



General Certificate of Secondary Education
2017

Centre Number

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Candidate Number

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Biology

Unit 2

Higher Tier



[GBY22]

GBY22

FRIDAY 16 JUNE, MORNING

TIME

1 hour 45 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 in black ink only. **Do not write with a gel pen.**

Answer **all thirteen** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 115.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

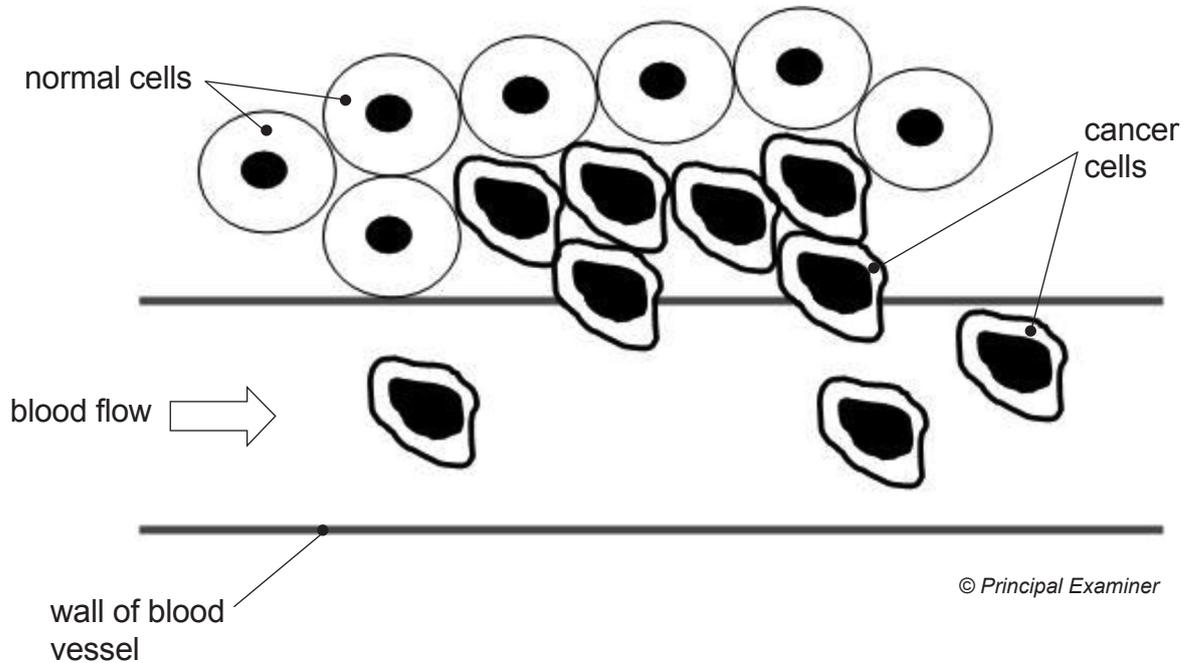
Quality of written communication will be assessed in Questions **4(b)** and **11(b)**.



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.

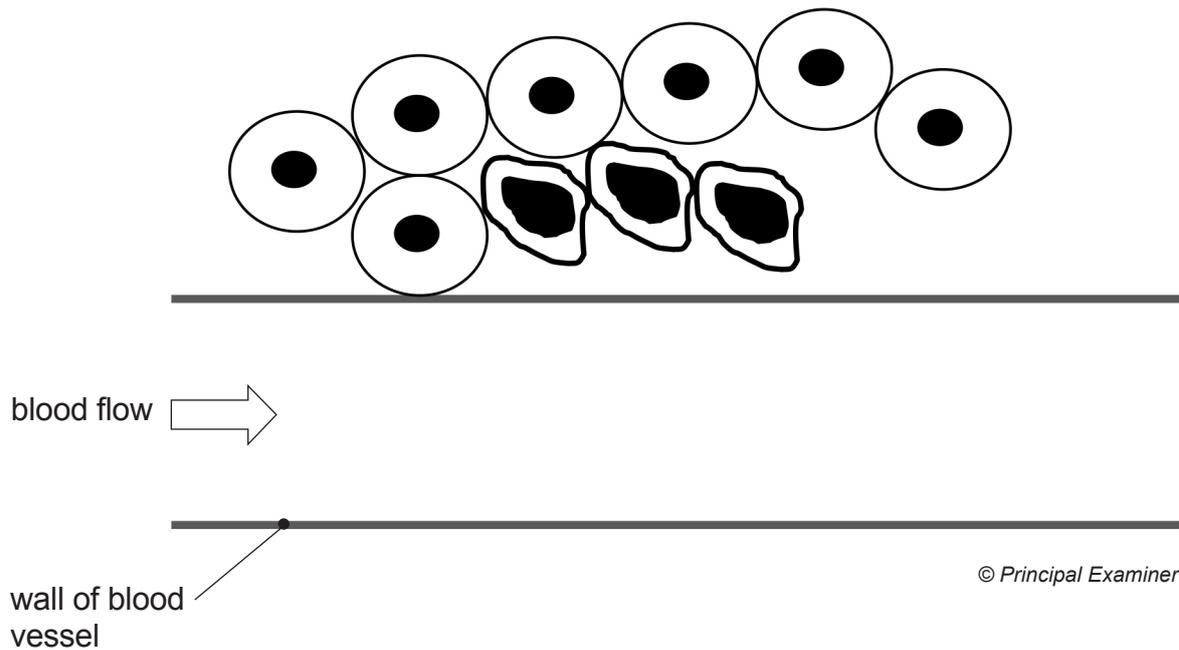
(a) Describe **two** differences between a cancer cell and a normal cell.

