



**Surname** \_\_\_\_\_

**Other Names** \_\_\_\_\_

**Centre Number** \_\_\_\_\_

**Candidate Number** \_\_\_\_\_

**Candidate Signature** \_\_\_\_\_

**GCSE**

**COMBINED SCIENCE: TRILOGY**

**Foundation Tier**

**Biology Paper 2F**

**8464/B/2F**

**F**

**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]**



**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**

- **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.**

**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]**

---

---

**01.4** Global warming affects the migration of animals.

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

---

---

---

**[Turn over]**

**01.5** 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**



**01.6** Which gas in the atmosphere causes acid rain? [1 mark]

**Tick ONE box.**

**Carbon monoxide**

**Oxygen**

**Ozone**

**Sulfur dioxide**

**[Turn over]**

<b>8</b>



**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**

**02.2 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]**



**02.3** 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 \_\_\_\_\_

**02.4** What is the process called when the gametes join? [1 mark]

\_\_\_\_\_  
\_\_\_\_\_

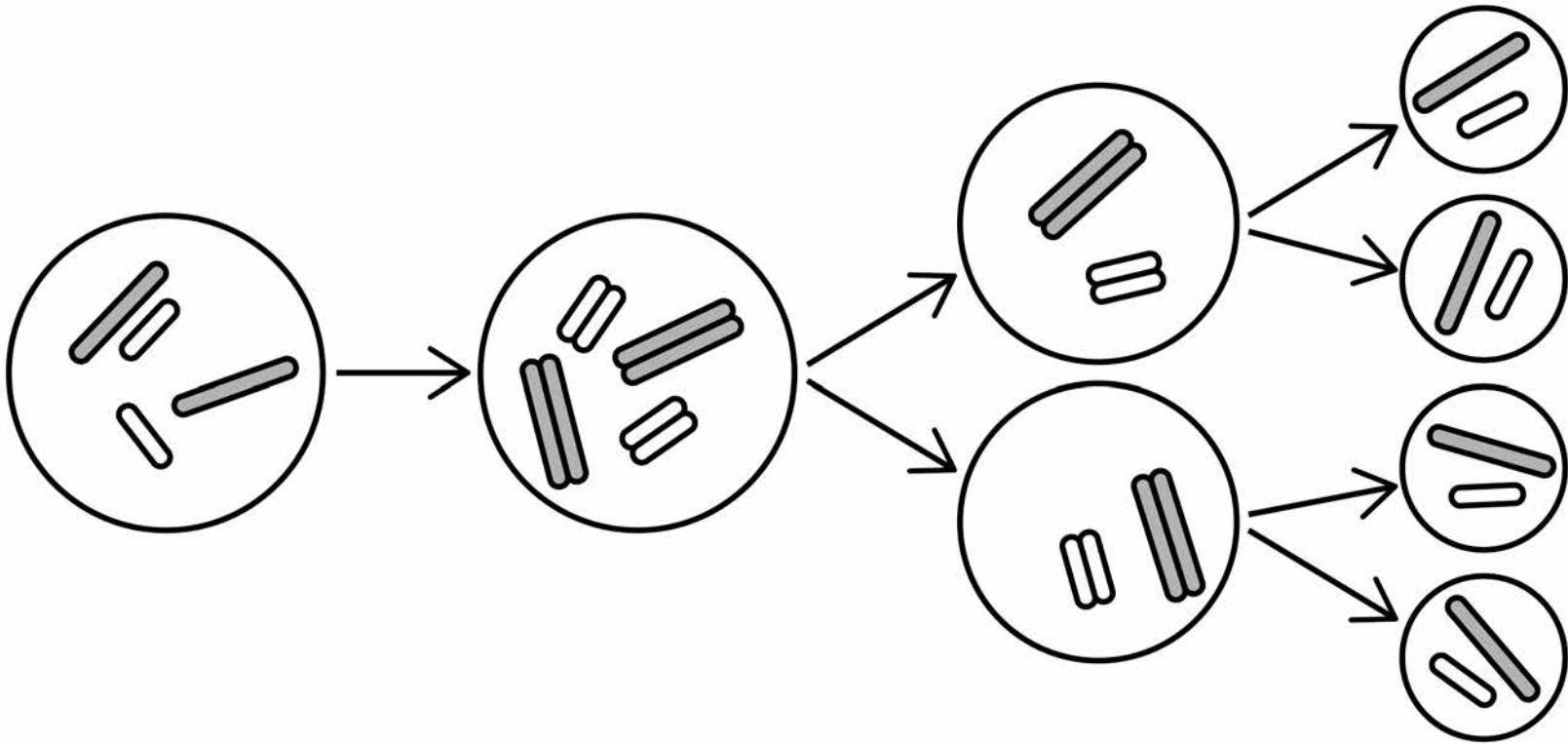
**BLANK PAGE**

**[Turn over]**



**02.5** FIGURE 1 shows cell division by meiosis to form gametes.

**FIGURE 1**



**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**

**[Turn over]**

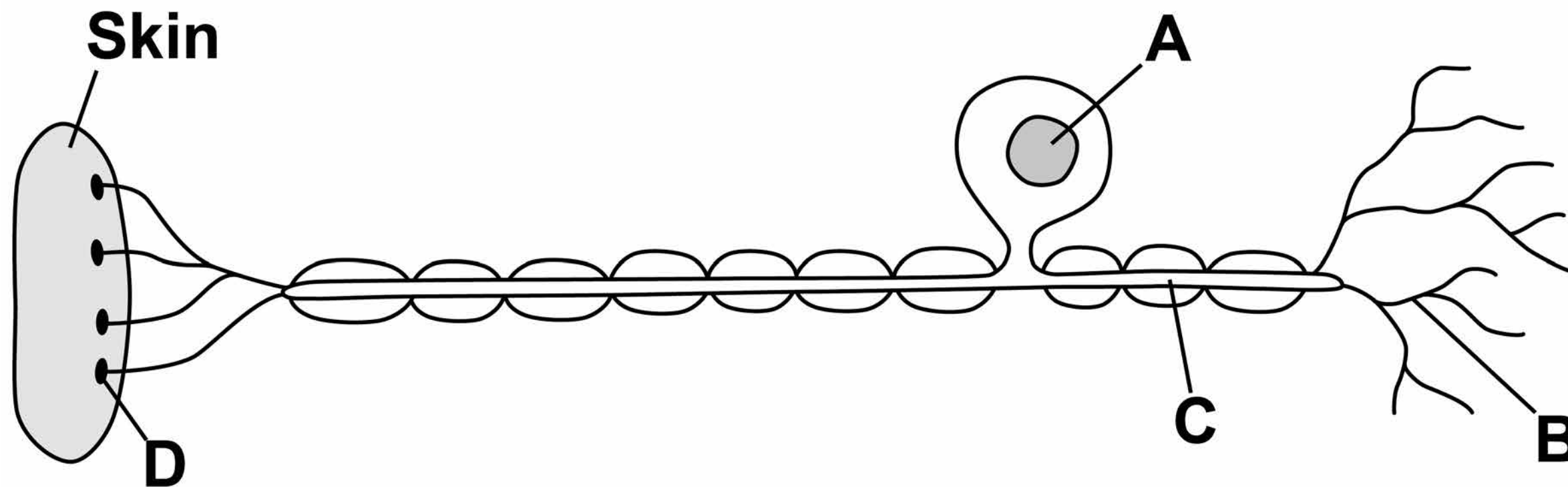


03

This question is about coordination in the human body.

FIGURE 2 shows a sensory neurone (nerve cell).

