Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2017

# Biology

Unit 2
Higher Tier

MV18

**[GBY22]**

**FRIDAY 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 this page.
**You must answer the questions in the spaces provided.**
Complete in black ink only.
Answer **all thirteen** questions.

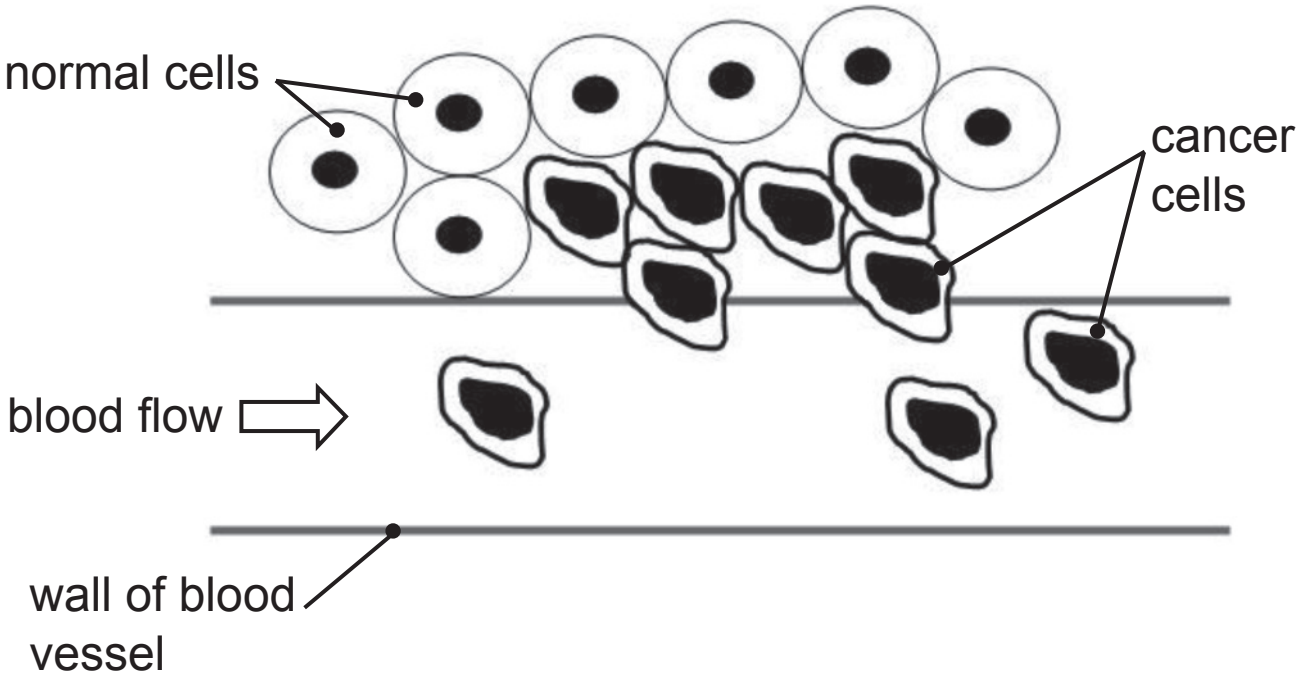
## Information for Candidates

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 **4(b)** and **11(b)**.

**1** Cancer cells are produced by uncontrolled cell division.

This results in a tumour.

The diagram shows a malignant tumour and a blood vessel **before** chemotherapy treatment.




Look at the diagram above.

**(a)** Describe **two** differences between a cancer cell and a normal cell. [1 mark for each]

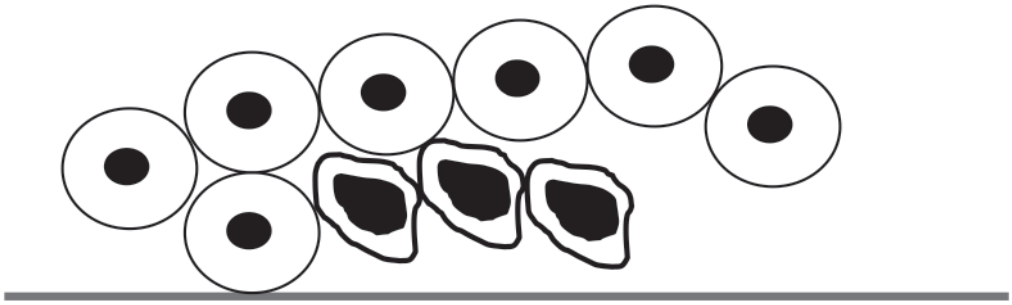
1. _____

_____

2. _____

_____

The diagram shows the tumour and the blood vessel **after** chemotherapy treatment.




Look at the diagrams.

**(b)** Give **two** ways the tumour has changed after chemotherapy treatment. [1 mark for each]

1. _____

_____

2. _____

_____

Chemotherapy is one way of treating cancer.

