A

AQA

Surname _____

Other Names _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

GCSE
BIOLOGY

F

Foundation Tier Paper 2F

8461/2F

Monday 11 June 2018 **Morning**

Time allowed: 1 hour 45 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.**
- **Answer ALL questions in the spaces provided.**
- **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

- **There are 100 marks available on this paper.**
- **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 **FIGURE 1 shows a food chain in a river.**

FIGURE 1

0 1 . 1 Draw ONE line from each scientific term to the correct organism in the food chain. [3 marks]

Scientific term	Organism in the food chain
Apex predator	Algae
Primary consumer	Invertebrate animals
Producer	Large fish
	Small fish

[Turn over]

0 1 . 2 **TABLE 1 shows the biomass of the organisms at each stage in the food chain.**

TABLE 1

Organism	Biomass in arbitrary units
Algae	840
Invertebrate animals	200
Small fish	40
Large fish	10

Calculate the percentage of the biomass of the invertebrate animals that is transferred to the large fish. [2 marks]

Use the equation:

$$\text{percentage} = \frac{\text{biomass of large fish}}{\text{biomass of invertebrate animals}} \times 100$$

Percentage = _____

[Turn over]

0 1 . 3 **A large amount of biomass is lost from the food chain.**

Complete the sentences.

Choose answers from the list.
[3 marks]

coordination

digestion

excretion

filtration

ingestion

respiration

When the small fish eat the invertebrate animals, not all of this material is broken down during _____.

Materials absorbed from the gut may enter the body cells of the small fish. These materials are broken down into carbon dioxide and water by _____.

The carbon dioxide and other waste materials from the body cells are removed from the small fish by _____.

[Turn over]

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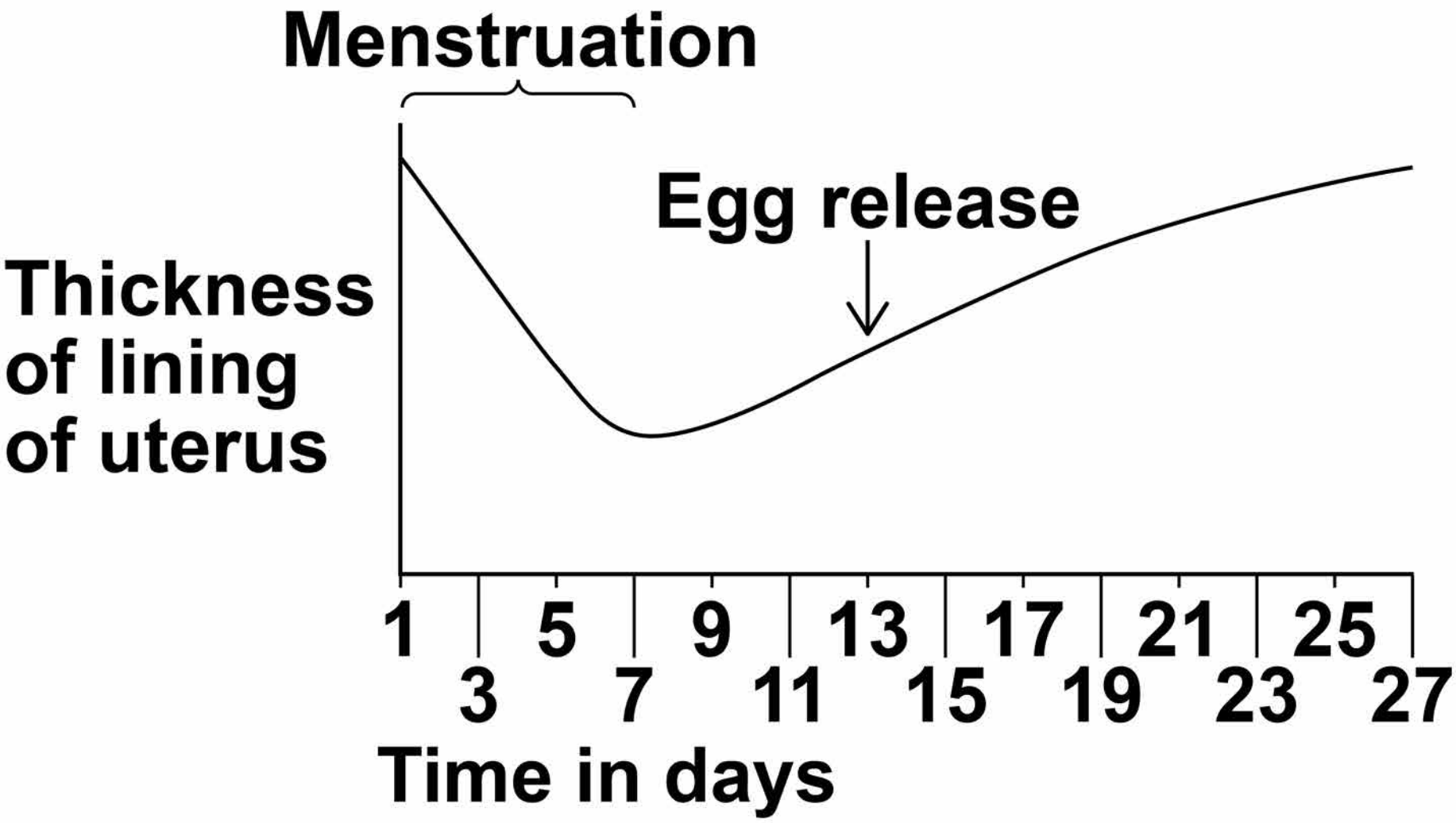
0 1 . 4 **A disease kills many of the small fish.**

Why does the number of invertebrate animals increase? [1 mark]

0 2 **FIGURE 2 shows some changes that occur during the menstrual cycle.**

FIGURE 2



0 2 . 1 **FIGURE 2 shows that the lining of the uterus thickens between days 7 and 27.**

What is the purpose of thickening the lining of the uterus? [1 mark]

Tick ONE box.

- ☐ **To allow implantation of the embryo**
- ☐ **To break down waste**
- ☐ **To prevent sperm reaching the egg**

[Turn over]

0 2 . 2 **Which hormone causes thickening of the lining of the uterus? [1 mark]**

Tick ONE box.

☐ **Auxin**

☐ **Oestrogen**

☐ **Testosterone**

0 2 . 3 **On which day is fertilisation most likely to occur?**

Use information from FIGURE 2, on page 12.
[1 mark]

Contraception can be used to lower the chance of pregnancy.

0 2 . 4 **Draw ONE line from each method of contraception to how the method works.**
[3 marks]

Method of contraception	How the method works
Contraceptive pill	Barrier to prevent sperm reaching the egg
Diaphragm	Contains hormones to stop eggs maturing
Spermicidal cream	Kills sperm
	Slows down sperm production

0 2 . 5 **TABLE 2 gives information about some different methods of contraception.**

TABLE 2

METHOD	NUMBER OF PREGNANCIES PER 100 WOMEN IN ONE YEAR	POSSIBLE SIDE EFFECTS
Diaphragm and spermicidal cream	8	Usually none, but can cause bladder infection in some women
Condom	2	None
Contraceptive pill	1	Mood swings, headaches, high blood pressure, blood clots, breast cancer

A man and a woman decide to use the condom as their method of contraception.

Suggest THREE reasons for this decision.

Use information from TABLE 2 and your own knowledge. [3 marks]

1 _____

2 _____

_____

3 _____

_____

[Turn over]

9

0 3 **Fossils give evidence about organisms that lived a long time ago.**

0 3 . 1 **Scientists have found very few fossils of the earliest life forms.**

Give ONE reason why. [1 mark]

