Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024

Biology

Unit 2
Higher Tier

[GBL22]

GBL22

TUESDAY 11 JUNE, MORNING

TIME

1 hour 30 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 ten** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 90.
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 Question **8(b)**.

13863.06 **R**

1 **(a)** Explain how a plant loses water by transpiration.

_____

_____

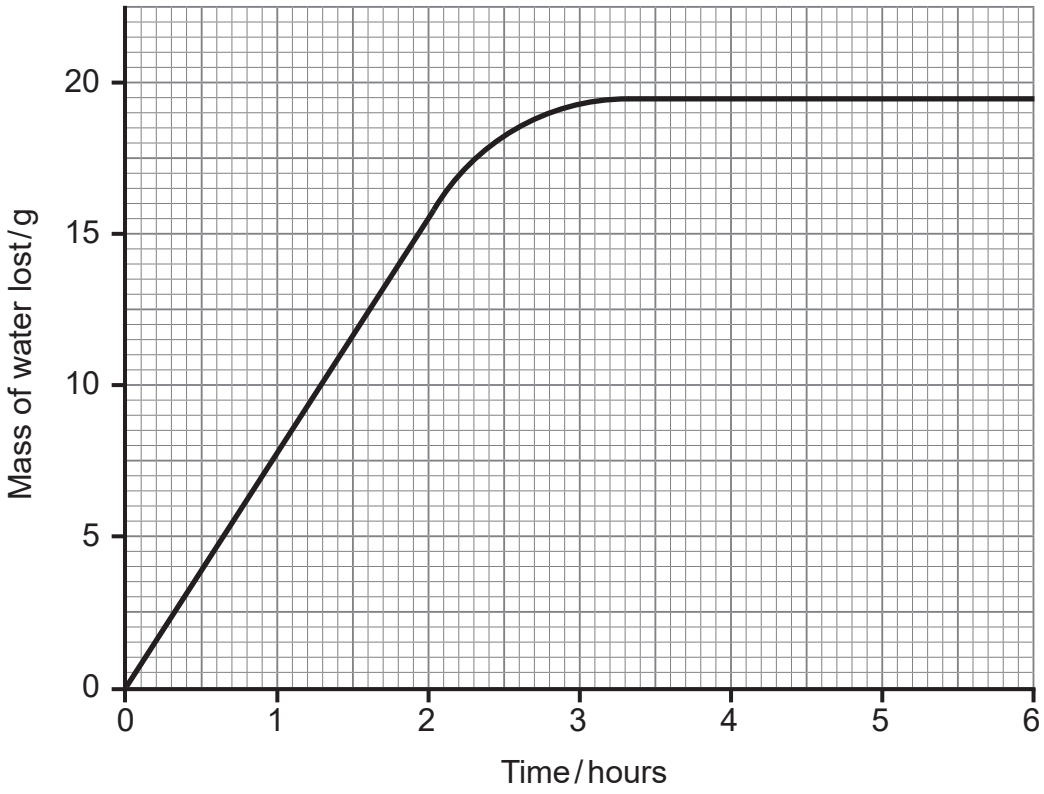
_____

_____

_____

_____ [3]

(b) The graph shows the mass of water lost by a plant kept in windy conditions for six hours.



Source: Principal Examiner

(i) Calculate the rate of water loss per hour over six hours.

Give your answer **to one decimal place**.

Show your working.

_____ g per hour [3]

(ii) **Draw a curve on the graph** showing the water loss for the same plant in humid conditions. [1]

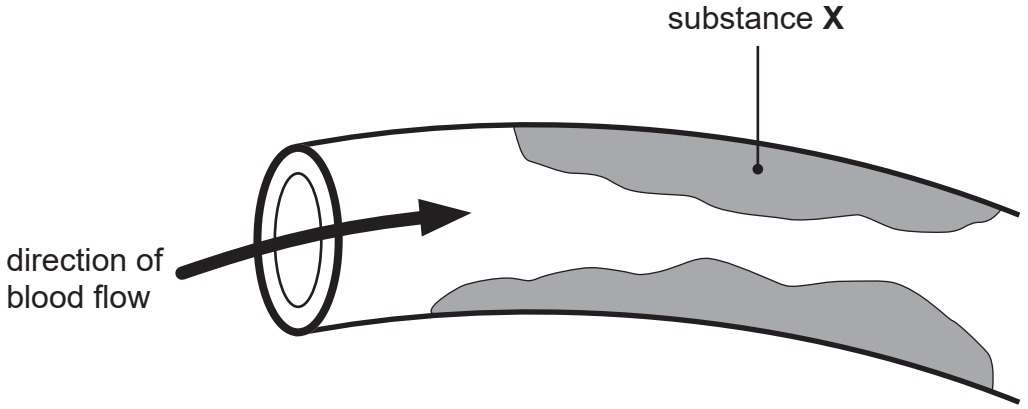
Transpiration is one way a plant uses water.