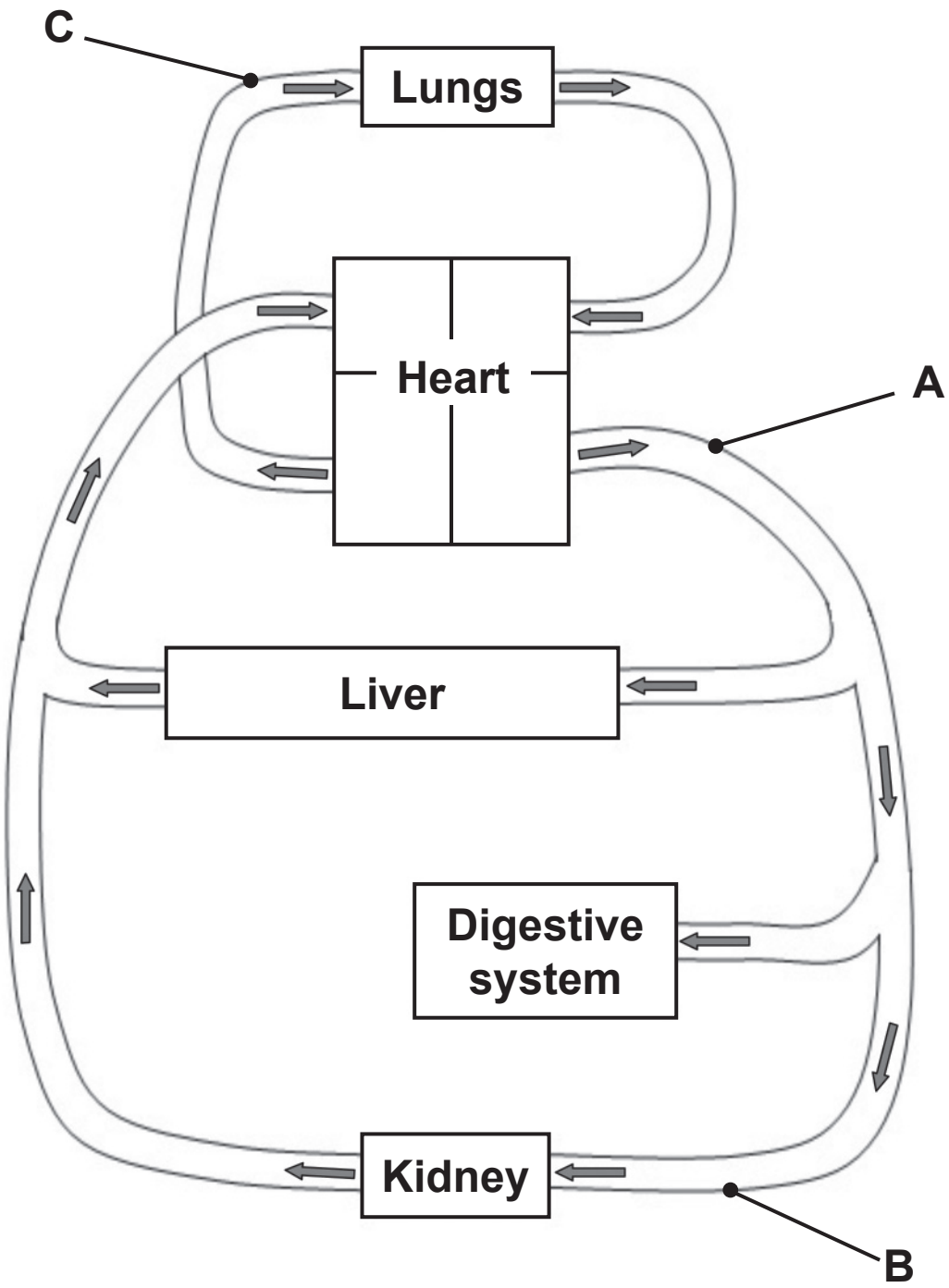
**(c)** Give **two** other ways of treating cancer. [1 mark for each]

1. _____

2. _____

**2** The diagram shows part of the human circulatory system.

The arrows show the direction of blood flow.



Look at the diagram.

**(a)** Name blood vessels **A**, **B** and **C**. [1 mark for each]

**A** _____

**B** _____

**C** _____

**(b) (i)** **Complete** the diagram by drawing the hepatic portal vein. [1 mark]

**(ii)** Draw an arrow to show the direction of blood flow in the hepatic portal vein. [1 mark]

**3** Blood groups are an example of variation.

**(a) (i)** Name this type of variation. [1 mark]

_____

**(ii)** Give **one other** example of this type of variation in humans. [1 mark]

_____

**(b)** The table shows information about blood groups in the Northern Ireland population.

| Blood group | Number of people in Northern Ireland | Percentage of Northern Ireland population |
|---|---|---|
| **O** | 954 000 | 53 |
| **A** | | 34 |
| **B** | 180 000 | 10 |
| **AB** | 54 000 | 3 |

Look at the table.

**(i)** The population of Northern Ireland is 1 800 000.

Calculate the number of people in the Northern Ireland population with blood group **A**.

Show your working. [2 marks]

_____

It is preferable that people receive a blood donation of their own blood group.

**(ii)** Suggest why people with group **AB** in Northern Ireland are at a disadvantage. [1 mark]

During surgery blood transfusions are often necessary.

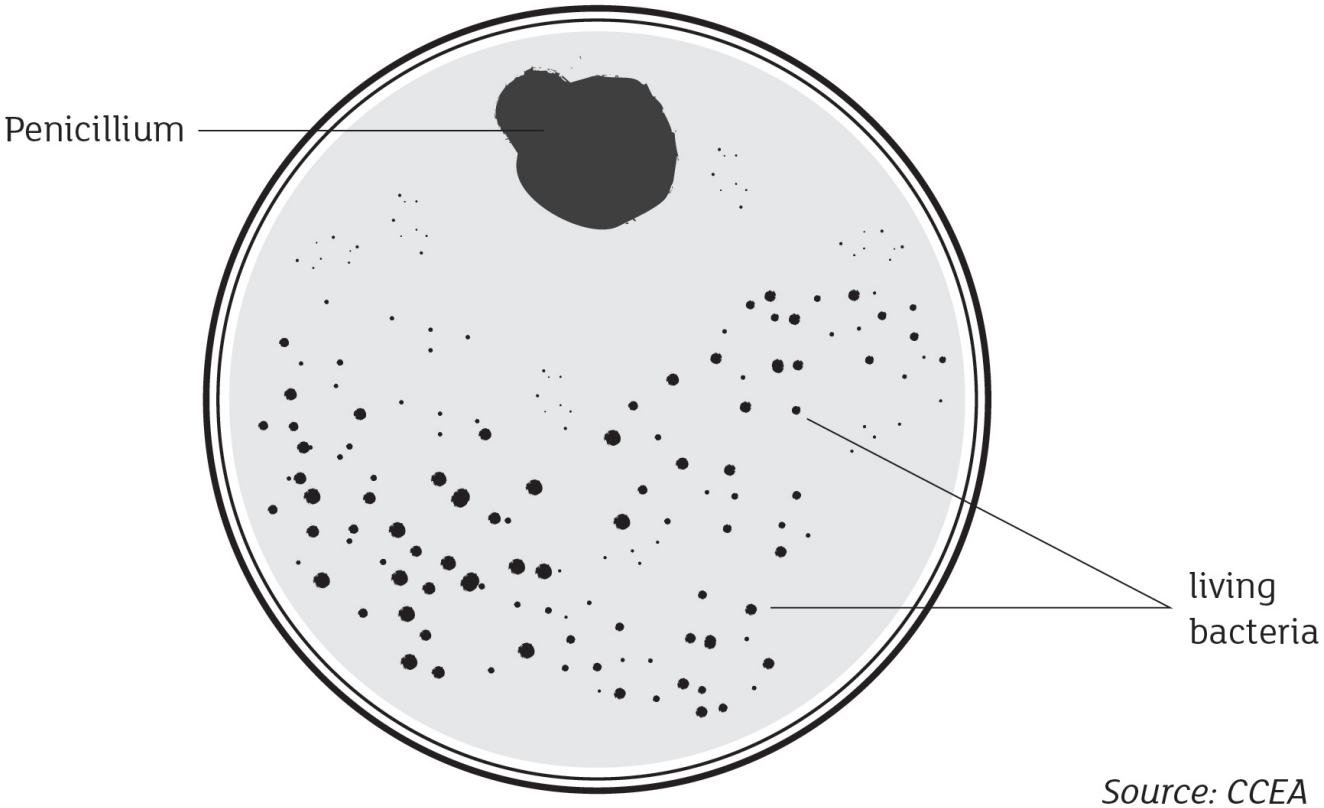
**(c)** What is a blood transfusion? [1 mark]