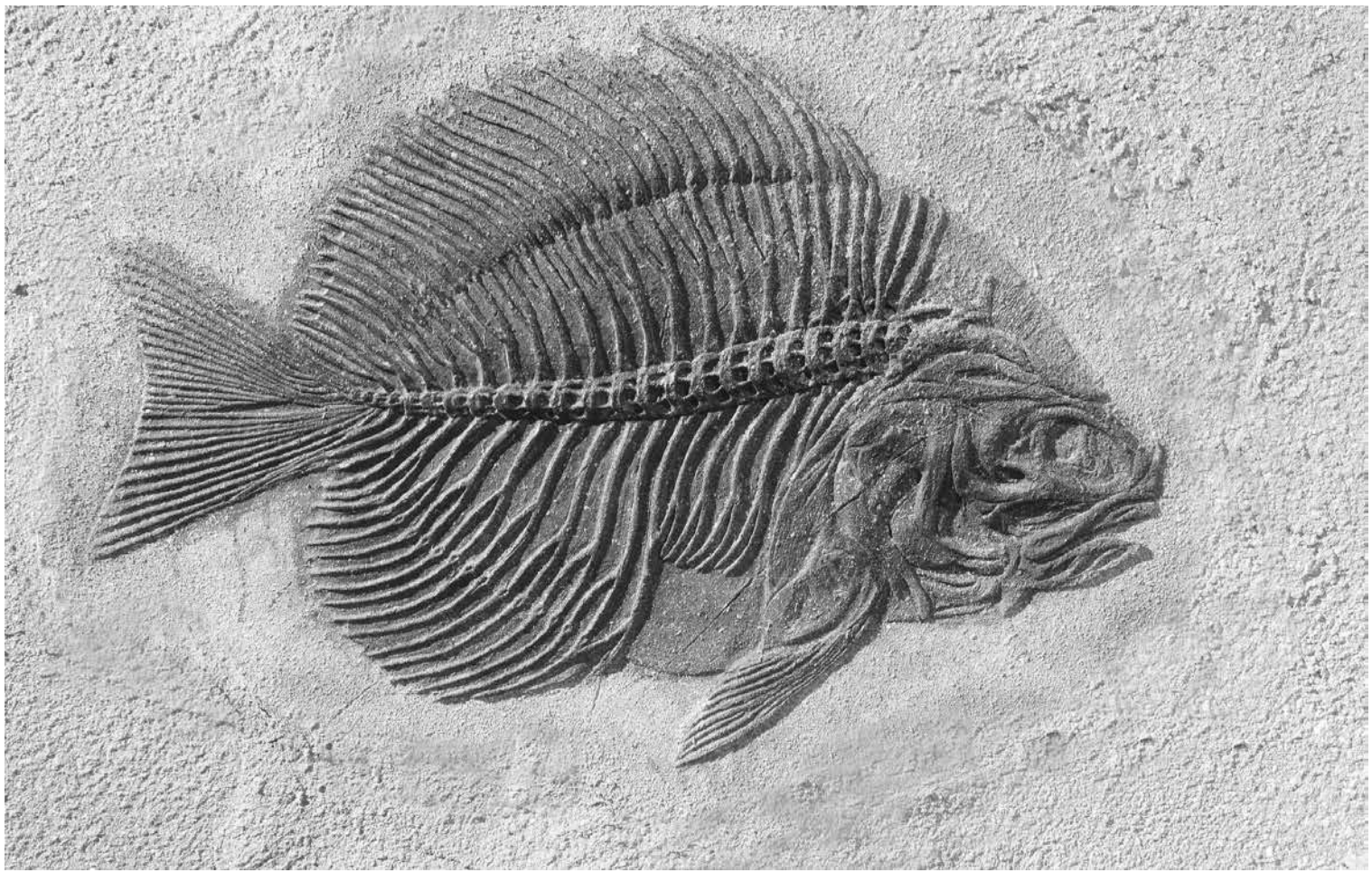
_____

_____

_____

FIGURE 3 is a photograph of a fossilised fish.

FIGURE 3



0 3 . 2 **Suggest how the fossil in FIGURE 3, on page 18, was formed. [2 marks]**

0 3 . 3 **The species of fish shown in FIGURE 3 is now extinct.**

Give TWO possible causes of extinction. [2 marks]

1

2

Modern fish species have evolved from fish that lived a long time ago.

Evolution is caused by mutation and natural selection.

0 3 . 4 What is a mutation? [1 mark]

Tick ONE box.

- ☐ A change in a gene
- ☐ Accidental damage to an organism
- ☐ An organism with a new characteristic
- ☐ The loss of a species

0 3 . 5 Describe the process of natural selection. [3 marks]

9

In the mid-19th century, a scientist studied inheritance in pea plants.

The scientist's work was the beginning of our modern understanding of genetics.

0 4 . 1 What is the name of this scientist? [1 mark]

Tick ONE box.

- ☐ **Alfred Russel Wallace**
- ☐ **Charles Darwin**
- ☐ **Gregor Mendel**
- ☐ **Jean-Baptiste Lamarck**

0 4 . 2 In the mid-20th century, other scientists identified the chemical substance that makes up genetic material.

What is the name of the chemical substance that makes up genetic material? [1 mark]

Tick ONE box.

- ☐ Carbohydrate
- ☐ DNA
- ☐ Lipid
- ☐ Protein

[Turn over]

0 4 . 3 **A gene often has two alleles.**

One allele is dominant and the other allele is recessive.

When is a recessive allele expressed as a characteristic? [1 mark]

Tick ONE box.

- ☐ **When the dominant allele is not present**
- ☐ **When the recessive allele is inherited from the female parent**
- ☐ **When the recessive allele is inherited from the male parent**
- ☐ **When the recessive allele is present on only one of the chromosomes**

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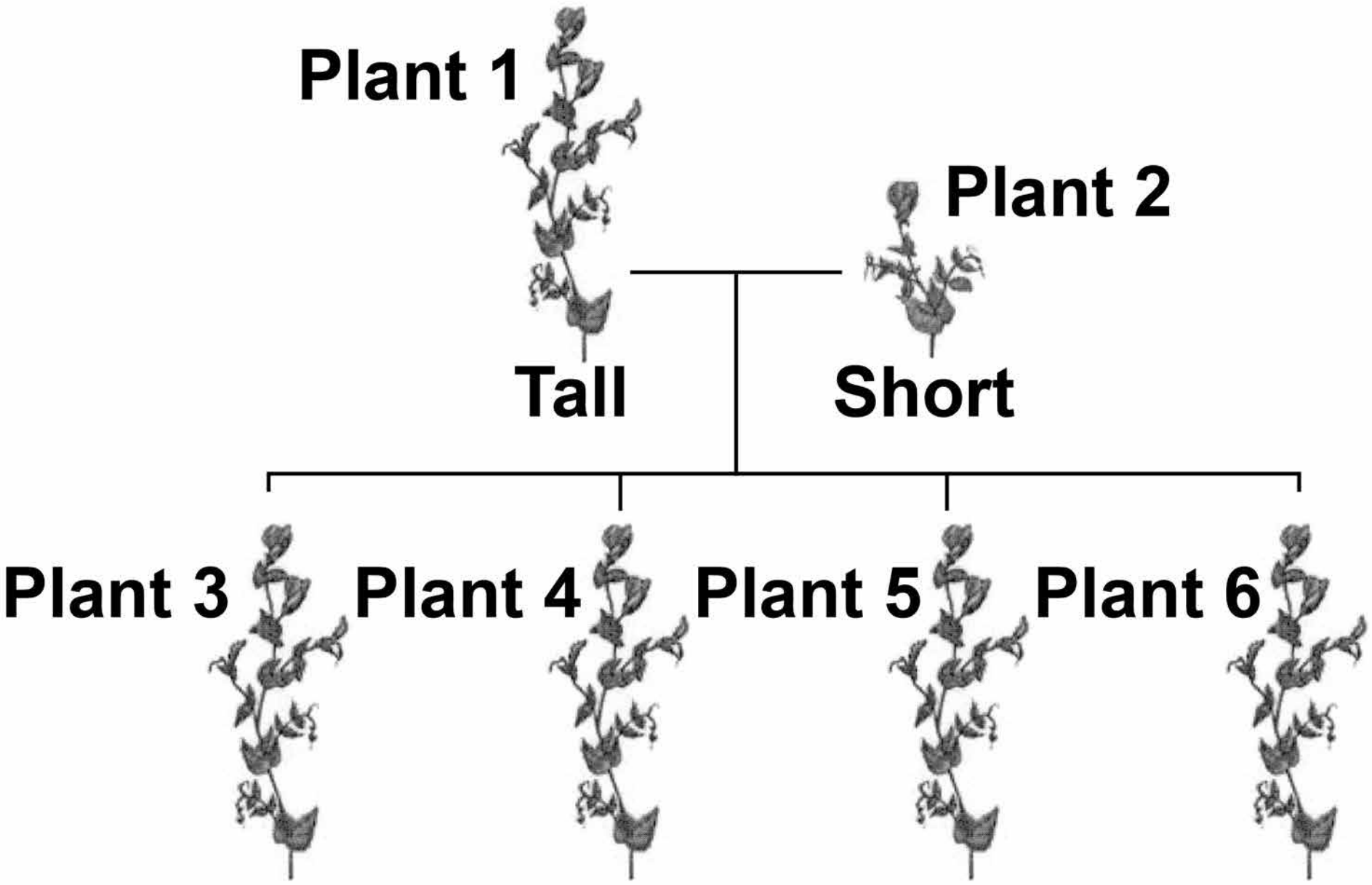
[Turn over]

A scientist investigated the inheritance of height in pea plants.

The scientist crossed tall pea plants with short pea plants.

FIGURE 4 shows the scientist's results.

FIGURE 4



In Questions 04.4 and 04.5, use the following symbols to represent alleles:

T = the dominant allele for tall.

t = the recessive allele for short.

