A

# AQA

**Surname** _____

**Other Names** _____

**Centre Number** _____

**Candidate Number** _____

**Candidate Signature** _____

# GCSE
# COMBINED SCIENCE: TRILOGY

**Foundation Tier**

**Biology Paper 2F**

**F**

# 8464/B/2F

**Monday 11 June 2018    Morning**

**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]**

**2**

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.**

# 3

## 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** **Every year scientists have recorded the date when migrating birds arrived at summer breeding grounds in the UK.**

**The records show that for every 1 °C increase in mean global temperature, the birds arrived one day earlier.**

**5**

**0 1 . 1** **What will the birds be competing for when they arrive at their UK breeding grounds? [2 marks]**

**Tick TWO boxes.**

☐ **Eggs**

☐ **Food**

☐ **Light**

☐ **Mates**

☐ **Oxygen**

**[Turn over]**

**0 1 . 2** **Birds that arrive early might survive better than birds that arrive later.**

**Suggest ONE reason why.**
**[1 mark]**

_____

_____

_____

**0 1 . 3** **Global temperatures are increasing every year.**

**This is because of an increase of greenhouse gases in the atmosphere.**

**Name ONE greenhouse gas.**
**[1 mark]**

_____

_____

06

0 1 . 4 **Global warming affects the migration of animals.**

**Give ONE other effect of global warming.   [1 mark]**

_____

_____

_____

**[Turn over]**

**8**

**0 1 . 5** **Which TWO human activities cause global warming?**
**[2 marks]**

**Tick TWO boxes.**

☐ **Burning fossil fuels**

☐ **Eating vegetables**

☐ **Farming cows**

☐ **Turning off lights**

☐ **Using too much water**

08

**9**

**0 1 . 6** **Which gas in the atmosphere causes acid rain? [1 mark]**

**Tick ONE box.**

☐ **Carbon monoxide**

☐ **Oxygen**

☐ **Ozone**

☐ **Sulfur dioxide**

**[Turn over]**

**8**

09

**0 2** The genetic material in cells is made of DNA.

**0 2 . 1** Which TWO of the following describe the structure of DNA? [2 marks]

Tick TWO boxes.

☐ A double helix

☐ A monomer

☐ A polymer

☐ A protein

☐ A single strand

0 2 . 2 **Complete the sentences.**

**Choose answers from the list. [2 marks]**

**clone      disorder      gene**

**genome     mutation**

**A small section of DNA which codes for one protein is called a _____ .**

**All the genetic material of an organism is called its _____.**

**[Turn over]**

0 2 . 3 **Gametes (sex cells) contain half the amount of DNA compared to body cells.**

**Give the names of the TWO types of gametes in humans.**
**[1 mark]**

_____ **and** _____

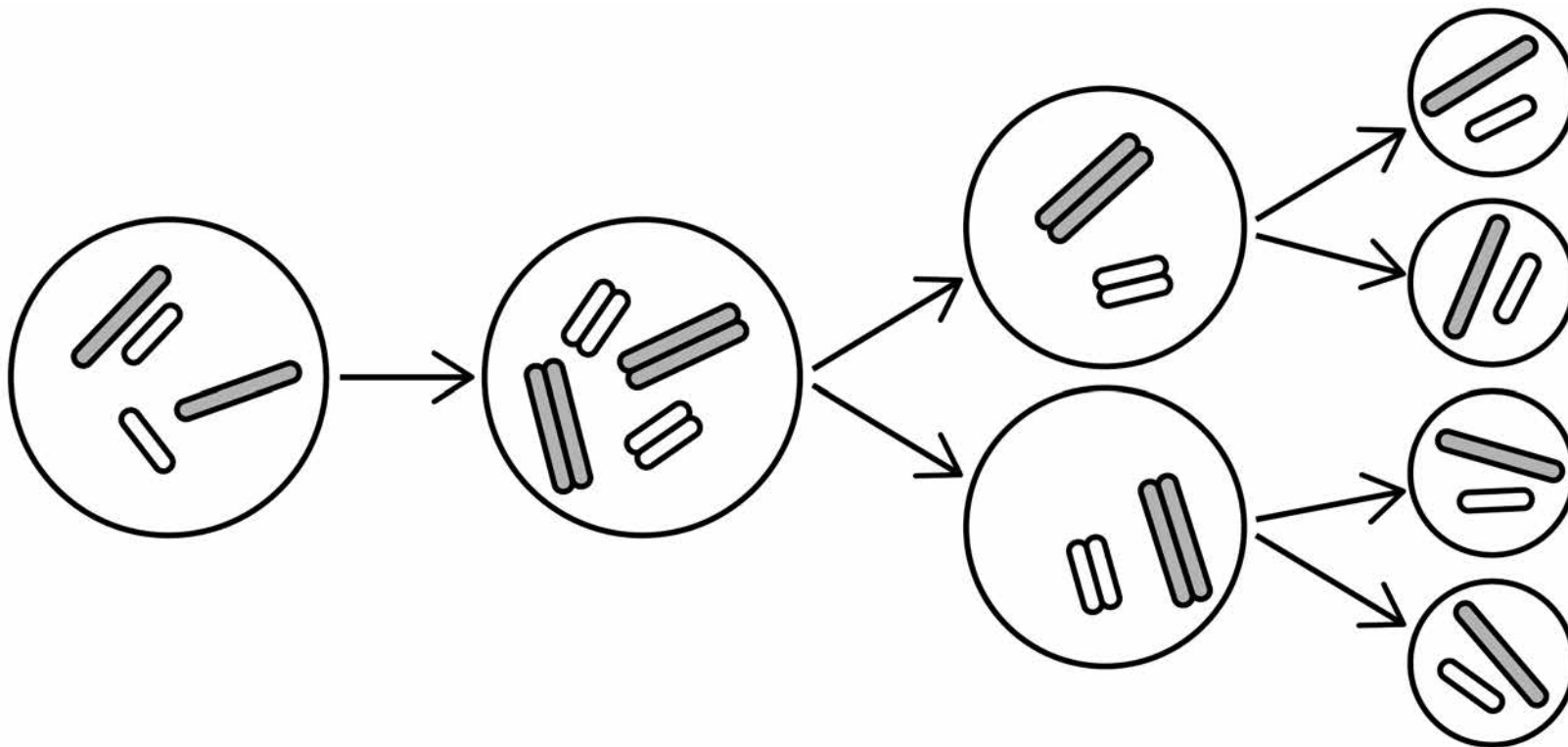0 2 . 4 **What is the process called when the gametes join?**
**[1 mark]**