**4** **(a)** Penicillin was discovered in 1928.

Name the scientist who discovered penicillin.
[1 mark]

_____

**(b)** The diagram shows the result of the experiment which led to the discovery of penicillin.




*Source: CCEA*

Use the diagram to help explain how penicillin was discovered. [6 marks]

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

**5** Some microorganisms cause disease.

**(a)** Complete the table. [5 marks]

| **Disease** | **Type of microorganism** | **How microorganism spreads** | **Prevention** |
|---|---|---|---|
| gonorrhoea | | | wear a condom |
| mumps | virus | | |
| athlete's foot | | contact | avoid direct contact |

**(b)** Food poisoning is caused by the microorganism **Salmonella**.

**(i)** What type of microorganism is **Salmonella**? [1 mark]

_____

A person can suffer the symptoms of food poisoning 1–3 days after eating contaminated meat.

**Salmonella** sometimes survives cooking.

It can be spread on knives, cutting surfaces or by the food handler.

**(ii) Use this information** to suggest **two** ways to reduce the risk of spreading **Salmonella**.
[1 mark for each]

1. _____

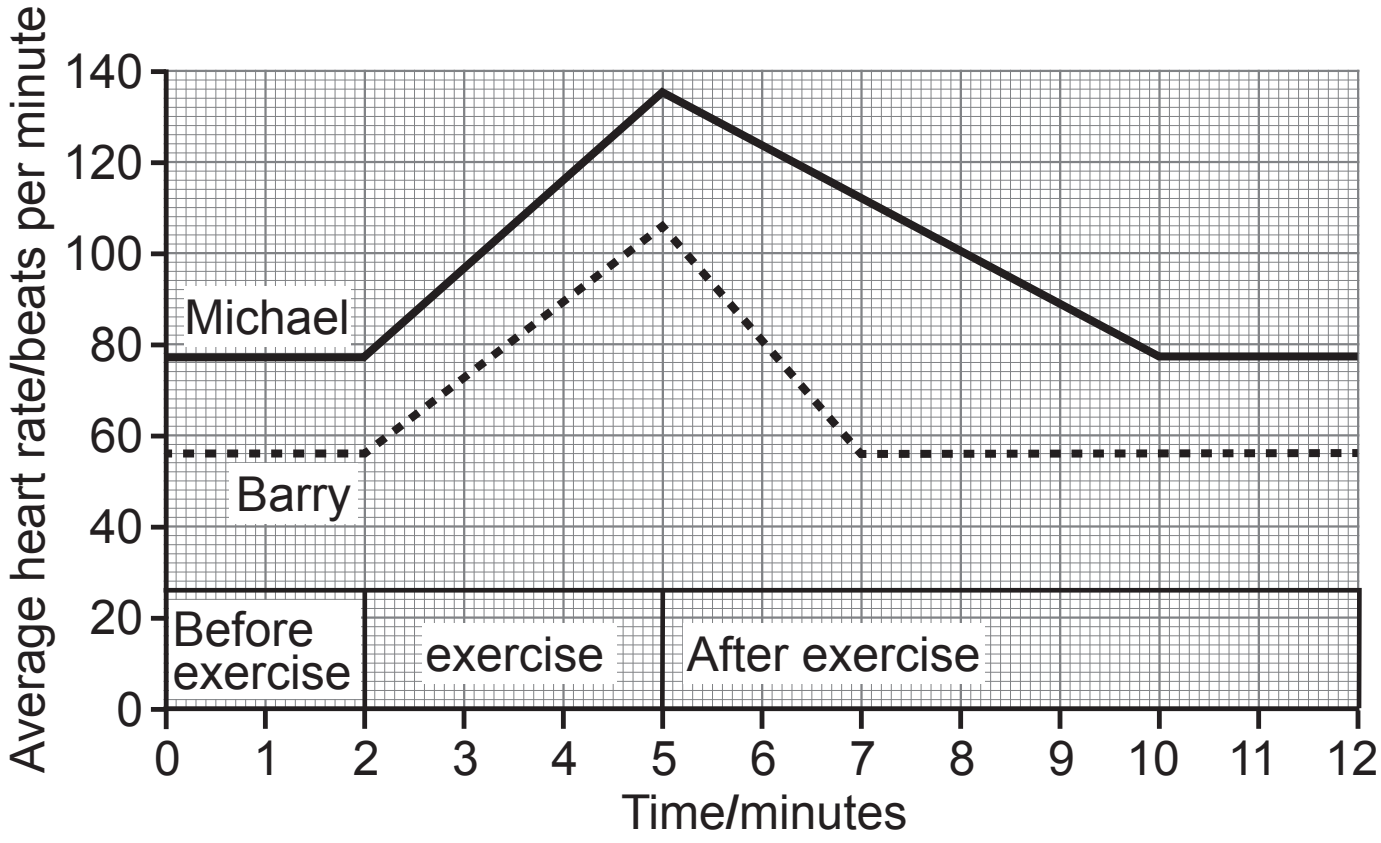
_____

2. _____

_____

**6** In an experiment the heart rates of two men were measured before, during and after exercise.

The graph below shows the results.