0 4 . 4 **In FIGURE 4, the genotype of plant 1 is TT.**

Give the genotype of plant 2.
[1 mark]

_____

0 4 . 5 **The scientist crossed plant 3 with plant 4.**

Complete FIGURE 5 to show the offspring produced from this cross. [2 marks]

FIGURE 5

		Male gametes	
		T	**t**
Female gametes	**T**	**TT**	
	t		

0 4 . 6 **Draw a circle around ONE of the homozygous offspring in FIGURE 5, on page 28.**
[1 mark]

0 4 . 7 **What is the ratio of tall plants : short plants in the offspring in FIGURE 5? [1 mark]**

Ratio of tall plants : short plants =

_____ : _____

[Turn over]

8

0 5 A person with Type 1 diabetes cannot make enough insulin.

0 5 . 1 Which organ makes insulin? [1 mark]

Tick ONE box.

- ☐ Adrenal gland
- ☐ Pancreas
- ☐ Pituitary gland
- ☐ Thyroid

0 5 . 2 A person with Type 1 diabetes can control the concentration of glucose in the blood by injecting insulin.

Complete the sentences.

Choose answers from the list on page 31. [2 marks]

DNA

glycogen

kidney

liver

protein

skin

Insulin acts on an organ called the _____ .

This organ then takes in excess glucose from the blood and changes the glucose into _____ .

[Turn over]

0 5 . 3 **Insulin cannot be taken as a tablet. This is because insulin is a type of protein.**

What would happen to the insulin in the tablet if it reached the stomach? [1 mark]

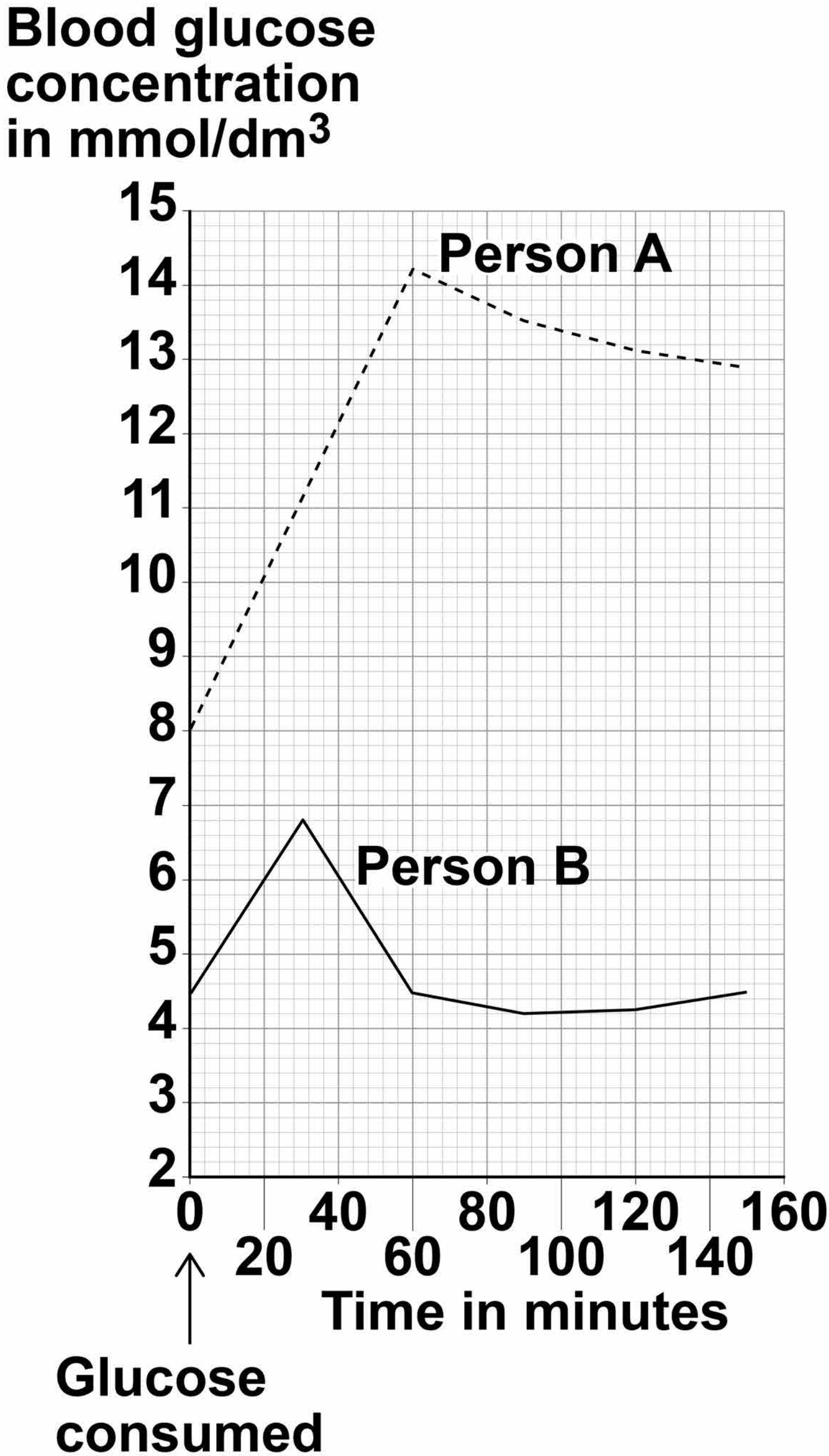
Two people each drank the same volume of a glucose drink.

Person A has Type 1 diabetes.

Person B does NOT have diabetes.

FIGURE 6, on page 33, shows how the concentration of glucose in their blood changed.

FIGURE 6



0 5 . 4 How much higher was the HIGHEST concentration of glucose in the blood of person A than the HIGHEST concentration in person B?

Use information from FIGURE 6 on page 33. [2 marks]

Answer = _____ mmol/dm^3

0 5 . 5 **Describe ONE other way that the results for person A were different from the results for person B.**

Use information from FIGURE 6 on page 33. [1 mark]

Type 2 diabetes is another form of diabetes. Type 2 diabetes is common in obese people.

People with Type 2 diabetes make enough insulin, but still cannot control their blood glucose concentration. This is because the body cells are not sensitive to the insulin.

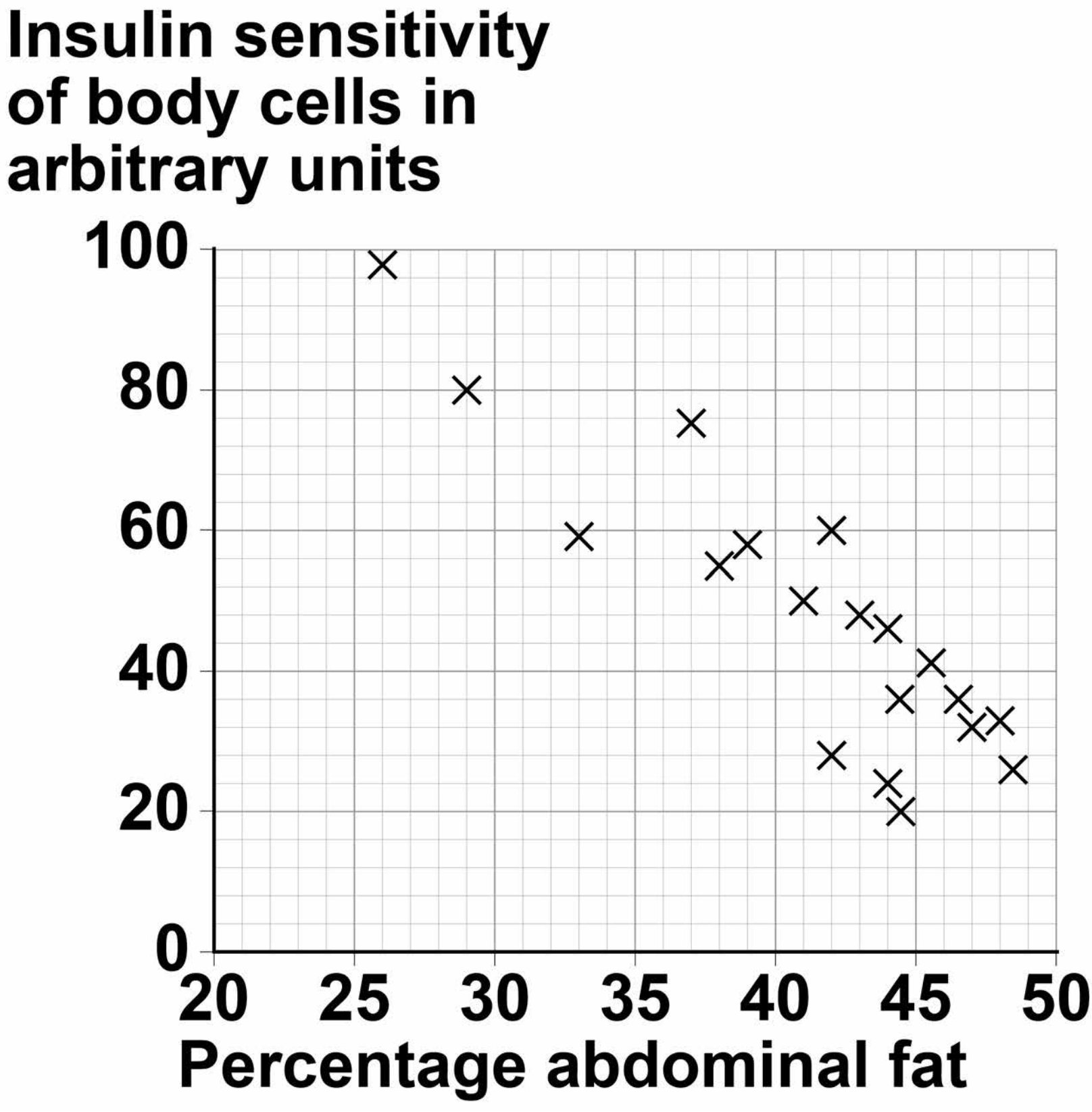
FIGURE 7, on page 37, shows information about abdominal fat and insulin sensitivity in body cells.