_____

_____

13

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**[Turn over]**

**0 2 . 5** **FIGURE 1 shows cell division by meiosis to form gametes.**

## FIGURE 1

**15**

**Which TWO features in FIGURE 1, on page 14, show that this cell division is meiosis and NOT mitosis? [2 marks]**

**Tick TWO boxes.**

☐ **The cell divides twice**

☐ **The chromosomes pull apart into the new cells**

☐ **The cytoplasm divides into new cells**

☐ **The DNA is copied**

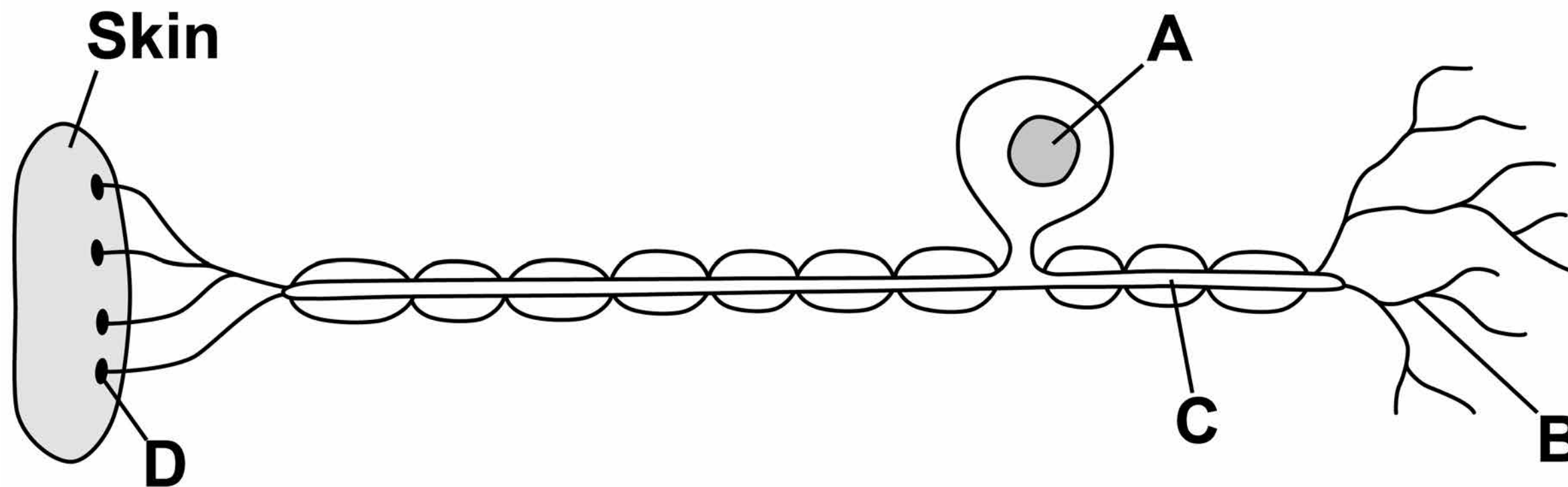☐ **The new cells have half the number of chromosomes**

**8**

**0 3** **This question is about coordination in the human body.**

**FIGURE 2 shows a sensory neurone (nerve cell).**

**FIGURE 2**

**0 3 . 1** Which label is the cell nucleus?  [1 mark]

Tick ONE box.

