



General Certificate of Secondary Education  
2014

## Double Award Science: Biology

Unit B2

Higher Tier

[GSD42]



FRIDAY 6 JUNE 2014, AFTERNOON

### 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.

Write your answers in the spaces provided in this question paper.

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 **questions 5(b) and 7(b)**.

Centre Number

71

Candidate Number

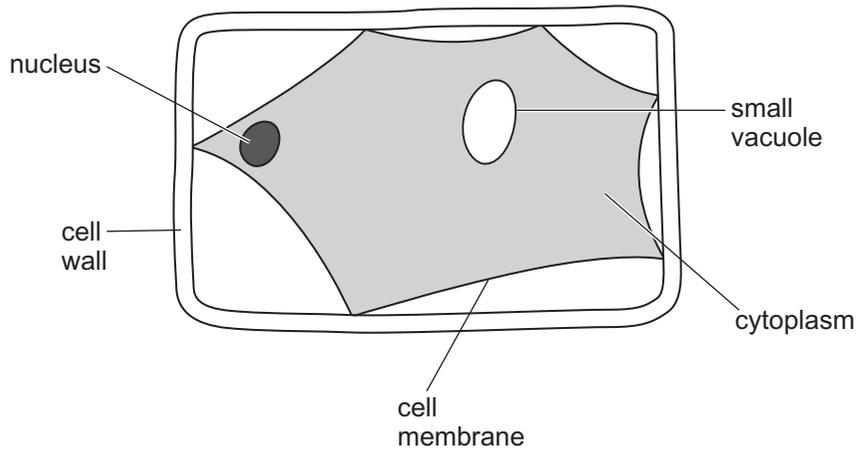
For Examiner's  
use only

| Question Number | Marks |
|-----------------|-------|
| 1               |       |
| 2               |       |
| 3               |       |
| 4               |       |
| 5               |       |
| 6               |       |
| 7               |       |
| 8               |       |
| 9               |       |
| 10              |       |

Total  
Marks

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- 1 The diagram below shows a plant cell as seen under a microscope. The cell had been left in strong sugar solution for 30 minutes.



- (a) What term describes the cell as it appears in the diagram?

\_\_\_\_\_

[1]

- (b) Redraw the cell, **to the same scale**, as it would appear after being left in water for 30 minutes. Label the **cell wall**, **cell membrane** and **vacuole** on your drawing.

[4]

| Examiner Only |        |
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| Marks         | Remark |
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- 2 (a) The photograph below shows the type of mosquito which can carry the virus that causes the disease yellow fever. When a person is bitten by this type of mosquito, the virus can be passed to that person. Approximately 7% of people who catch yellow fever die from it within three weeks.



© Sinclair Stammers/ Science Photo Library

Paul is planning to visit Africa and has been advised to be vaccinated against yellow fever before he travels.

Suggest two reasons why Paul should be vaccinated before he travels.

1. \_\_\_\_\_
2. \_\_\_\_\_ [2]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
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- (b) The MMR vaccine gives immunity against measles, mumps and rubella.

The table below shows the percentage of the population who received the MMR vaccine in 2011, in the different regions of the United Kingdom.

| Region of United Kingdom | Percentage of the population who received the MMR vaccine |
|--------------------------|---|
| England                  | 89.1  |
| Wales                    | 91.5  |
| Scotland                 | 93.2  |
| Northern Ireland         | 92.9  |

- (i) Calculate the difference in the percentage of the population who received the MMR vaccine in Northern Ireland compared to England.

\_\_\_\_\_ % [1]

In 2011, there were fewer cases of measles in Northern Ireland than in England.

- (ii) Suggest **one** reason why there were fewer cases of measles in Northern Ireland than in England, in 2011.