0 5 . 6 What type of relationship is shown in FIGURE 7? [1 mark]

Tick ONE box.

- ☐ A negative correlation
- ☐ No correlation
- ☐ A positive correlation

FIGURE 7



[Turn over]

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0 5 . 7 **A person is at risk of developing Type 2 diabetes.**

Suggest TWO ways the person could lower the chance of developing Type 2 diabetes.
[2 marks]

1 _____

_____

_____

2 _____

_____

_____

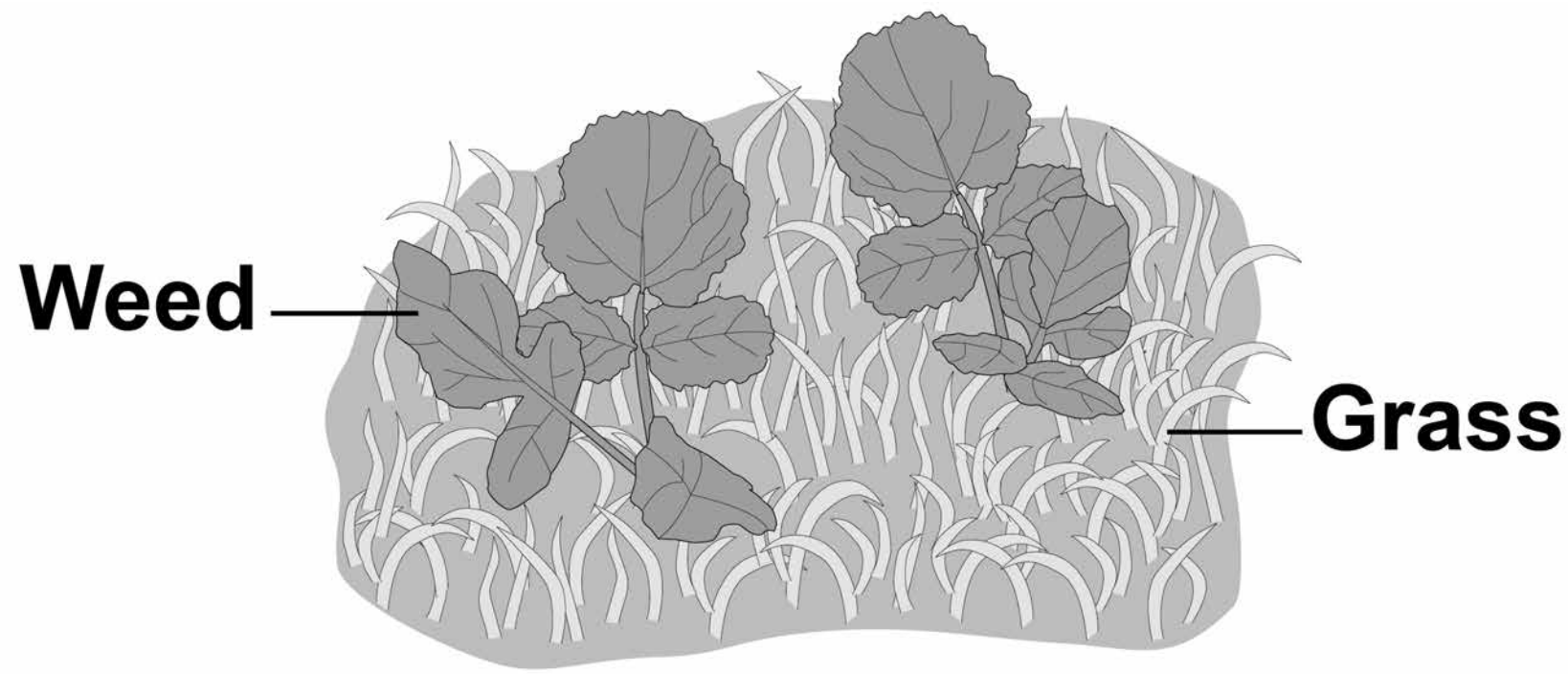
10

0 6 **Some weed killers are selective.**

Selective weed killers kill broad-leaved weed plants, but do NOT kill narrow-leaved grass plants.

FIGURE 8 shows some weeds growing on a grassy lawn.

FIGURE 8



Some students investigated the effect of a selective weed killer on the weeds growing in a lawn. They used 0.5 m × 0.5 m quadrats.

The lawn was 20 metres long and 10 metres wide.

The method used is on page 41.

1. Divide the lawn into two halves, side A and side B.
2. Place 5 quadrats in different positions on side A.
3. Place 5 more quadrats in different positions on side B.
4. Count the number of weed plants in each quadrat.
5. Spray side A with weed killer solution.
6. Spray side B with the same volume of water.
7. Repeat steps 2-4 after 2 weeks.

0 6 . 1 Suggest a method the students should have used to place each quadrat. [1 mark]

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0 6 . 2 **Give the reason for the method you suggested in Question 06.1.**
[1 mark]

0 6 . 3 **Explain why the students used water on one side of the lawn instead of weed killer.**
[2 marks]

[Turn over]

TABLE 3 shows the students' results.

TABLE 3

Number of weeds per quadrat			
At start		After 2 weeks	
Side A (Weed killer)	Side B (Water)	Side A (Weed killer)	Side B (Water)
8	14	3	8
2	9	4	15
12	3	0	7
15	16	2	12
13	3	1	13
Mean 10	9	2	X

0 6 . 4 Calculate the mean value, X, in TABLE 3. [1 mark]

_____

_____

Mean value, X = _____

0 6 . 5 **Calculate the percentage decrease in the number of weeds on side A after 2 weeks.**
[2 marks]

Use the following equation:

$$\text{percentage decrease} = \frac{(\text{mean at start} - \text{mean after 2 weeks})}{\text{mean at start}} \times 100$$

Percentage decrease =

[Turn over]

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0 6 . 6 **One student thought the results were NOT valid.**

Suggest ONE improvement the students could have made to the method to make the results more valid.

Give the reason for your answer. [2 marks]