(c) Give **two other** ways a plant uses water.

1. _____

2. _____ [2]

2 **(a)** The diagram shows a section through an artery of a patient who has had a stroke.



Source: Principal Examiner

(i) Name substance **X**.

_____ [1]

(ii) Describe and explain why this patient may have another stroke if he does not receive treatment.

_____

_____

_____

_____

_____

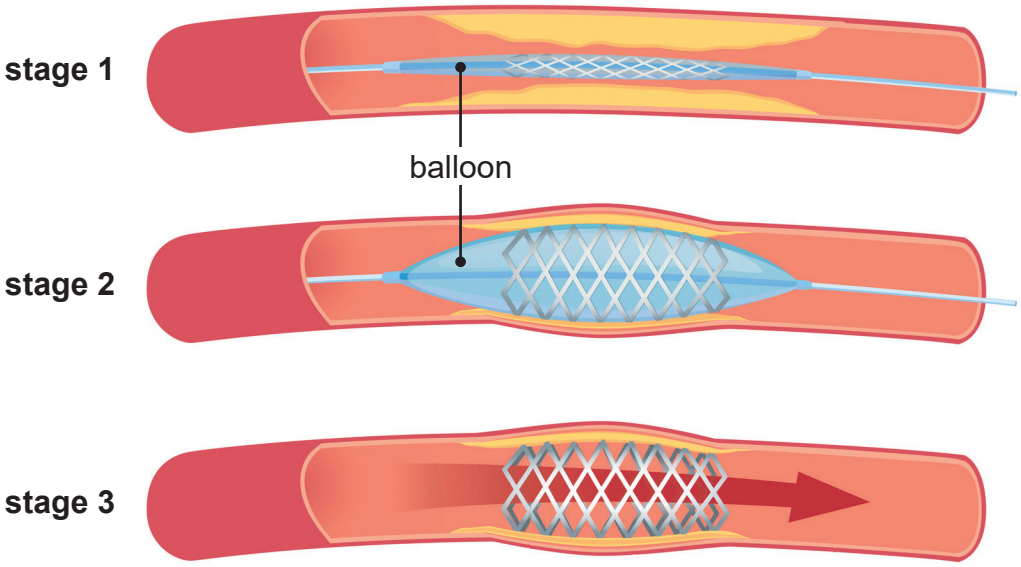
_____

_____

_____ [4]

The diagrams show three stages in the treatment received by the patient to reduce the chances of having another stroke.

In stage 1, a wire cage containing a balloon is pushed into the artery.