1. _____ [1]

2. _____ [1]



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. _____ [1]
- 2. _____ [1]

Chemotherapy is one way of treating cancer.

(c) Give **two** other ways of treating cancer.

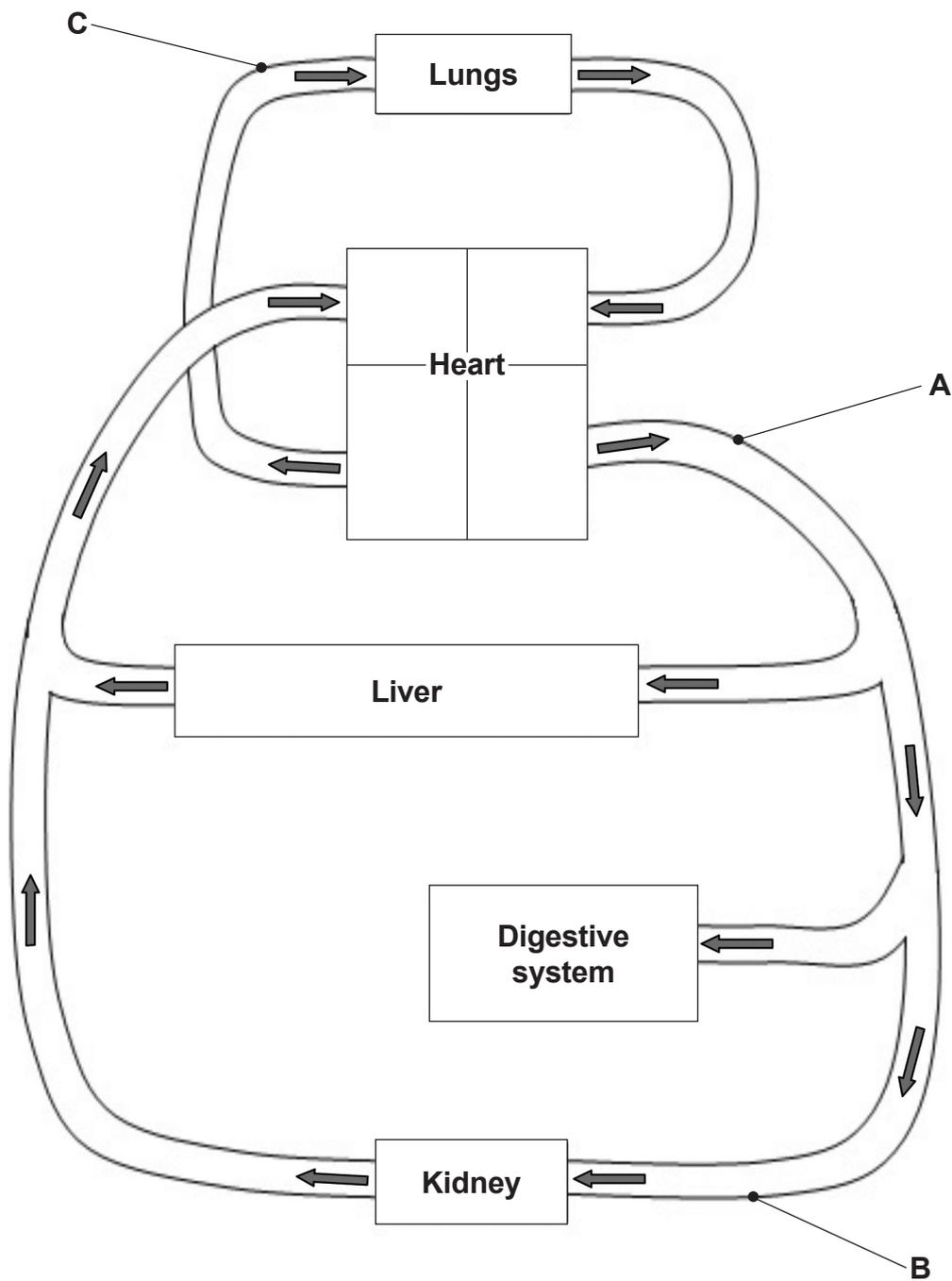
- 1. _____ [1]
- 2. _____ [1]

[Turn over



2 The diagram shows part of the human circulatory system.

The arrows show the direction of blood flow.



