Rewarding Learning

Centre Number

71

Candidate Number

General Certificate of Secondary Education
2014

GCSE Biology

Unit 2

Higher Tier

[GBY22]

MV18

MONDAY 16 JUNE, MORNING

TIME

1 hour 45 minutes, plus your additional time allowance.

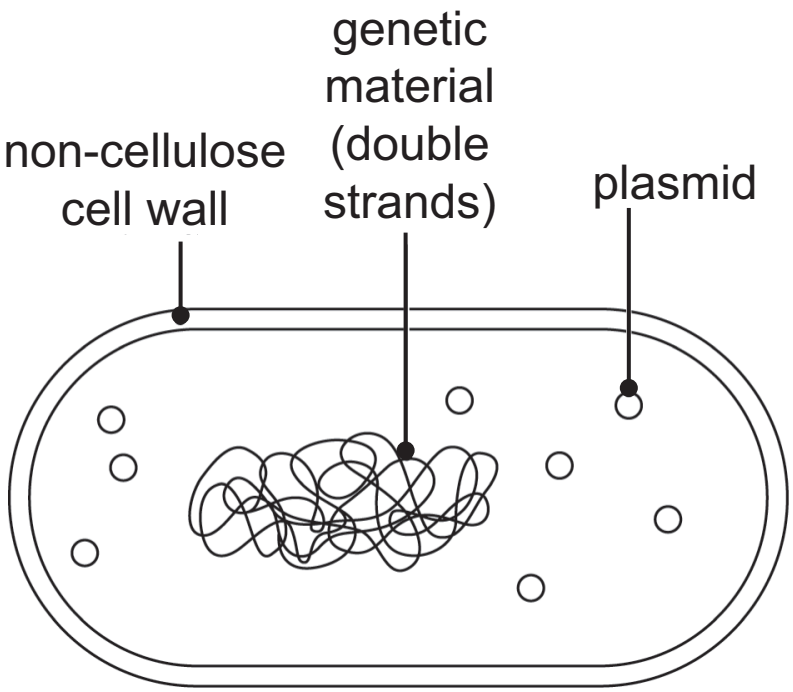
INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of the page.
You must answer the questions in the spaces provided.
Complete in blue or black ink only.
Answer **all thirteen** questions.

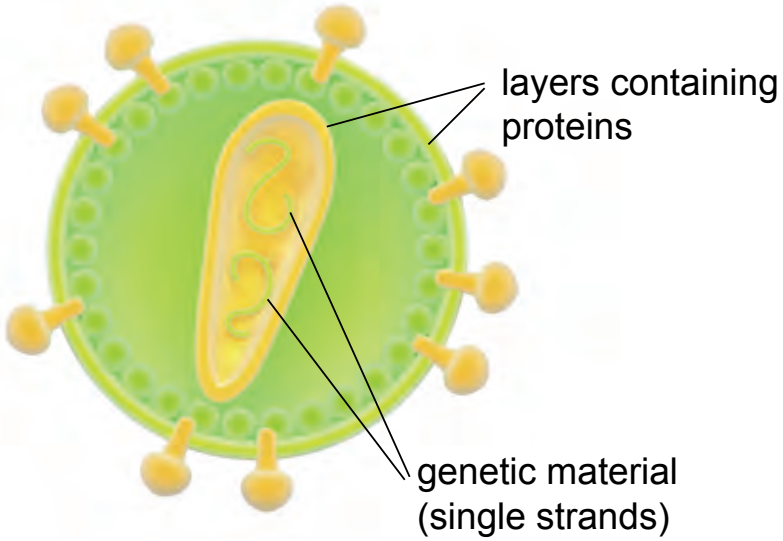
INFORMATION FOR CANDIDATES

The total mark for this paper is 115.
Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.
Quality of written communication will be assessed in questions **5** and **13(b)**.

1 The diagrams show a tuberculosis bacterium and a Human Immunodeficiency Virus (HIV).



Tuberculosis bacterium



Human Immunodeficiency Virus

Look at the diagrams.

(a) Give one similarity and one difference between the bacterium and the virus. [1 mark for each]

Similarity _____

_____

_____

Difference _____

_____

_____

(b) Tuberculosis is spread by droplet infection.

Explain what is meant by droplet infection. [1 mark]

_____

_____

(c) Give one way HIV can be spread and prevented. [1 mark for each]

Spread _____

_____

Prevented _____

_____

2 **(a)** The table shows the number of deaths from coronary heart disease in men and women in the UK during 2008.

Age/years	Deaths from coronary heart disease per 100 000 of population	
	Men	Women
35–44	17	4
45–54	67	14
55–64	175	47
65–74	443	179

Look at the table.

(i) Describe one similarity and one difference between the number of deaths from coronary heart disease in men and women. [1 mark for each]

Similarity _____

_____

Difference _____

_____

(ii) The number of deaths from coronary heart disease will affect the number of men and women surviving in the population.

Suggest how the number of 65–74 year old men and women surviving in the population will differ. [1 mark]

_____

_____

(b) Describe **two** ways to reduce the risk of coronary heart disease. [2 marks]

3 A market gardener investigated the variation in the mass of strawberries. The photograph shows how he sampled his crop.

The results are shown in the table.

