii) On the axes below, **draw a line** to show how increasing temperature affects the rate of transpiration.

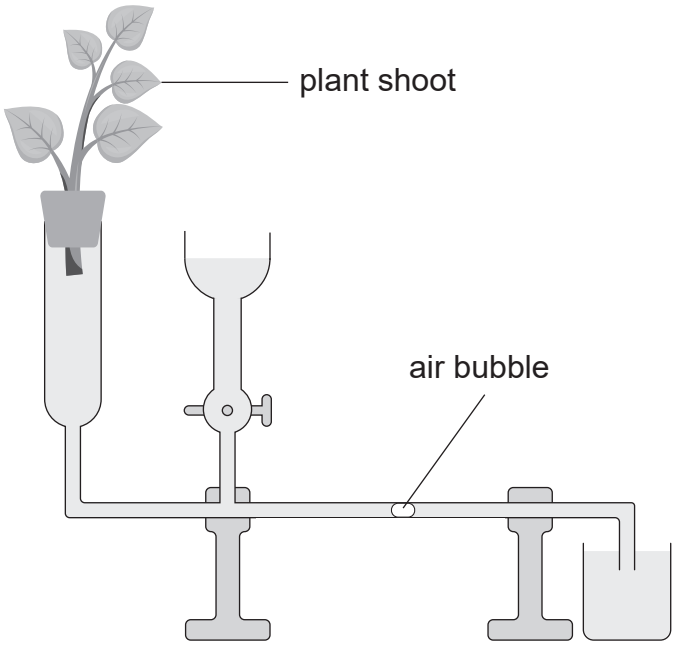


[1]

(iii) Name one **other** environmental factor that affects the rate of transpiration.

_____ [1]

The diagram shows a potometer which can be used to investigate water uptake by a plant shoot.



(c) Describe and explain what will happen to the air bubble as transpiration occurs.

Description _____

_____

Explanation _____

_____

_____

_____

_____

_____ [3]

6 **(a)** Some couples may use in vitro fertilisation (IVF) treatment to help the woman become pregnant.

(i) Suggest why a woman with blocked oviducts may use IVF to help her become pregnant.

_____

_____ [1]

(ii) Suggest **one other** reason why a woman may use IVF to help her become pregnant.

_____

_____ [1]

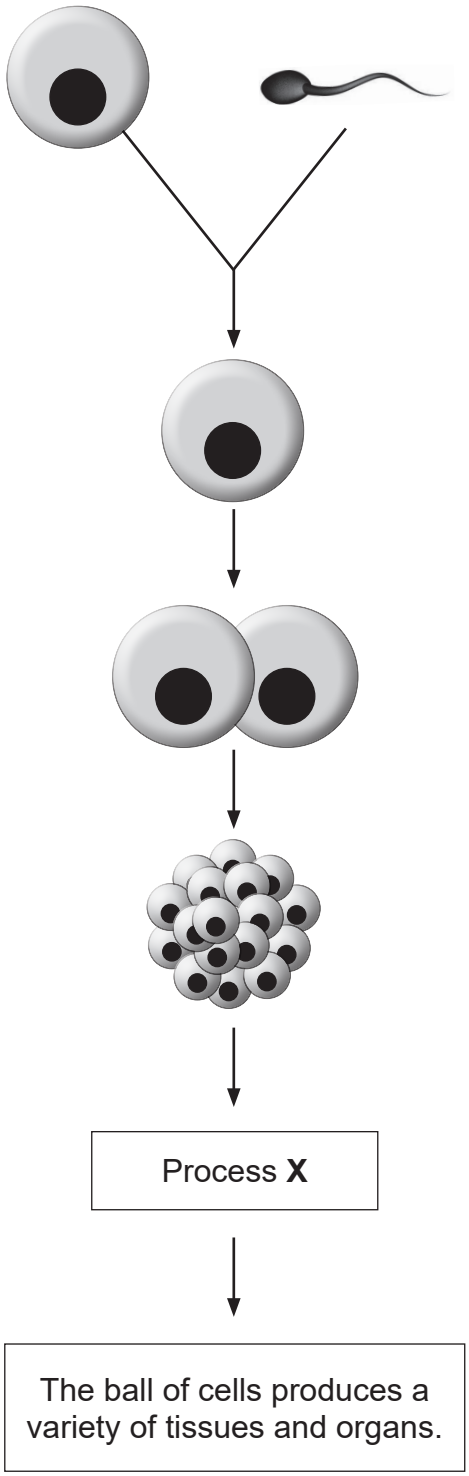
(b) Hormones are given to a woman at the start of the IVF process.

