A

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier

Biology Paper 2F

F

8464/B/2F

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and other names, your centre number, your candidate number and add your signature.

[Turn over]

For this paper you must have:
- **a ruler**
- **a scientific calculator.**

INSTRUCTIONS

- **Use black ink or black ball-point pen.**
- **Pencil should only be used for drawing.**
- **Answer ALL questions in the spaces provided.**
- **If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).**
- **Do all rough work in this book. Cross through any work you do not want to be marked.**
- **In all calculations, show clearly how you work out your answer.**

INFORMATION

- **The maximum mark for this paper is 70.**
- **The marks for questions are shown in brackets.**
- **You are expected to use a calculator where appropriate.**
- **You are reminded of the need for good English and clear presentation in your answers.**

DO NOT TURN OVER UNTIL TOLD TO DO SO

0 1

This question is about genetics.

0 1 . 1

Crop plants are genetically modified (GM) for useful characteristics.

Which useful characteristic are crops genetically modified for? [1 mark]

Tick (✓) ONE box.

- ☐ **Fewer roots**
- ☐ **Larger yields**
- ☐ **Smaller fruits**

0 1 . 2

What is ONE concern about GM crops?
[1 mark]

Tick (✓) ONE box.

- ☐ **GM crops will add to global warming.**
- ☐ **GM crops will cause air pollution.**
- ☐ **GM crops will harm wildlife.**
- ☐ **GM crops will produce too much food.**

Some inherited disorders are caused by a faulty piece of DNA.

0 1 . 3

What is the name of a piece of DNA that codes for a characteristic? [1 mark]

0 1 . 4

DNA contains a code for making substances in the cell.

What type of substance is made using the DNA code? [1 mark]

Tick (✓) ONE box.

- ☐ **Fat**
- ☐ **Protein**
- ☐ **Starch**
- ☐ **Sugar**

[Turn over]

Cystic fibrosis (CF) is an inherited disorder.

The allele for having CF is recessive (h).

The allele for NOT having CF is dominant (H).

0 1 . 5

What is a recessive allele? [1 mark]

Tick (✓) ONE box.

☐ An allele that is always expressed.

☐ An allele that is expressed if only one copy is present.

☐ An allele that is only expressed if two copies are present.

A man and a woman do NOT have CF.
The man has the alleles Hh.

0 1 . 6

What word describes the alleles of the man? [1 mark]

Tick (✓) ONE box.

- ☐ Heterozygous
- ☐ Homozygous
- ☐ Phenotype

0 1 . 7

The man and the woman want to have a child.

Complete FIGURE 1 to show the possible genotypes of the child.

Draw a ring around the genotype of a child who will have CF. [3 marks]

FIGURE 1

		Woman	
		H	**h**
Man	**H**		
	h		**hh**

0 1 . 8

What is the chance that a child of the man and the woman will have CF?
[1 mark]

Tick (✓) ONE box.

- ☐ **25%**
- ☐ **50%**
- ☐ **75%**
- ☐ **100%**

[Turn over]

0 1 . 9

The woman is pregnant.

The woman can have embryo screening to find out if the child will have CF.

Suggest ONE reason why the woman might NOT want to have embryo screening. [1 mark]

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[Turn over]

0 2

On a school field:

- **one area of the soil was usually wet**
- **another area of the soil was usually dry.**

Students investigated the effect of water in the soil on the number of buttercup plants growing in each area.

On the field the students marked out:

- **an area of 10 m by 10 m on the wet soil**
- **an area of 10 m by 10 m on the dry soil.**

0 2 . 1

Describe how a quadrat can be used to measure the size of the buttercup population on the wet soil area.
[4 marks]

16

0 2 . 2

What type of factor is water in the soil?
[1 mark]

Tick (✓) ONE box.

- ☐ **A biotic factor**
- ☐ **A control factor**
- ☐ **An abiotic factor**

0 2 . 3

Give TWO factors which might affect the number of buttercups growing on the school field.

Do NOT refer to water in your answer.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 4

Complete the sentence.

Choose the answer from the list.
[1 mark]