Mass interval/g	Number of strawberries
6.0 to 7.9	29
8.0 to 9.9	68
10.0 to 11.9	211
12.0 to 13.9	45
14.0 to 15.9	35
16.0 to 17.9	0

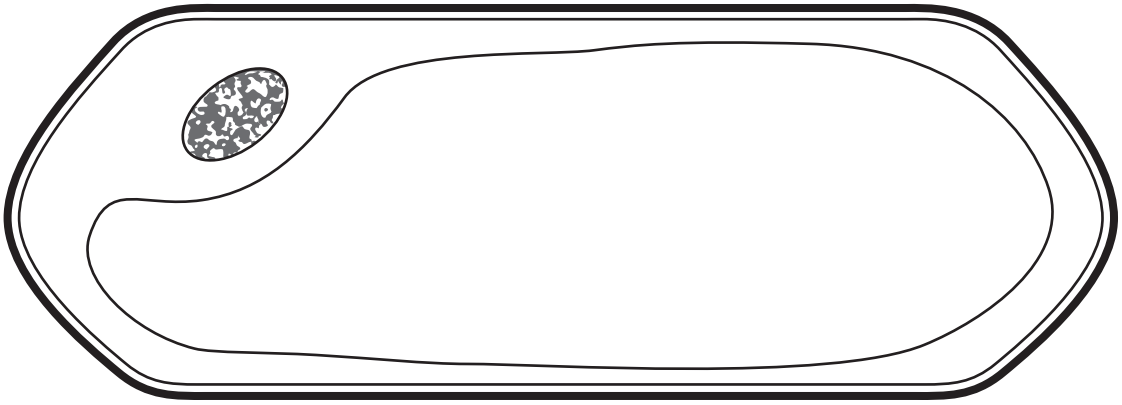
(a) Describe how he sampled, measured and recorded the results. [3 marks]

(b) (i) Name the variation shown by these results. [1 mark]

(ii) What type of graph should be used to present these results? [1 mark]

(c) Give **one** conclusion that can be made from these results. [1 mark]

4 **(a)** The diagram shows one cell from an onion epidermis.



Part of the cell is selectively permeable.

(i) Name this part. [1 mark]

_____

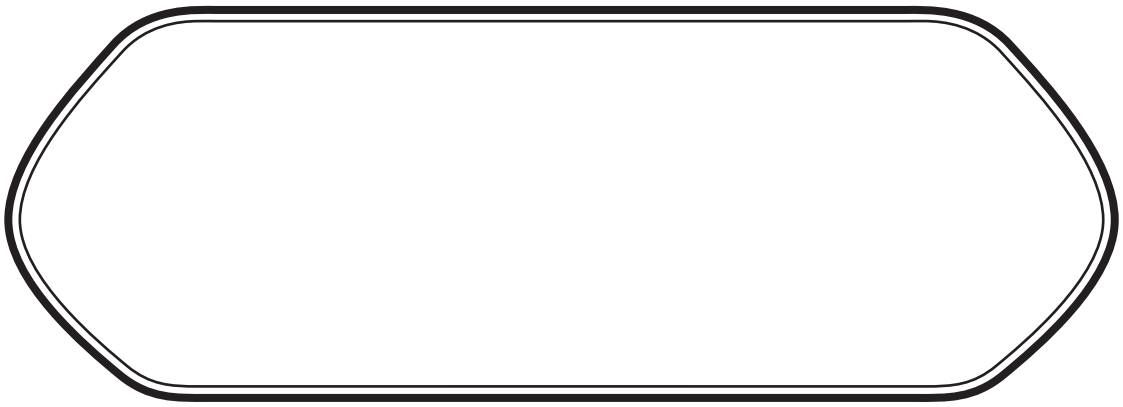
(ii) What does selectively permeable mean? [1 mark]

_____

_____

(b) The cell is placed in concentrated sugar solution for 30 minutes.

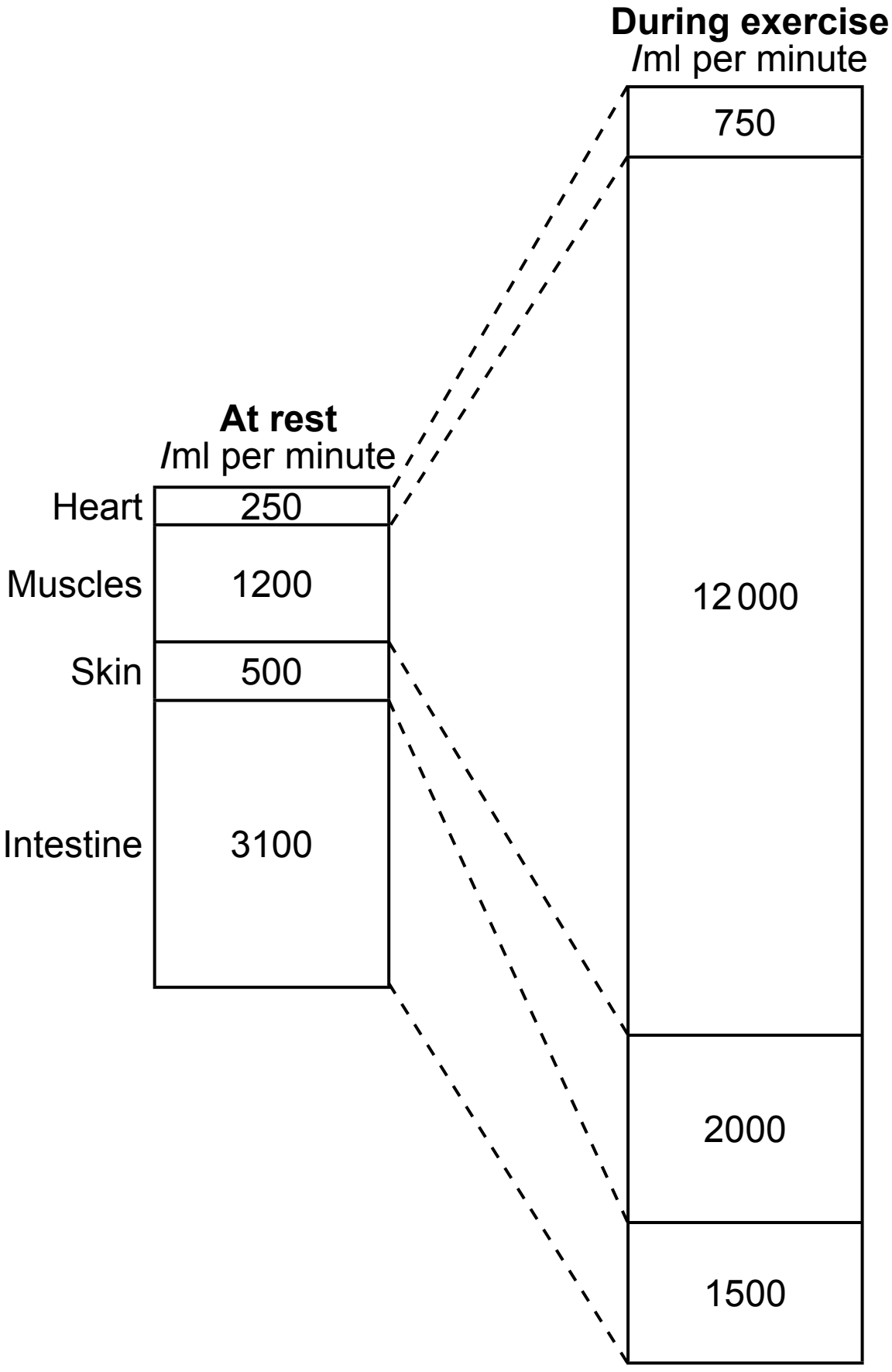
(i) Complete the diagram below to show the appearance of this cell **after** 30 minutes. [3 marks]