**(a)** Give **two** variables which had to be controlled during this experiment. [2 marks]

1. _____

2. _____

**(b)** Barry is fitter than Michael.

Use data from the graph to help explain this statement. [4 marks]

_____

_____

_____

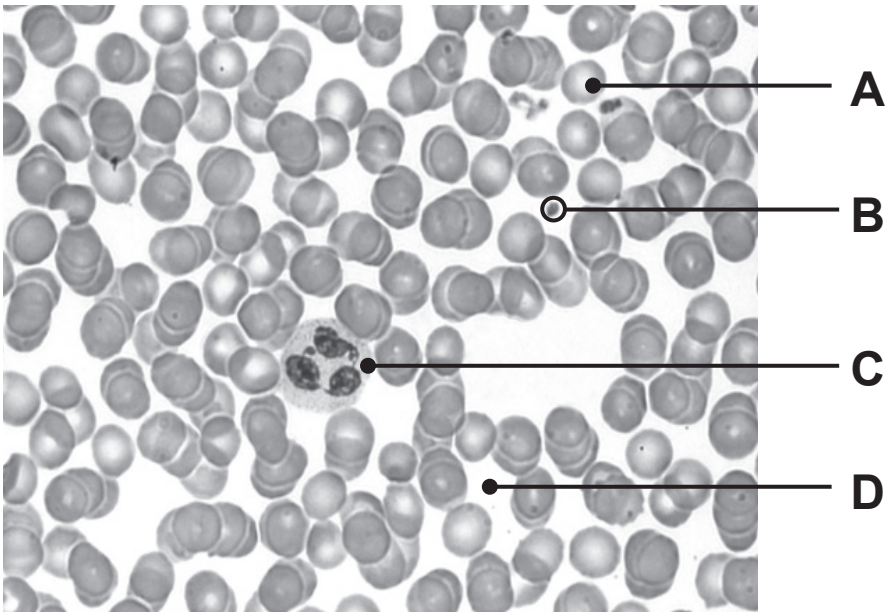
_____

_____

_____

**7** The photograph shows a normal blood sample.

Magnification
×500




**(a)** Identify the parts of the blood labelled **A**, **B** and **C**.
[1 mark for each]

**A** _____

**B** _____

**C** _____

**(b)** Give **two** differences, shown in the photograph, between **A** and **C**. [1 mark for each]

1. _____

_____

2. _____

_____

Part **D** is a liquid that transports different food substances around the body.

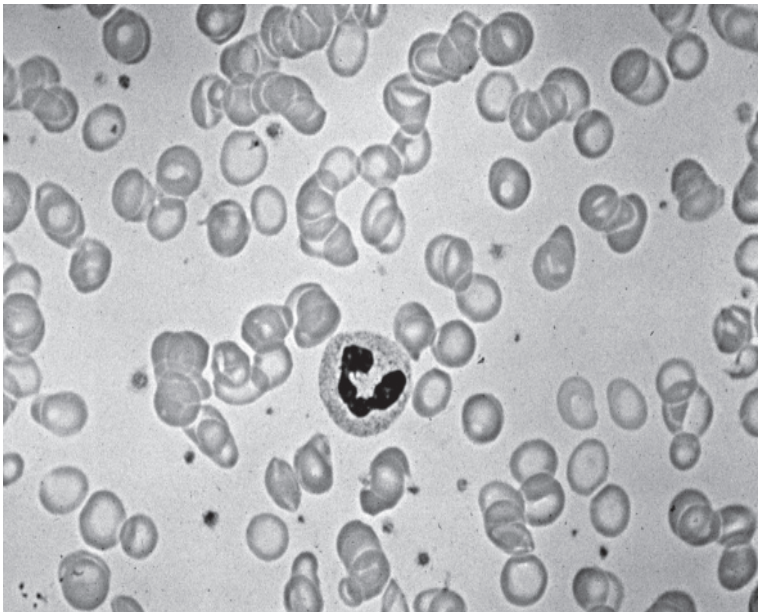
**(c)** Name **two other** substances which are transported in this part of the blood. [2 marks]

1. _____

2. _____

**(d)** The photograph below shows a blood sample from a person suffering from a blood disorder.

Magnification
×500



**(i)** Describe **one** difference between this sample and the normal blood sample. [1 mark]

_____

_____

**(ii)** Suggest which blood disorder this person suffers from and describe **one** possible treatment. [2 marks]

Disorder _____

Treatment _____

_____

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**(Questions continue overleaf)**

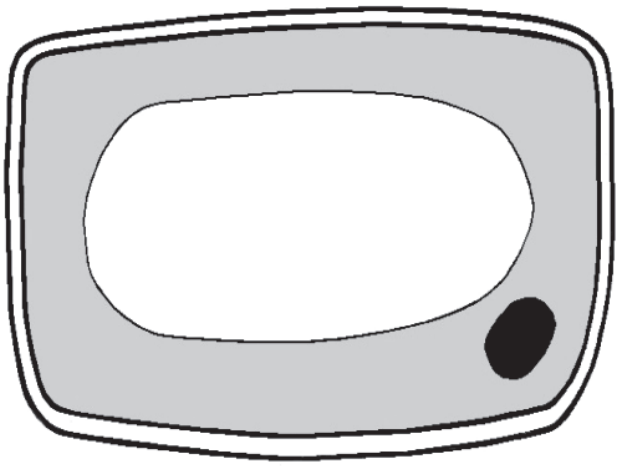
**8** A pupil carried out an experiment to investigate the effect of placing cylinders of carrot in a range of concentrations of sugar solutions.

He weighed the cylinders and left them in the sugar solutions for two hours.

He then removed, dried and reweighed the cylinders.

**(a)** Diagram A below shows a carrot cell after it had been left in a dilute sugar solution for two hours.

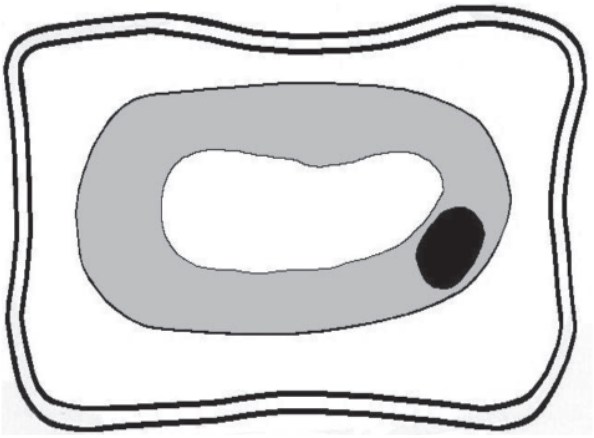
**Diagram A**



**(i)** **On diagram A**, draw a labelled line to show the part of the carrot cell that stops it from bursting.
[1 mark]

Diagram B below shows a carrot cell after it had been left in a concentrated sugar solution for two hours.