\_\_\_\_\_  
\_\_\_\_\_ [1]

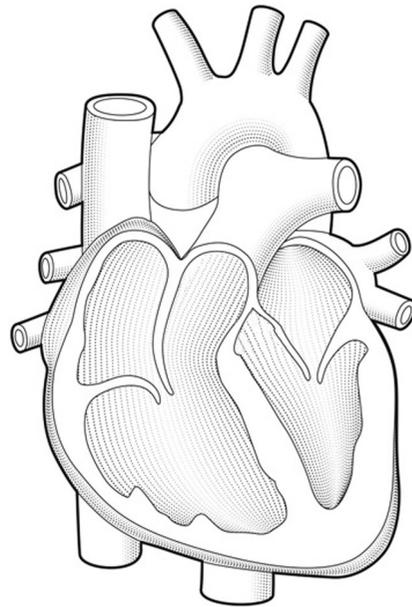
- (iii) Name the scientist who developed the first vaccine.

\_\_\_\_\_ [1]

| Examiner Only |        |
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| Marks         | Remark |
|               |        |

3 The heart pumps blood around the body.

(a) The diagram below shows a section through the heart.



© Paul Wootton/ Science Photo Library

On the diagram, label the left ventricle and the pulmonary artery.

[2]

Blood passes through the heart twice during one complete circuit of the body.

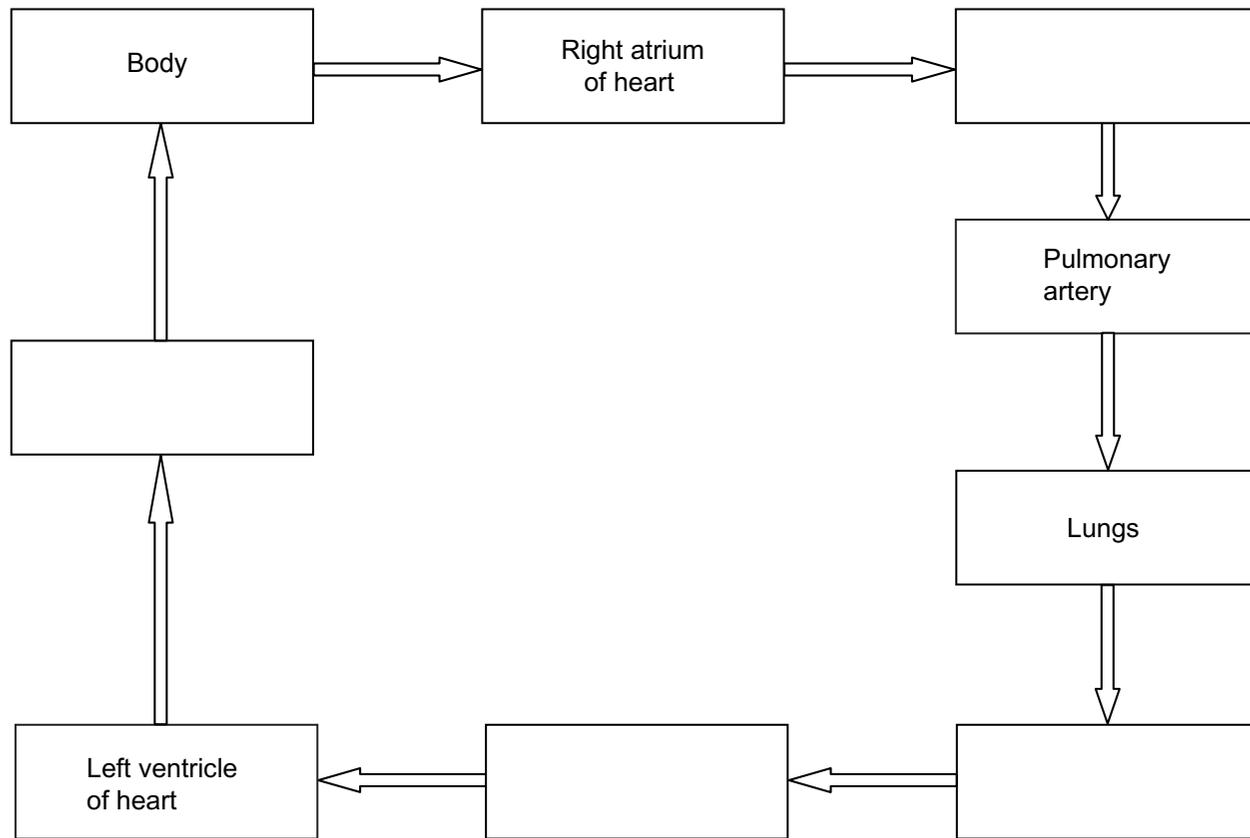
(b) What term is used to describe the passage of blood twice through the heart during one complete circuit of the body?