Improvement _____

_____

_____

Reason _____

_____

_____

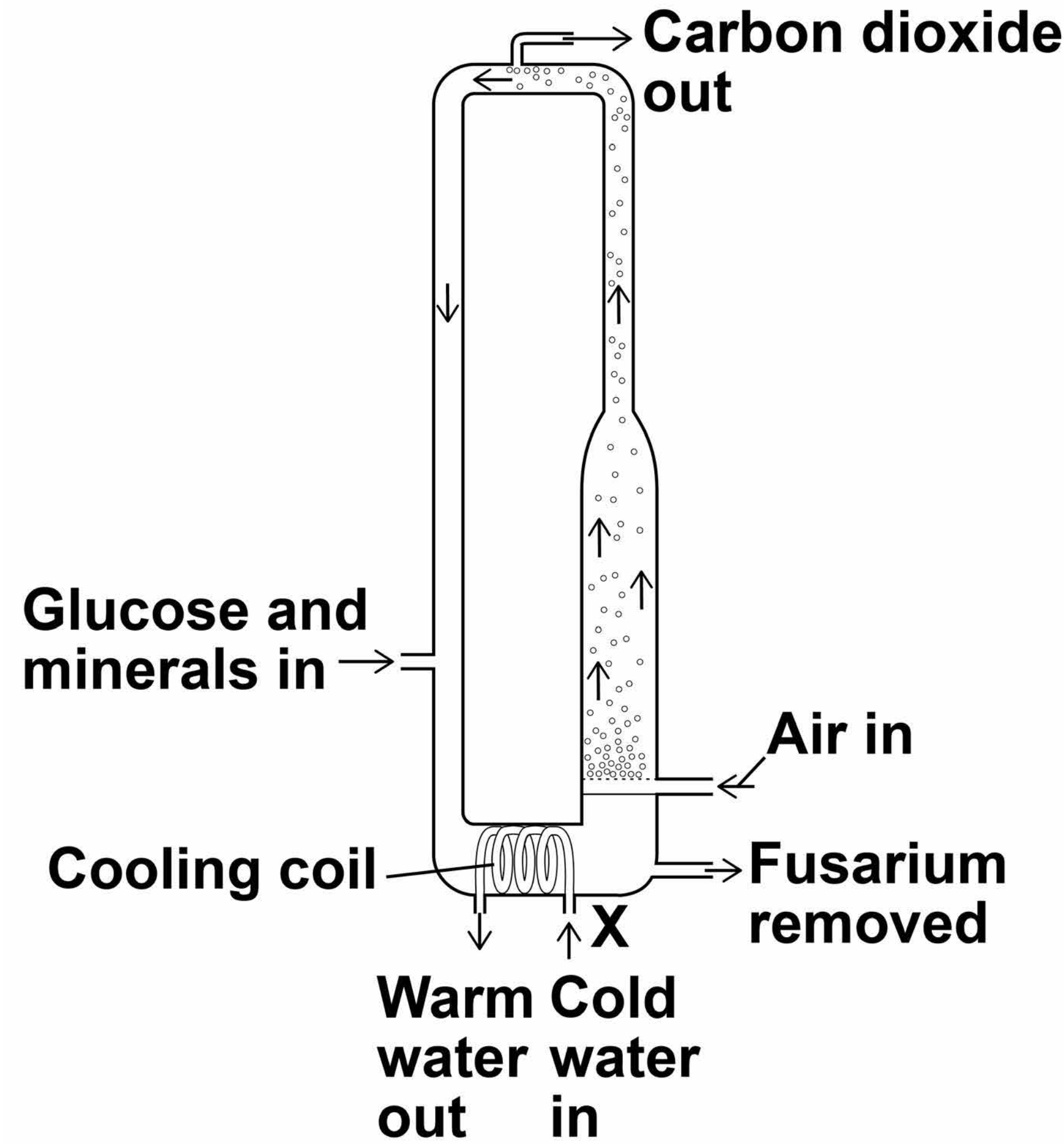
0 7 **Mycoprotein is a protein-rich food.**

Mycoprotein is made from the fungus Fusarium.

FIGURE 9, on page 49, shows a fermenter used for growing Fusarium.

0 7 . 1 **Explain why the fermenter is sterilised before use.**
[2 marks]

FIGURE 9



[Turn over]

0 7 . 2 **Cold water is pumped through the cooling coil at point X.**

This maintains a constant temperature inside the fermenter.

Suggest the temperature at which Fusarium grows fastest.
[1 mark]

Tick ONE box.

- ☐ **5 °C**
- ☐ **20 °C**
- ☐ **30 °C**
- ☐ **85 °C**

0 7 . 3 **Glucose and bubbles of air enter the fermenter.**

The bubbles of air supply oxygen.

Explain why Fusarium needs glucose and oxygen. [2 marks]

0 7 . 4 **The bubbles of air also move materials around the fermenter.**

Suggest why it is useful for bubbles of air and materials to move around inside the fermenter. [2 marks]

0 7 . 5 **100 grams of chicken meat contains 22 grams of protein.**

100 grams of mycoprotein contains 11 grams of protein.

A man ate 100 grams of chicken in one meal.

How many grams of mycoprotein would the man need to eat to get the same mass of protein as in 100 grams of chicken? [1 mark]

Tick ONE box.

- ☐ 100 grams
- ☐ 110 grams
- ☐ 200 grams
- ☐ 220 grams

0 8 **Some students investigated phototropism in plant seedlings.**

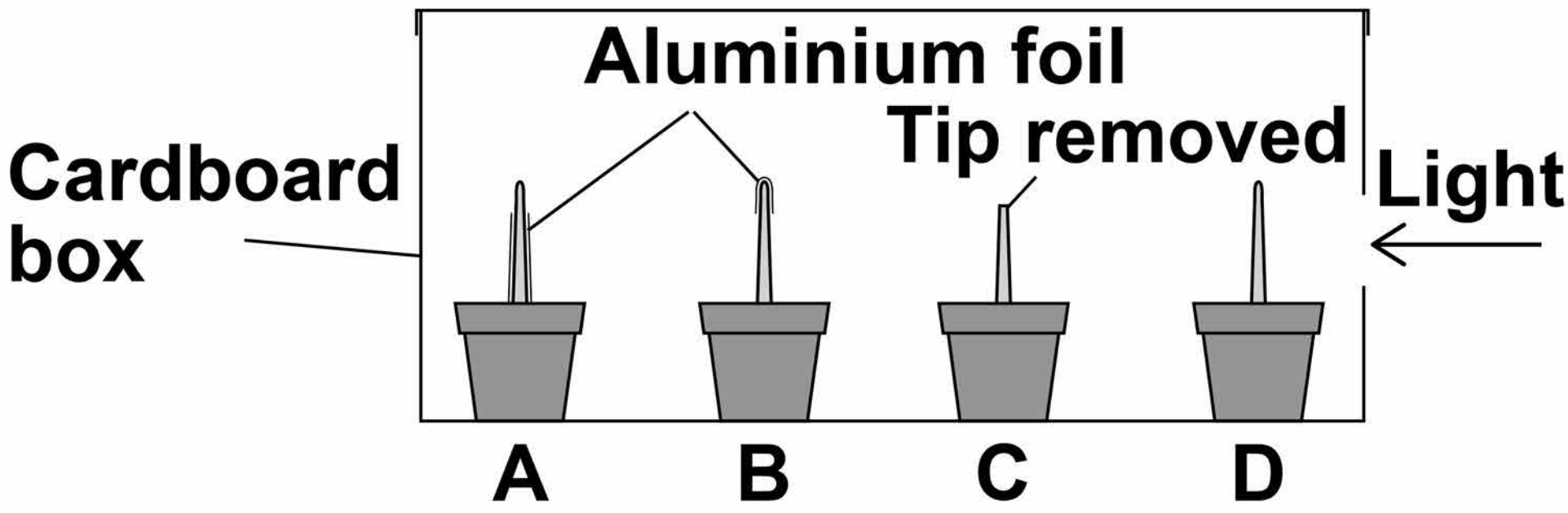
This is the method used.

1. **Measure the lengths of the shoots of 20 seedlings.**
2. **Set up four groups of seedlings as follows:**
   - **A – bottom of shoot covered in aluminium foil**
   - **B – tip covered in aluminium foil**
   - **C – tip removed**
   - **D – no changes.**
3. **Put the seedlings in a cardboard box.**
4. **Use a lamp to shine a light into the box through a hole in one side.**
5. **After one day, re-measure the lengths of the shoots.**

6. Make a drawing of the appearance of one seedling from each group.

FIGURE 10, below, shows the appearance of one seedling in each group at the start of the investigation.

FIGURE 10



[Turn over]

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0 8 . 1 **Which TWO conditions should the students have kept constant for each group of seedlings? [2 marks]**

Tick TWO boxes.

- ☐ The length of the roots
- ☐ The number of seedlings in each group
- ☐ The temperature
- ☐ The thickness of the aluminium foil
- ☐ The volume of water added to the soil

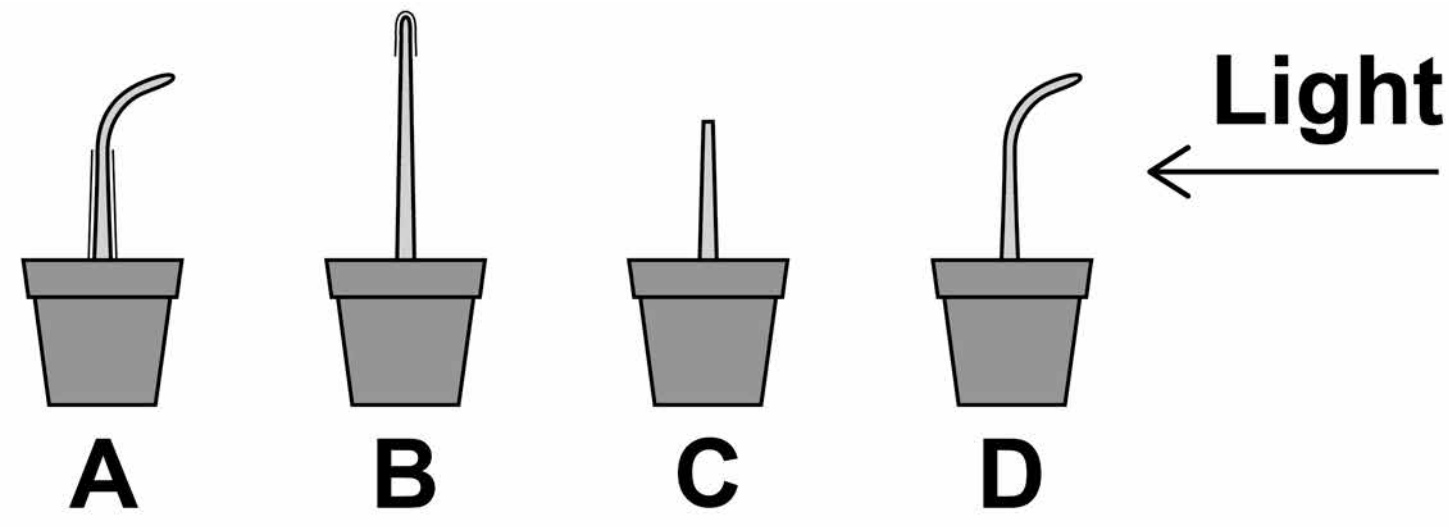
0 8 . 2 **What is the purpose of the aluminium foil? [1 mark]**

Tick ONE box.