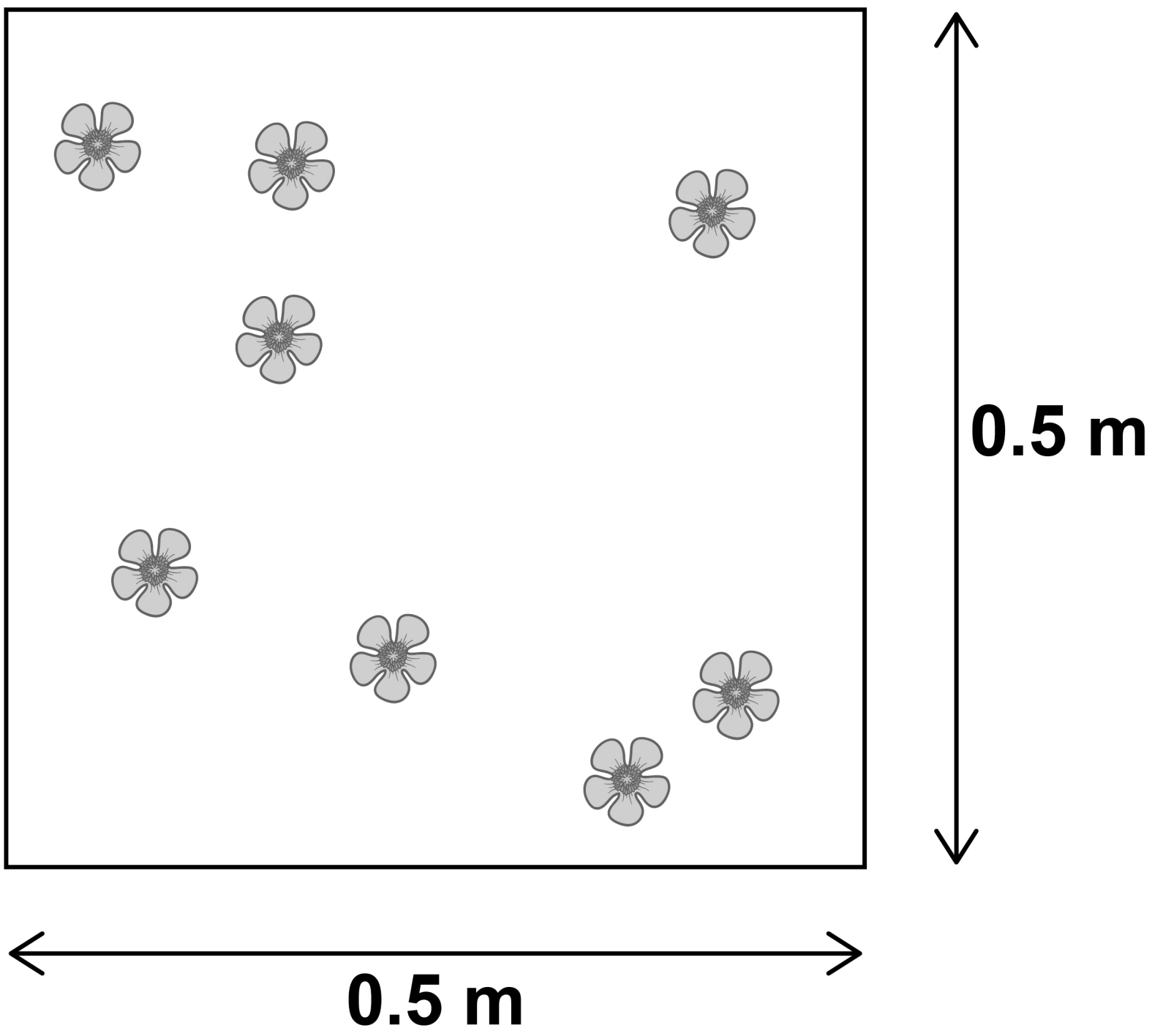
- **a control**
- **the dependent**
- **the independent**

In this investigation the number of buttercups in each quadrat was

_____ variable.

FIGURE 2 shows a quadrat on an area of the school field.

FIGURE 2



KEY

Buttercup plant

0 2 . 5

Calculate the area of the quadrat.
[1 mark]

Area of the quadrat = _____ m^2

[Turn over]

BLANK PAGE

0 2 . 6

The mean number of buttercups in one quadrat was 8

Calculate the number of buttercups per m^2

Use your answer from Question 02.5, on page 21. [2 marks]

Number of buttercups = per m^2

[Turn over]

In a laboratory another group of students investigated the effect of soil acidity on the growth of beans.

This is the method used.

1. **Put soil with a neutral pH in two large boxes.**
2. **Add acid to the soil in one box.**
3. **Plant some bean seeds in each box.**
4. **Water the seeds over 3 weeks.**
5. **After 3 weeks, measure the height of the bean plants in each box.**
6. **Calculate the mean height of bean plants in each box.**

0 2 . 7

Give TWO improvements the students could make to the method to give more valid results. [2 marks]

1

2

The students then carried out a valid investigation.

TABLE 1 shows the students' results.

TABLE 1

	Height of bean plants in cm	
Bean plant	**Acid soil**	**Neutral soil**
1	**8**	**11**
2	**6**	**12**
3	**4**	**11**
4	**10**	**17**
5	**7**	**19**
Mean	**7**	**X**

0 2 . 8

Calculate mean value X in TABLE 1, on the opposite page. [2 marks]

X = _____ cm

0 2 . 9

What conclusion can the students make about the effect of acid soil on the growth of bean plants? [1 mark]

0 3

The theory of evolution by natural selection was suggested by Charles Darwin in 1859.

Evidence from fossils supports Darwin's theory.

0 3 . 1

What evidence supports the theory of evolution by natural selection? [1 mark]

Tick (✓) ONE box.