\_\_\_\_\_

[1]

| Examiner Only |        |
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| Marks         | Remark |
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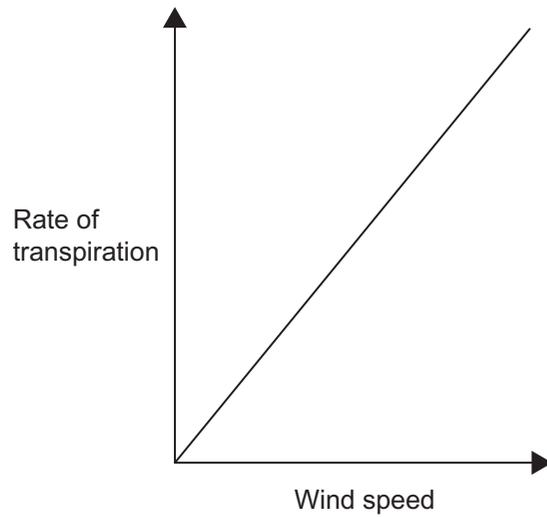
(c) In the diagram below, fill in the empty boxes to show the passage of blood through the heart and around the body. The empty boxes represent heart chambers or blood vessels.



[4]

| Examiner Only |        |
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| Marks         | Remark |
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- 4 (a) The graph below shows the effect of increasing wind speed on the rate of transpiration in plants.



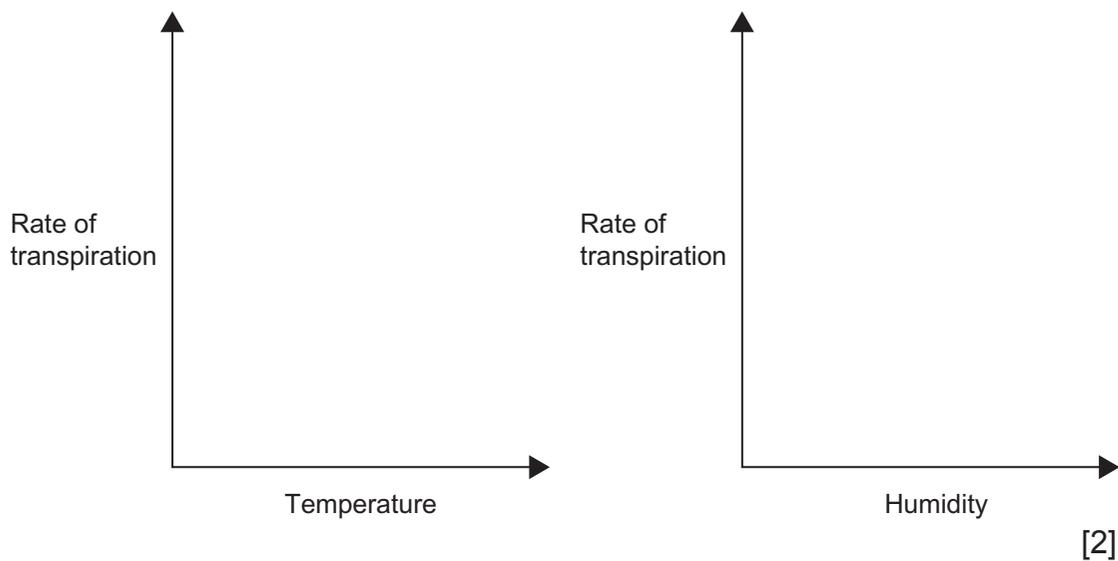
- (i) Using the graph, describe the trend shown.