© Principal Examiner



Look at the diagram.

(a) Name blood vessels **A**, **B** and **C**.

A _____ [1]

B _____ [1]

C _____ [1]

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

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



3 Blood groups are an example of variation.

(a) (i) Name this type of variation.

[1]

(ii) Give **one other** example of this type of variation in humans.

[1]

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

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

*Statistics adapted from the Northern Ireland Blood Transfusion Service "About Blood".
© Crown Copyright, 2010 - Contains public sector information licensed under the Open Government Licence v3.0*

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]



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]

During surgery blood transfusions are often necessary.

(c) What is a blood transfusion?

[1]

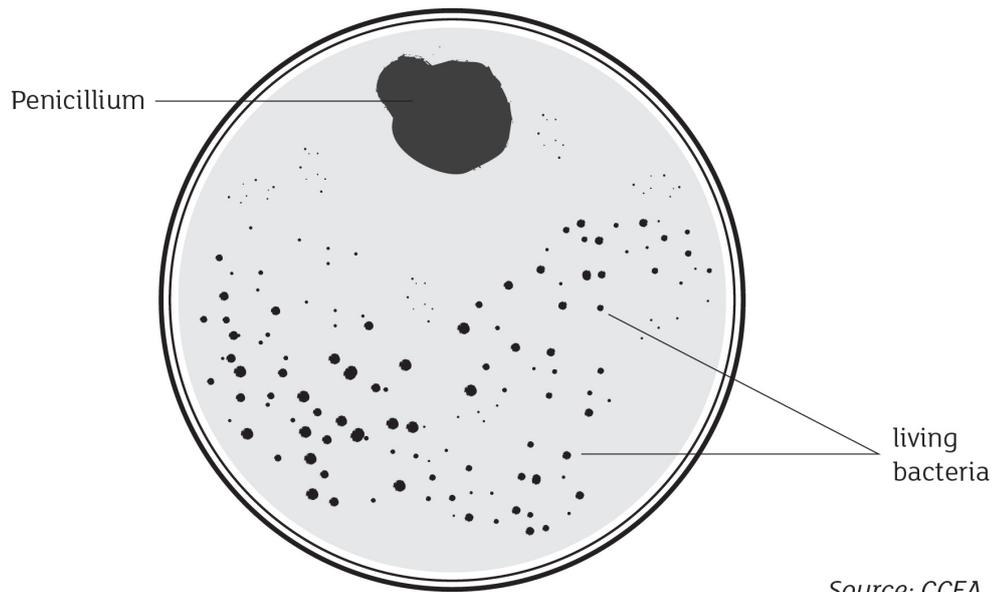


4 (a) Penicillin was discovered in 1928.

Name the scientist who discovered penicillin.

[1]

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



Source: CCEA



5 Some microorganisms cause disease.

(a) Complete the table.

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

[5]

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

(i) What type of microorganism is *Salmonella*?

[1]