Source: © Getty Images

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

Stage 2 _____

_____

_____

_____

Stage 3 _____

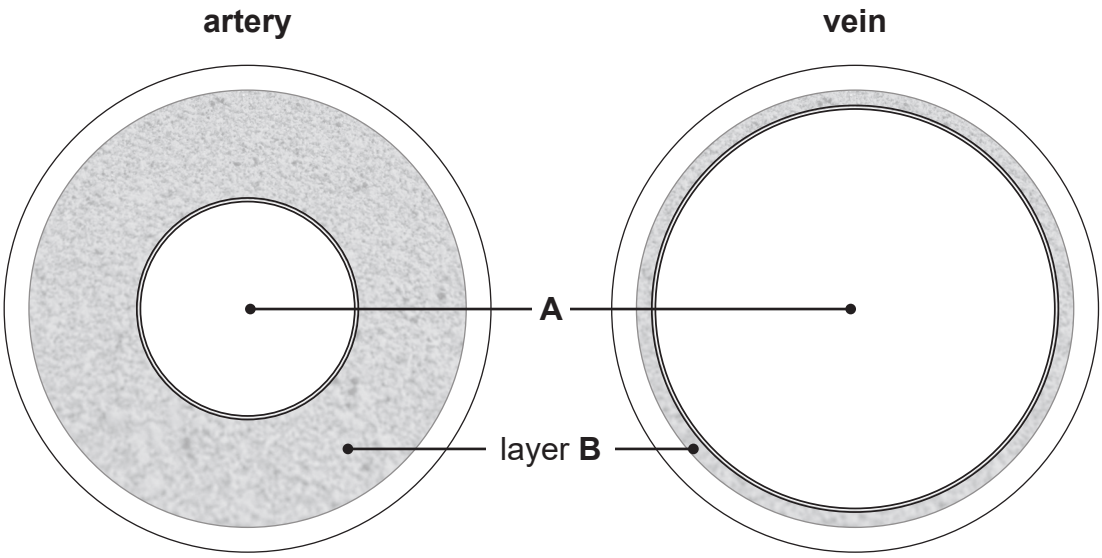
_____

_____

_____ [4]

[Turn over

3 **(a)** The diagrams show a cross section of an artery and a cross section of a vein.



Source: Chief Examiner

(i) Name part **A**.

_____ [1]

(ii) Describe how layer **B** in an artery is different from layer **B** in a vein.

Explain how this difference adapts the artery to its function.

Description _____

_____

_____

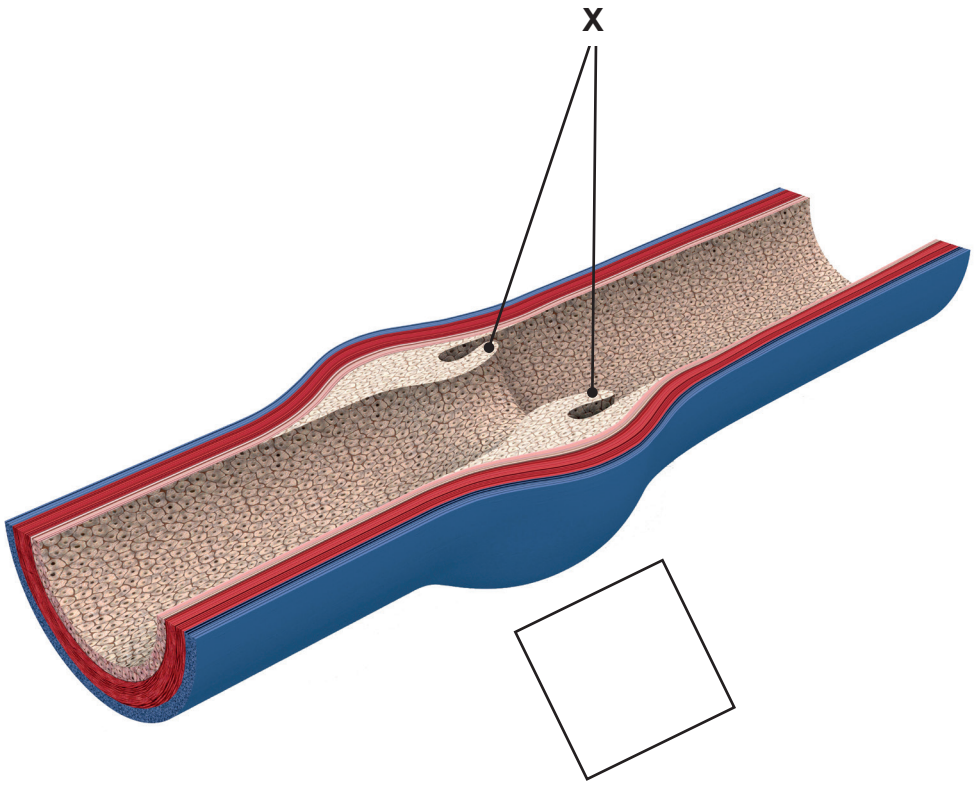
Explanation _____

_____

_____

_____ [3]

(b) The diagram shows a different section through a vein.



Source: © Mikkel Juul Jensen / Science Photo Library

(i) Name structure **X** and explain its function.

