Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

I declare this is my own work.

GCSE
COMBINED SCIENCE: TRILOGY

F

Foundation Tier
Biology Paper 2F

Friday 7 June 2024 Afternoon Time allowed: 1 hour 15 minutes

Materials

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.
- Fill in the boxes at the top of this page.
- 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.

For Examiner's Use	
Question	Mark
1	
2	
3	
4	
5	
6	
TOTAL	

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 write outside the box

0 1 Cystic fibrosis is a genetic disorder.

0 1 . 1 Cystic fibrosis affects the movement of substances into and out of cells.

Which part of a cell controls the movement of substances into and out of the cell?

[1 mark]

Tick (✓) **one** box.

Cell membrane ☐

Cytoplasm ☐

Mitochondria ☐

Cystic fibrosis is caused by a recessive allele, **b**.

0 1 . 2 What name is given to the allele **B**?

[1 mark]

Tick (✓) **one** box.

DNA ☐

Dominant ☐

Gene ☐

0 1 . 3 Which term describes the genotype **Bb**?

[1 mark]

Tick (✓) **one** box.

Chromosome ☐

Heterozygous ☐

Phenotype ☐

Do not write outside the box

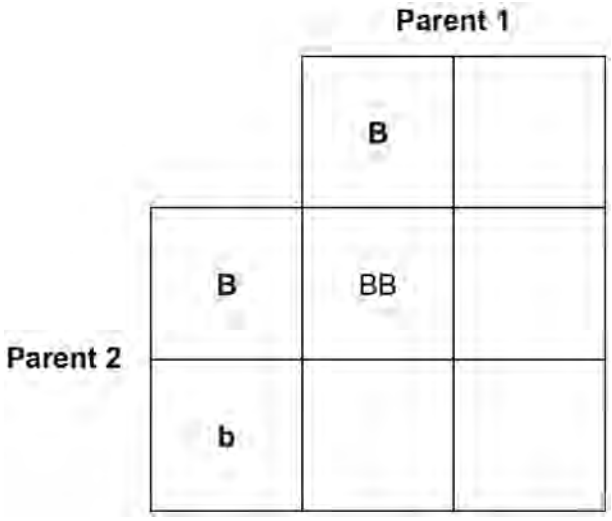
0 1 . 4 Two people plan to have a child.

Both people have the genotype **Bb**.

Complete **Figure 1** to show the possible genotypes of the child.

[3 marks]

Figure 1



0 1 . 5 What is the chance that a child of these parents will have cystic fibrosis?

Use **Figure 1**.

[1 mark]

Tick (✓) **one** box.

0% ☐ 25% ☐ 50% ☐ 75% ☐

Question 1 continues on the next page

Do not write outside the box

0 1 . 6 An embryo can be tested to find out its genotype.

What is the name of the testing process?

[1 mark]

Tick (✓) **one** box.

Genetic engineering ☐

Screening ☐

Selective breeding ☐

0 1 . 7 Inherited disorders can be caused by changes in DNA.

What is the name of a change in DNA?

[1 mark]

Tick (✓) **one** box.

Genome ☐

Helix ☐

Mutation ☐

0 1 . 8 Inheritance is one cause of variation in a population.

Environmental factors also cause variation in a population.

Suggest **one** environmental cause of variation in a human population.

Do **not** refer to inheritance or to changes in DNA in your answer.

[1 mark]