- ☐ **Knowledge of how DNA controls inheritance**
- ☐ **Knowledge of how the dinosaurs became extinct**
- ☐ **Knowledge of how the Earth was formed**
- ☐ **Knowledge of what causes global warming**

[Turn over]

0 3 . 2

FIGURE 3 shows a fossil fly preserved in amber.

The fossil formed when the amber solidified with the fly trapped inside.

FIGURE 3

Why has the fly been preserved?
[1 mark]

Tick (✓) ONE box.

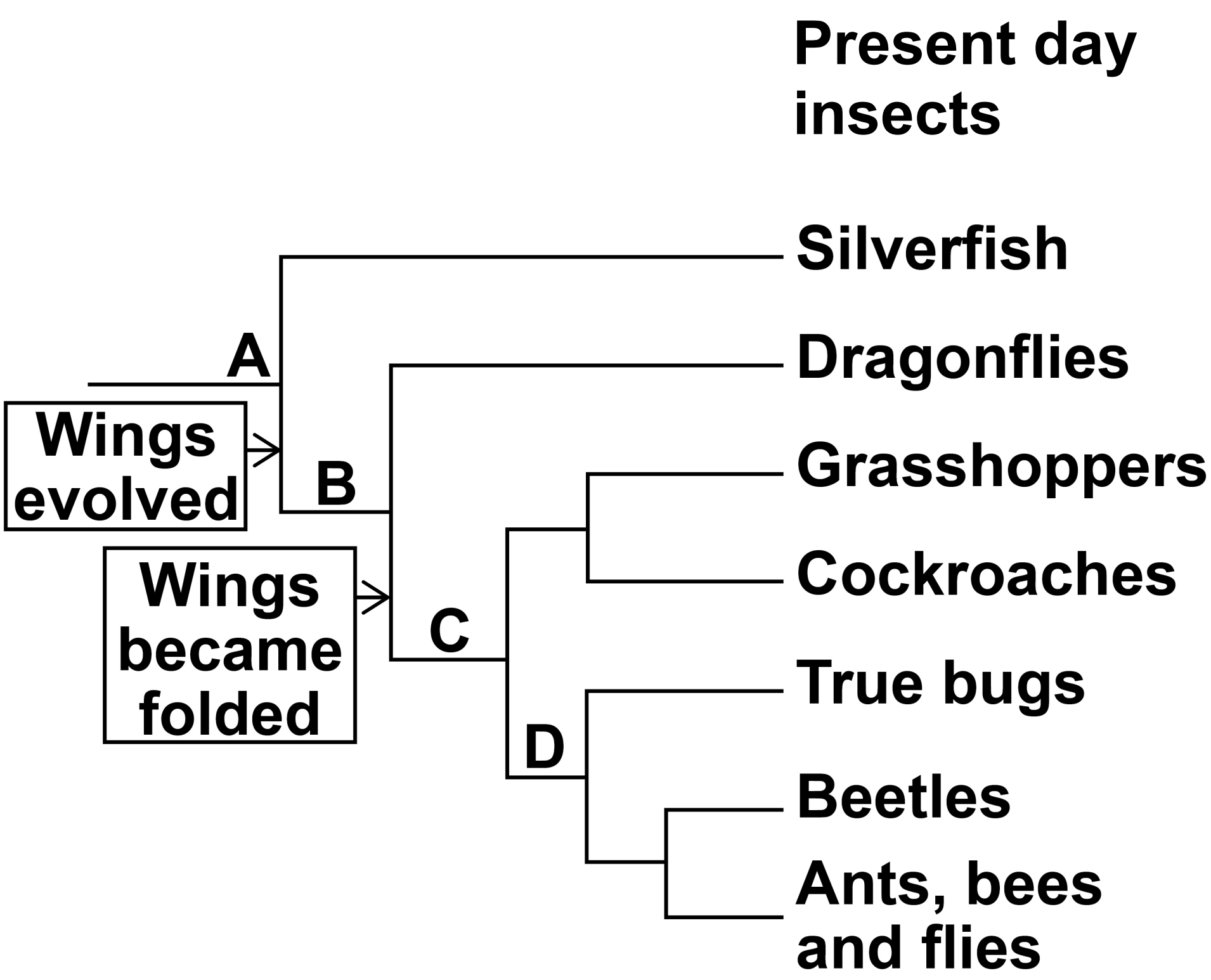
☐ **The amber has been kept at a constant temperature.**

☐ **The fly was soft-bodied.**

☐ **There was no oxygen in the amber.**

FIGURE 4 shows a simplified evolutionary tree for the insect group of animals.

FIGURE 4



0 3 . 3

Which present day insect evolved first?
[1 mark]

[Turn over]

0 3 . 4

Animals A, B, C and D were ancestors of present day insects.

Which animal is the most recent ancestor of both grasshoppers and beetles? [1 mark]

Tick (✓) ONE box.