Structure **X** _____

Function _____

_____

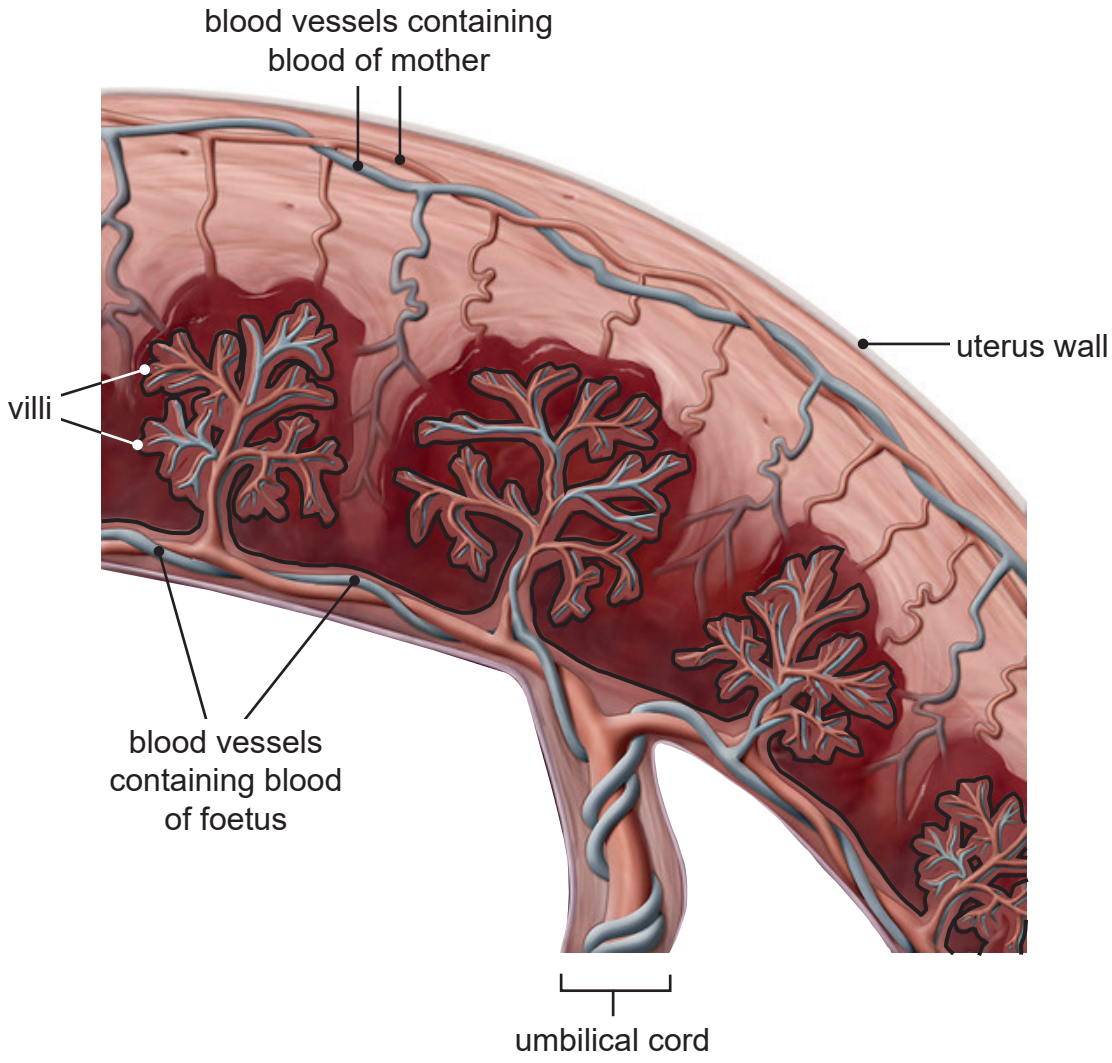
_____ [2]

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

[Turn over

4 Diagram A shows the structure of part of the placenta.

Diagram A



Source: © Getty Images

(a) Use evidence from the diagram to describe and explain **two** ways villi adapt the placenta for the exchange of gases and nutrients.