(ii) What word is used to describe the cell after 30 minutes? [1 mark]

_____

5 The diagram shows blood flow to some parts of the body while **at rest** and **during exercise**.



Describe and **explain** the effect of exercise on the blood flow to

- the heart.
- the muscles.
- **one** other part of the body.

Use evidence from the diagram in your answer. [6 marks]

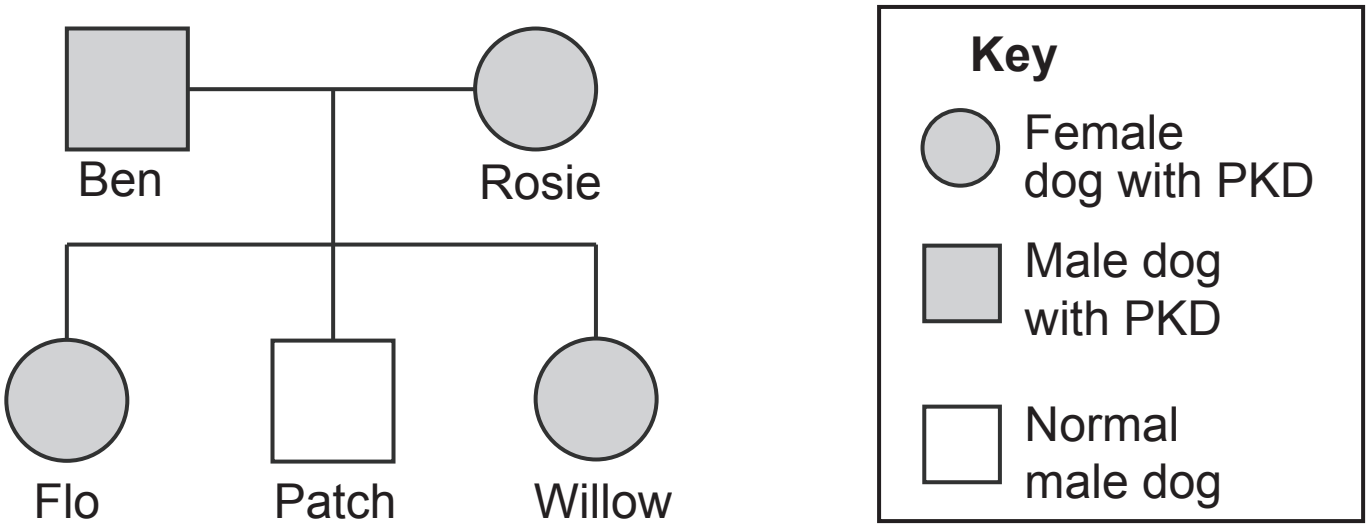
In this question, you will be assessed on your written communication skills, including the use of specialist scientific terms.

6 A dominant allele **(H)** causes polycystic kidney disease (PKD) in bull terrier dogs.

Dogs with this condition have cysts or swellings in their kidneys.

This causes the kidneys to enlarge and become painful.

The pedigree diagram shows the pups produced by two bull terriers, Ben and Rosie.



(a) Explain how the pups show that Ben and Rosie are both heterozygous for PKD.

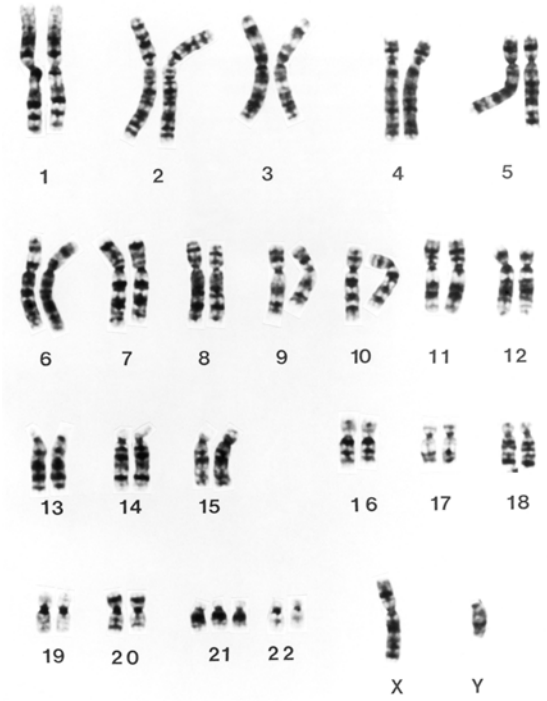
Use **H** for the PKD allele and **h** for the normal allele.
[3 marks]

(b) A dog breeder wants to find out the genotype of Willow.