- ☐ **To hold the shoot straight**
- ☐ **To keep the shoot warm**
- ☐ **To remove the effect of gravity**
- ☐ **To stop light reaching the shoot**

FIGURE 11, below and on page 59, shows the students' results.

FIGURE 11



	A	B	C	D
Mean length of shoot at start in mm	23	24	21	25
Mean length of shoot after 1 day in mm	28	30	23	30
Mean change in length of shoot in mm	5	6	2	5

0 8 . 3 **Suggest how the students measured the lengths of the curved shoots of seedlings A and D at the end of the investigation. [2 marks]**

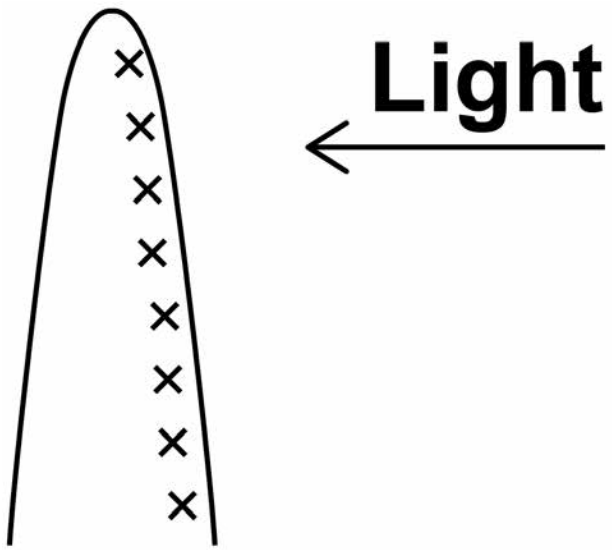
0 8 . 4 **The students concluded that the TIP of the shoot is needed for the plant to respond to light.**

Give evidence for this conclusion from FIGURE 11 on pages 58 and 59. [2 marks]

0 8 . 5 **A hormone stimulates growth in shoots.**

Which distribution of the hormone would cause the results seen in shoot D?
[1 mark]

Tick ONE box.



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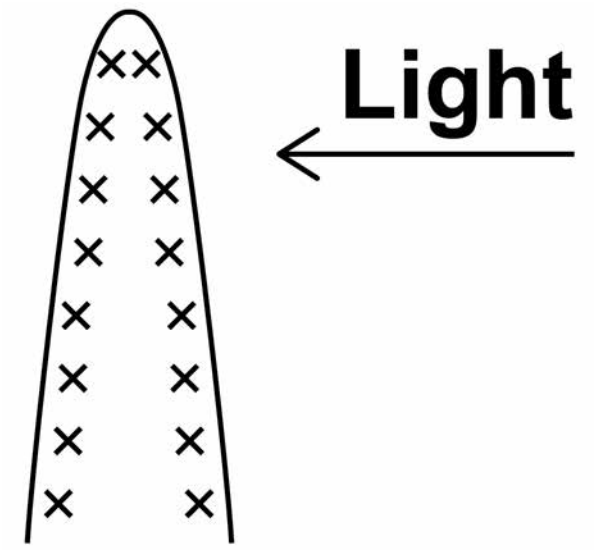

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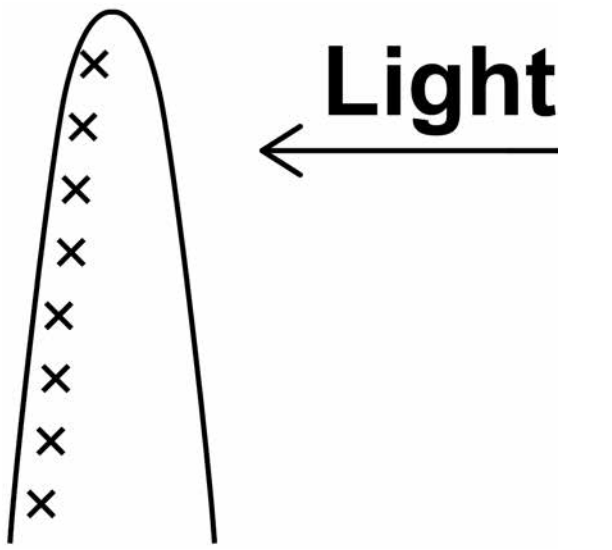


☐

Key:

× ×
× × = **Molecules of**
× **hormone**

8

0 9 **Many human actions are reflexes.**

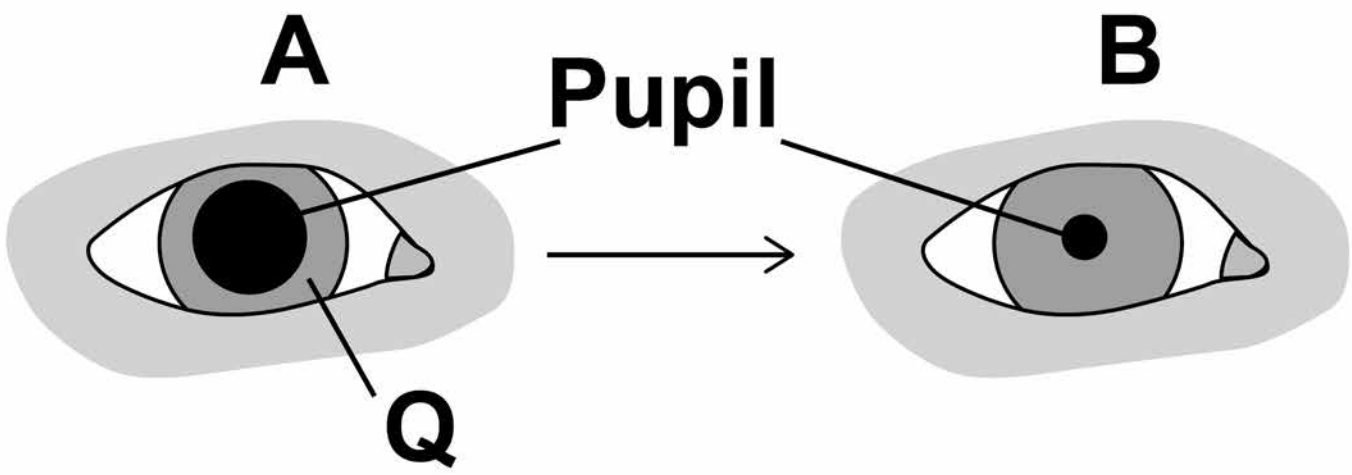
0 9 . 1 **Which TWO of the following are examples of reflex actions?**
[2 marks]

Tick TWO boxes.

- ☐ **Jumping in the air to catch a ball**
- ☐ **Raising a hand to protect the eyes in bright light**
- ☐ **Releasing saliva when food enters the mouth**
- ☐ **Running away from danger**
- ☐ **Withdrawing the hand from a sharp object**

FIGURE 12 shows how the size of the pupil of the human eye can change by reflex action.

FIGURE 12



0 9 . 2 Name ONE stimulus that would cause the pupil to change in size from A to B, as shown in FIGURE 12. [1 mark]

0 9 . 3 Structure Q causes the change in size of the pupil.