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. _____

_____ [1]

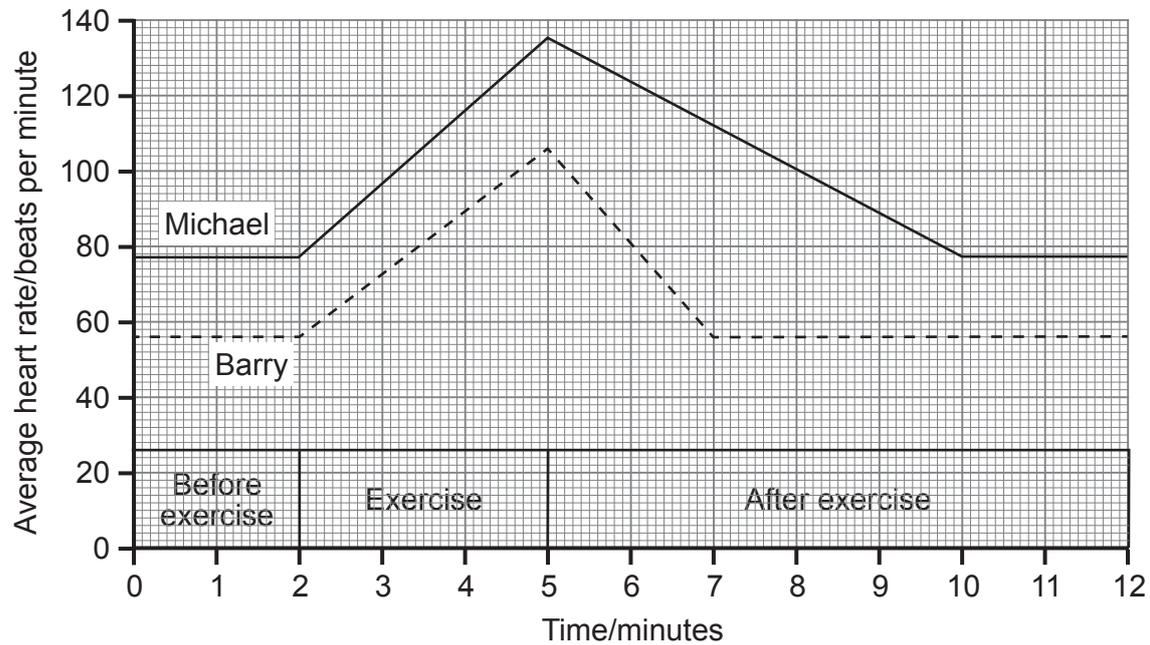
2. _____

_____ [1]



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

The graph shows the results.



- (a) Give **two** variables which had to be controlled during this experiment.

- _____
- _____ [2]

- (b) Barry is fitter than Michael.

Use data from the graph to help explain this statement.

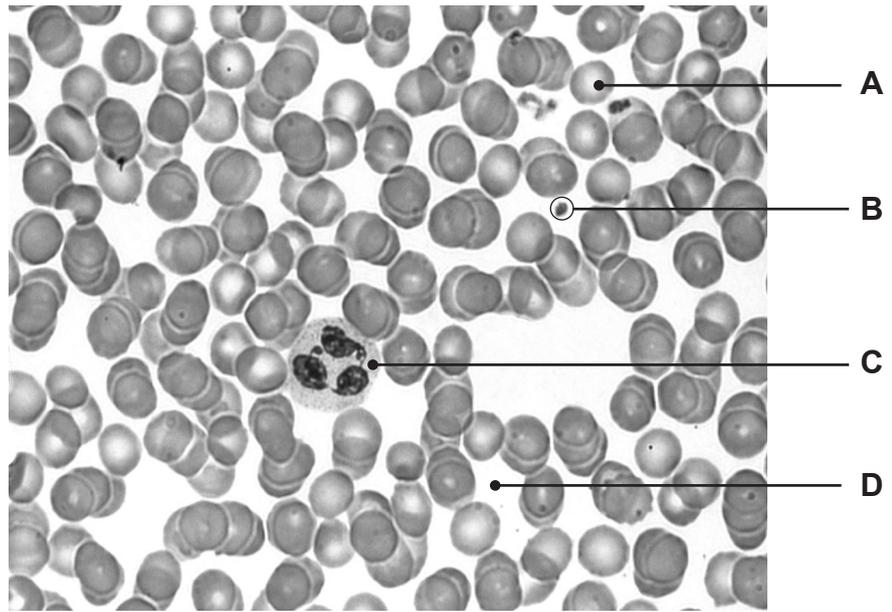
[4]

[Turn over



7 The photograph shows a normal blood sample.

Magnification
× 500



© Dr Gopal Murti / Science Photo Library

(a) Identify the parts of the blood labelled **A**, **B** and **C**.

- A** _____ [1]
B _____ [1]
C _____ [1]

(b) Give **two** differences, shown in the photograph, between **A** and **C**.

1. _____ [1]
 _____ [1]
 2. _____ [1]
 _____ [1]



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.

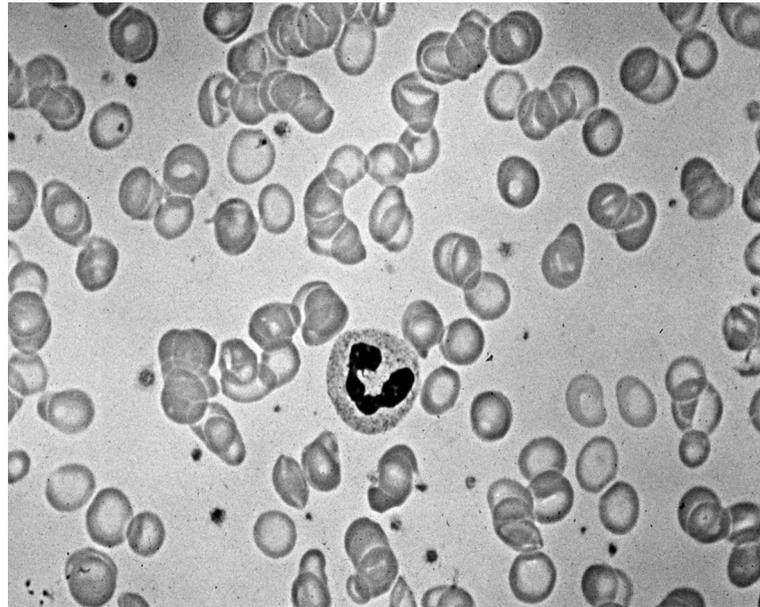
1. _____

2. _____

[2]

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

Magnification
× 500



© CNRI / Science Photo Library

(i) Describe **one** difference between this sample and the normal blood sample.