Name and describe the cross she would use to do this. [5 marks]

7 **(a)** Mutations can cause inherited conditions.

The diagram shows a set of chromosomes with a mutation.



(i) Name the condition this mutation causes. [1 mark]

_____

(ii) Use evidence from the diagram to explain how you identified this condition. [2 marks]

_____

_____

_____

_____

(iii) What evidence in the diagram suggests these chromosomes belong to a human? [1 mark]

_____

_____

(iv) What evidence in the diagram suggests these chromosomes belong to a male? [1 mark]

_____

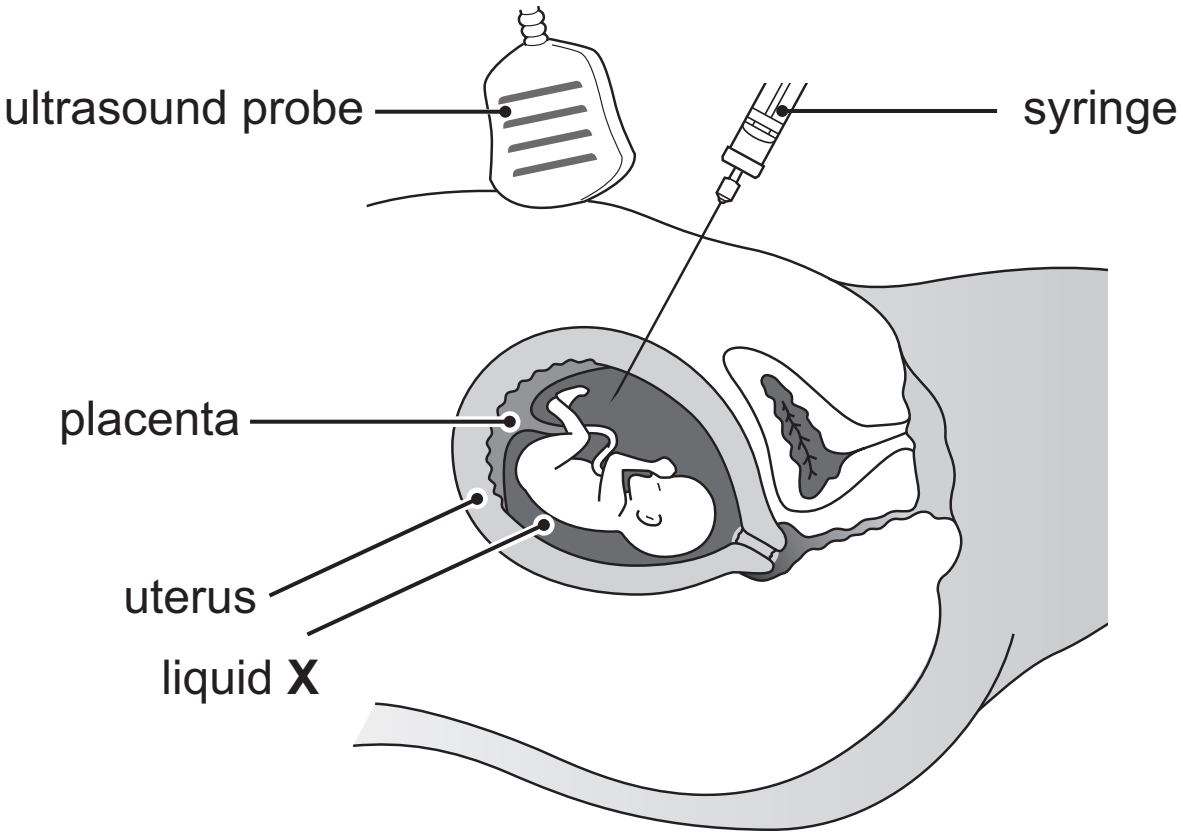
_____

(b) Genetic screening is used to find out if a developing foetus has a condition caused by a mutation.

Liquid containing foetal cells is removed using a syringe.

These cells are allowed to multiply in a Petri dish.

The chromosomes are examined to see if the foetus has the condition.



(i) Name liquid **X**. [1 mark]

_____

(ii) Name this test. [1 mark]

_____

(iii) During the test the doctor uses an ultrasound probe to find the position of the foetus.

Why is this necessary? [1 mark]

_____

_____

_____

(iv) Give **two ethical** objections to genetic screening. [2 marks]

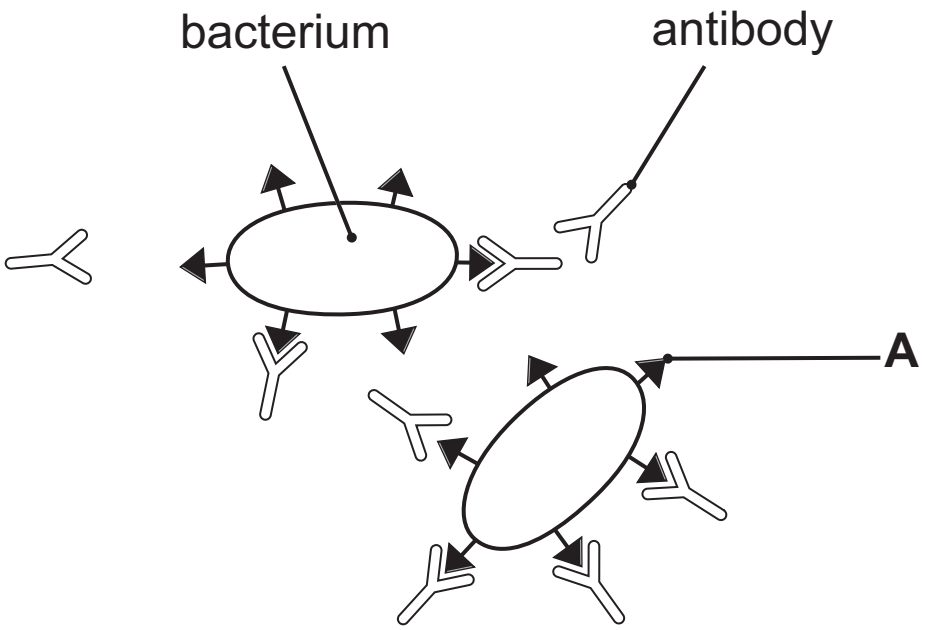
_____

_____

_____

_____

8 **(a)** The diagram shows antibodies attacking bacteria.