_____

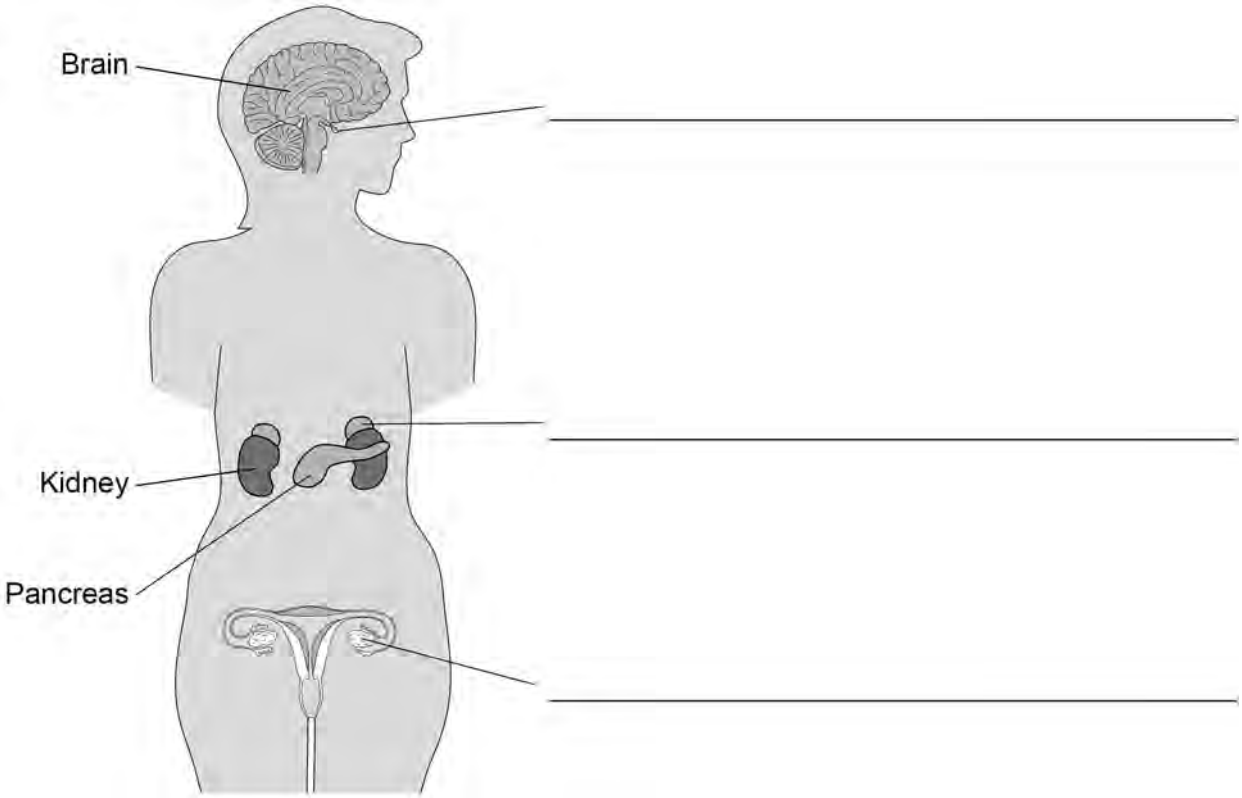
_____

10

Do not write outside the box

0 2 **Figure 2** shows organs and glands in a human body.

Figure 2



0 2 . 1 Label the glands on **Figure 2**.

Choose answers from the box.

[3 marks]

adrenal gland	**ovary**	**pituitary gland**
testis	**thyroid gland**	

Question 2 continues on the next page

Do not write outside the box

0 2 . 2 Cells in the pancreas detect blood glucose concentration.

What type of cells **detect** blood glucose concentration?

[1 mark]

Tick (✓) **one** box.

Coordinator cells ☐

Muscle cells ☐

Receptor cells ☐

0 2 . 3 The pancreas produces insulin.

How is insulin transported from the pancreas to the rest of the body?

[1 mark]

Do not write outside the box

0 2 . 4 Which organ is a target organ of insulin?

[1 mark]

Tick (✓) **one** box.

Liver ☐

Small intestine ☐

Stomach ☐

0 2 . 5 Which chemical is a store of glucose in human cells?

[1 mark]

Tick (✓) **one** box.