_____ [1]

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

Disorder _____

Treatment _____

_____ [2]

[Turn over



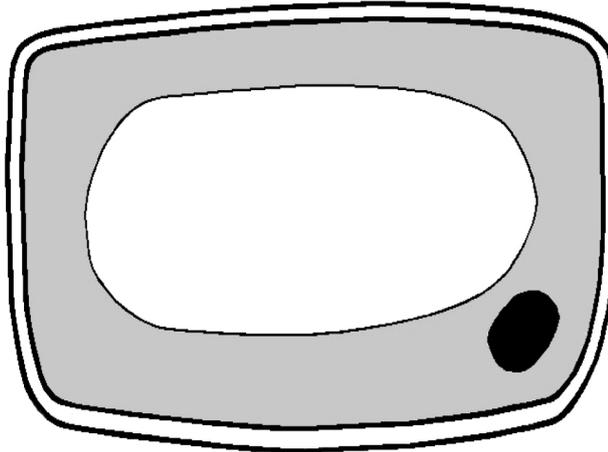
- 8 A pupil carried out an experiment to investigate the effect of placing cylinders of carrot in a range of concentrations of sugar solutions.

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 shows a carrot cell after it had been left in a dilute sugar solution for two hours.

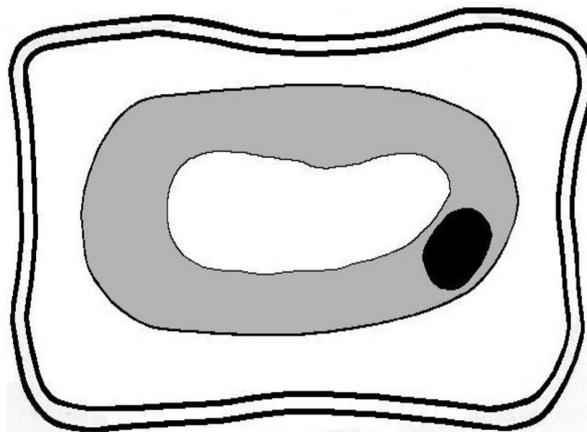
Diagram A



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

Diagram B 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. _____
_____ [1]

2. _____
_____ [1]

3. _____
_____ [1]

(iii) Explain the appearance of the carrot cell in diagram B.

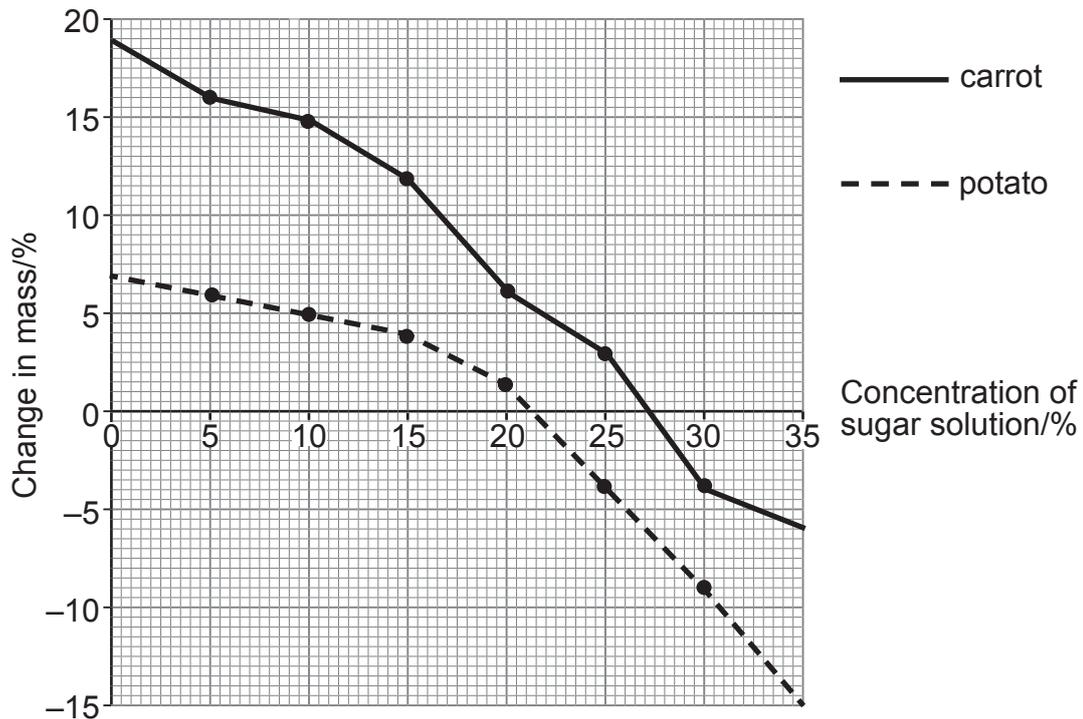
_____ [4]

[Turn over



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

The graph shows the results.