Description _____

_____

Explanation _____

_____

Description _____

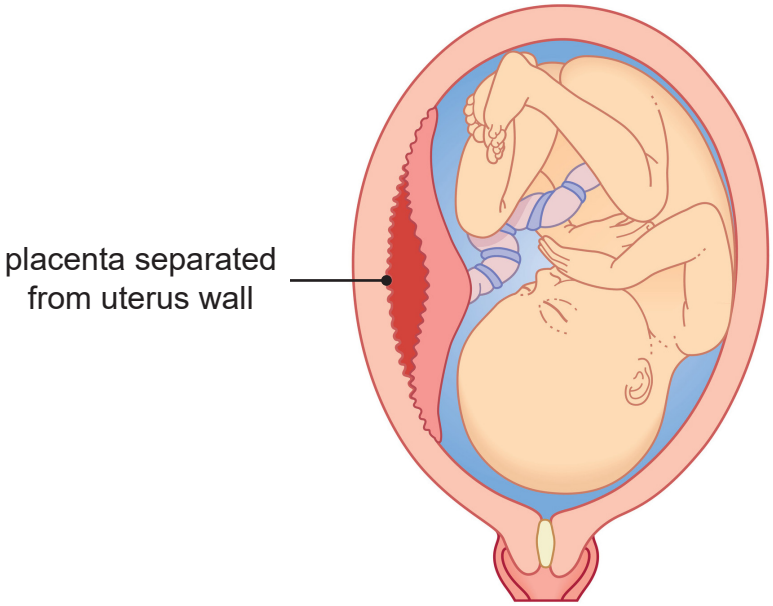
_____

Explanation _____

_____ [4]

(b) Diagram B shows a rare condition called a placental abruption.
In a placental abruption, part of the placenta separates from the uterus wall.

Diagram B



Source: © Getty Images

(i) Suggest what effect a placental abruption may have on the delivery of a **named** nutrient to a foetus.

_____

_____

_____ [2]

(ii) Describe how this may affect the growth of the foetus.

_____

_____ [1]

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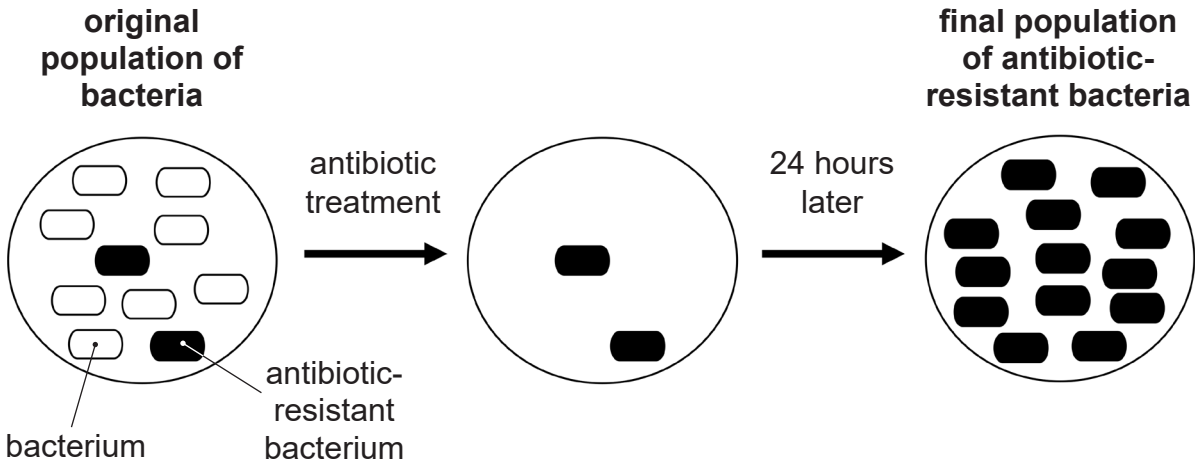
(Questions continue overleaf)

5 The diagram shows a population of bacteria and what happened when it was treated with an antibiotic.



Source: Chief Examiner

The original population of bacteria shows genetic variation.
This is caused by a random change in the DNA of the bacteria.

(a) What term describes this random change in the DNA of the bacteria?

_____ [1]

(b) Explain how the antibiotic treatment results in the final population of antibiotic-resistant bacteria.

_____

_____

_____

_____

_____

_____

_____

_____ [4]

(c) Suggest how this population of antibiotic-resistant bacteria could develop into a superbug.

_____

_____

_____

_____ [2]

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6 **(a)** COVID-19 is a disease which can be spread from one person to another.

(i) What term describes a disease which can be spread from one person to another?

_____ [1]

COVID-19 is caused by a type of coronavirus which causes respiratory infections.

It spreads in a **similar way** to tuberculosis (TB).

(ii) Describe how COVID-19 can be **spread** from one person to another.