Explain why.

_____

_____ [1]

(c) The diagram shows some of the stages of IVF.



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(i) Name the **organs** that produce male and female gametes.

Male gametes _____

Female gametes _____ [2]

(ii) Name the cell produced by fertilisation at stage **1**.

_____ [1]

The cell produced by fertilisation divides into a ball of identical cells.

(iii) Name the ball of identical cells produced at stage **3**.

_____ [1]

Stage **4** occurs in the uterus lining.

(iv) Name the process **X** that occurs at stage **4**.

_____ [1]

(v) Name the process that occurs at stage **5**.

_____ [1]

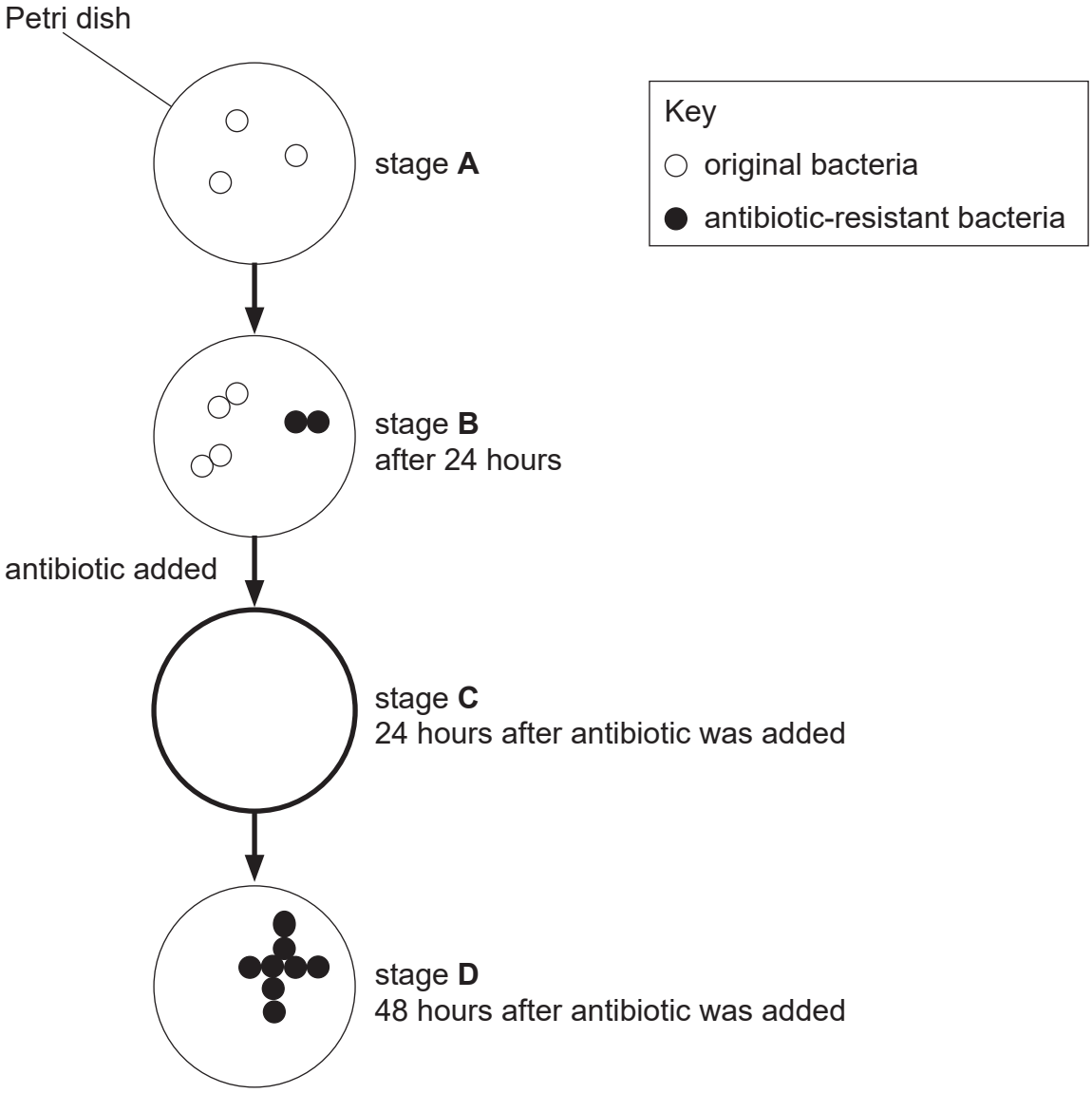
7 **(a)** An investigation was carried out into antibiotic resistance in **one** type of bacteria.

