



Surname _____

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Centre Number _____

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Candidate Signature _____

GCSE

COMBINED SCIENCE: TRILOGY

F

Foundation Tier

Biology Paper 2F

8464/B/2F

Monday 11 June 2018 Morning

Time allowed: 1 hour 15 minutes

For this paper you must have:

- a ruler
- a scientific calculator.

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

[Turn over]



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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
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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
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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



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]

[Turn over]



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

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

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



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



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 _____.

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 _____

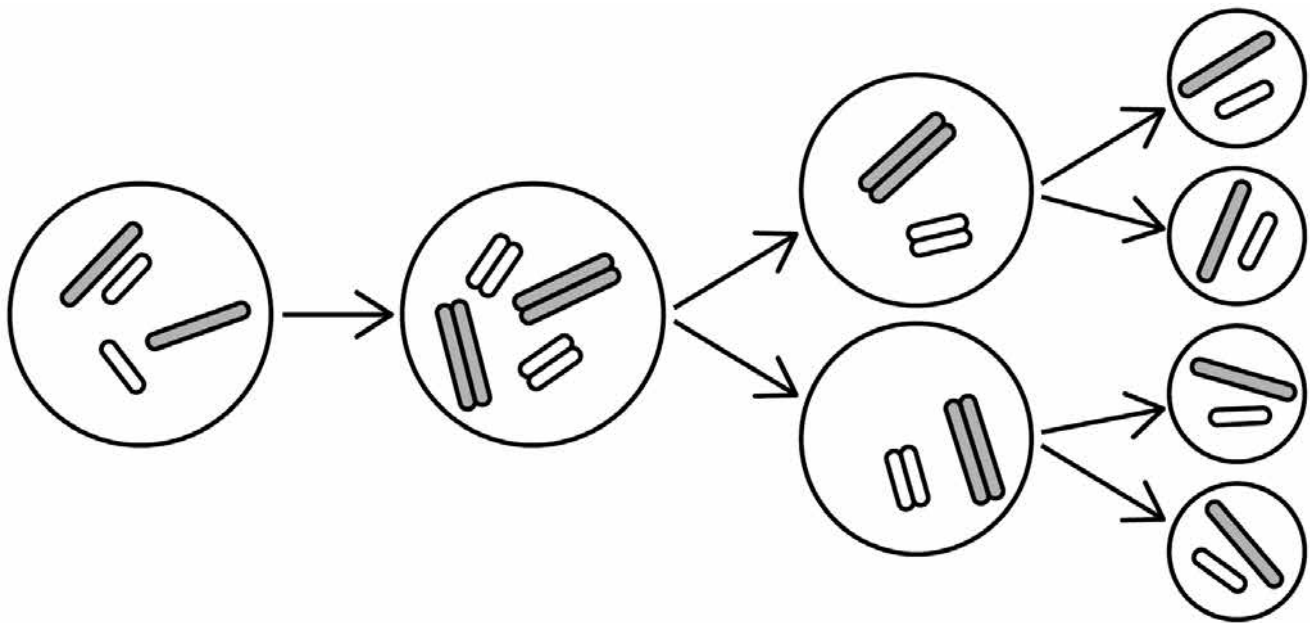
[Turn over]



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

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

FIGURE 1



Which **TWO** features in **FIGURE 1**, on page 10 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]