A ☐       B ☐     C ☐       D ☐

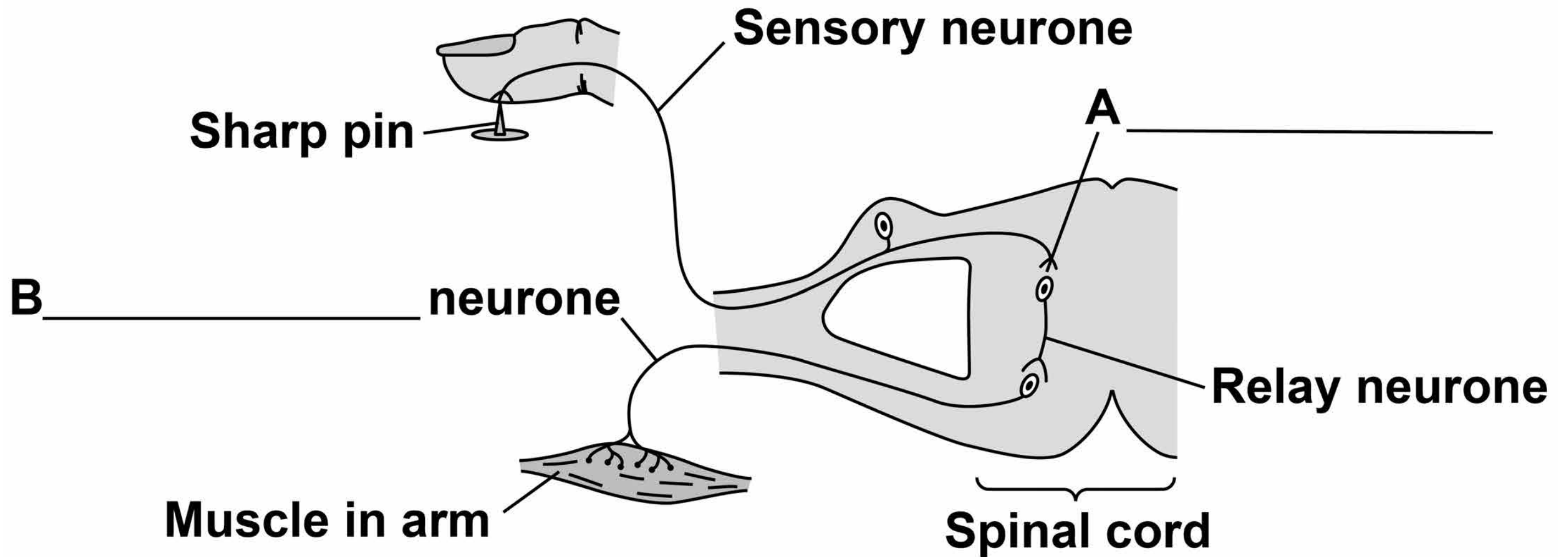**0 3 . 2** Which label is the receptor?  [1 mark]

Tick ONE box.

A ☐       B ☐     C ☐       D ☐

[Turn over]

$\boxed{0}\boxed{3}.\boxed{3}$ FIGURE 3 shows the nerve pathway when a person touches a sharp pin.

**FIGURE 3**



Sensory neurone

Sharp pin

A _____

B _____ neurone

Relay neurone

Muscle in arm

Spinal cord

Name structures A and B on FIGURE 3 [2 marks]

**0 3 . 4** When the finger touches the sharp pin, the muscle in the arm contracts to pull the arm away.

What type of action is this?  [1 mark]

Tick ONE box.