Scientists grew bacteria on agar in a Petri dish.

The diagram shows the stages and some of the results of the investigation.

An antibiotic was added after stage **B**.

Stage **C** has **not** been completed on the diagram.



(i) Use the diagram to describe **two** changes between stages **A** and **B**.

1. _____

_____

2. _____

_____ [2]

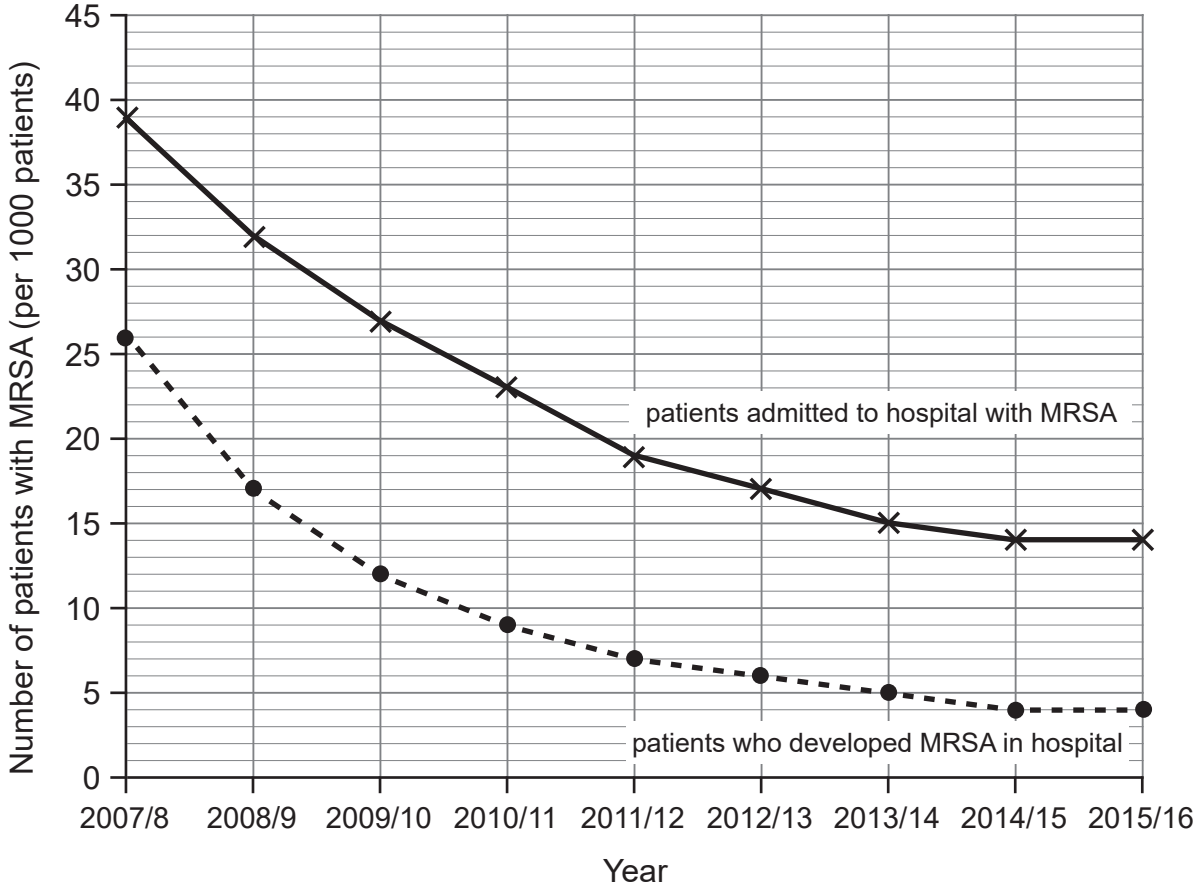
(ii) Complete stage **C on the diagram opposite** by drawing what you would expect to see 24 hours after the antibiotic was added. [3]

In an investigation, patients in hospitals in the United Kingdom (UK) between 2007 and 2016 had blood samples taken to check for the presence of MRSA bacteria.

The graph shows the number of patients with MRSA when they were **admitted** to hospital from the years 2007/8 to 2015/16.