(i) Name structure **A** on the bacterium. [1 mark]

_____

(ii) Describe how antibodies prevent the spread of the bacteria within the body. [2 marks]

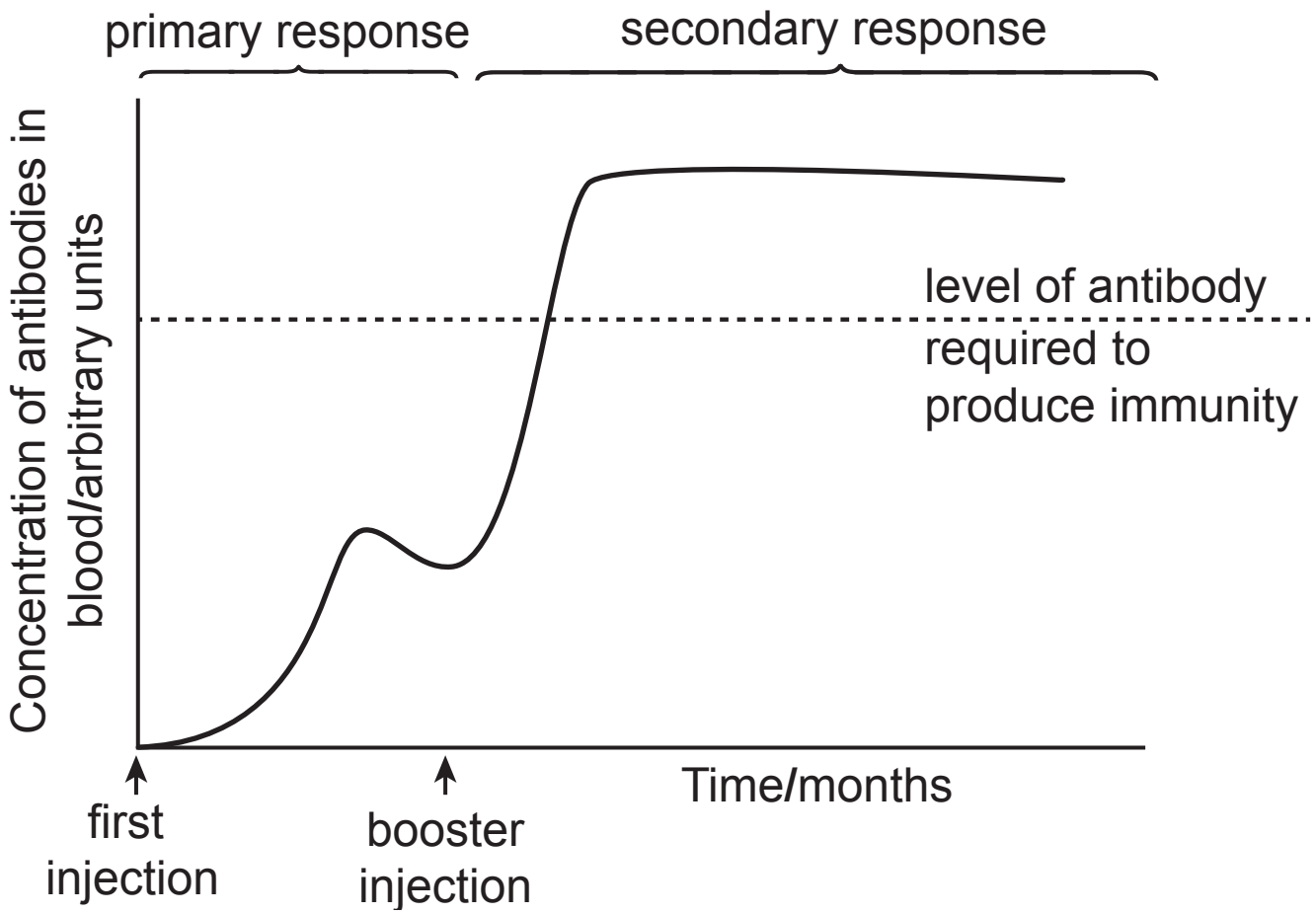
_____

_____

_____

_____

(b) The graph shows the concentration of antibodies in the blood after vaccination.
Two injections were given.
Each injection contained the same type of weakened bacteria.