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

0 3 . 5

Name the group of present day insects which have wings which do NOT fold.
[1 mark]

[Turn over]

0 3 . 6

The house fly has the binomial name Musca domestica.

TABLE 2 shows part of the classification for the house fly.

TABLE 2

Classification group	Name
Kingdom	
Phylum	arthropoda
Class	
Order	diptera
Family	muscidae
Genus	
Species	

Complete TABLE 2, on the opposite page.

Choose answers from the list. [3 marks]

- **animalia**
- **domestica**
- **Musca**
- **insecta**

[Turn over]

0 3 . 7

Carl Woese proposed the 'three-domain system' of classification.

Which domain are insects in? [1 mark]

Tick (✓) ONE box.

- ☐ **Archaea**
- ☐ **Eukaryota**
- ☐ **Prokaryota**

9

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[Turn over]

0 4

The endocrine system is made up of glands which secrete hormones.

FIGURE 5, on the opposite page, shows the position of endocrine glands in the human body.

0 4 . 1

Which letter shows the pancreas?
[1 mark]

Tick (✓) ONE box.

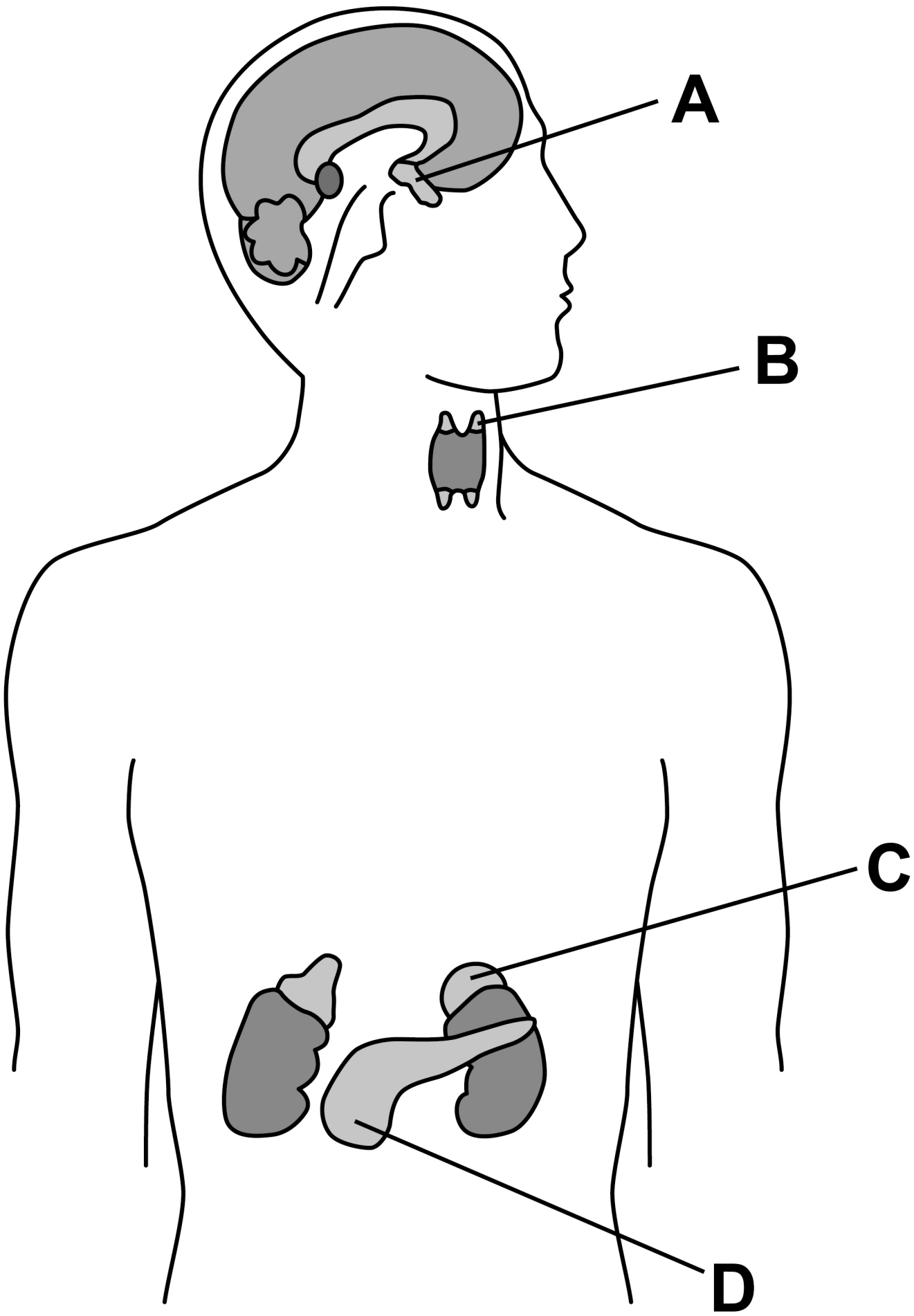
☐ **A**

☐ **B**

☐ **C**

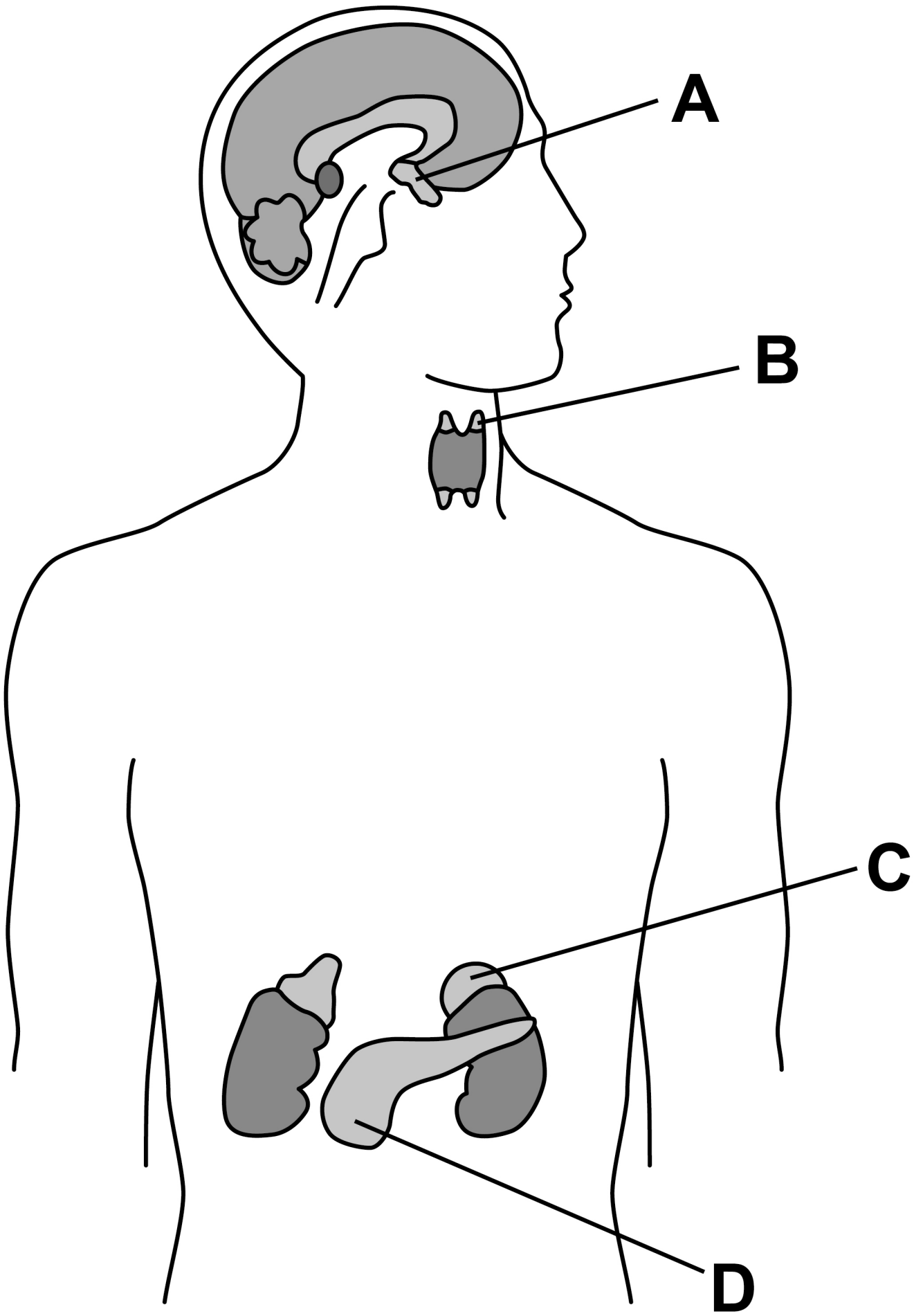
☐ **D**

FIGURE 5



[Turn over]

REPEAT OF FIGURE 5



0 4 . 2

Which letter shows the thyroid gland?
[1 mark]

Tick (✓) ONE box.

- ☐ **A**
- ☐ **B**
- ☐ **C**
- ☐ **D**

[Turn over]

0 4 . 3

Hormones travel from the gland where they are made to the target organ where they have an effect.

How do hormones travel from the gland to the target organ? [1 mark]

When blood glucose concentration becomes too high, hormone X from the pancreas causes a decrease in the glucose concentration.