8

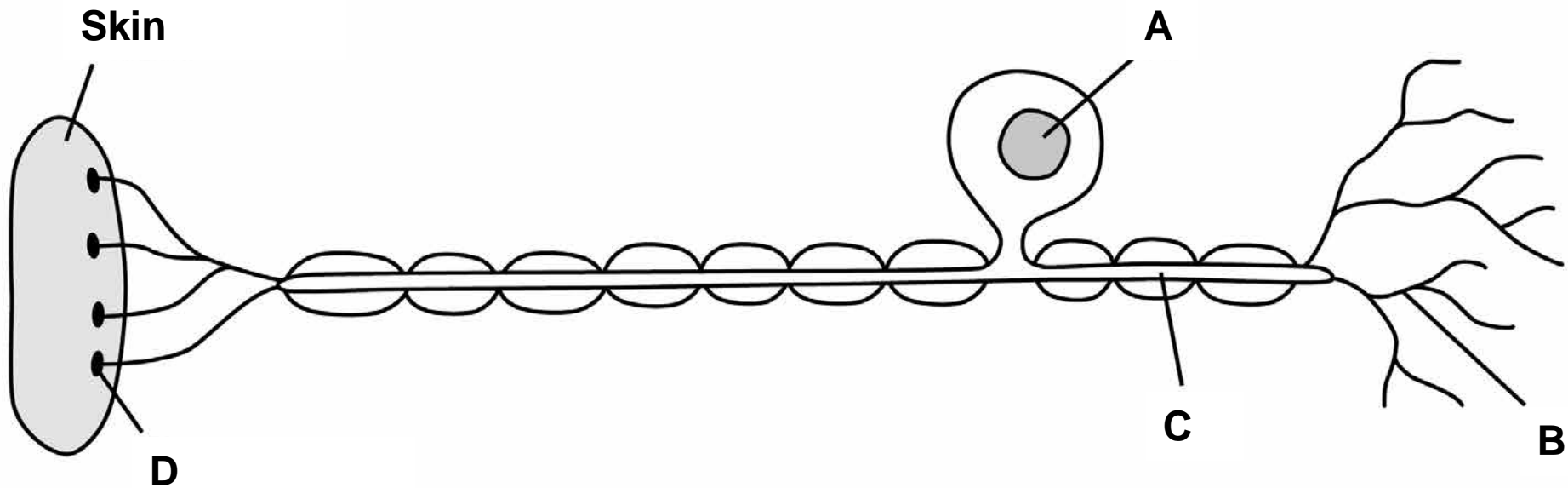


03

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.

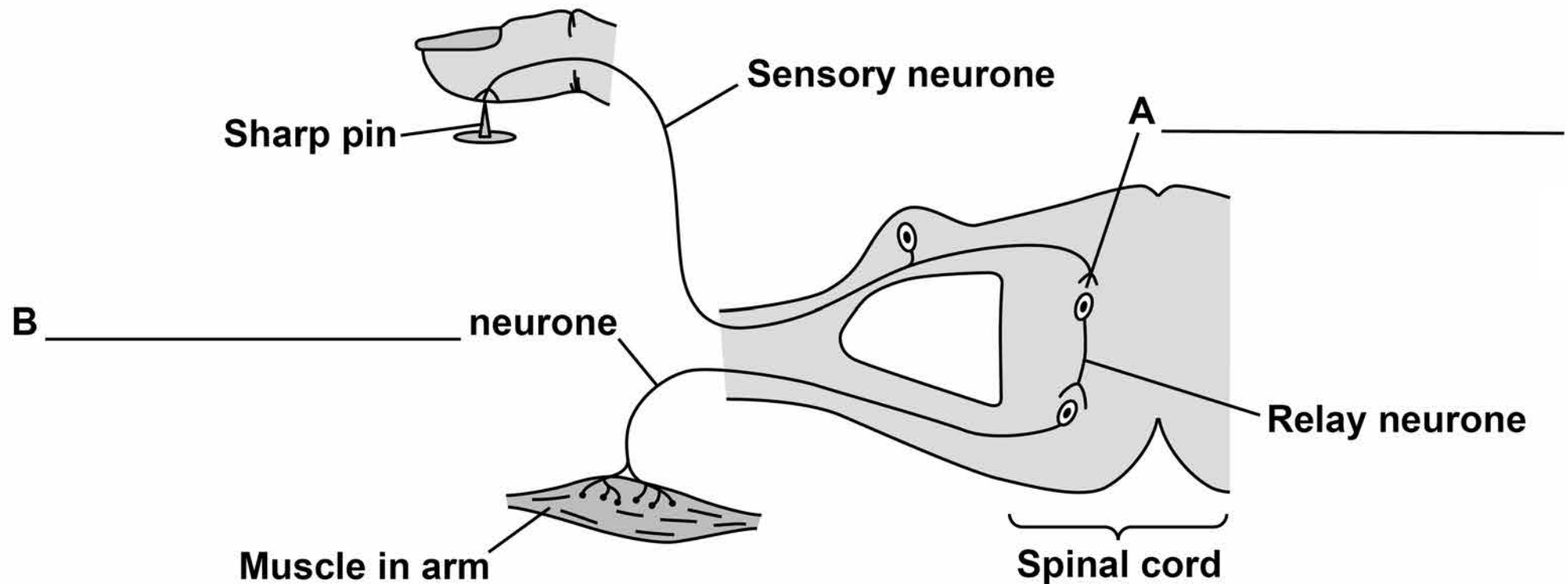
A B C D

[Turn over]



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

FIGURE 3



14

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

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



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]