☐ A conscious action

☐ A delayed action

☐ A reflex action

**[Turn over]**

0 3 . 5 **Doctors tested people of different ages to time how long it took between touching a sharp pin and the arm muscle contracting.**

**At each age they tested five men and calculated a mean value for the time.**

**TABLE 1 shows the results.**

**TABLE 1**

| Age in years | Mean time for muscle to contract in milliseconds |
|---|---|
| 20 | 18 |
| 40 | 20 |
| 60 | 23 |
| 80 | 30 |

**21**

**How much longer does it take for the muscle to contract at 80 years of age compared to at 20 years of age?**
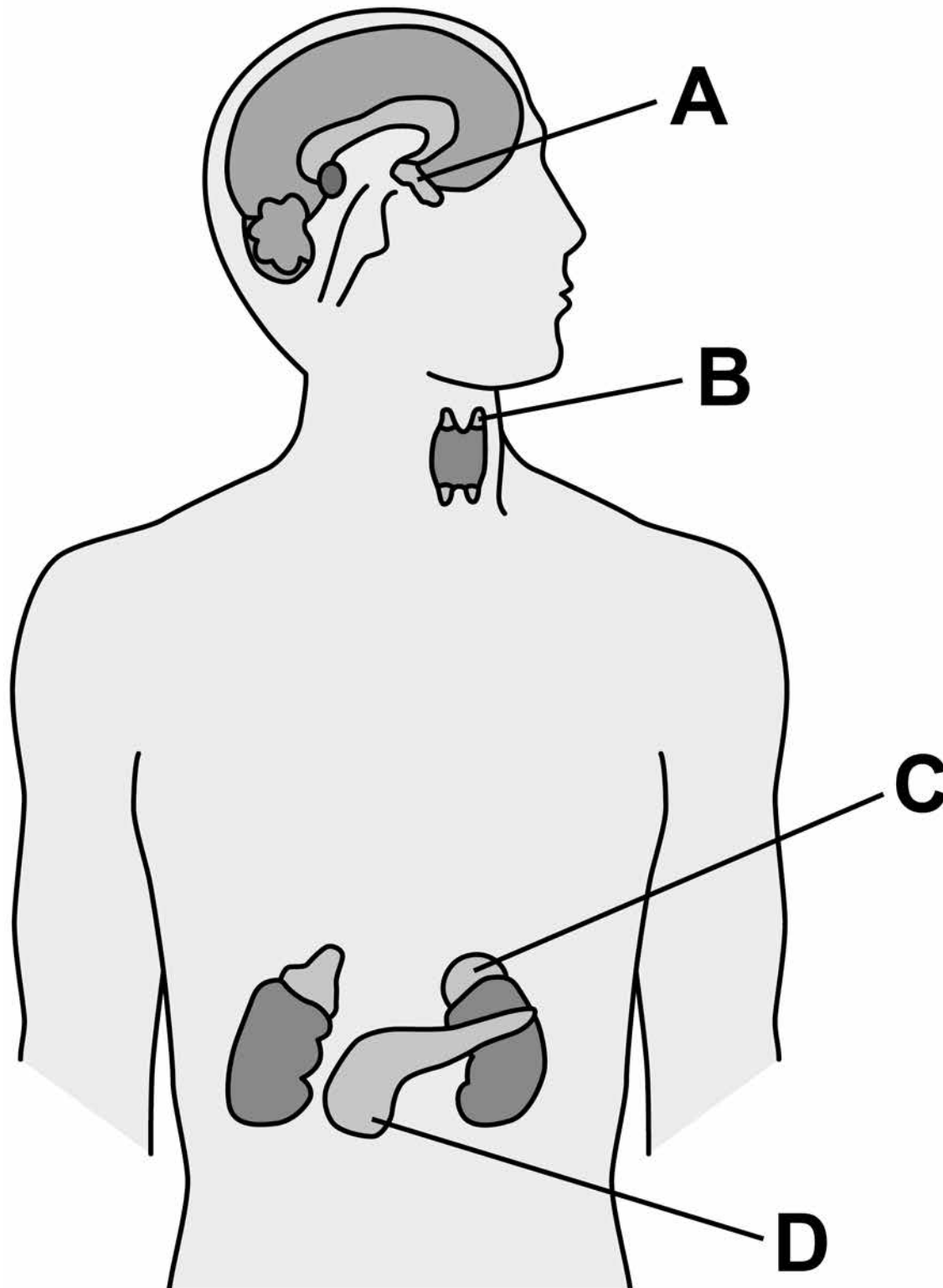
**Give your answer in seconds.
[2 marks]**