0 4 . 4

Name hormone X. [1 mark]

0 4 . 5

In what TWO ways does hormone X cause a decrease in blood glucose concentration? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Glucose is broken down.**
- ☐ **Glucose is converted to glycogen.**
- ☐ **Glucose is excreted by the kidneys.**
- ☐ **Glucose moves from the blood into the cells.**
- ☐ **Glucose moves into the small intestine.**

[Turn over]

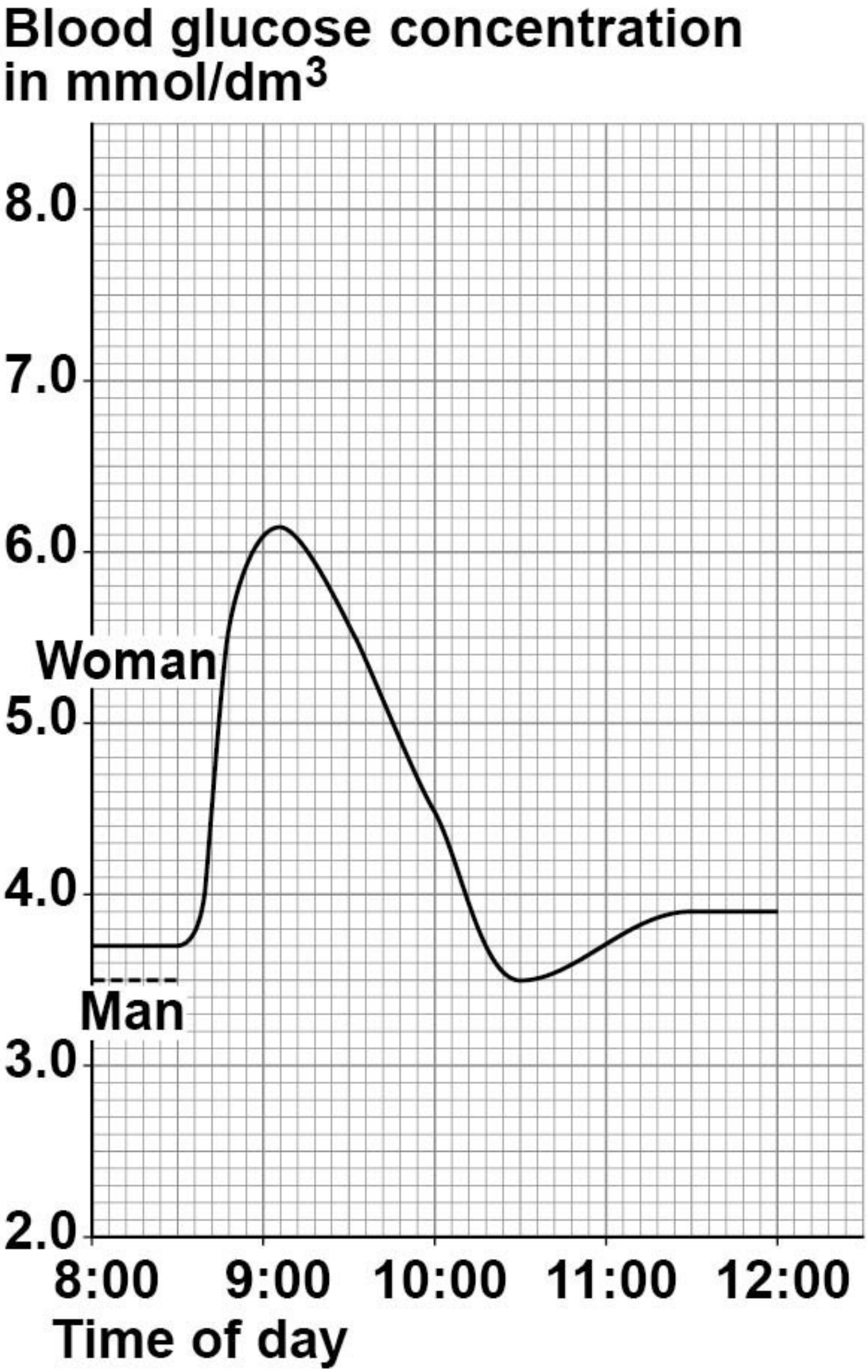
FIGURE 6, on the opposite page, shows the blood glucose concentration in a woman.

0 4 . 6

Suggest what time of day the woman ate her breakfast of sugar-coated cereal. [1 mark]