Name structure Q. [1 mark]

[Turn over]

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0 9 . 4 **Describe how structure Q causes the change in the size of the pupil from A to B.**
[1 mark]

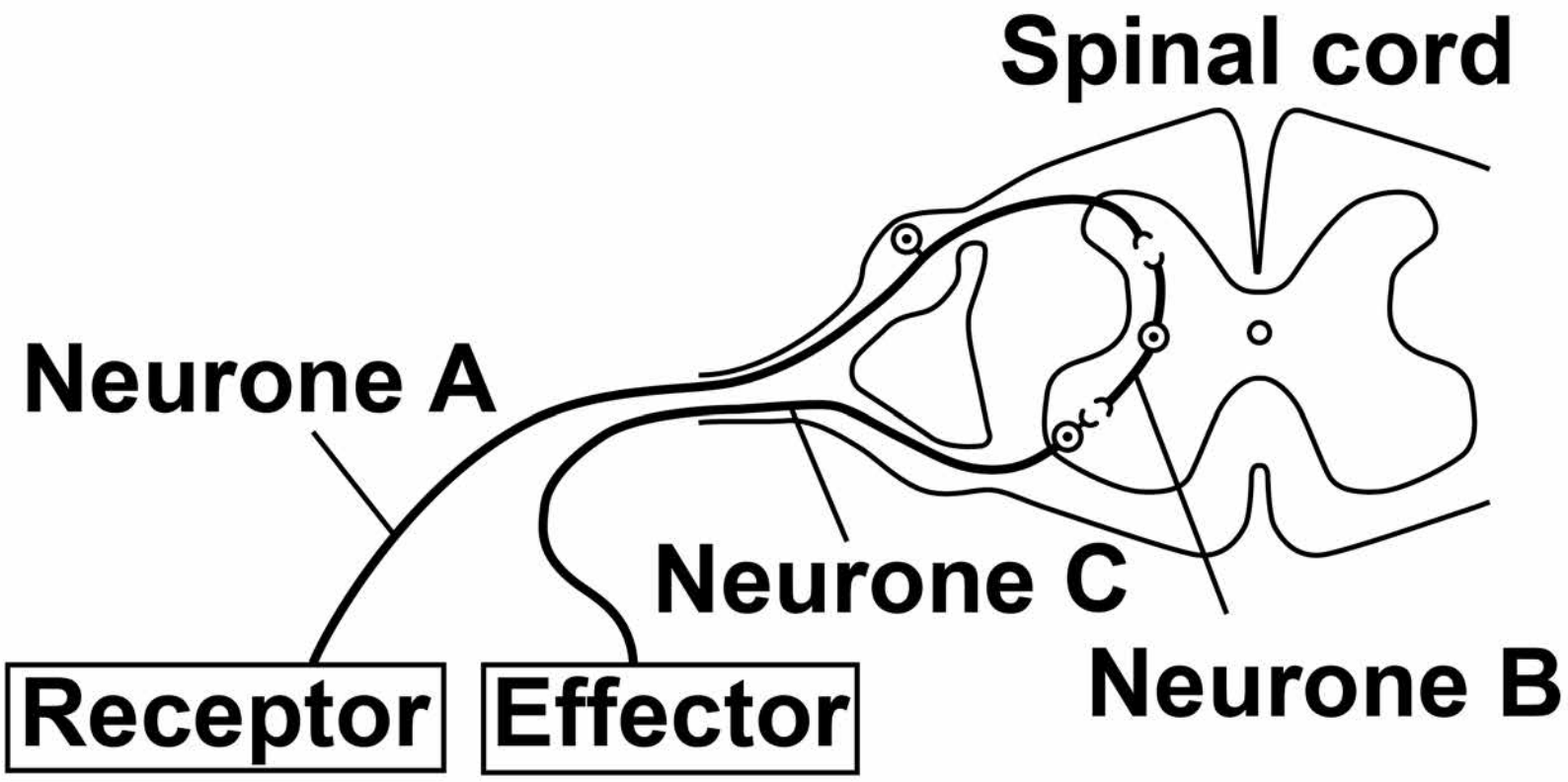
_____

_____

[Turn over]

0 9 . 5 **FIGURE 13 shows some structures involved in the coordination of a reflex action.**

FIGURE 13

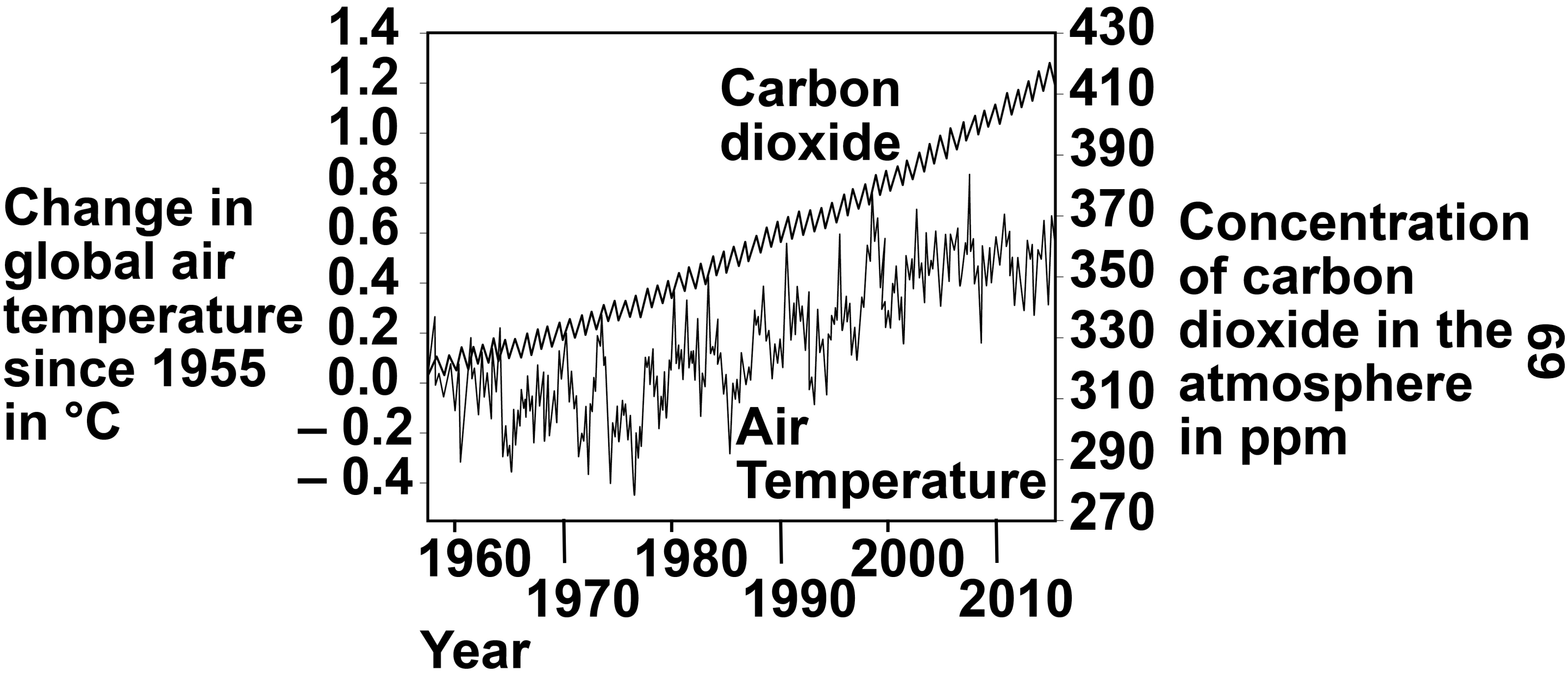


Describe how the structures shown in FIGURE 13 help to coordinate a reflex action.
[6 marks]

1 0 **Many scientists think that global air temperature is related to the concentration of carbon dioxide in the atmosphere.**

FIGURE 14 shows changes in global air temperature and changes in the concentration of carbon dioxide in the atmosphere.

FIGURE 14



[Turn over]

10.1 Complete TABLE 4, on page 71.

Use information from FIGURE 14, on page 69.
[2 marks]

Choose answers from the list below.

You may use each answer once, more than once or not at all.

constant

decreasing

increasing

TABLE 4

	1960 – 1977	1977 – 2003	2003 – 2015
Trend in carbon dioxide concentration	**Increasing**		
Trend in air temperature			

Many scientists think that an increase in carbon dioxide concentration in the atmosphere causes an increase in air temperature.

10.2 How would an increase in the concentration of carbon dioxide in the atmosphere cause an increase in air temperature? [1 mark]

1 0 . 3 **Evaluate evidence for and against the theory that an increase in the concentration of carbon dioxide in the atmosphere causes an increase in air temperature.**

Use data from FIGURE 14, on page 69, and your own knowledge. [4 marks]

[Turn over]

In each year, the concentration of carbon dioxide in the atmosphere is higher in the winter than in the summer.