\_\_\_\_\_

\_\_\_\_\_ [1]

Temperature and humidity are two other factors that have an effect on the rate of transpiration in plants.

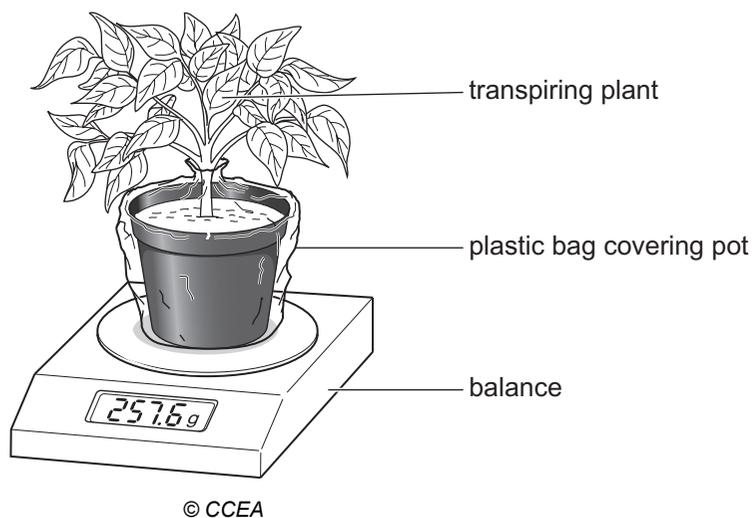
- (ii) On the axes below, draw a line to show the effect of increasing temperature and a line to show the effect of increasing humidity on the rate of transpiration.



[2]

| Examiner Only |        |
|---------------|--------|
| Marks         | Remark |
|               |        |

- (b) The diagram below shows apparatus used to investigate the effect of surface area of leaves on the rate of transpiration in a plant.



- (i) Suggest why the pot was covered with a plastic bag.

\_\_\_\_\_ [1]

The plant was weighed, left for **24 hours** and then reweighed.

The **rate** of transpiration was calculated as 3.8 g per hour.

Some leaves were removed from the plant and the experiment was repeated.

The table below shows the result for the second experiment.

| Mass of plant at start /g | Mass of plant after 24 hours /g |
|---------------------------|---------------------------------|
| 257.6                     | 185.6                           |

- (ii) Using the data in the table above, calculate the rate of transpiration (in g per hour) in the second experiment.

Show your working.

\_\_\_\_\_ g per hour [2]

| Examiner Only |        |
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| Marks         | Remark |
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(iii) Explain why the rate of transpiration is lower when some leaves were removed.

\_\_\_\_\_

\_\_\_\_\_ [2]

(iv) Plants use water in transpiration.

Give two **other** uses of water by a plant.