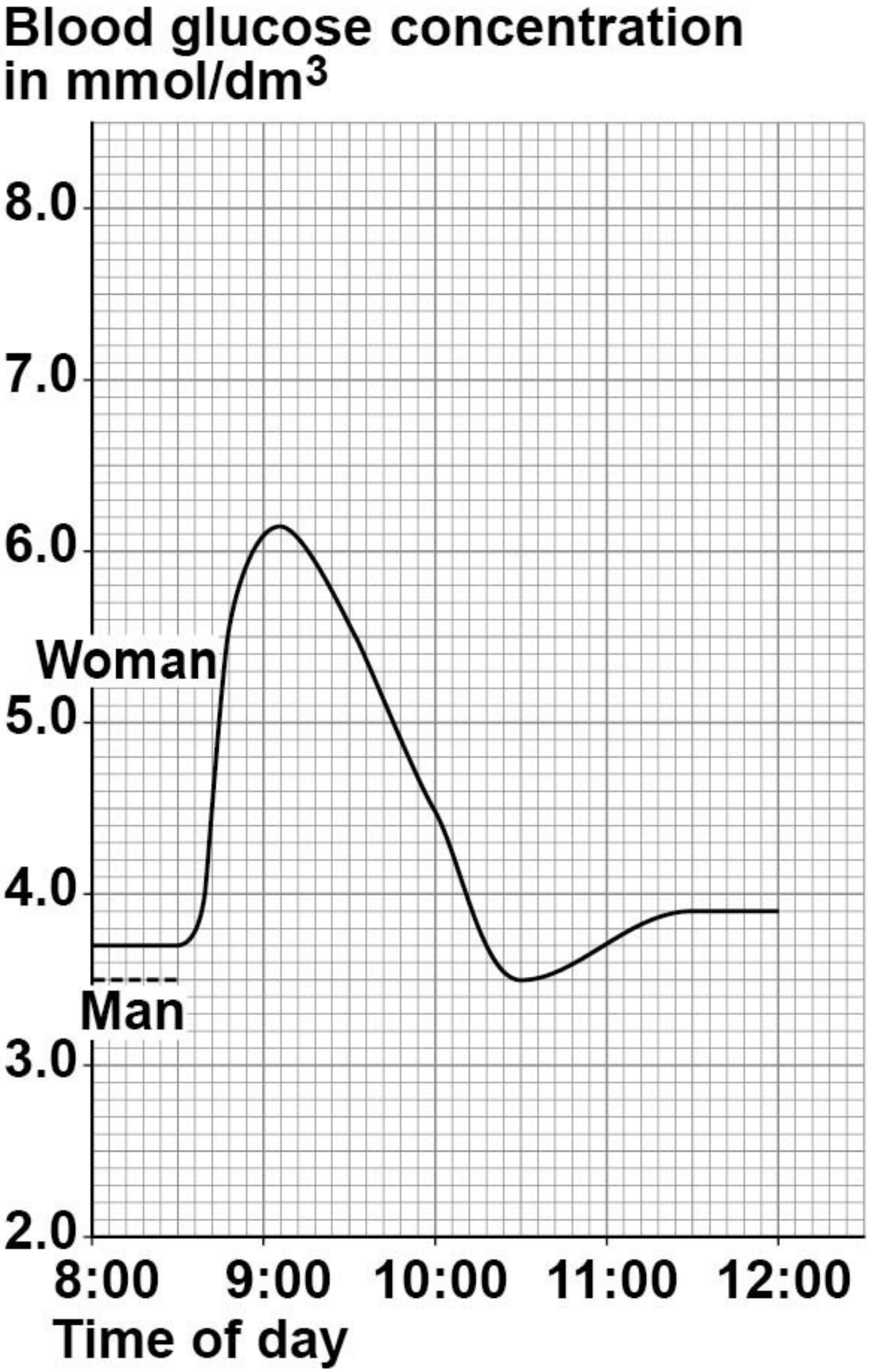
Time of day = _____

FIGURE 6



[Turn over]

REPEAT OF FIGURE 6



The man in FIGURE 6 has Type 2 diabetes but he has NOT been treated.

0 4 . 7

The man ate:

- **the same type and amount of breakfast cereal as the woman**
- **at the same time as the woman.**

Suggest what his blood glucose concentration would be at 9:00 [1 mark]

Blood glucose concentration =

_____ **mmol/dm^3**

[Turn over]

0 4 . 8

The man:

- **is an obese office worker**
- **does not exercise**
- **eats sugary snacks at his desk.**

Give TWO lifestyle changes a doctor might recommend to the man to help him control his diabetes. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

0 4 . 9

Describe how a LOW blood glucose concentration would lead to a person feeling weak. [2 marks]

12

0 5

This question is about the cycling of water and carbon in ecosystems.

0 5 . 1

Which reaction produces water?
[1 mark]

Tick (✓) ONE box.