_____

_____

_____

_____

_____

**Time = _____ s**

**[Turn over]**

2 1

**0 3 . 6** **FIGURE 4 shows the position of some of the glands which release hormones.**

**FIGURE 4**

**23**

**Which label on FIGURE 4 shows the position of the pituitary gland?  [1 mark]**

**Tick ONE box.**

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

**[Turn over]**

**24**

**0 3 . 7** **Luteinising hormone (LH) is a hormone released by the pituitary gland.**

**What is the function of LH?**
**[1 mark]**

**Tick ONE box.**

☐ **Controls blood glucose concentration**

☐ **Controls the formation of sperm**

☐ **Controls the growth of muscles**

☐ **Controls the release of an egg**

2 4

| 0 | 3 | . | 8 |
|---|---|---|---|

**How does LH travel from the pituitary gland to its target organ?  [1 mark]**
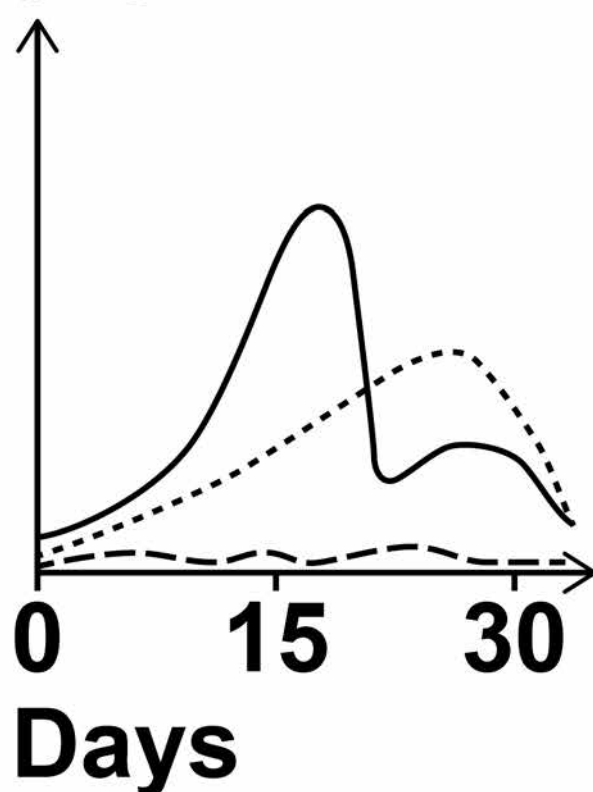
_____

_____

**[Turn over]**

**0 3 . 9** **FIGURE 5, below and on page 27, shows the relative levels of sex hormones of three young people over 30 days.**

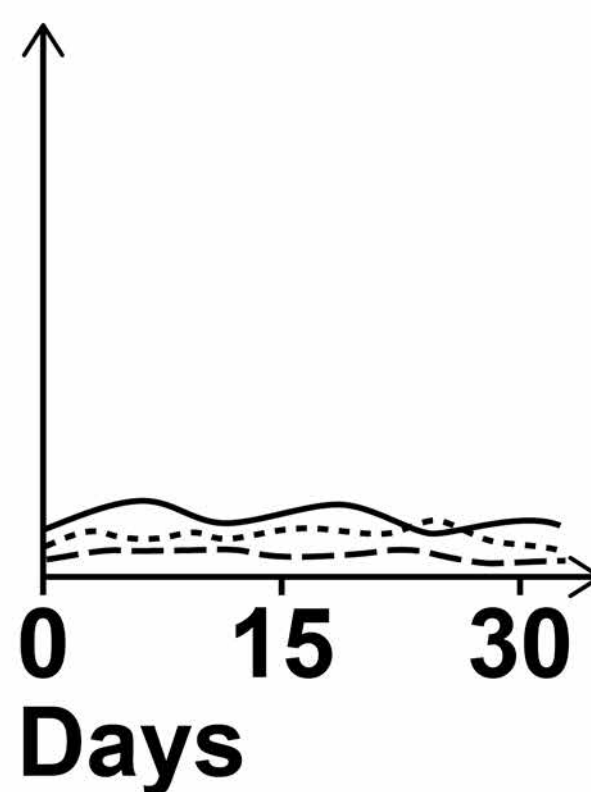**One person is an 8-year-old girl, one is an 18-year-old boy and the other is an 18-year-old girl.**