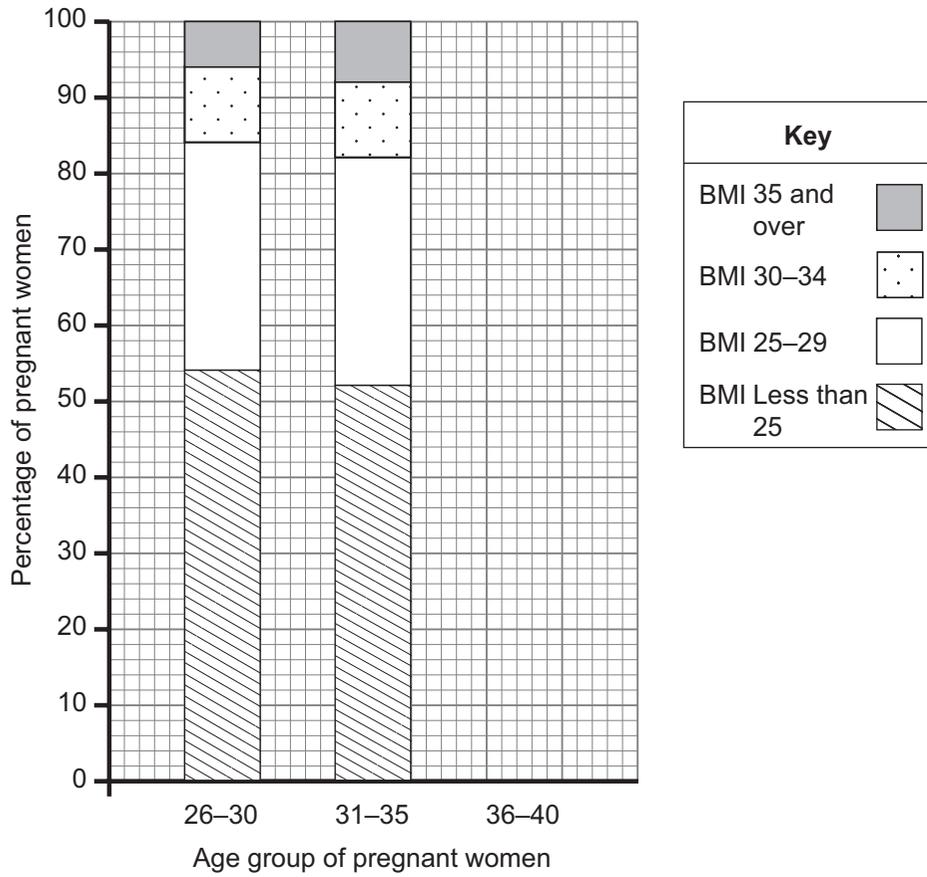
1. \_\_\_\_\_
2. \_\_\_\_\_ [2]

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- 5 (a) Obesity in pregnant women can increase the risk of health problems in the developing baby.

The graph below shows the BMI (body mass index) of pregnant women, in different age groups, in Northern Ireland in 2010–2011.



**Women are defined as being obese if they have a BMI of 30 and over.**

- (i) What percentage of pregnant women aged 31–35 were classed as being obese?

Show your working.

\_\_\_\_\_ % [2]

| Examiner Only |        |
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| Marks         | Remark |
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The table below shows the BMI of pregnant women aged 36–40.

| BMI          | Key   | Percentage of pregnant women aged 36–40 |
|--------------|---|---|
| 35 and over  |  | 10                                      |
| 30–34        |  | 10                                      |
| 25–29        |  | 38                                      |
| Less than 25 |  | 42                                      |

[3]

(ii) Complete the graph opposite by using this data to draw the bar for pregnant women aged 36–40.

(iii) Using the completed graph, give the age group of pregnant women that is **least** likely to have a developing baby with health problems.

\_\_\_\_\_

[1]

| Examiner Only |        |
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| Marks         | Remark |
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(b) As well as causing problems in pregnancy, obesity can result in high cholesterol levels.

Describe and explain how a diet which is high in cholesterol could lead to a heart attack.

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

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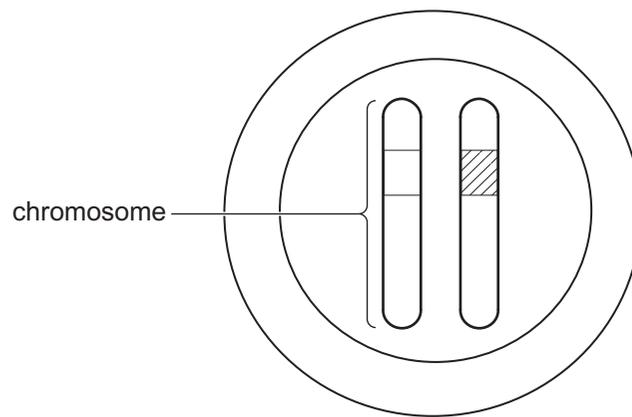
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[6]

| Examiner Only |        |
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| Marks         | Remark |
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- 6 (a) The diagram below shows a cell containing a nucleus with two chromosomes.