Cellulose ☐

Glycogen ☐

Protein ☐

Question 2 continues on the next page

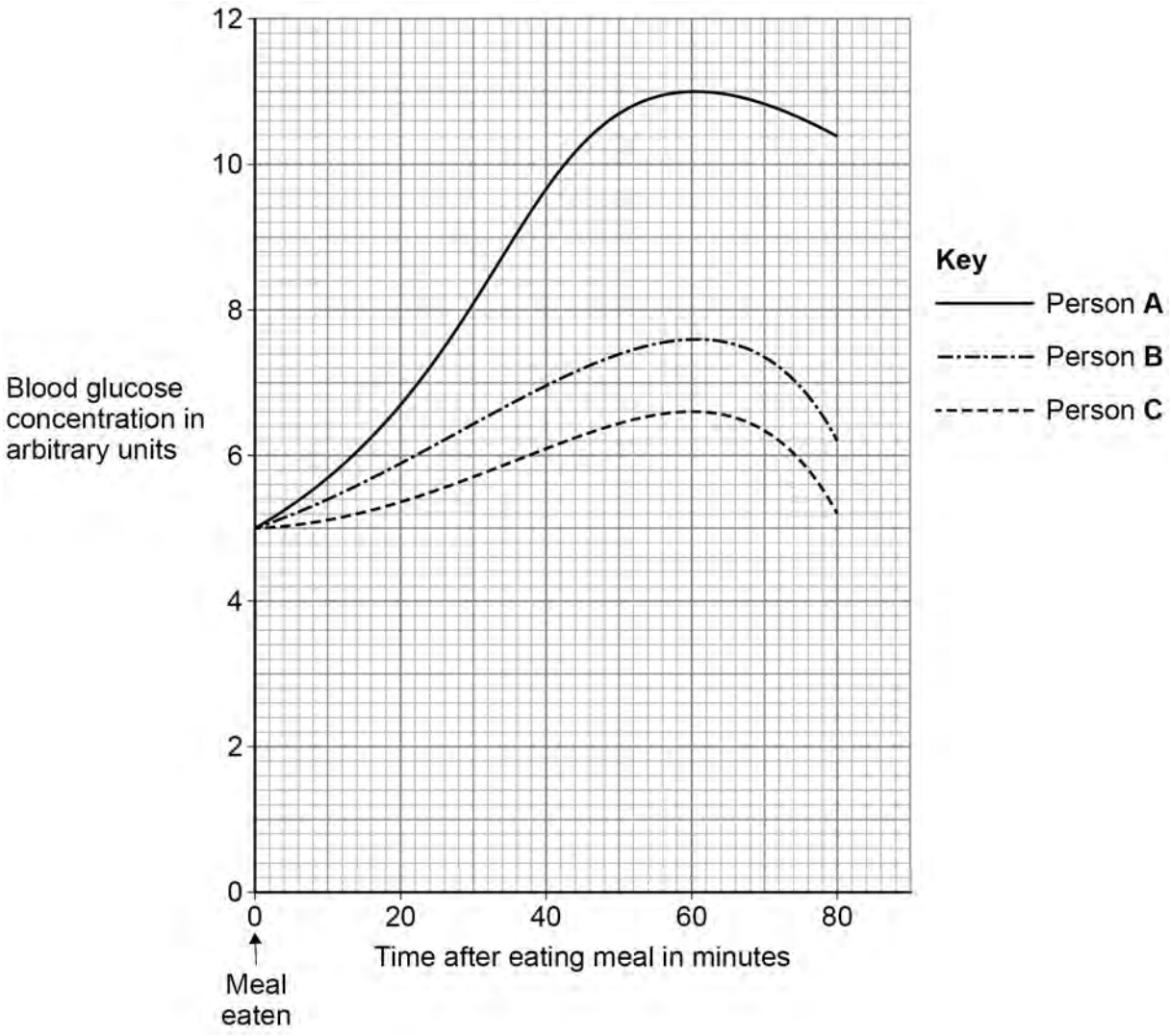
Do not write outside the box

Three people each ate similar meals.

The blood glucose concentration of each person was recorded for 80 minutes after the meal.

Figure 3 shows the results.

Figure 3



0 2 . 6 What was the **change** in blood glucose concentration in person **A** from 0 minutes to 60 minutes?

[1 mark]

Change = _____ arbitrary units

Do not write outside the box

0 2 . 7 Describe the **trend** in the relationship between blood glucose concentration and time after the meal.

[2 marks]

0 2 . 8 A student concluded:

'Person **A** has diabetes'.

Explain how **Figure 3** supports the student's conclusion.

You should refer to insulin in your answer.