**FIGURE 5**

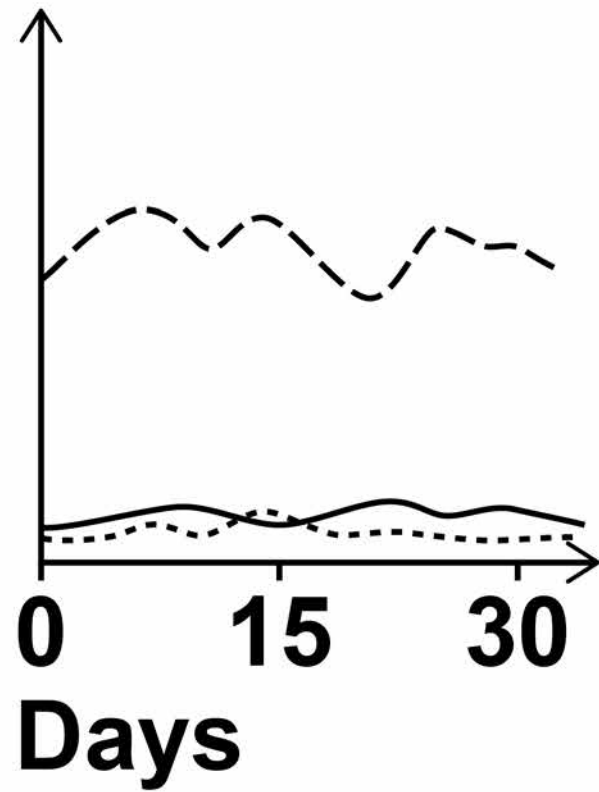PERSON A

Relative hormone level

0    15    30
Days

PERSON B

Relative hormone level

0    15    30
Days

**PERSON C**

**Relative hormone level**



**KEY**
—— Oestrogen
········ Progesterone
- - - - Testosterone

[Turn over]

28

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**29**

## Which person is the 18-year-old boy?

## Give ONE reason for your answer.
## [2 marks]

**Person** _____

_____

**Reason** _____

_____

_____

**[Turn over]**

**12**

**0 4** **A class of eight students measured the population of water fleas living at the edge of a large pond.**

**This is the method each student used.**

1. **Put some pond water in a white tray.**
2. **Take a pond net and scoop at the edge of the pond a few times.**
3. **Empty the pond net into the water in the tray.**
4. **Count the number of water fleas in the tray.**

**FIGURE 6 shows a student working.**

**FIGURE 6**



**0 4 . 1** The students did NOT control some variables.

Give TWO variables the students should have controlled to make this a valid method. [2 marks]

1 _____

_____

_____

2 _____

_____

_____

**[Turn over]**

**The eight students then used a different method to obtain valid results.**

**TABLE 2 shows their results.**

**TABLE 2**

| Student | Number of water fleas per 1000 cm$^3$ pond water |
|---------|---------------------------------------------------|
| A | 66 |
| B | 37 |
| C | 51 |
| D | 102 |
| E | 40 |
| F | 122 |
| G | 75 |
| H | 19 |

**33**

0 4 . 2 **Calculate the students' mean value for the population of water fleas at the edge of the pond. [1 mark]**

_____

_____

_____

**Mean population = _____**

**water fleas per 1000 cm³ pond water**

0 4 . 3 **What was the range of the students' results? [1 mark]**

**Range = _____**

**[Turn over]**

**0 4 . 4** **Suggest ONE reason why such a wide range of results was found.  [1 mark]**

_____

_____

_____

**0 4 . 5** **The teacher then sampled the centre of the pond eight times.**

**His mean value was 12 water fleas per 1000 cm$^3$ pond water.**

**What conclusion can you make about the distribution of water fleas in the pond?**

**Use the students' mean value from question 04.2 to compare with the teacher's mean value.**
**[1 mark]**

_____

_____

_____

**[Turn over]**

Scientists counted some different invertebrates living in a pond in 2014 and in 2016

TABLE 3 shows the results.

TABLE 3

| Invertebrate species | Number of invertebrates | |
|---|---|---|
| | 2014 | 2016 |
| Bloodworms | 13 | 48 |
| Freshwater shrimps | 24 | 9 |
| Mayfly nymphs | 32 | 0 |
| Water snails | 19 | 24 |

0 4 . 6  Calculate the change in the number of bloodworms between 2014 and 2016.  [1 mark]

_____

_____

Change = _____ bloodworms

0 4 . 7 **Calculate the number of shrimps in the pond in 2016 as a percentage of the number of shrimps in the pond in 2014.**
**[1 mark]**

_____

_____

**Percentage = _____ %**

**[Turn over]**

**0 4 . 8** **Invertebrate species found in a pond can be used as an indicator of the pollution level.**

**TABLE 4 shows which species can survive in different levels of pollution.**

## TABLE 4

| Invertebrate species | Pollution level | | |
|---|---|---|---|
| | **Low** | **Medium** | **High** |
| **Bloodworms** | ✓ | ✓ | ✓ |
| **Freshwater shrimps** | ✓ | ✓ | ✘ |
| **Mayfly nymphs** | ✓ | ✘ | ✘ |
| **Water snails** | ✓ | ✓ | ✓ |

## Key

✓ = Can survive

✘ = Cannot survive

**39**

**What conclusion can you make about the change in the level of pollution in the pond between 2014 and 2016?**

**Give ONE reason for your conclusion.**

**Use the data in TABLE 3, on page 36, and TABLE 4, on page 38.  [2 marks]**

_____

_____

_____

_____

_____

_____

**[Turn over]**

**40**

**0 4 . 9** **Water pollution and global warming are two problems that have been caused by the rapid increase of the human population.**

**Suggest TWO other problems caused by the rapid increase of the human population.**
**[2 marks]**

**1** _____

_____

_____

**2** _____

_____

_____

**12**

41

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**[Turn over]**

**0 5** Variation in individual organisms can be caused by:

- genes

- the environment

- a combination of both genes and the environment.