FIGURE 2





**03.1** Which label is the cell nucleus? [1 mark]

**Tick ONE box.**

A       B       C       D

**03.2** Which label is the receptor? [1 mark]

**Tick ONE box.**

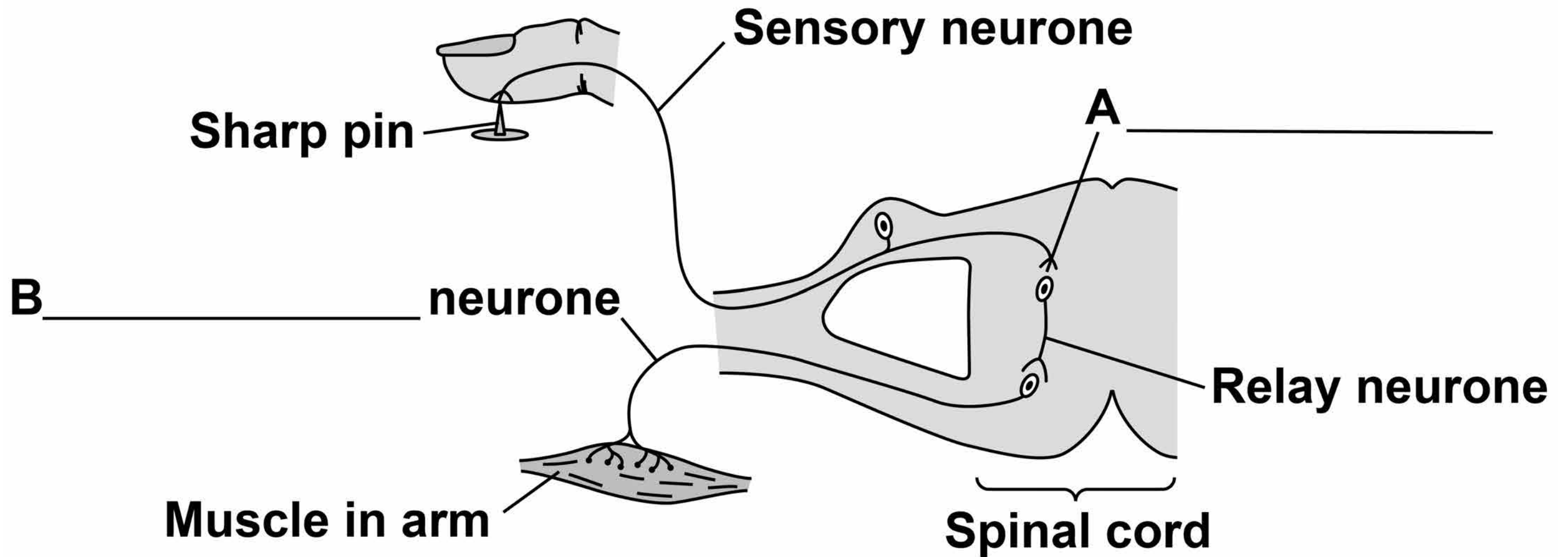
A       B       C       D

**[Turn over]**



**03.3** FIGURE 3 shows the nerve pathway when a person touches a sharp pin.

**FIGURE 3**



18

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

**03.4** 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]**



**03.5** 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**

<b>Age in years</b>	<b>Mean time for muscle to contract in milliseconds</b>
<b>20</b>	<b>18</b>
<b>40</b>	<b>20</b>
<b>60</b>	<b>23</b>
<b>80</b>	<b>30</b>