It also shows the number of patients who did not have MRSA when they were admitted to hospital, but **developed** MRSA in hospital.

The figures given are per 1000 patients.



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(b) Complete the table using **only** the information in the graph.

Place a tick (✓) in one empty box for each statement.

Statement	True	False	Cannot tell
The trends for both groups of patients were the **same**.			
45 patients (per 1000 patients) were admitted to hospital with MRSA in 2007/8.			
More patients were admitted to hospital with MRSA in 2003/4 than in 2007/8.			
Each year, **more** patients **developed** MRSA in hospital than were admitted to hospital with MRSA.			

[4]

(c) **(i)** Suggest **two** measures that staff in hospitals could have used to reduce the **spread** of MRSA bacteria.

1. _____

_____

2. _____

_____ [2]

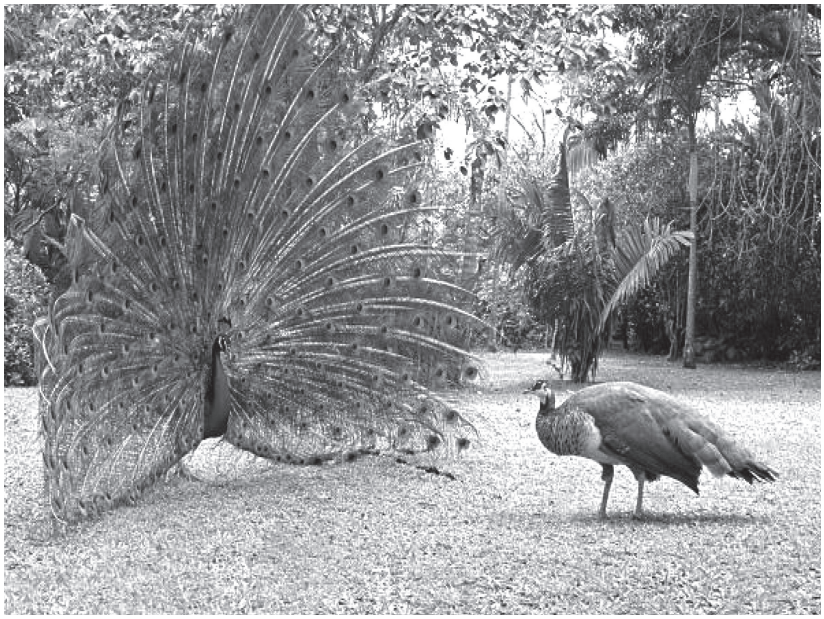
(ii) Suggest **one** measure that staff in hospitals could have used to **kill** MRSA bacteria.

_____

_____ [1]

[Turn over

8 The photograph shows a peacock (male) and a peahen (female).



Peacocks have brightly coloured fronts and tail feathers.

In some peacocks and peahens, the main body colour is brown.

In other peacocks and peahens, the main body colour is white.