FIGURE 7 shows variations in a woman.

FIGURE 7

**0 5 . 1** **What is the cause of each variation in TABLE 5?**

**Tick only ONE box in each row.  [3 marks]**

**TABLE 5**

| Variation | Cause of variation | | |
|---|---|---|---|
| | **Genes only** | **Environment only** | **Both genes and the environment** |
| **Brown eyes** | | | |
| **Light brown skin colour** | | | |
| **Short hair** | | | |

[Turn over]

**05.2** **The allele for blue eyes is recessive (b).**

**The allele for brown eyes is dominant (B).**

**A woman has blue eyes.**

**What are the woman's alleles? [1 mark]**

**Tick ONE box.**

**BB** ☐    **Bb** ☐    **bb** ☐

**05.3** **The woman marries a man with the alleles Bb for eye colour.**

**What colour eyes does the man have?  [1 mark]**

_____

_____

0 5 . 4  Complete the Punnett square diagram in FIGURE 8 for this man and woman.  [1 mark]

FIGURE 8

**Woman**

**Man**

| | | |
|---|---|---|
| | | |
| **B** | | |
| **b** | | |

0 5 . 5  What is the probability that a child of this man and woman will have brown eyes?
[1 mark]

_____

_____

**[Turn over]**

**0 5 . 6** **What is the scientific term used for the child's eye colour?**
**[1 mark]**

**Tick ONE box.**

☐ **Chromosome**

☐ **Condition**

☐ **Genotype**

☐ **Phenotype**

**0 5 . 7** **What effect will a mutation have?  [1 mark]**

**Tick ONE box.**

☐ **Almost certainly have no effect**

☐ **Definitely change appearance**

☐ **Definitely be passed on to all children**

☐ **Probably cause a disease**

**[Turn over]**

9

**0 6**  **Many biotic and abiotic factors can affect the growth of plants.**

**0 6 . 1**  **Are the factors in TABLE 6 biotic or abiotic?  [2 marks]**

**Tick ONE box for each factor.**

**TABLE 6**

| FACTOR | BIOTIC | ABIOTIC |
|---|---|---|
| Diseases | | |
| Herbivores | | |
| Temperature | | |
| Water | | |

**Two students investigated the effect of light intensity on the distribution of small plants.**

**The plants are growing under a tree in a park.**

**The students made the following hypothesis:**

**'As you move outwards from a tree there will be more plant growth.'**

| 0 | 6 |.| 2 |

**Explain why the students thought their hypothesis would be correct. [3 marks]**

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

**[Turn over]**

**0 6 . 3** The students used two pieces of equipment.

Give the scientific name of each piece of equipment.
[2 marks]

A square frame measuring 0.5 m × 0.5 m

_____

An electronic device to measure light intensity

_____

This is the method used.