**Diagram B**



**(ii)** Describe **three** differences between the carrot cells shown in diagrams A and B. [1 mark for each]

1. _____

_____

2. _____

_____

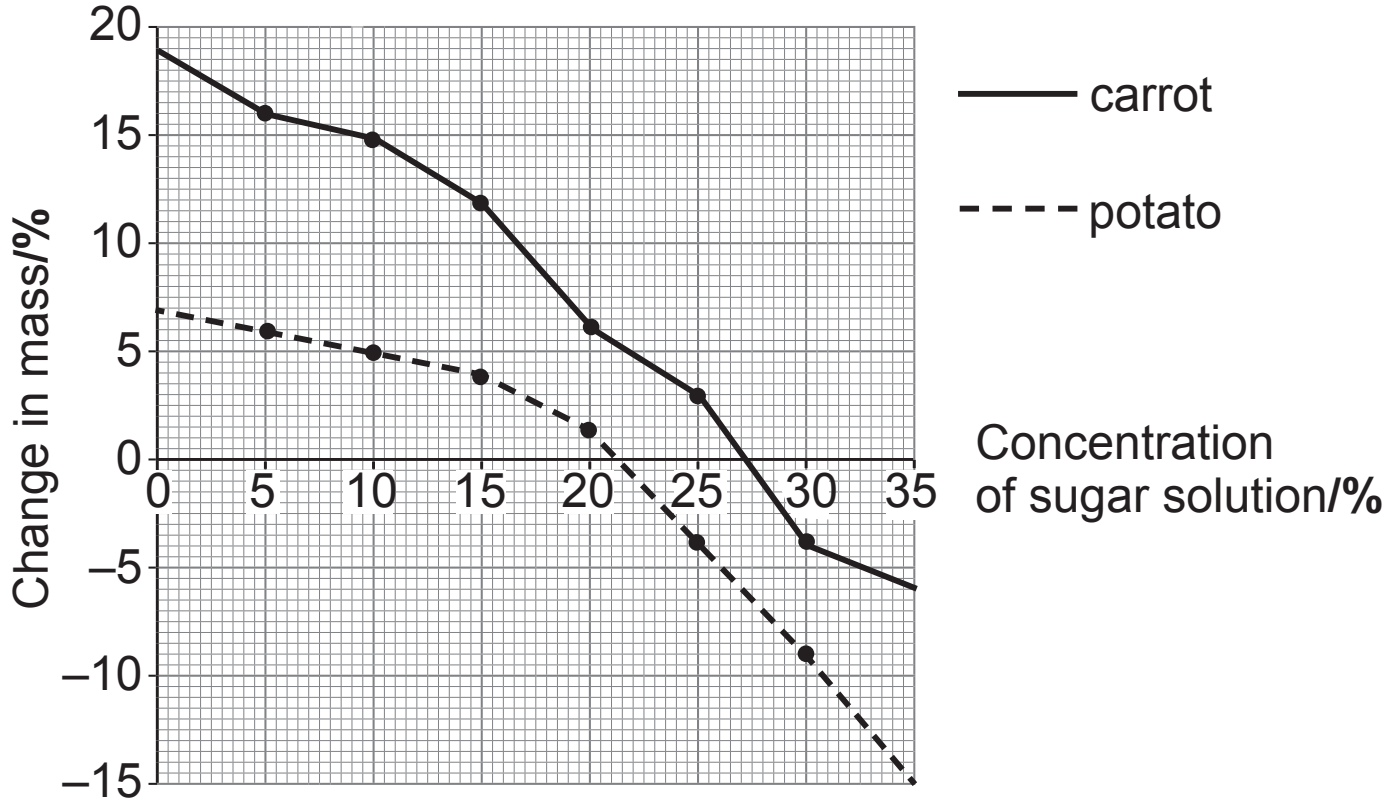
3. _____

_____

**(iii)** Explain the appearance of the carrot cell in diagram B. [4 marks]

**(b)** The pupil repeated the experiment with potato cylinders.

The graph below shows the results.



**(i)** Give the concentration of the sugar solution that causes no change in the mass of the carrot cylinders.

_____ [1 mark]

The pupil concluded that the carrot and the potato contained different concentrations of sugar.

**(ii)** Use data from the graph to help explain this conclusion. [3 marks]

_____

_____

_____

_____

_____

_____

_____

**9** DNA carries the genetic code for living organisms.

Throughout the 1950s several scientists were involved in working out the structure of DNA.

**(a)** How did the work of Chargaff, Franklin and Wilkins lead to the discovery of the structure of DNA?

Chargaff [2 marks]

Franklin and Wilkins [1 mark]

The work of these scientists led to new scientific knowledge.