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

[1]

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]



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]

Franklin and Wilkins _____

_____ [1]

The work of these scientists led to new scientific knowledge.

- (b) Describe how scientific knowledge can be validated.

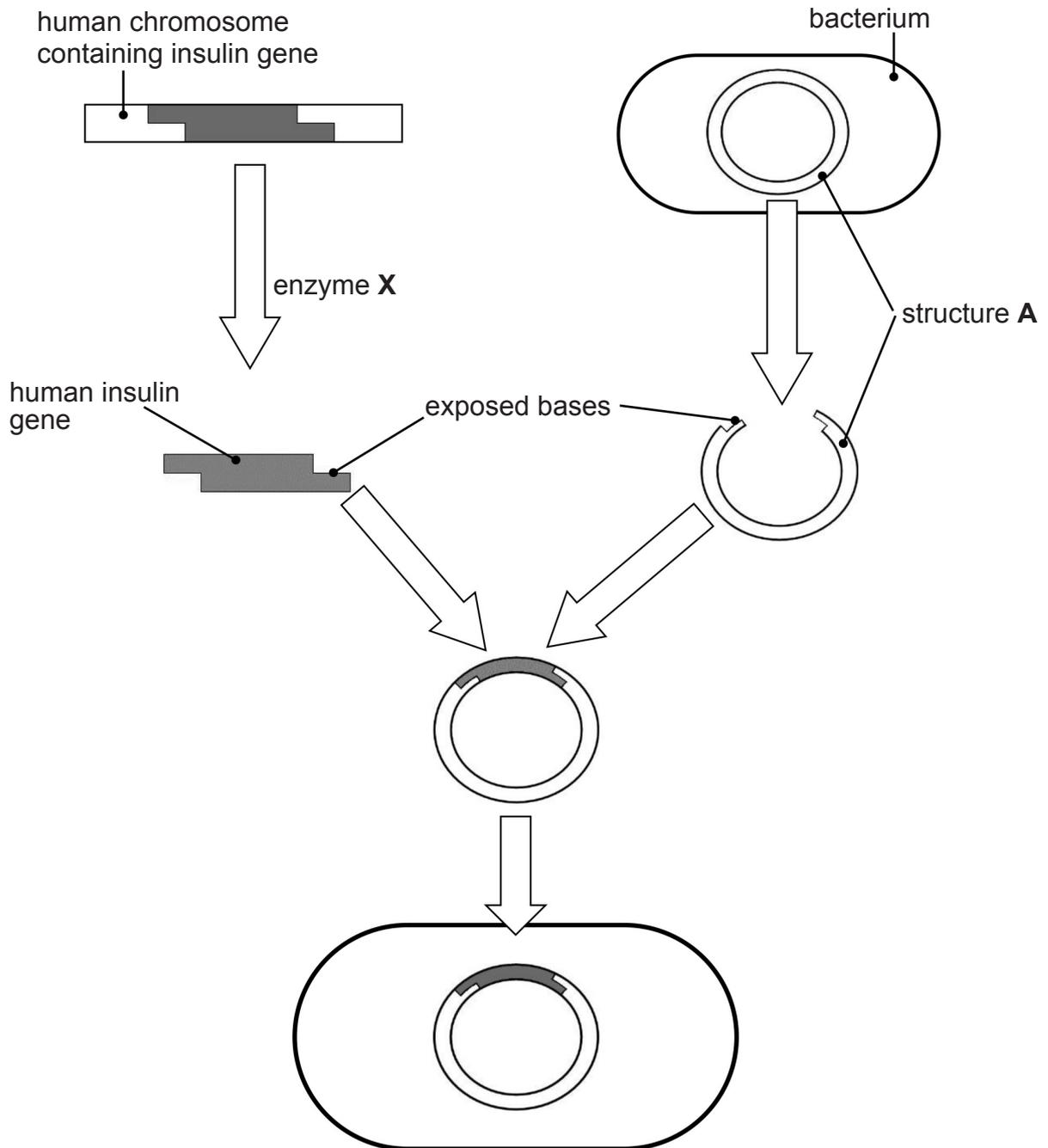
_____ [2]

[Turn over



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

The diagram shows the stages involved.



(i) Name structure A.