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- (i) Name the molecule that makes up chromosomes.

\_\_\_\_\_

[1]

- (ii) In the space below, draw the cells and chromosomes that would be produced when this cell divides by **mitosis**.

[3]

| Examiner Only |        |
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(c) Explain how a test (back) cross could be used to determine the possible genotypes of a smooth pea plant.

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[3]

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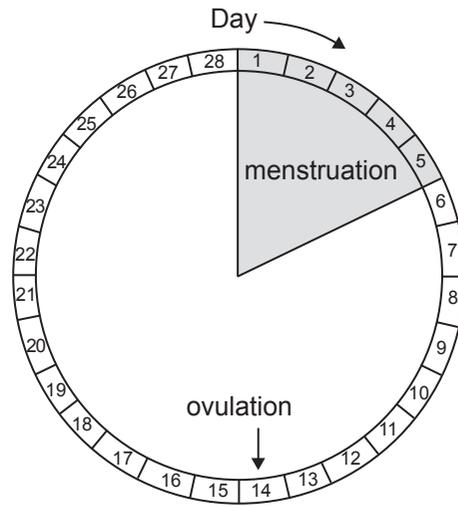
7 Sex hormones are involved in the menstrual cycle.

(a) How are hormones transported around the body?

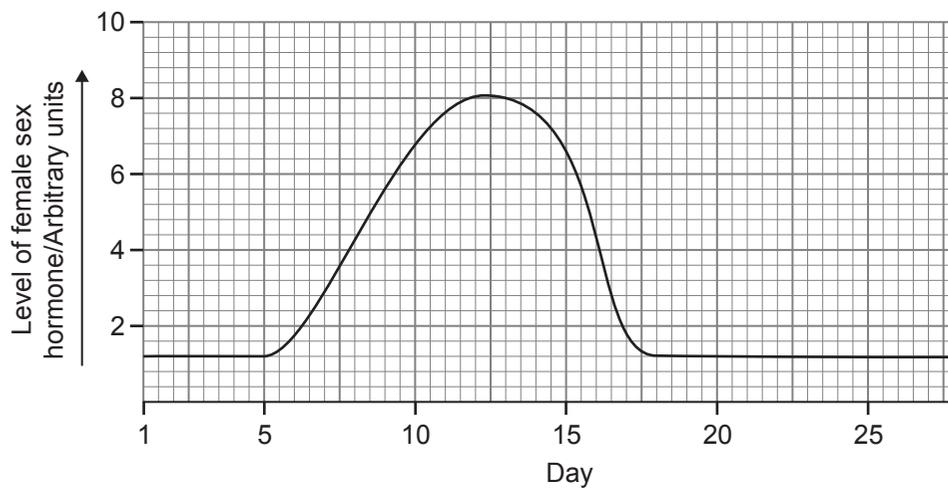
\_\_\_\_\_

[1]

(b) The diagram below shows a 28 day menstrual cycle.



The graph below shows how levels of a female sex hormone change during the menstrual cycle.