**(b)** Describe how scientific knowledge can be validated. [2 marks]

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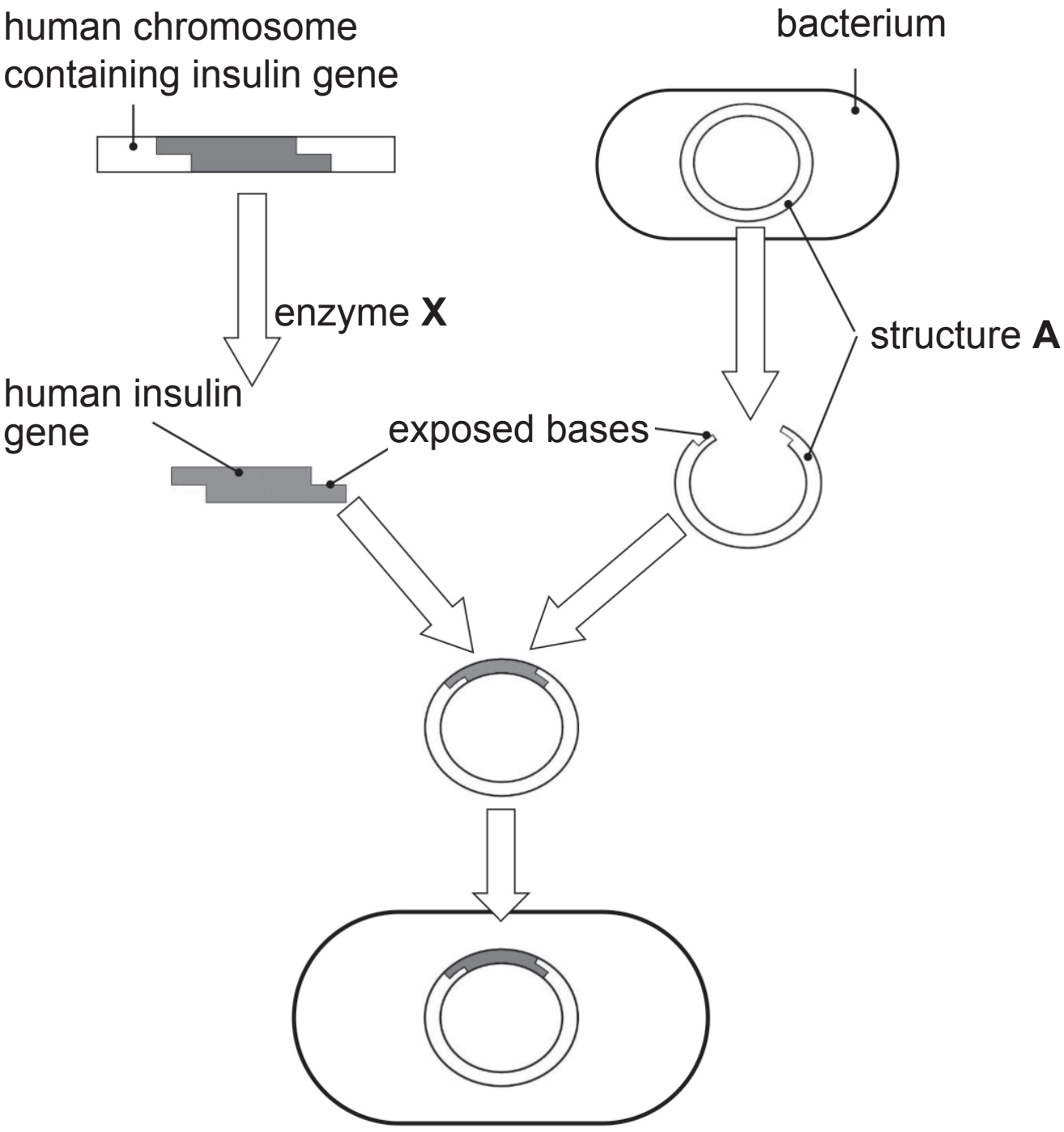
**(Questions continue overleaf)**

**10 (a)** Genetic engineering is used to produce human insulin.

The diagram shows the stages involved.




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

_____

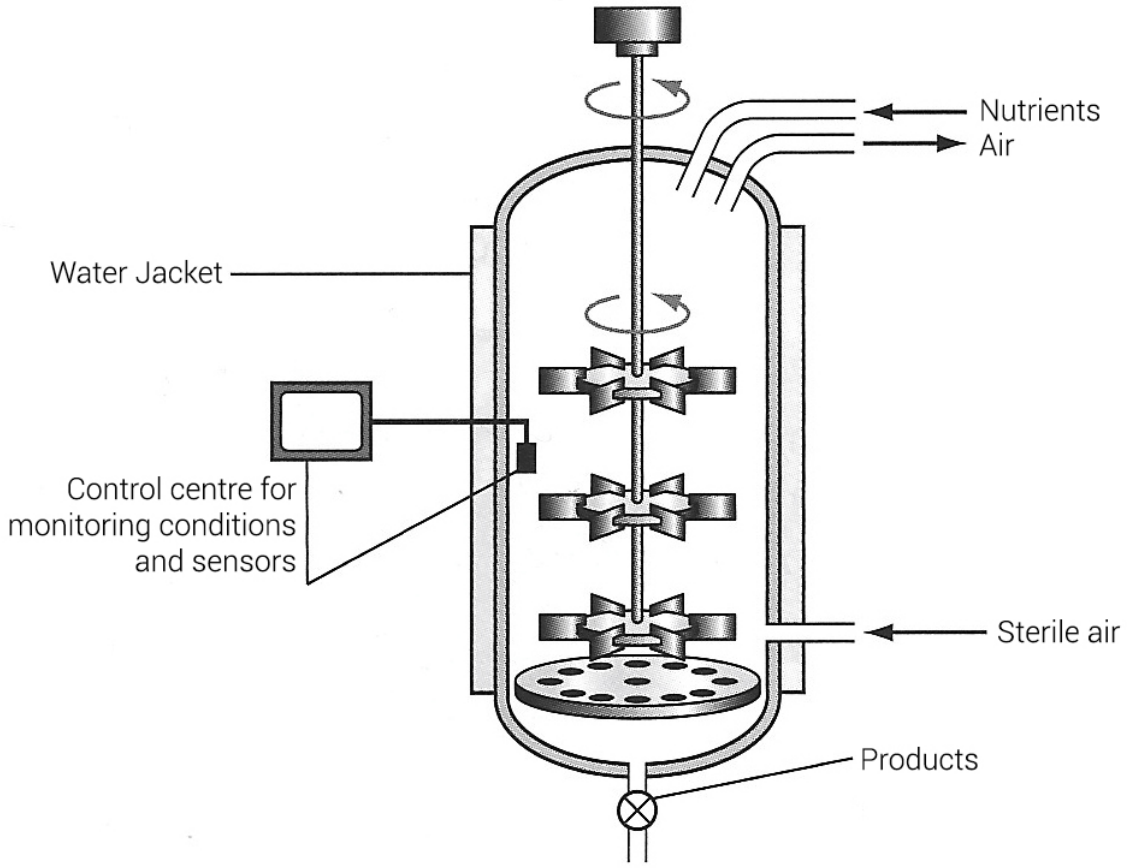
**(ii)** What type of enzyme is **X**? [1 mark]

_____

**(iii)** What term is given to the exposed bases in the gene and structure **A** that allows for complementary base pairing? [1 mark]

_____

**(b)** The diagram shows a fermenter in which bacteria carrying the human insulin gene are grown.




**(i)** Explain why the air entering the system has to be sterile. [1 mark]

_____

_____

The fermenter provides the optimum temperature for growth of bacteria.