_____

_____

_____

_____

_____

_____ [3]

(b) The table shows the total number of COVID-19 cases reported in the UK from 15th February to 19th May in 2020.

Date	Number of COVID-19 cases reported
15th February	9
27th February	16
6th March	151
24th March	7 310
11th April	71 428
22nd April	120 706
7th May	186 909
19th May	224 980

Source: www.worldometers.info/coronavirus/country/uk Data © Crown copyright

(i) Calculate the percentage increase in the number of COVID-19 cases from 22nd April to 19th May.

Give your answer to **two decimal places**.

Show your working.

_____ % [3]

(ii) Suggest **one economic** impact on society of this increase in the number of COVID-19 cases.

_____

_____ [1]

(c) In Europe, the first clinical trials of a COVID-19 vaccine began on 23rd April 2020.

Before clinical trials begin, preclinical trials have to be carried out on tissues and animals.

(i) Give **two** reasons for carrying out preclinical trials.

1. _____

_____

2. _____

_____ [2]

Clinical trials of a vaccine are carried out on a small number of healthy volunteers before the vaccine is given to patients.

(ii) Explain the purpose of these clinical trials.

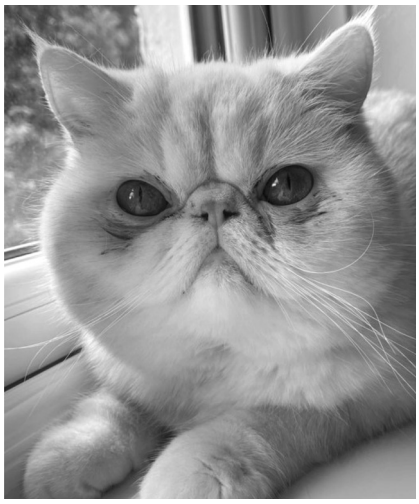
_____

_____ [1]

7 Some people have an allergic reaction to cats.

These allergic reactions are caused by proteins, called Fd proteins, found in the cat's fur.

The allergic reactions may include a runny nose, rash and itchy eyes.



Source: Principal Examiner

(a) Suggest how selective breeding could be used to breed cats with fewer Fd proteins in their fur.

_____

_____

_____

_____

_____

_____

_____

_____ [3]

(b) Suggest why it would be an advantage to own a cat with fewer Fd proteins in its fur.

_____

_____ [1]

(c) Suggest **one other** desirable characteristic which could be developed in cats by selective breeding.

_____

_____ [1]

8 Human insulin is used to treat diabetes.

Human insulin can now be produced by genetic engineering.

Before human insulin was produced by genetic engineering, insulin was obtained from animals.

(a) Explain what is meant by the term genetic engineering.

_____

_____

_____

_____ [2]

(b) Describe the steps a genetic engineer uses to **create genetically engineered bacteria** which can produce human insulin.

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

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

[6]

(c) The genetically engineered bacteria are cultured in a fermenter and produce human insulin. The human insulin is then extracted and purified.

(i) Suggest why it is important to purify the human insulin before it is used to treat diabetes.

_____

_____ [1]

Human insulin produced by genetic engineering is more effective than insulin obtained from animals.

(ii) Suggest **two other** advantages of producing human insulin by genetic engineering.

1. _____

_____

2. _____

_____ [2]

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(Questions continue overleaf)

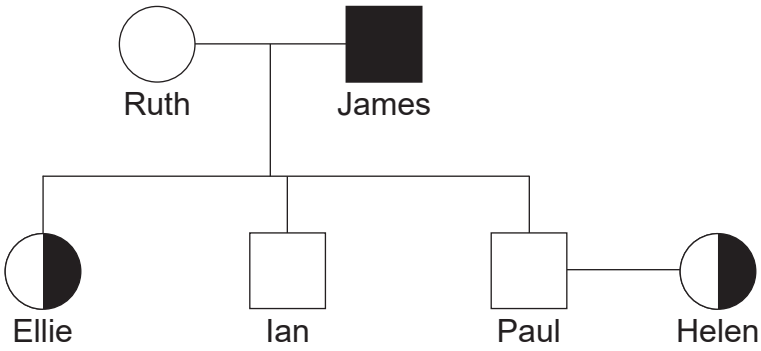
9 Haemophilia is a genetic condition caused by a recessive, sex-linked allele.