[2 marks]

0 2 . 9 Describe **two** ways a person with Type 2 diabetes could change their lifestyle to control their diabetes.

[2 marks]

1

2

14

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 3 Students used a reaction test card in an investigation.

The reaction test card can be used to test the reactions of car drivers.

Figure 4 shows the reaction test card.

Figure 4

Reaction score	How fast are your reactions?
5	Too slow
4	A bit slow
3	OK
2	Good
1	Super

0 3 . 1 Suggest why fast reactions are important for car drivers.

[1 mark]

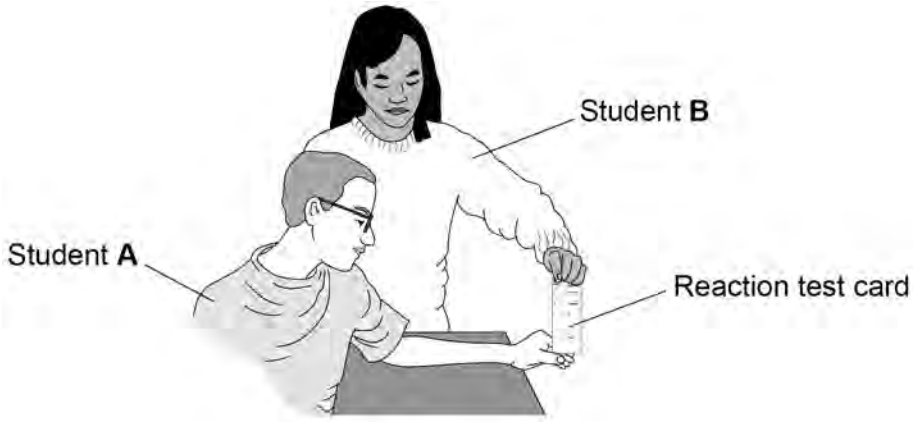
Do not write outside the box

Students investigated the effect of number of hours of sleep on reaction time.

The students used the reaction test card shown in **Figure 4** on page 11.

Figure 5 shows the method used.

Figure 5



This is the method used.

1. Record the number of hours of sleep student **A** had the night before the test.
2. Student **B** holds the lower edge of the card level with the top of student **A**'s thumb.
3. Student **A** holds their thumb and forefinger slightly apart, with space for the card to drop.
4. Student **B** drops the card.
5. Student **A** catches the card as quickly as possible.
6. Record the number shown at the top of student **A**'s thumb.
7. Repeat steps 1 to 6 with seven other students.

Do not write outside the box

0 3 . 2 Draw **one** line from each type of variable to the example of that variable in the investigation.

[3 marks]

Type of variable	Example
Control variable	Number nearest top of thumb when student catches card
Dependent variable	Number of hours of sleep
Independent variable	Number of students tested
	Start with lower edge of card level with top of thumb

Question 3 continues on the next page

Do not write outside the box

Figure 4 is repeated below.

Figure 4

Reaction score	How fast are your reactions?
5	Too slow
4	A bit slow
3	OK
2	Good
1	Super

0 3 . 3 A student said:

'It would be better to use a ruler showing millimetres instead of the card in **Figure 4**.'

Why is the student correct?

[1 mark]

Tick (✓) **one** box.