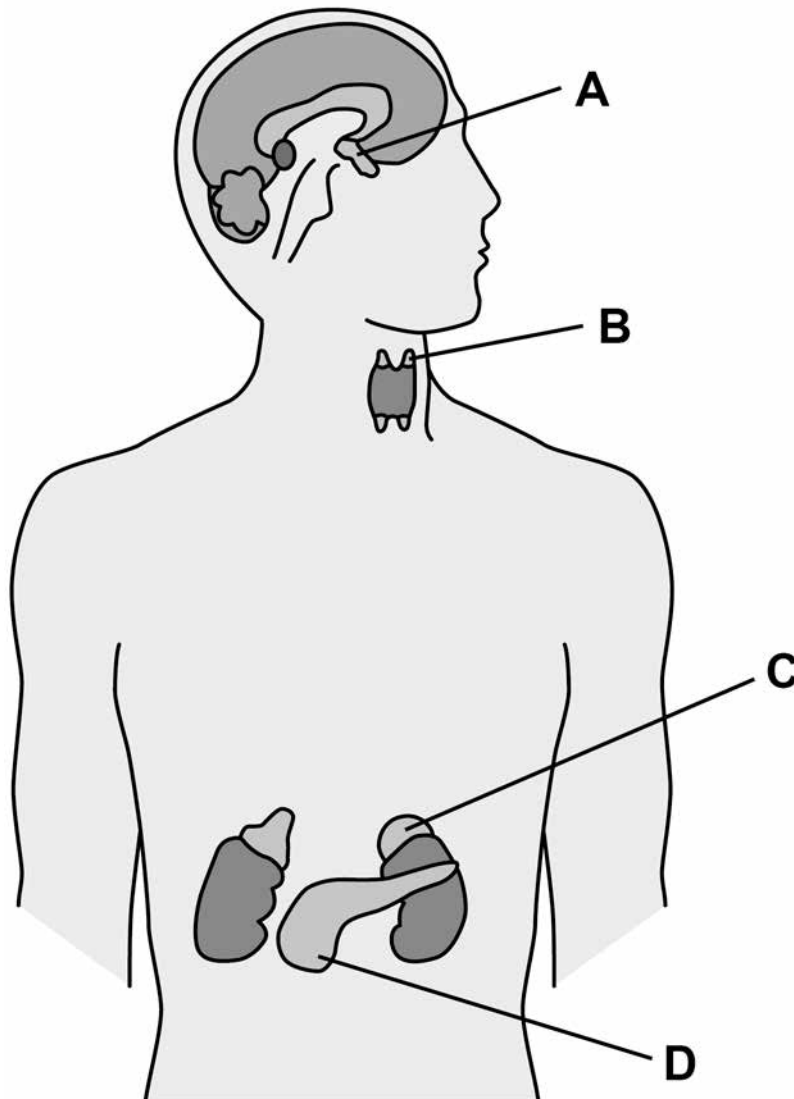
Time = _____ s

[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	<input type="checkbox"/>	B	<input type="checkbox"/>	C	<input type="checkbox"/>	D	<input type="checkbox"/>
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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]



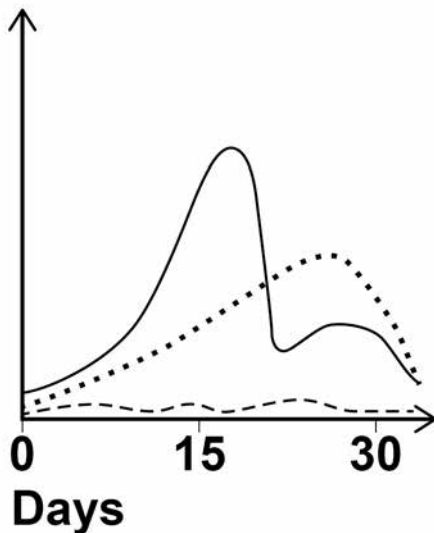
03.9 FIGURE 5, below and on page 21, shows the relative levels of sex hormones of three young people over 30 days.

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

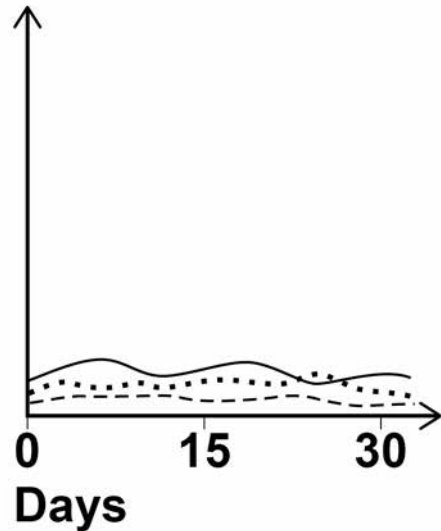
PERSON A

Relative hormone level



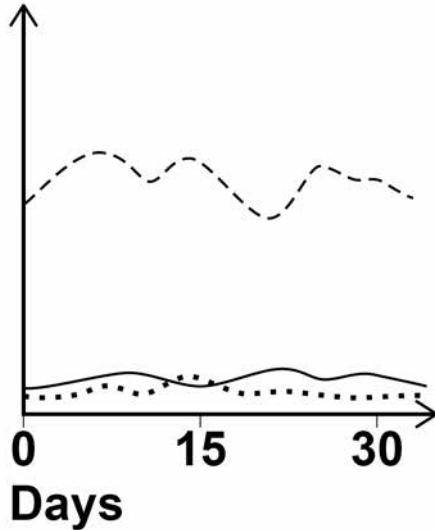
PERSON B

Relative hormone level



PERSON C

Relative
hormone
level



KEY

- Oestrogen
 Progesterone
 - - - - Testosterone

Which person is the 18-year-old boy?