(i) Explain why the secondary response is faster than the primary response. [1 mark]

_____

_____

(ii) Describe **two other** differences between the primary and secondary response. [2 marks]

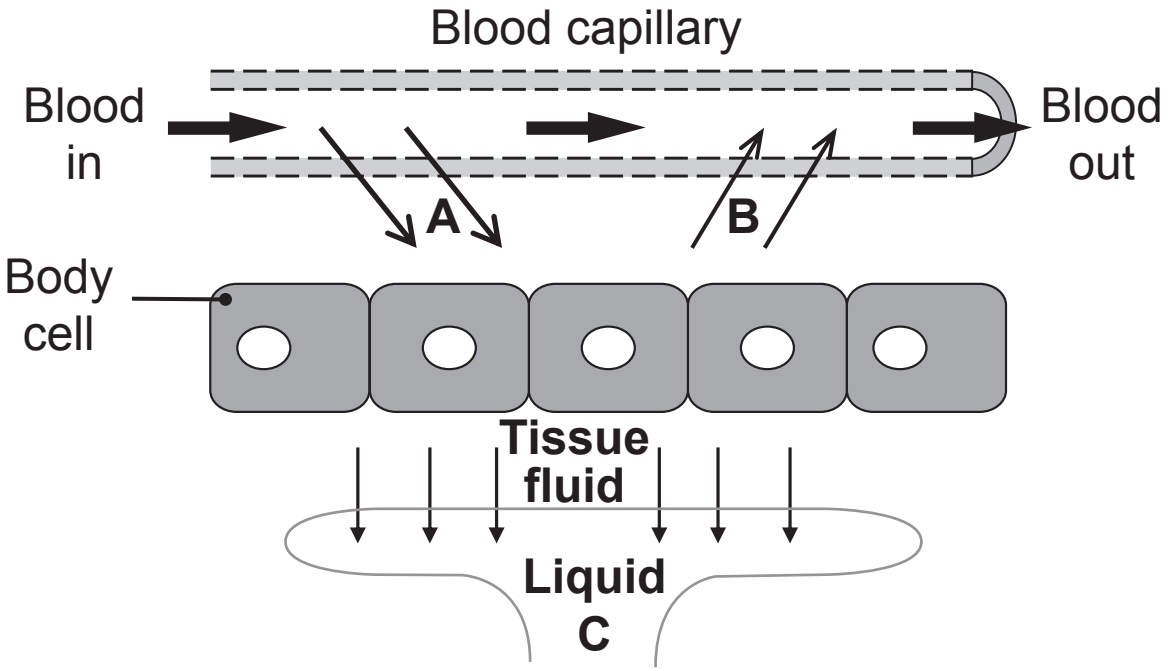
(iii) Use evidence from the graph to suggest why a booster injection must be given a few months after the first injection. [2 marks]

(iv) Suggest **one** disadvantage of the vaccination being given as two injections rather than one. [1 mark]

(v) Explain why manufacturers of this vaccine weaken the bacteria used in the injections. [2 marks]

(vi) Name the type of immunity given by this vaccination. [1 mark]

9 The diagram shows the formation of tissue fluid.



(a) Give **two** ways the capillary is adapted to allow substances to move in direction **A**. [2 marks]

_____

_____

_____

_____

(b) Name **one** substance which moves in direction **B**. [1 mark]

_____

(c) Name and describe what happens to liquid **C**. [2 marks]

Name _____

Description _____

_____

10 A medical student placed samples of blood in three different solutions.

The table shows changes in the average diameter of the red blood cells in each solution.

Test tube	Concentration of salt solution/ grams per litre	Average diameter of red blood cells/micrometres	
		At start	After 10 minutes
A	15	8	4
B	10	8	8
C	0	8	10

(a) The average diameter of the red blood cells placed in **test tube A** changes.

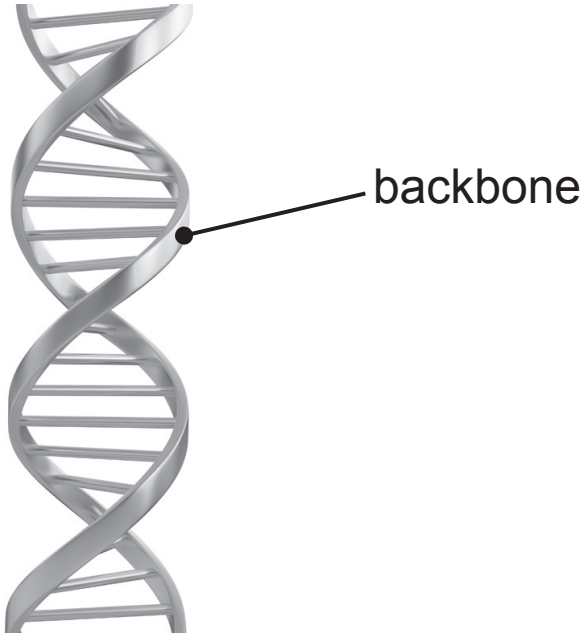
Describe this change and explain what causes it.
[4 marks]

Patients suffering from dehydration are given replacement fluids using a sterile salt solution in a drip.

The salt solution in the drip passes into the bloodstream.

(b) Explain why solution **B** is used in the drip rather than solution **C**. [4 marks]

11 The diagram shows part of a DNA molecule.



(a) Name the two molecules found in the DNA backbone. [2 marks]

1. _____

2. _____

(b) Chargaff investigated the chemical composition of DNA in different animals. The table shows some of his results.

	Percentage of bases			
Mammal	**A**	**G**	**C**	**T**
Rat	28.6	21.6	20.4	28.4
Human	30.9	19.1	18.4	29.6
Pig	29.4	20.5	20.5	29.6
Sheep			21.0	

(i) Give **three** conclusions from Chargaff's results. [3 marks]

(ii) Sheep have 21**%** cytosine (C) in their DNA.

Calculate the expected percentage of adenine (A) in sheep.

Show your working. [2 marks]

(c) Other scientists built on the work of Chargaff to discover the structure of DNA.