**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]**

---

---

---

---

---

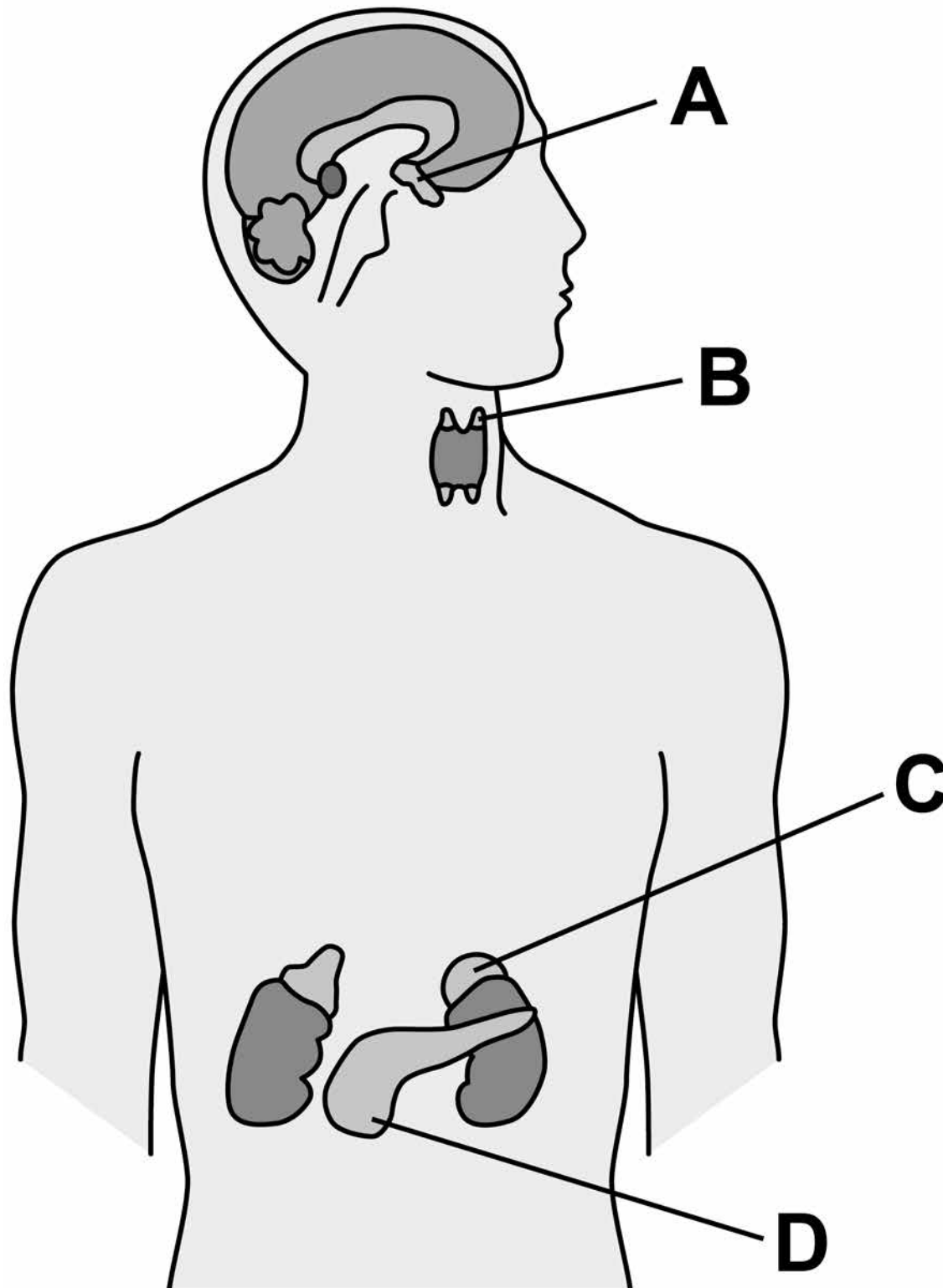
**Time = \_\_\_\_\_ s**

**[Turn over]**

03.6

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

**FIGURE 4**



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

**Tick ONE box.**

**A**

**B**

**C**

**D**

**[Turn over]**

**03.7** 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**



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

---

---

**[Turn over]**

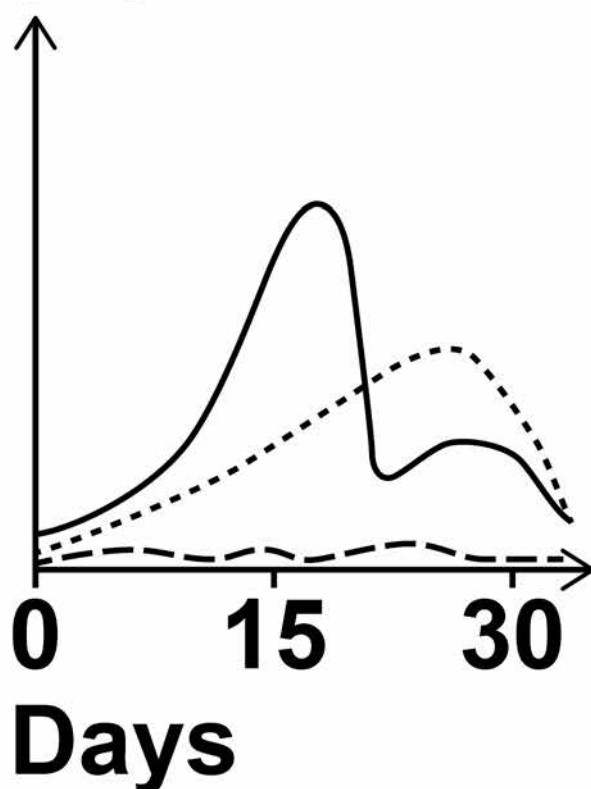
**03.9** **FIGURE 5**, below and on page 27, shows the relative levels of sex hormones of three young people over 30 days.