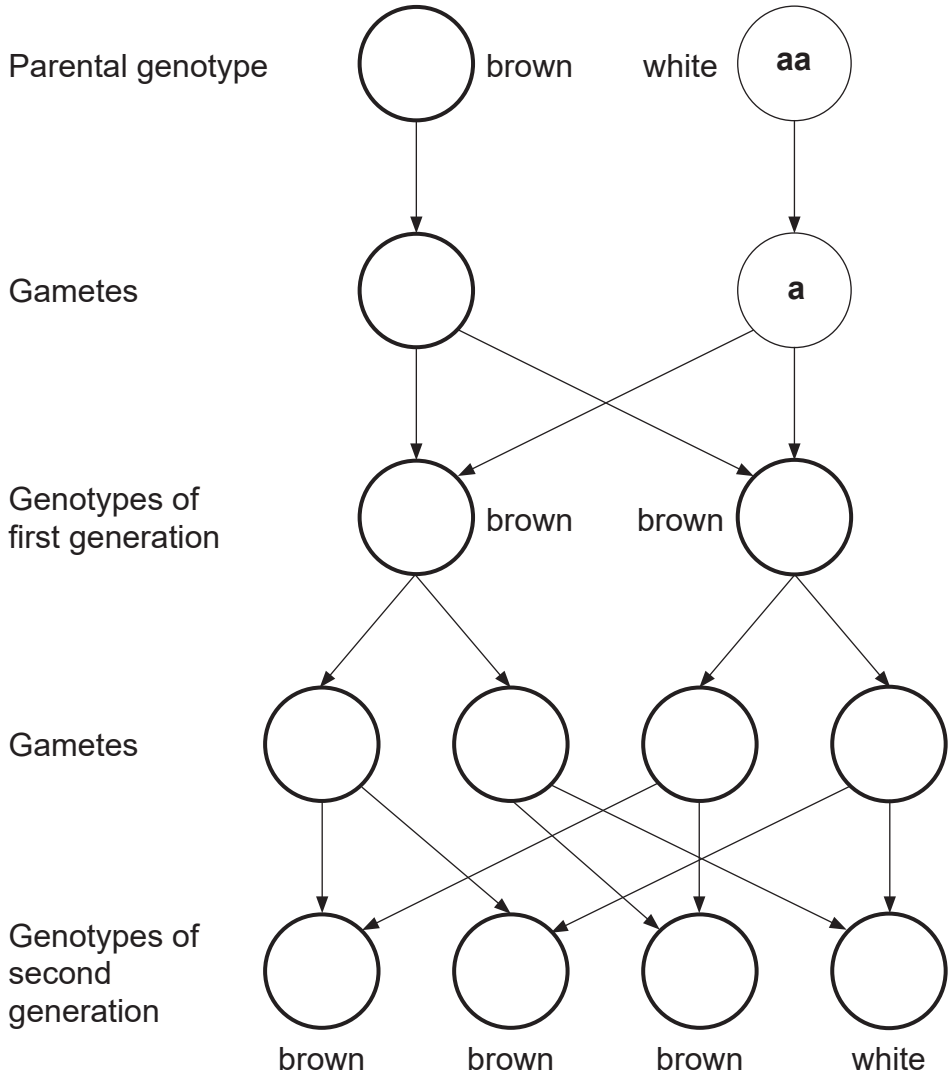
The allele for brown body colour (**A**) is dominant to the allele for white body colour (**a**).

Main body colour in peacocks and peahens is **not** sex-linked.

(a) Use the letters **A** and **a** to complete the diagram for the inheritance of the main body colour in peacocks and peahens over two generations.

Write the correct letter or letters in the empty circles.

Two circles have been completed for you.



[4]

A breeder had a peacock with a brown main body colour.

(b) Describe how he could carry out a test (back) cross to determine the genotype of this peacock.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

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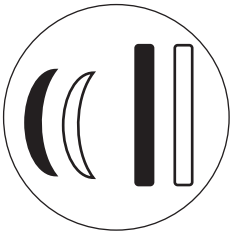
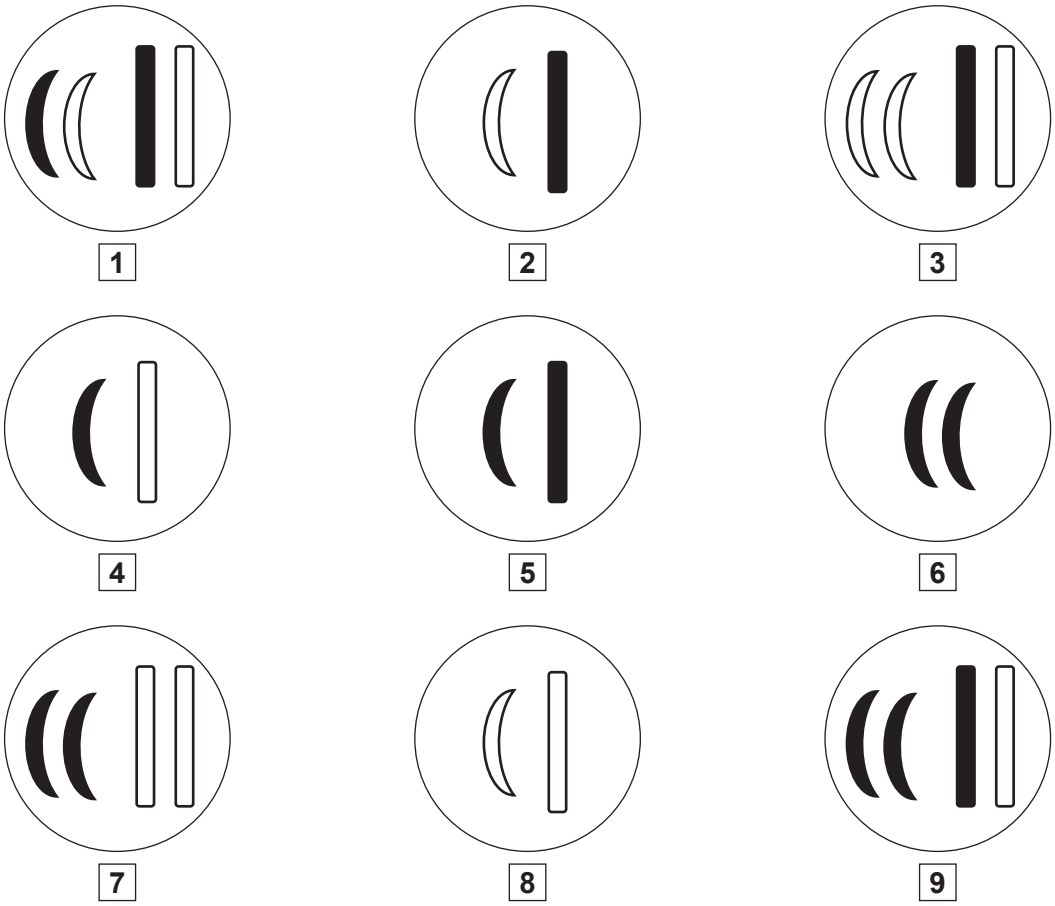
(Questions continue overleaf)