| Examiner Only |        |
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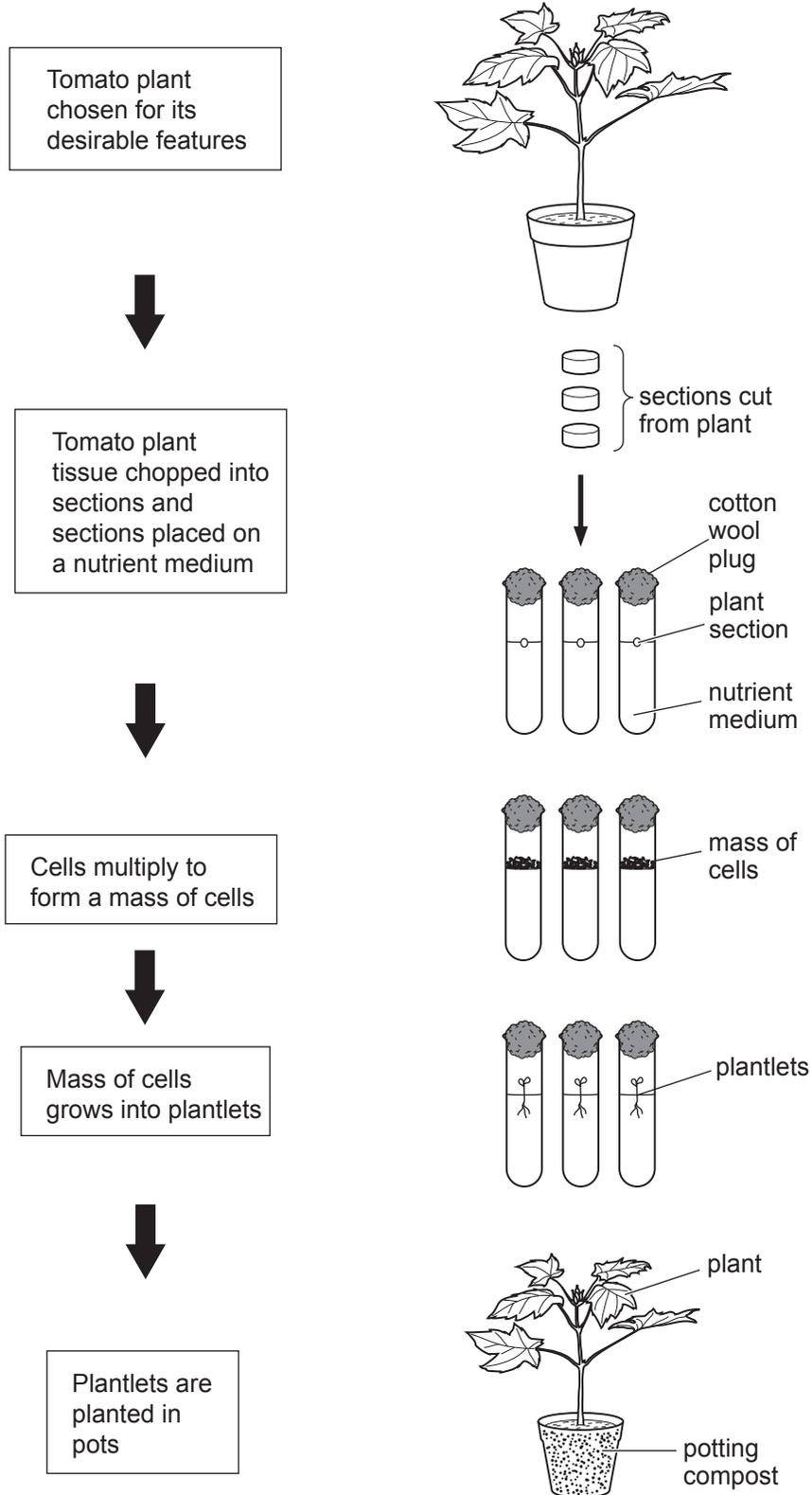


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- 8 (a) Explain why cloning in plants can be described as asexual reproduction.

[1]

- (b) The diagram shows one method of asexual reproduction by which plants can be cloned.



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| Marks         | Remark |
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- 9 In a grassland there were equal numbers of brown and white rabbits. A farmer changed the use of this land from grassland to woodland.

Several years after the change in land use he surveyed the rabbit population. The results showed that there was the same number of rabbits but the number of brown rabbits had increased while the number of white rabbits had decreased.