[1]



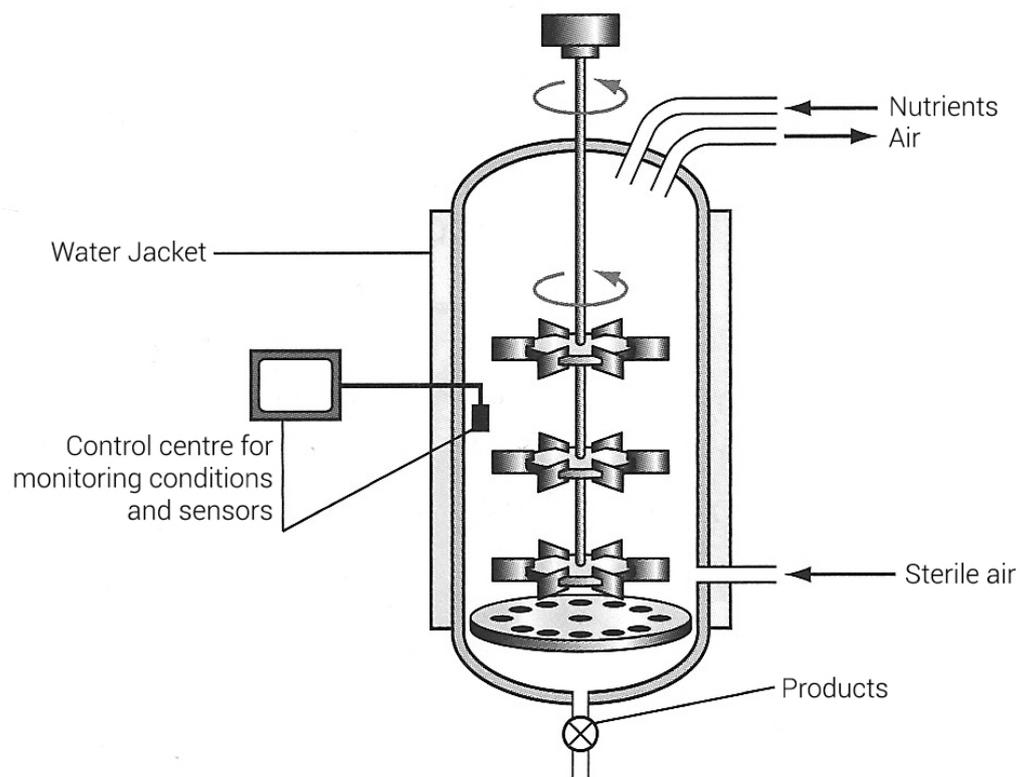
(ii) What type of enzyme is **X**?

[1]

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

[1]

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



© Barking Dog Art

(i) Explain why the air entering the system has to be sterile.

_____ [1]

[Turn over



The fermenter provides the optimum temperature for growth of bacteria.

(ii) Why is this necessary?

[1]

(iii) Describe how the temperature inside the fermenter is controlled.

[2]

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

(iv) What processes are involved in downstreaming?

[1]



- 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.



© Sovereign / ISM / Science Photo Library

- (i) Name the arteries shown in the X-ray.

[1]

- (ii) What builds up in the wall of the arteries to cause reduced blood flow?

[1]

- (iii) Give **two** factors that increase the risk of this type of damage to the arteries.

1. _____

[1]

2. _____

[1]