9 **(a)** The diagram shows the chromosomes in the nucleus of a cell **before** cell division.



The diagrams below show different chromosome combinations.



(i) Choose the numbers of **all** the diagrams that show the nuclei that could be produced if this cell divided by **meiosis**.

Write the correct numbers on the line below.

_____ [3]

(ii) Name the process in meiosis that results in variation.

_____ [1]

The other type of cell division is mitosis.

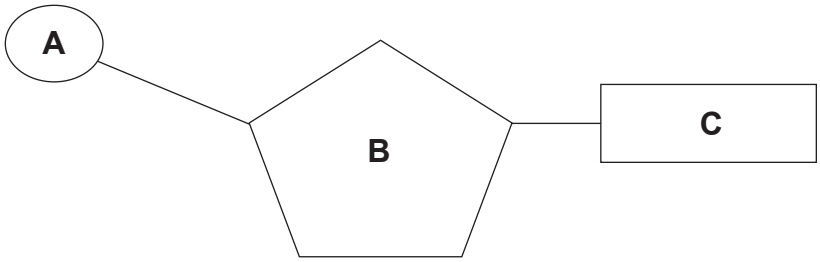
(b) Give **two** functions of **mitosis** in the body.

1. _____

2. _____ [2]

10 **(a)** DNA is made up of a backbone with interlinking bases to form a double helix.

The diagram shows part of a DNA molecule.



(i) Which part of the diagram, **A**, **B** or **C**, represents the base?

_____ [1]

(ii) Name the **two** substances that make up the backbone of a DNA molecule.

_____ and _____ [2]

(b) (i) In a length of DNA, the percentage (%) of the base **T** is 35%.

Calculate the percentage (%) of the base **C** in this length of DNA.

Show your working out.

_____ % [3]

The diagram shows the base pairs in a length of DNA.

C	T	G	C	A	G	C	T	G	C	A	A	C	T	G	A	C	T
G	A	C	G	T	C	G	A	C	G	T	T	G	A	C	T	G	A

(ii) How many amino acids are coded for by this length of DNA?

_____ [1]

(c) In genetic engineering, a gene is cut from human DNA using a restriction enzyme.

One of these restriction enzymes cuts DNA between the bases **T** and **G** when they are found in the sequence **TGCA**. This produces sticky ends.

The diagram shows where this restriction enzyme would cut a length of DNA.

The base sequence **TGCA** can be read from left to right or from right to left.

C	C	C	A	A	**T**	**G**	**C**	**A**	sequence is read left to right →
G	G	G	T	T	**A**	**C**	**G**	**T**	sequence is read right to left ←

A different length of DNA is shown below.

(i) Use a thick black line to show each cut produced by the **same** restriction enzyme on this length of DNA.

Use the diagram above to help you.

G	C	T	G	C	A	A	C	T	G	C	A	G	G	T	A	C	T	G	C	A
C	G	A	C	G	T	T	G	A	C	G	T	C	C	A	T	G	A	C	G	T

[3]

(ii) Into how many sections will this length of DNA be cut, by this restriction enzyme?

_____ [1]

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SOURCES

Question 1: Chief Examiner
Question 2: Chief Examiner
Question 3(b): Principal Examiner
Question 5(a): Chief Examiner
Question 5(b)–(c): Principal Examiner
Question 6(c): Principal Examiner
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