Foxes hunt and eat rabbits. The population of foxes in the area did not change.

- (a) Describe how natural selection can account for the **increase** in the number of brown rabbits in the rabbit population as a result of the change in land use.

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[4]

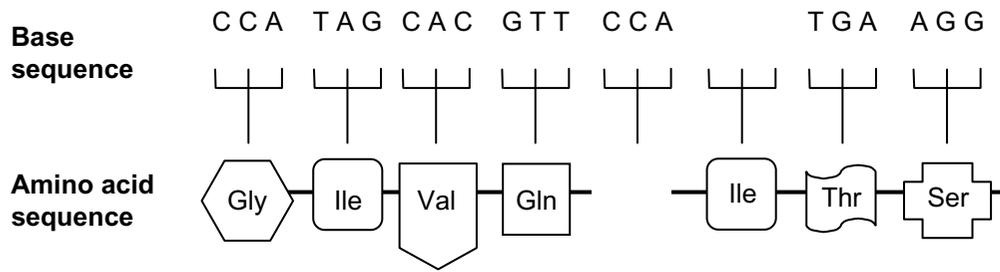
- (b) Suggest two changes that could cause the number of **white** rabbits in the population to increase in the future.

1. \_\_\_\_\_

2. \_\_\_\_\_ [2]

| Examiner Only |        |
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| Marks         | Remark |
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- 10 (a) The diagram below shows part of the base sequence of DNA which is used to code for specific amino acids. The amino acids join to make a protein molecule such as insulin.



- (i) Complete the diagram by:
- adding the missing three bases in the base sequence.
  - drawing the missing amino acid in the amino acid sequence.
- [2]

- (ii) Insulin is a protein made up of 51 amino acids.

How many bases are needed to code for this protein?

\_\_\_\_\_ [1]

- (iii) Explain what would happen if the first base (C) in the base sequence above was removed.

\_\_\_\_\_

\_\_\_\_\_

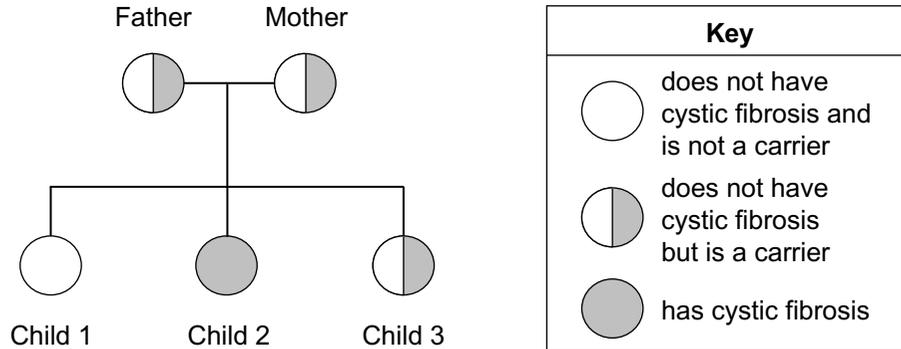
\_\_\_\_\_ [2]

| Examiner Only |        |
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- (c) Cystic fibrosis is an inherited condition. The diagram below shows how two parents who are carriers can have a child with cystic fibrosis.

A carrier is a person who has an allele for a condition but does not have the condition.



- (i) Using the diagram and your knowledge, explain how two parents who are carriers can have a child with cystic fibrosis.

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_ [2]

- (ii) Anne and Niall have a child with cystic fibrosis.

Anne is pregnant with a second baby and has asked her doctor for information on genetic screening.

Suggest two ethical issues associated with genetic screening during pregnancy.

1. \_\_\_\_\_
2. \_\_\_\_\_ [2]

- (iii) Cystic fibrosis is caused by a change in the genes.

Name one genetic condition that is caused by a change in the **number of chromosomes**.

\_\_\_\_\_ [1]

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

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| Marks         | Remark |
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