(a) Explain why the allele for haemophilia is described as sex-linked.

_____

_____ [1]

The diagram shows the inheritance of haemophilia in a family.



Key

normal female

normal male

carrier female

haemophiliac male

(b) Name this type of diagram.

_____ [1]

Ellie is a carrier.

(c) Describe her phenotype.

_____ [1]

(d) Let $\mathbf{X^H}$ represent a normal X chromosome.

Let $\mathbf{X^h}$ represent an X chromosome carrying the allele which causes haemophilia.

Let **Y** represent a Y chromosome.

(i) Explain why Ian is a normal male even though his father has haemophilia.

_____

_____

_____

_____ [2]

Helen and Paul are expecting their first child.

(ii) Complete the genetic diagram to show Helen's gametes, Paul's gametes and the possible genotypes of their children.

Helen's gametes

Paul's gametes			
	Y		

[4]

(e) **(i)** What is the percentage probability of Helen and Paul having a child with haemophilia?

_____ % [1]

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Genetic screening involves testing an individual for the presence of a genetic condition caused by a particular allele.

(ii) Suggest why Helen and Paul may have benefited from genetic screening before deciding to start a family.

Use evidence from your completed genetic diagram to support your answer.

_____

_____

_____

_____

_____

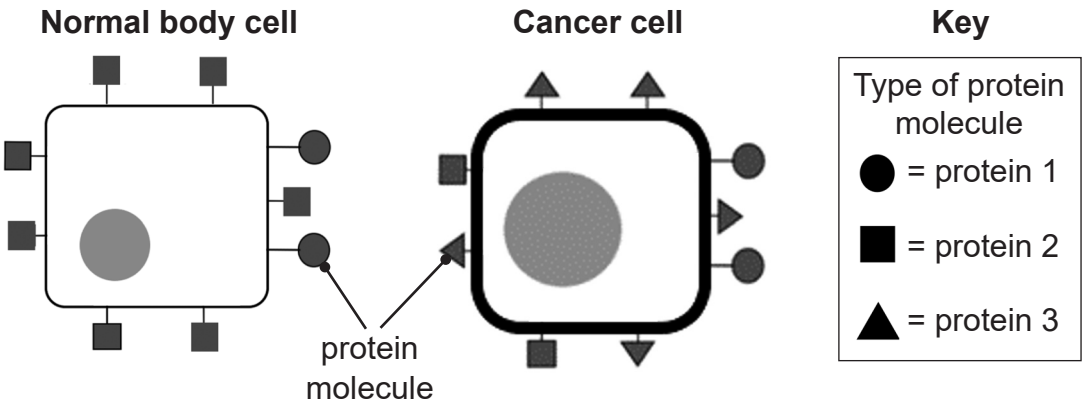
_____

_____

_____

_____ [3]

10 (a) The diagrams show different types of protein molecule found on the cell membrane of a normal body cell and on a cancer cell from a patient.



Source: Principal Examiner

Scientists decided to use antibodies to treat this cancer patient.

Antibodies are used to target specific proteins on the cancer cell.

(i) Name this type of cancer treatment.

_____ [1]

(ii) Suggest which type of protein molecule the scientists should target.

Explain your choice.

Protein _____

Explanation _____

_____

_____ [2]

(iii) Give **one** advantage of this type of treatment compared to other types of cancer treatment.

_____

_____ [1]

(iv) Give **two other** differences between the cancer cell and the normal body cell.

1. _____

_____

2. _____

_____ [2]

(b) The scientists carried out the following steps to produce antibodies in the laboratory.

Step 1 One type of protein molecule is removed from a cancer cell.

↓

Step 2 These protein molecules are injected into a mouse.

↓

Step 3 Three days later, lymphocytes are removed from the mouse.

↓

Step 4 Large numbers of these lymphocytes are cultured.

↓

Step 5 Antibodies made by these lymphocytes are injected into the cancer patient.

(i) Describe how the lymphocytes in the mouse's body respond to the protein molecule being injected in **step 2**.

_____

_____

_____ [1]

(ii) Suggest why large numbers of lymphocytes are cultured in **step 4**.

_____

_____ [1]

(iii) Explain what happens to the cancer cells when the antibodies are injected into the patient in **step 5**.

_____

_____

_____

_____

_____

_____ [3]

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
Total Marks	

Examiner Number

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