**(ii)** Why is this necessary? [1 mark]

_____

_____

**(iii)** Describe how the temperature inside the fermenter is controlled. [2 marks]

_____

_____

_____

Before the product containing insulin can be used for medical purposes it needs to be downstreamed.

**(iv)** What processes are involved in downstreaming? [1 mark]

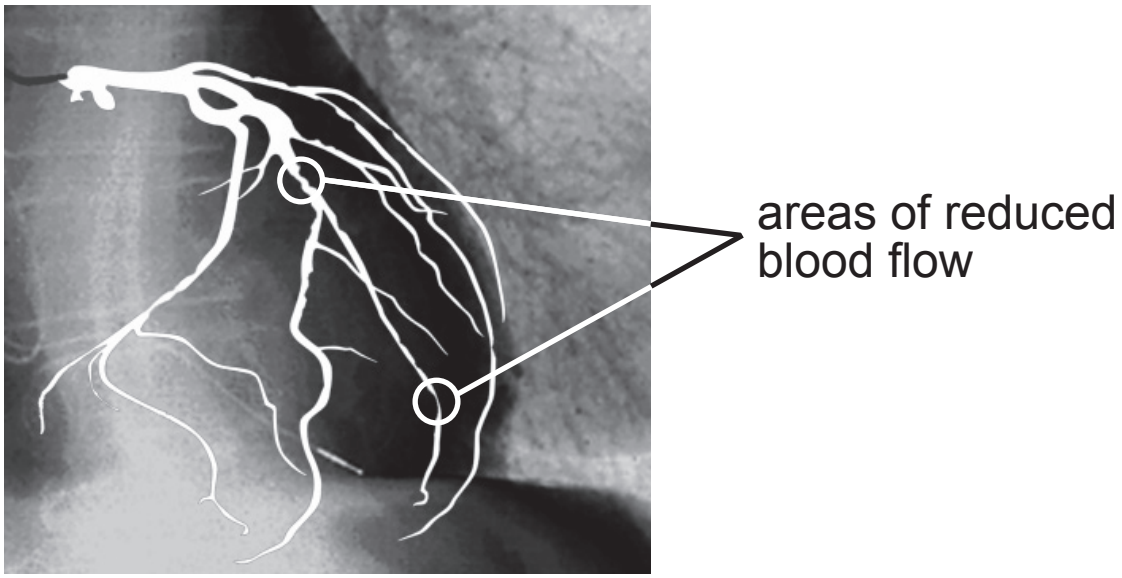
_____

_____

_____

**11 (a)** An X-ray was taken of the arteries on the surface of the heart of a patient suffering from heart disease.

The white areas show the blood flow through the arteries on the surface of the heart.




**(i)** Name the arteries shown in the X-ray. [1 mark]

_____

**(ii)** What builds up in the wall of the arteries to cause reduced blood flow? [1 mark]

_____

_____

**(iii)** Give **two** factors that increase the risk of this type of damage to the arteries. [1 mark for each]

1. _____

_____

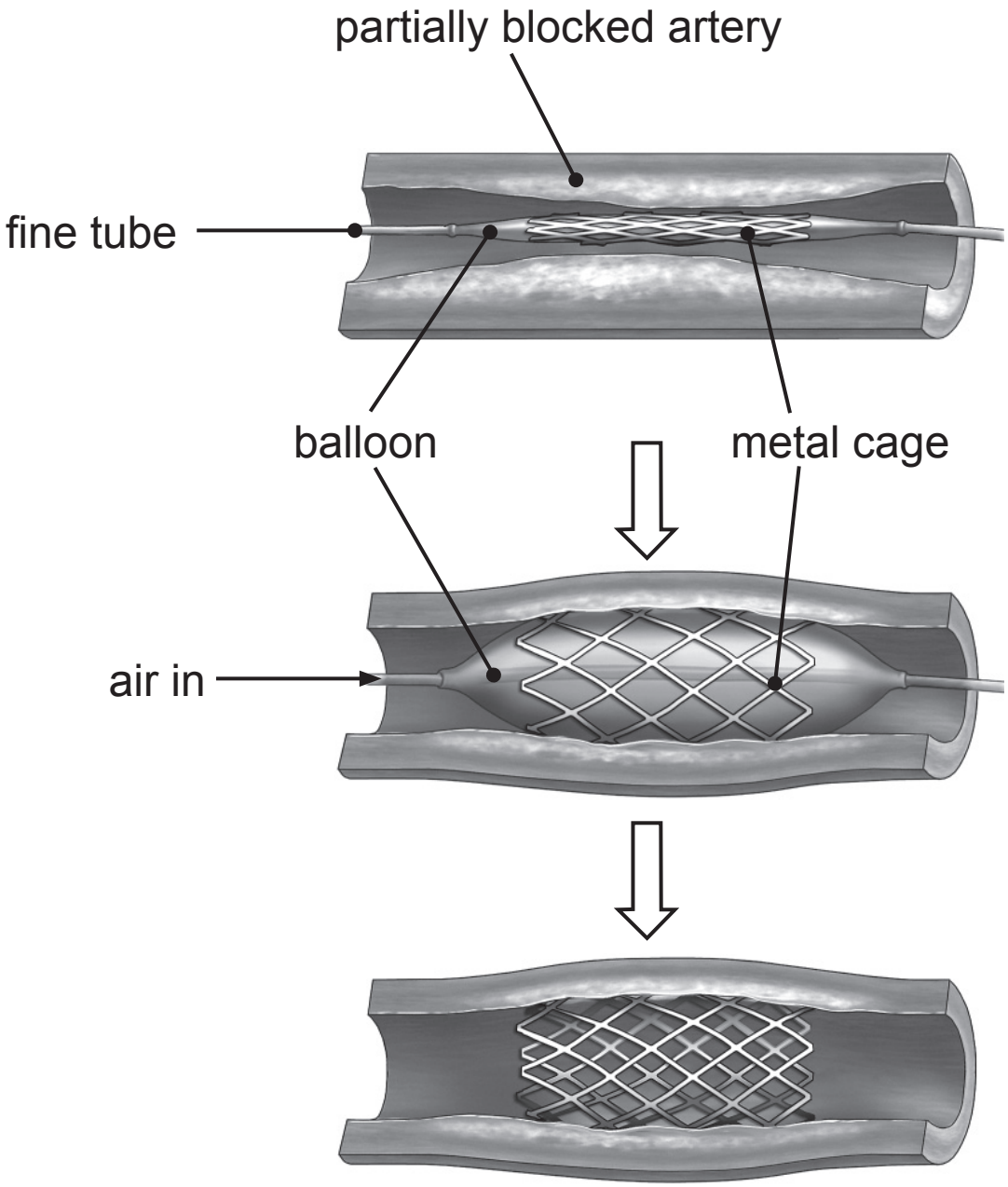
2. _____

_____

The diagrams below show three stages of the treatment given to a patient with heart disease.