Name these scientists and describe the approaches they used. [4 marks]

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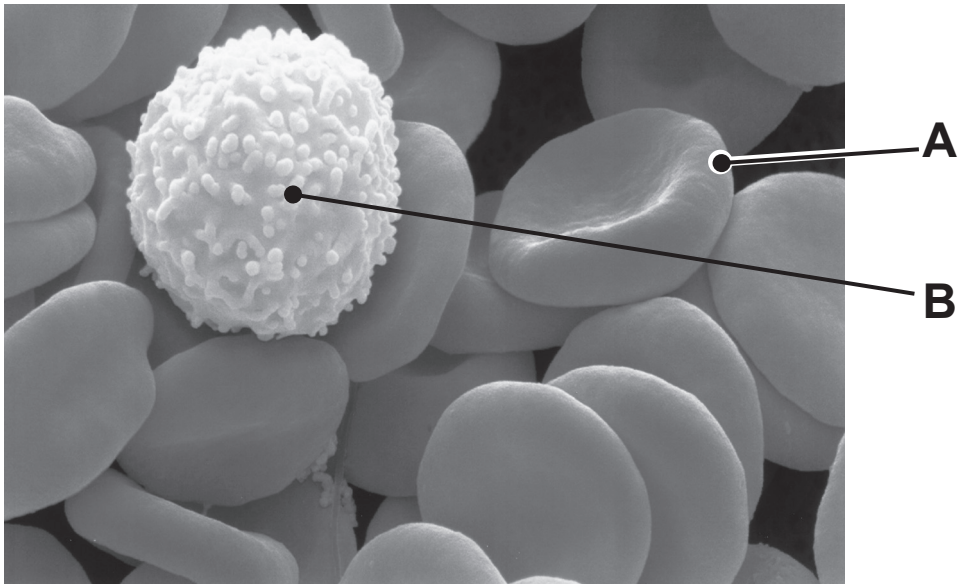
(Questions continue overleaf)

12 (a) The photograph shows blood cells.



(i) Name cells **A** and **B**. [1 mark for each]

A _____

B _____

(ii) Give the function of cell **A**. [1 mark]

_____

(iii) Describe **one** adaptation of cell **A**, **visible in the photograph**, and explain how this enables it to carry out its function. [2 marks]

_____

_____

_____

_____

(iv) When the skin is cut changes occur in the blood proteins to bring about clotting and scab formation.

Describe these changes. [3 marks]

(b) Many people suffer from anaemia.

Anaemia is caused by a mineral deficiency.

(i) Name this mineral. [1 mark]

One of the symptoms of anaemia is lack of energy.

(ii) Explain how anaemia can result in a lack of energy. [3 marks]

(c) Blood donation and transfusion is needed to treat certain blood disorders.

(i) Name the blood component needed to treat patients who lack clotting factors. [1 mark]

_____

Patients with severe burns lose tissue fluid.

(ii) Name the blood component needed to treat these patients. [1 mark]

_____

The table shows the number of units of blood stored by the UK blood transfusion service and the number of days this store of blood will last.

Blood group	Store of blood/ number of units	Number of days store of blood will last
AB	1465	11.45
A	15281	8.07
B	3352	7.42
O	22430	10.18

(iii) Comment on the figures for blood group **AB** and explain what this suggests about the proportion of blood group **AB** in the population. [3 marks]

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13 (a) Penicillin was one of the first antibiotics to be used in the treatment of disease.

(i) Name the scientist who discovered penicillin. [1 mark]

_____

(ii) What type of organism produces penicillin? [1 mark]

_____

(iii) Describe the role of Florey and Chain in the development of penicillin as an antibiotic that could be used to treat disease. [2 marks]