Students are familiar with a ruler but the card is new. ☐

Students have very fast reactions. ☐

Students may catch the card between scores. ☐

Do not write outside the box

Question 3 continues on the next page

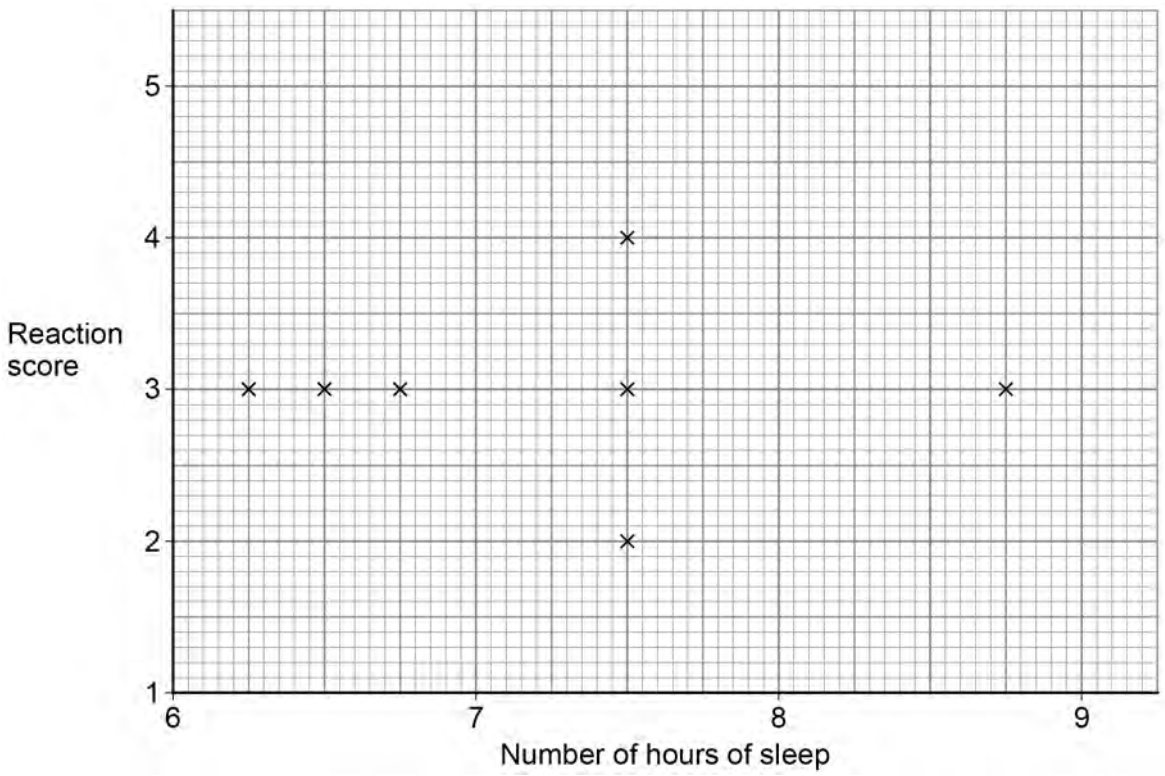
DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Turn over ►

Do not write outside the box

Figure 6 shows the results for the seven other students.

Figure 6



0 3 . 4 Student **A** had 8 hours and 30 minutes of sleep and a reaction score of 3

Plot the result for student **A** on **Figure 6**.

[1 mark]

0 3 . 5 The mean number of hours of sleep for all students was 7.4

What was the **mode** for the number of hours of sleep?

[1 mark]

Mode = _____ hours

Do not write outside the box

0 3 . 6 A lower reaction score means a faster reaction.

What was the effect of increasing the number of hours of sleep on reaction time?

Use **Figure 6**.

[1 mark]

Tick (✓) **one** box.

Reaction time decreased ☐

Reaction time stayed the same ☐

Reaction time increased ☐

0 3 . 7 Suggest **two** ways the students could improve the investigation.

Do **not** refer to using a ruler in your answer.

[2 marks]

1 _____

_____

2 _____

_____

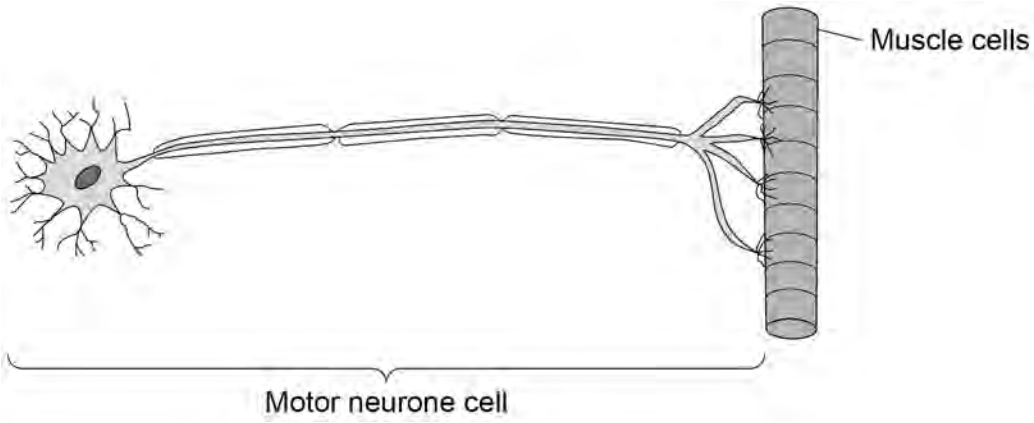
Question 3 continues on the next page

Do not write outside the box

0 3 . 8 Motor neurones are involved in reactions.