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**

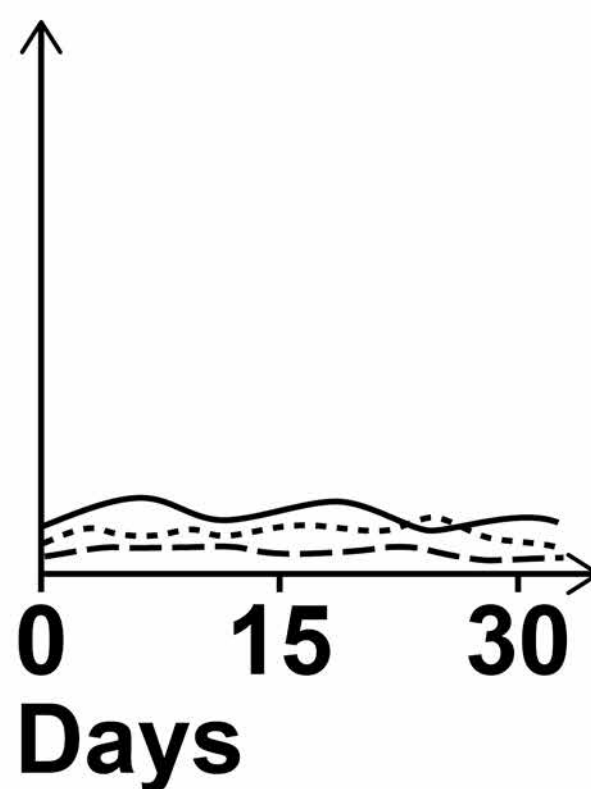
**PERSON A**

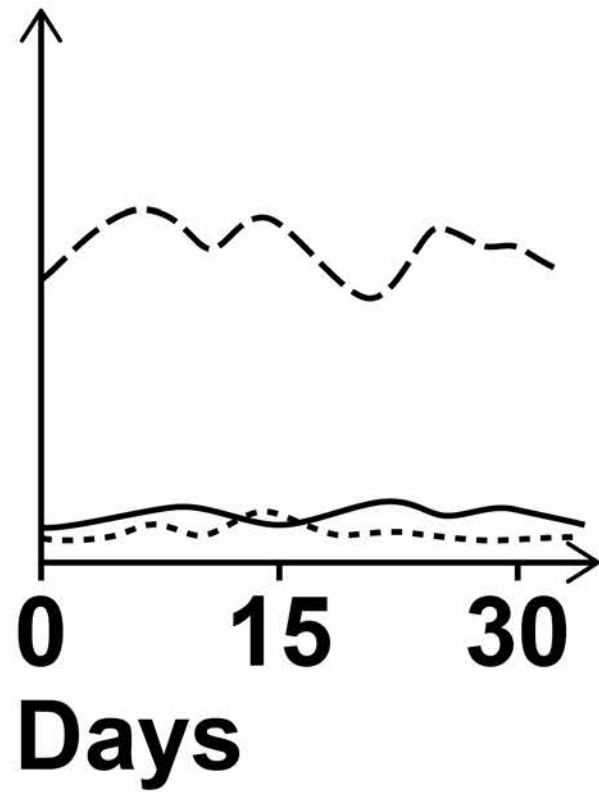
**Relative hormone level**



**PERSON B**

**Relative hormone level**



**PERSON C****Relative  
hormone  
level****KEY**

- Oestrogen
- ..... Progesterone
- Testosterone

**[Turn over]**

**BLANK PAGE**



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

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

**Person** \_\_\_\_\_

\_\_\_\_\_

**Reason** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**[Turn over]**

<b>12</b>

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**

**04.1** 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

<b>Student</b>	<b>Number of water fleas per 1000 cm<sup>3</sup> pond water</b>
<b>A</b>	<b>66</b>
<b>B</b>	<b>37</b>
<b>C</b>	<b>51</b>
<b>D</b>	<b>102</b>
<b>E</b>	<b>40</b>
<b>F</b>	<b>122</b>
<b>G</b>	<b>75</b>
<b>H</b>	<b>19</b>



- 04.2** 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 cm<sup>3</sup> pond water**

- 04.3** 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]

---

---

---

**04.5** The teacher then sampled the centre of the pond eight times.

His mean value was 12 water fleas per 1000 cm<sup>3</sup> 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**

**04.7** 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]**

**04.8** 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
<b>Bloodworms</b>	✓	✓	✓
<b>Freshwater shrimps</b>	✓	✓	✗
<b>Mayfly nymphs</b>	✓	✗	✗
<b>Water snails</b>	✓	✓	✓

### Key

✓ = Can survive