1 0 . 4 Give ONE human activity that could cause the higher concentration of carbon dioxide in the winter. [1 mark]

1 0 . 5 Give ONE biological process that could cause the lower concentration of carbon dioxide in the summer. [1 mark]

10.6 **Give TWO possible effects of an increase in global air temperature on living organisms. [2 marks]**

1 _____

_____

2 _____

_____

_____

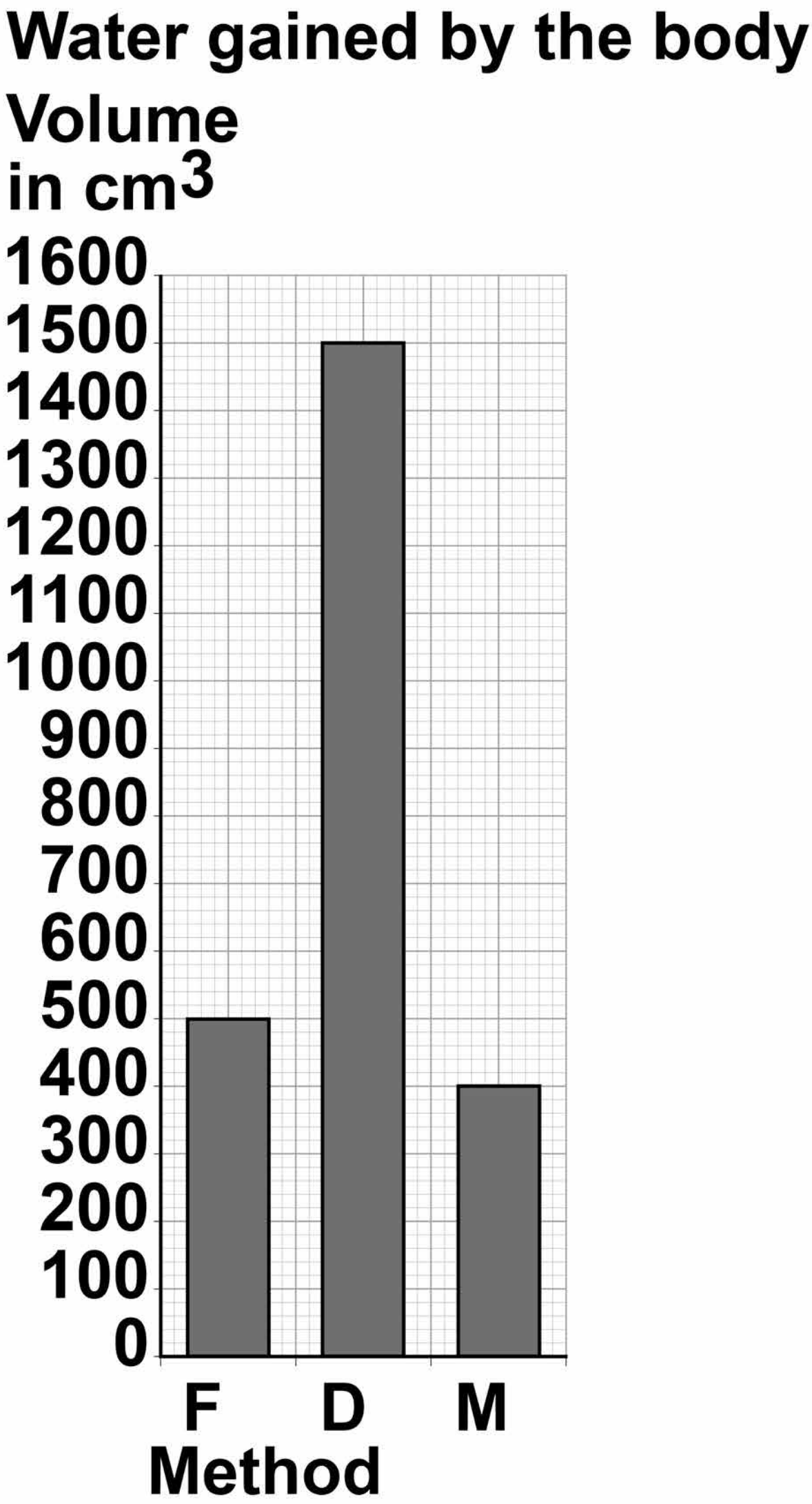
11

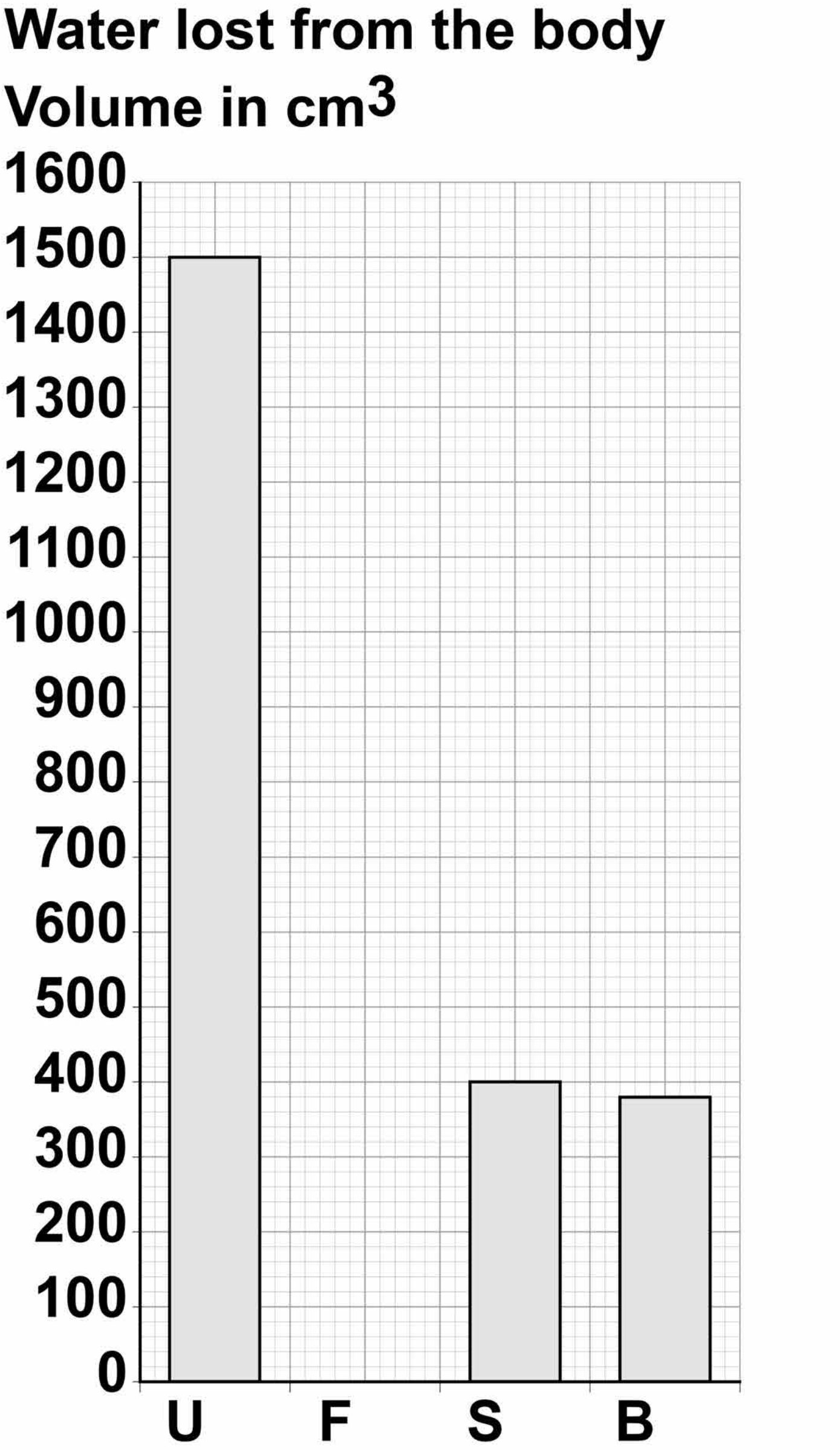
11 **It is important to maintain water balance in the body.**

FIGURE 15, on pages 78 and 79, shows how much water a person gained and lost by different methods in one day.

[Turn over]

FIGURE 15





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When water is balanced, the volume of water taken in by the body is equal to the volume of water lost from the body.

11.1 Calculate the volume of water the person lost in one day in faeces.

Use information from FIGURE 15 on pages 78 and 79. [2 marks]

Volume lost in faeces =

cm^3

11.2 **FIGURE 15, on pages 78 and 79, shows that one method of gaining water is by metabolism.**

Which metabolic process produces water? [1 mark]

Tick ONE box.

- ☐ **Breakdown of protein to amino acids**
- ☐ **Changing glycogen into glucose**
- ☐ **Digestion of fat**
- ☐ **Respiration of glucose**

The next day, the person ran a 10-kilometre race.

The volume of water lost from the body through the skin and by breathing increased.

11.3 **Explain why more water was lost through the skin during the race. [2 marks]**

1 1 . 4 **Explain why more water was lost by breathing during the race. [3 marks]**

END OF QUESTIONS

8

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For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
TOTAL	