Give ONE reason for your answer. [2 marks]

Person _____

Reason _____

[Turn over]



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



- 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]



- 04.4** 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 cm³ 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]



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

[Turn over]



- 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 = _____ %

- 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
Bloodworms	✓	✓	✓
Freshwater shrimps	✓	✓	✗
Mayfly nymphs	✓	✗	✗
Water snails	✓	✓	✓

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 27, and TABLE 4, on page 28. [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 _____

12



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[Turn over]



05

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]



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

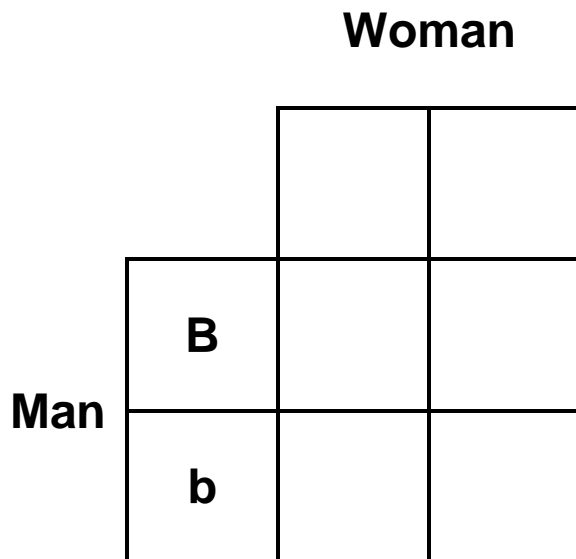
0 5 . 3 The woman marries a man with the alleles Bb for eye colour.

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



- 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]

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.’



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

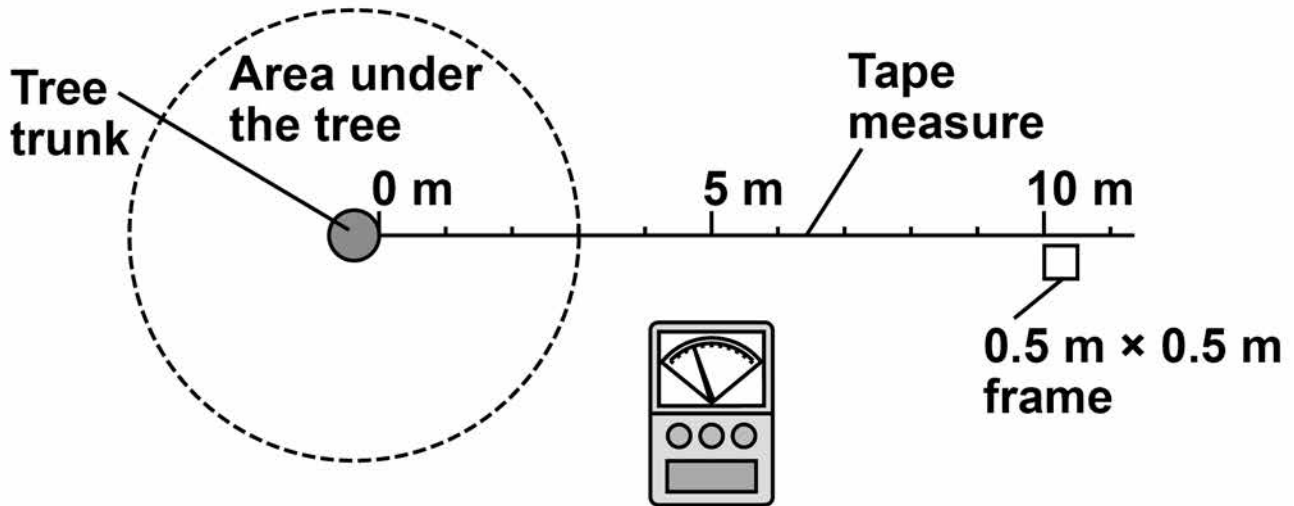
This is the method used.

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.



FIGURE 9 shows the equipment in this investigation.

FIGURE 9



06.4 Calculate the total area sampled. [1 mark]

Total area sampled = _____ m²

[Turn over]



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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



06.7 Which plant species in TABLE 7, on page 44, will only grow at high light intensity? [1 mark]

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 in your answer.
[2 marks]

[Turn over]



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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 _____

[Turn over]

15



END OF QUESTIONS

6



There are no questions printed on this page

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Question	Mark
1	
2	
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7	
TOTAL	

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