1. Fix one end of a tape measure at the base of the tree.

2. Fix the other end of the tape measure 11 metres from the tree.

3. At 0 metres put the square frame on the ground.

**4. Identify all the plant species growing inside the frame.**

**5. Estimate and record the percentage cover of each plant species.**

**6. Measure the light intensity inside the frame.**

**7. Put the square frame on the ground every 2 metres along the tape to 10 metres.**

**8. Repeat steps 4 – 6 in every frame.**

**[Turn over]**

**FIGURE 9 shows the equipment in this investigation.**

**FIGURE 9**
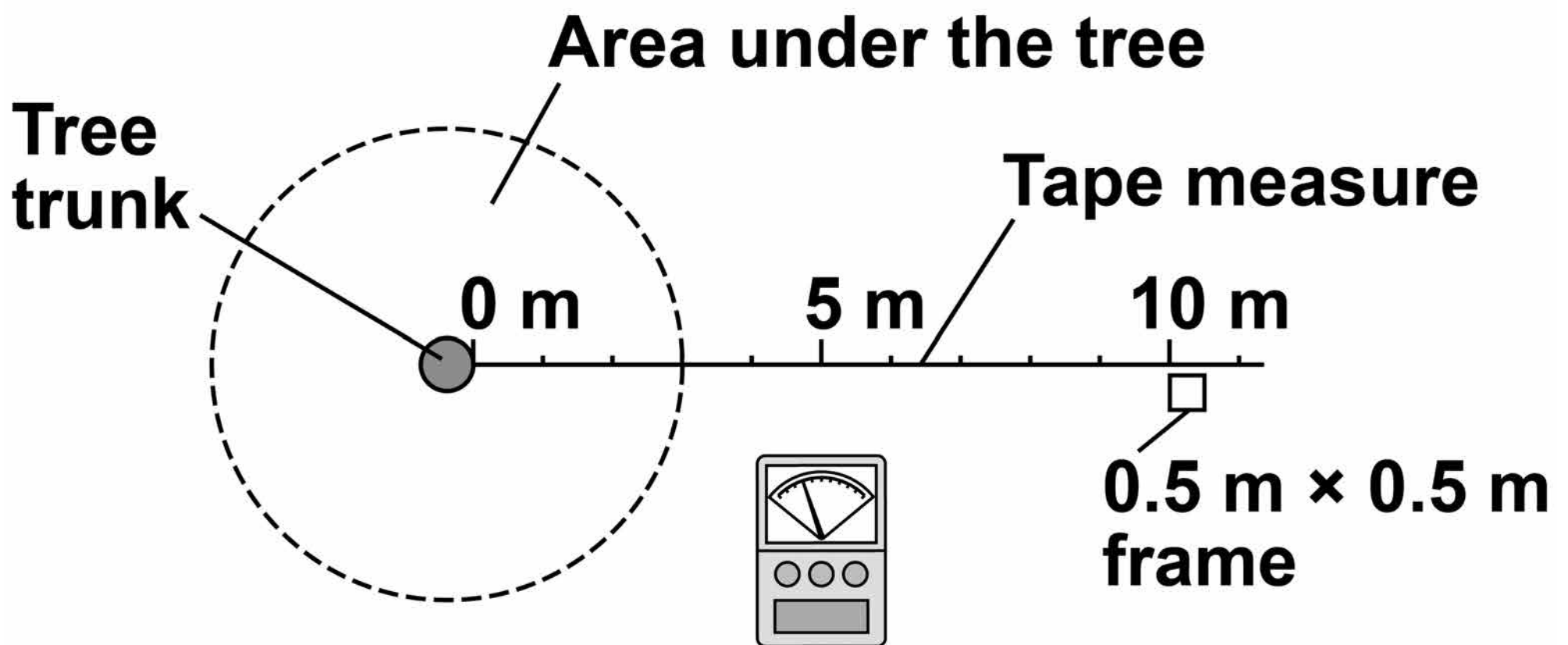


| 0 | 6 |.| 4 | **Calculate the total area sampled.  [1 mark]**

_____

_____

_____

**Total area sampled =**

_____ **m$^2$**

0 6 . 5 **The whole investigation was done as quickly as possible on the same day.**

**Suggest ONE reason why.**
**[1 mark]**

_____

_____

_____

0 6 . 6 **Give ONE way the investigation could be improved.  [1 mark]**

_____

_____

_____

**[Turn over]**

**TABLE 7 shows the results.**

**TABLE 7**

| | Distance from tree in metres | | | | | |
|---|---|---|---|---|---|---|
| | 0 | 2 | 4 | 6 | 8 | 10 |
| Percentage cover of grass | 15 | 50 | 35 | 16 | 15 | 15 |
| Percentage cover of plantain | 0 | 5 | 10 | 40 | 25 | 30 |
| Percentage cover of daisy | 0 | 0 | 0 | 4 | 20 | 10 |
| Percentage cover of clover | 1 | 10 | 25 | 40 | 40 | 45 |

| Total percentage cover of plants | 16 | 65 | 70 | 100 | 100 | 100 |
|---|---|---|---|---|---|---|
| Light intensity in arbitrary units | 37 | 59 | 150 | 175 | >200 | >200 |

0 6 . 7   **Which plant species in TABLE 7 will only grow at high light intensity?  [1 mark]**

_____

_____

**[Turn over]**

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**06.8** **What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?**

**Use data from TABLE 7, on pages 54 and 55, in your answer. [2 marks]**

_____

_____

_____

_____

_____

**[Turn over]**

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0 6 . 9 **Light intensity might NOT be the cause of this pattern of plant distribution.**

**Suggest ONE different factor that may cause these results.**

**Give ONE reason for your answer.  [2 marks]**

**Factor**    _____

_____

**Reason**    _____

_____

_____

15

**[Turn over]**

**0 7** **Pseudomonas bacteria cause infections in hospital patients.**

**A new strain of Pseudomonas bacteria has evolved.  This new strain can only be killed by one antibiotic called fluroquinolone.**

**Scientists want to prevent the new strain of Pseudomonas from spreading in the human population.**

**Explain the advice doctors should be given to prevent the spread of the new strain.
[6 marks]**

_____

_____

_____

_____

_____

60

_____

_____

_____

_____

_____

_____

_____

_____

**END OF QUESTIONS**

| |
|---|
| **6** |

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