☐ **Aerobic respiration**

☐ **Anaerobic respiration**

☐ **Photosynthesis**

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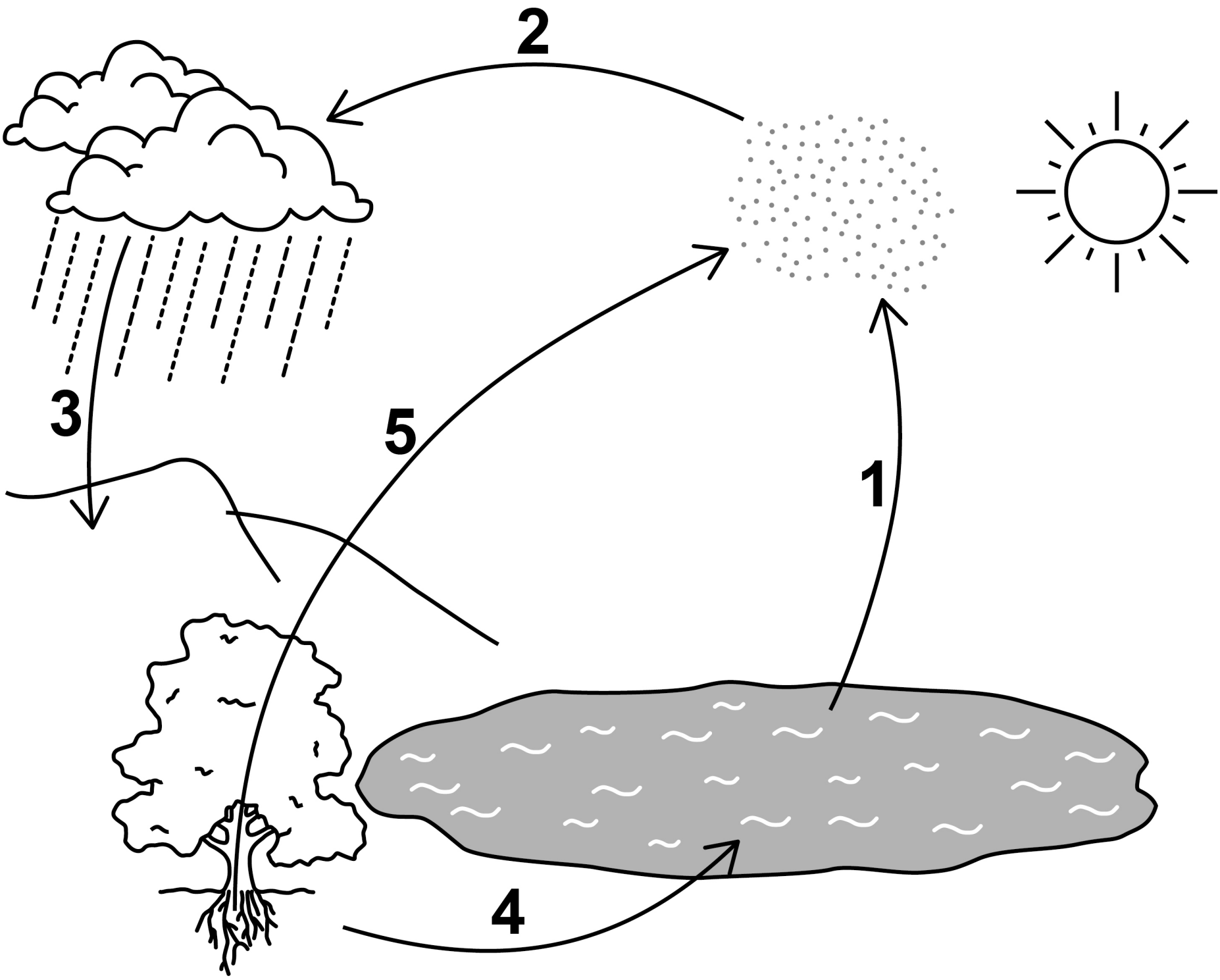
[Turn over]

The water cycle provides water for plants and animals on land before the water goes into lakes and seas.

FIGURE 7 represents the water cycle.

FIGURE 7



0 5 . 2

Name the processes 1 to 5 shown on FIGURE 7, on the opposite page.
[5 marks]

1 _____

2 _____

3 _____

4 _____

5 _____

0 5 . 3

In 2007 the population of the world was 6 000 000 000

A study found that 4.5% of the population had severe water shortage.

Calculate how many people had severe water shortage.

Give your answer in standard form.
[3 marks]

Number of people (in standard form) =

[Turn over]

0 5 . 4

Why do more people have severe water shortage now than in 2007? [2 marks]

Tick (✓) TWO boxes.

- ☐ **Climate change has increased the area of deserts.**
- ☐ **Each person drinks less water.**
- ☐ **More water is used to grow crops.**
- ☐ **Sea levels have risen because the ice caps are melting.**
- ☐ **Some countries have built de-salting factories for seawater.**

Leaves on a tree contain carbon compounds.

In autumn the leaves fall to the ground.

0 5 . 5

Microorganisms in the soil recycle carbon from the leaves so that the carbon is used for new plant growth.

Explain how. [4 marks]

60

0 5 . 6

What is one benefit of fallen leaves for living plants? [1 mark]

Tick (✓) ONE box.

- ☐ **Energy is released for living plants.**
- ☐ **Insect pests in the soil are killed.**
- ☐ **Nitrates are released into the soil.**
- ☐ **Oxygen is supplied to root cells.**

0 6

Water pollution is a problem for humans and wildlife.

Explain how human activities are polluting rivers, lakes and seas.

[6 marks]

END OF QUESTIONS

6

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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For Examiner's Use	
Question	Mark
1	
2	
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6	
TOTAL	

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