✗ = Cannot survive

**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]**

**04.9**

**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** \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

<b>12</b>



**BLANK PAGE**

**[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**

<b>Variation</b>	<b>Cause of variation</b>		
	<b>Genes only</b>	<b>Environment only</b>	<b>Both genes and the environment</b>
<b>Brown eyes</b>			
<b>Light brown skin colour</b>			
<b>Short hair</b>			

**43**

**[Turn over]**



**0 5 . 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

**0 5 . 3** The woman marries a man with the alleles Bb for eye colour.

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

---

---

- 05.4** Complete the Punnett square diagram in **FIGURE 8** for this man and woman. [1 mark]

**FIGURE 8**

		<b>Woman</b>	
<b>Man</b>	<b>B</b>		
	<b>b</b>		

- 05.5** What is the probability that a child of this man and woman will have brown eyes? [1 mark]

---



---

**[Turn over]**



**05.6** What is the scientific term used for the child's eye colour?  
[1 mark]

**Tick ONE box.**

**Chromosome**

**Condition**

**Genotype**

**Phenotype**

**05.7** 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]**

<b>9</b>

06

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

06.1

Are the factors in TABLE 6 biotic or abiotic? [2 marks]

Tick ONE box for each factor.

**TABLE 6**

<b>FACTOR</b>	<b>BIOTIC</b>	<b>ABIOTIC</b>
<b>Diseases</b>		
<b>Herbivores</b>		
<b>Temperature</b>		
<b>Water</b>		

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:







**06.3** 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.**

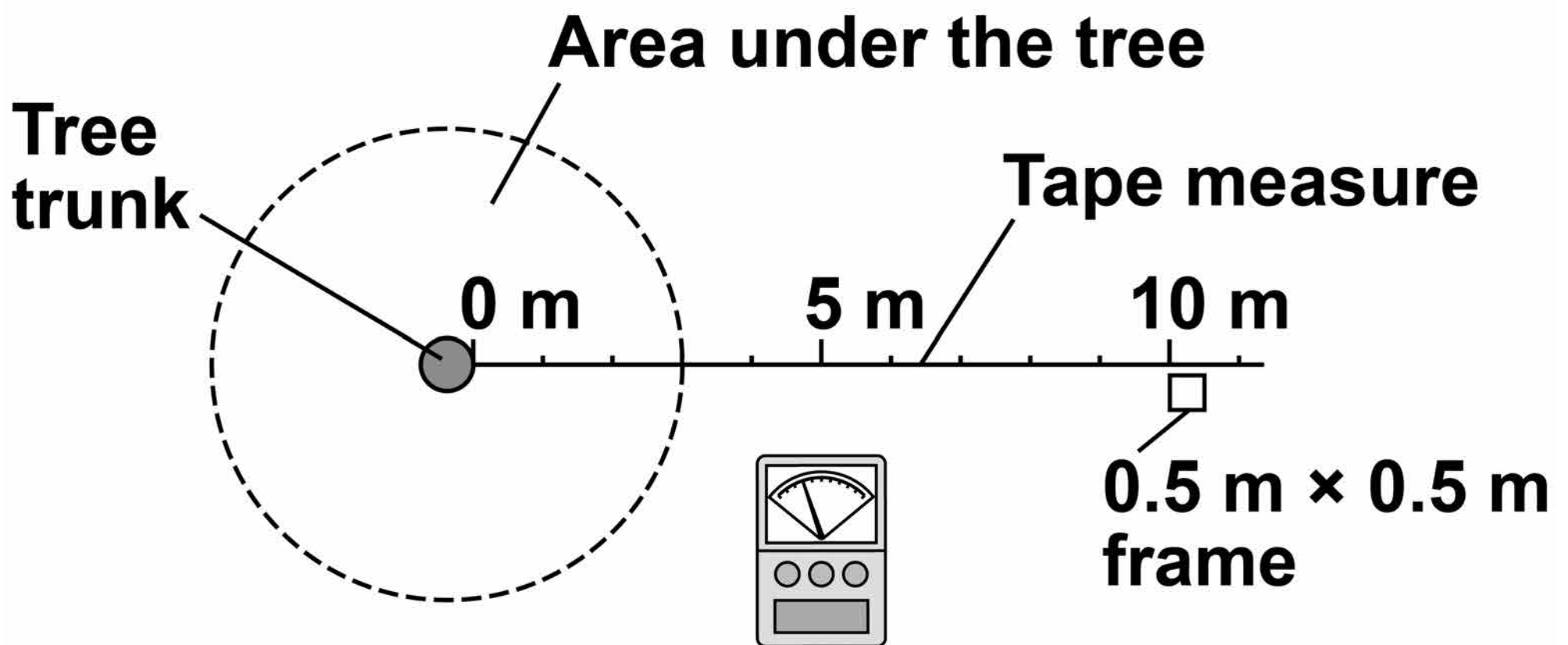
- 1. Fix one end of a tape measure at the base of the tree.**
- 2. Fix the other end of the tape measure 11 metres from the tree.**
- 3. At 0 metres put the square frame on the ground.**

- 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**



**06.4**

**Calculate the total area sampled. [1 mark]**

---



---



---

**Total area sampled =**

**m<sup>2</sup>**

**06.5** The whole investigation was done as quickly as possible on the same day.

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

---

---

---

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

---

---

---

**[Turn over]**

**TABLE 7 shows the results.**

**TABLE 7**

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



<b>Total percentage cover of plants</b>	<b>16</b>	<b>65</b>	<b>70</b>	<b>100</b>	<b>100</b>	<b>100</b>
<b>Light intensity in arbitrary units</b>	<b>37</b>	<b>59</b>	<b>150</b>	<b>175</b>	<b>&gt;200</b>	<b>&gt;200</b>

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

---

---

**[Turn over]**



**BLANK PAGE**





**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]**



**BLANK PAGE**



**06.9** 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** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

<b>15</b>

**[Turn over]**

**07**

**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]**

---

---

---

---

---

---

---

---



**There are no questions printed on this page**

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>TOTAL</b>	

### Copyright information

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from [www.aqa.org.uk](http://www.aqa.org.uk) after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 AQA and its licensors. All rights reserved.

**IB/M/Jun18/CD/8464/B/2F/E4**