_____

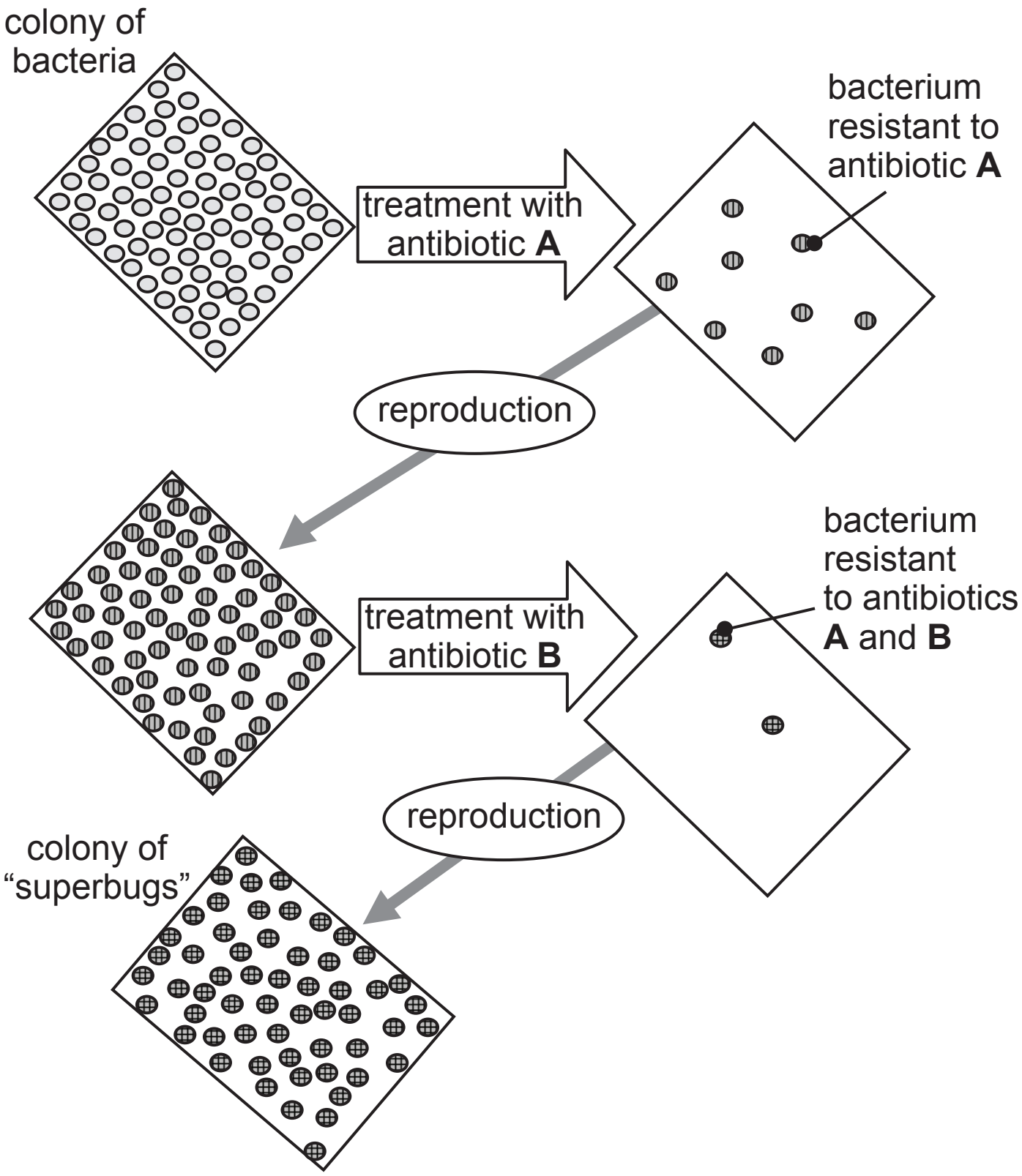
_____

_____

_____

_____

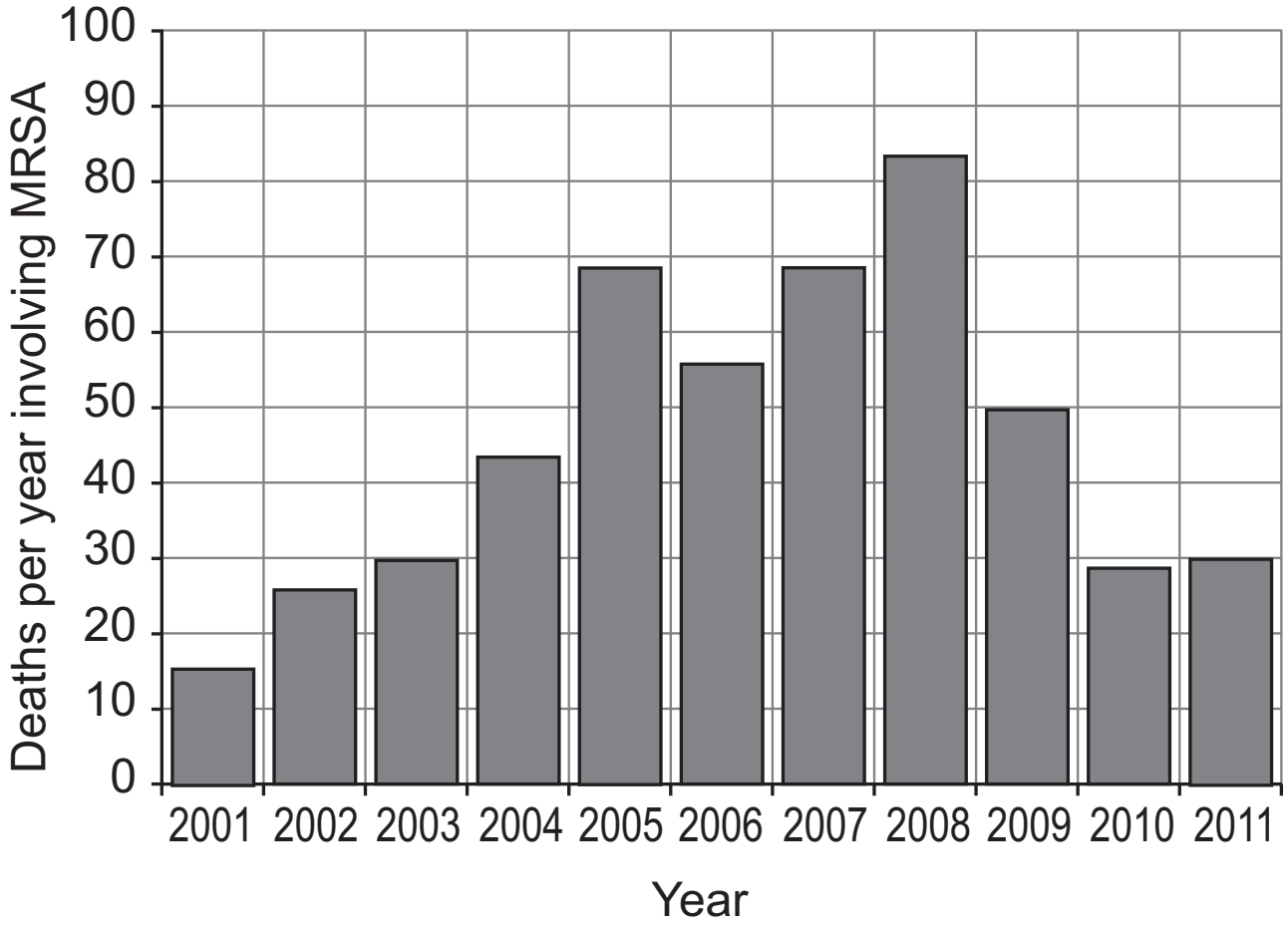
The diagram shows part of a bacterial colony and what happened when it was treated with antibiotics.



(b) Use information from the diagram to help explain how the overuse of antibiotics in treating bacteria can cause the development of "superbugs" such as MRSA. [6 marks]

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

(c) The graph shows some deaths in Northern Ireland hospitals between 2001 and 2011. The "superbug" MRSA was thought to have been involved in these deaths.



(i) Describe the trend shown in the graph. [2 marks]

(ii) Suggest why "superbugs" like MRSA are more likely to arise in hospitals than in family homes. [1 mark]

(iii) Describe three procedures used in hospitals to reduce infections by "superbugs". [1 mark for each]

1.

2.

3.

THIS IS THE END OF THE QUESTION PAPER

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