[Turn over

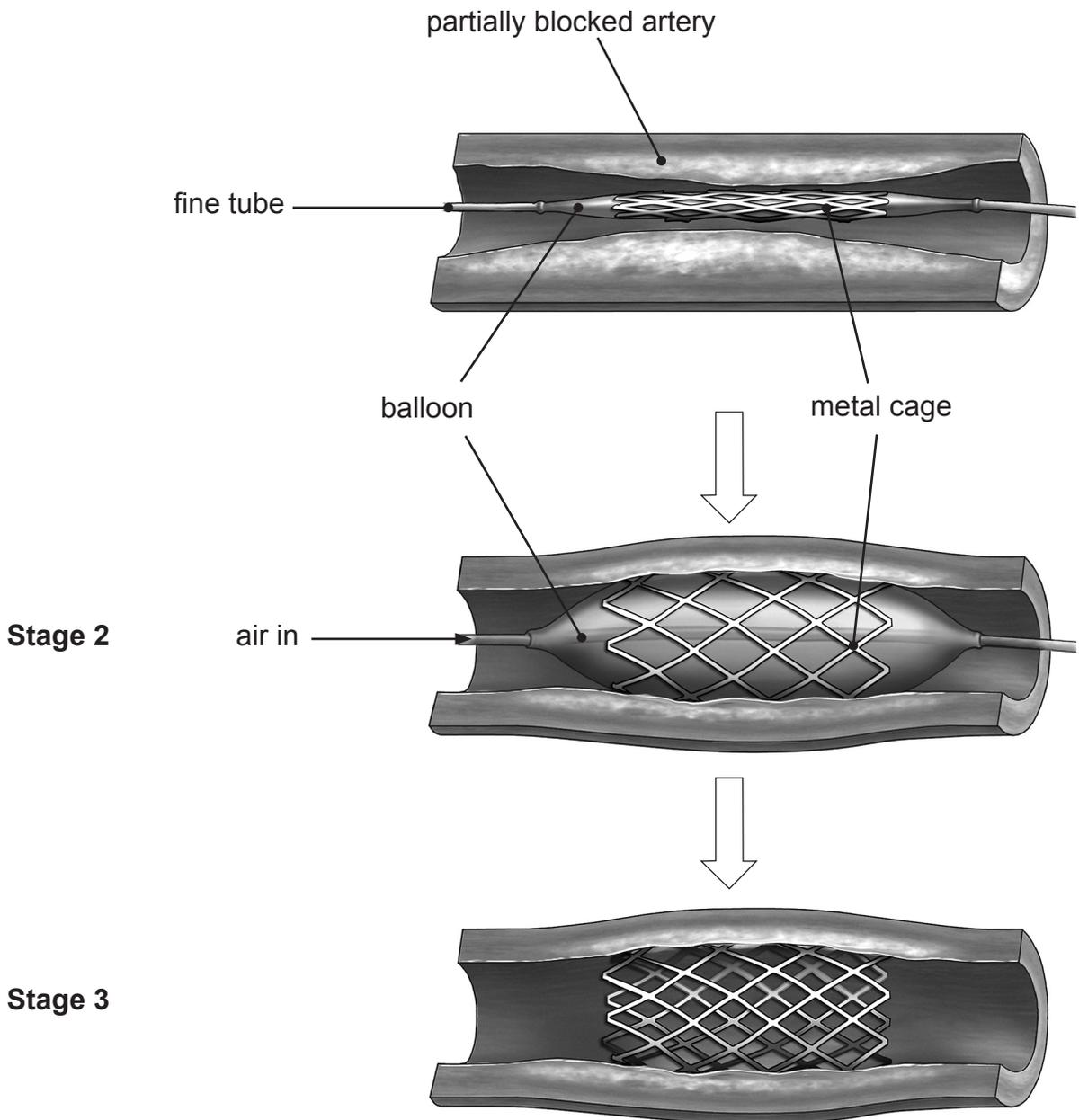


The diagrams show three stages of the treatment given to a patient with heart disease.

Stage 1

A fine tube is pushed into the partially blocked artery.

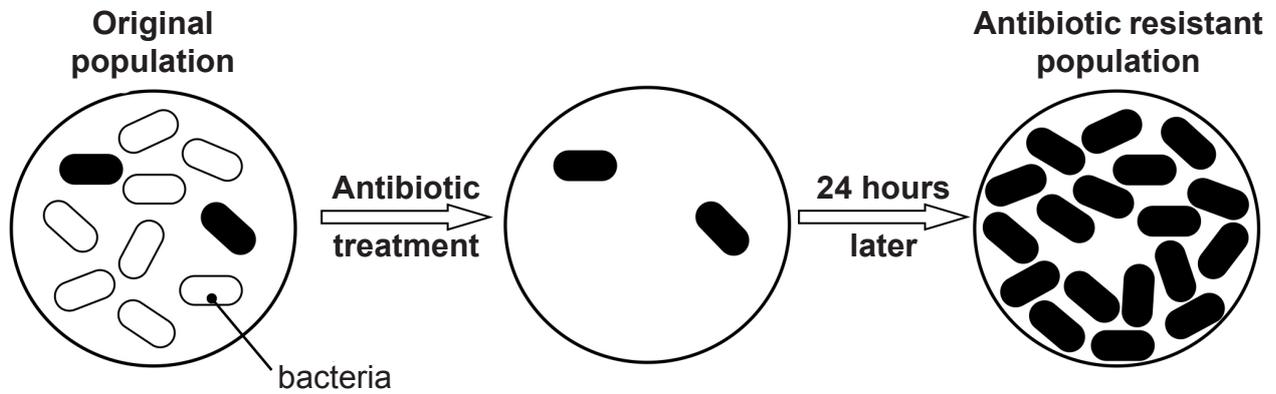
The tube is attached to a balloon covered with a metal cage.



© Nucleus Medical Art, Visuals Unlimited / Science Photo Library



- 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]

- (ii) Describe and explain the effect of the antibiotic treatment on the original population of bacteria.

 _____ [5]



(iii) Describe how this population of antibiotic resistant bacteria could develop into a superbug.

[2]



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

(i) Describe how tuberculosis is spread and prevented.

[2]

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

Tuberculosis in the UK 2014 report by Public Health Agency. Published September 2014. © Crown Copyright 2014. Contains public sector information licensed under the Open Government Licence v2.0

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

Describe the trend of this change.

[2]



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

© CDC - Data from Centers for Disease Control and Prevention, Office of Infectious Diseases "Antibiotic Resistance Threats in the United States, 2013" threat report

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]

[Turn over



13 (a) Describe and explain **two** ways the body can prevent microorganisms from entering.

1. _____

_____ [2]

2. _____

_____ [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.





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Question Number	Marks
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Examiner Number

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