**Stage 1**
A fine tube is pushed into the partially blocked artery.

The tube is attached to a balloon covered with a metal cage.

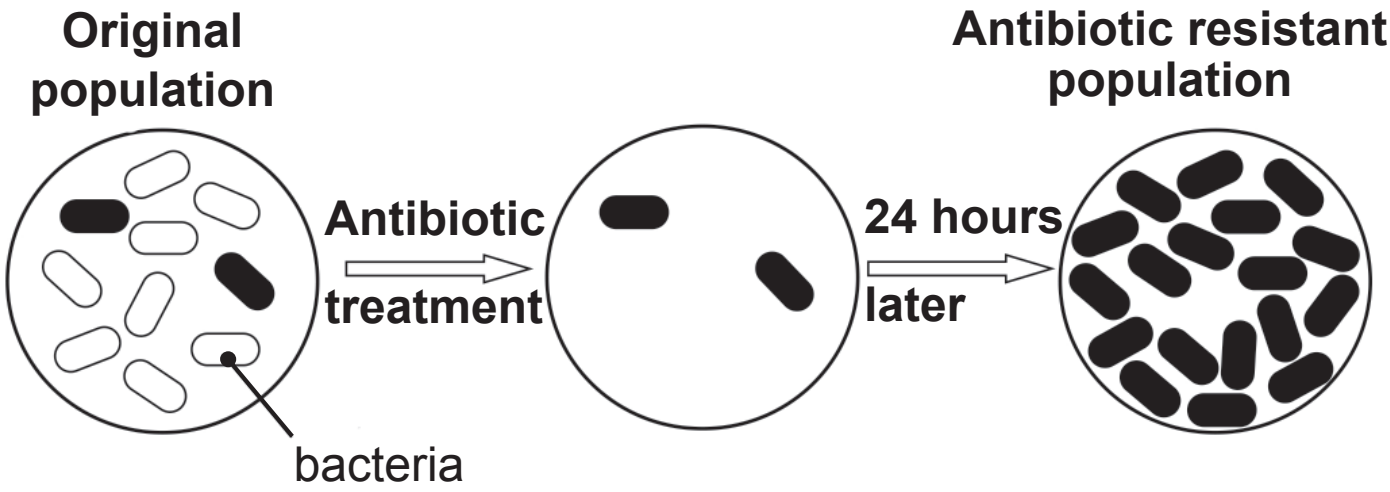


**(b) Use the diagrams** to describe what happens in **Stage 2** and **Stage 3**.

Suggest how this treatment helps reduce the risk of the patient having a heart attack. [6 marks]

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

**12 (a)** The diagram shows how treating bacteria with an antibiotic can result in a population of bacteria which are resistant to that antibiotic.




The original population of bacteria shows genetic variation.

**(i)** What causes this genetic variation? [1 mark]

_____

**(ii)** Describe and explain the effect of the antibiotic treatment on the original population of bacteria. [5 marks]

**(iii)** Describe how this population of antibiotic resistant bacteria could develop into a superbug. [2 marks]

**(b)** Tuberculosis is a serious infection, which mainly infects the lungs.

**(i)** Describe how tuberculosis is spread and prevented. [2 marks]

The table shows the number of antibiotic resistant tuberculosis cases in the UK.

| Year | Number of antibiotic resistant tuberculosis cases |
|---|---|
| 2007 | 493 |
| 2008 | 555 |
| 2009 | 496 |
| 2010 | 873 |
| 2011 | 835 |
| 2012 | 2246 |
| 2013 | 2923 |

**(ii)** The number of antibiotic resistant tuberculosis cases changes from 2007–2013.

Describe the trend of this change. [2 marks]

The table shows the number of new antibiotics available for use from 1990 to 2012.

| Year | Number of new antibiotics available for use |
|---|---|
| 1990–1999 | 22 |
| 2000–2009 | 7 |
| 2010–2012 | 1 |

Since 2012, twelve new antibiotics were in the final stage of development.

60% of these may become available for use.

**(c)** Use data from the tables to suggest how the change in the number of antibiotics available for use may affect the number of antibiotic resistant tuberculosis cases after 2013. [4 marks]

**13 (a)** Describe and explain **two** ways the body can prevent microorganisms from entering. [2 marks for each way]

1. _____

_____

_____

_____

2. _____

_____

_____

_____

**Read the passage.**

Viruses lack cellular organisation but contain genetic material surrounded by proteins which act as antigens.

The influenza virus reproduces quickly and often has mutations of the antigens. As a result, the influenza virus has many different types, known as strains.

Each year scientists identify the strains of the influenza virus most likely to cause the illness around the world.

Modified forms of the three most likely strains are used to produce an influenza vaccine for the next year.

Once injected into the patient the influenza vaccine takes about two weeks to provide immunity against those strains of the influenza virus.

A pandemic can happen when a previously unknown strain of the influenza virus causes illness in large numbers of people around the world.

**(b)** Suggest what is meant by a modified strain of the virus and explain why it is used in the vaccine to provide immunity. [5 marks]

**(c)** How does this immunity stop the spread of the virus in the body? [3 marks]

**(d)** Suggest why the vaccine for a particular year may be ineffective and not stop a pandemic of influenza.
[4 marks]

**THIS IS THE END OF THE QUESTION PAPER**

Sources

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| For Examiner’s use only | |
|---|---|
| **Question Number** | **Marks** |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
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| 9 | |
| 10 | |
| 11 | |
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| **Total Marks** | |

**Examiner Number**