Figure 7 shows a motor neurone.

Figure 7



Explain **one** way the motor neurone cell is adapted for its function.

[3 marks]

13

Do not write outside the box

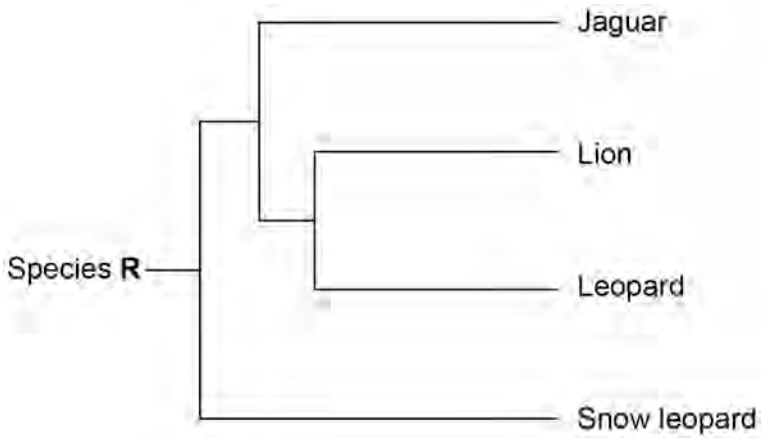
Turn over for the next question

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

0 4 **Figure 8** shows an evolutionary tree.

Figure 8



0 4 . 1 Which species in **Figure 8** is most closely related to lions?

[1 mark]

Tick (✓) **one** box.

Jaguar ☐

Leopard ☐

Snow leopard ☐

0 4 . 2 Tigers are more closely related to snow leopards than to jaguars.

Draw a line on **Figure 8** to show the evolution of tigers.

Label the line 'Tiger'.

[1 mark]

Do not write outside the box

0 4 . 3 What is represented by species **R** on **Figure 8**?

[1 mark]

Tick (✓) **one** box.

A species recently evolved from jaguars. ☐

A species that may evolve in the future. ☐

A species that the other species evolved from. ☐

0 4 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

classification	**homeostasis**	**natural selection**

Evolution occurs by the process of _____.

0 4 . 5 Species can become extinct.

Give **two** possible causes of extinction.

[2 marks]

1 _____

_____

2 _____

_____

Question 4 continues on the next page

Do not write outside the box

0 4 . 6 Fossils are used to study the evolution of some species.

Suggest **one** reason why fossils are used to study evolution.

[1 mark]

Some bacteria have evolved to be resistant to penicillin.

Penicillin is an antibiotic.

0 4 . 7 How has the process of evolution produced bacteria that are resistant to penicillin?

Write the stages, **A**, **B**, **C**, **D** and **E** in the correct order.

The first stage has been completed for you.

[3 marks]

A The bacteria with mutations are more likely to survive.

B The population of bacteria is exposed to penicillin.

C The mutation for resistance to penicillin is passed on to offspring.

D Variation in the population of bacteria is caused by mutation.

E The surviving bacteria reproduce.

D → _____ → _____ → _____ → _____

Do not write outside the box

0 4 . 8 New antibiotics are **not** likely to control the spread of bacteria that are resistant to antibiotics.

What are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

Antibiotics kill all types of bacteria. ☐

Antibiotic resistant bacteria will continue to evolve. ☐

Bacteria reproduce very rapidly. ☐

New antibiotics are cheap to produce. ☐

Testing new antibiotics is quick. ☐

12

Turn over for the next question

There are no questions printed on this page

Do not write outside the box

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

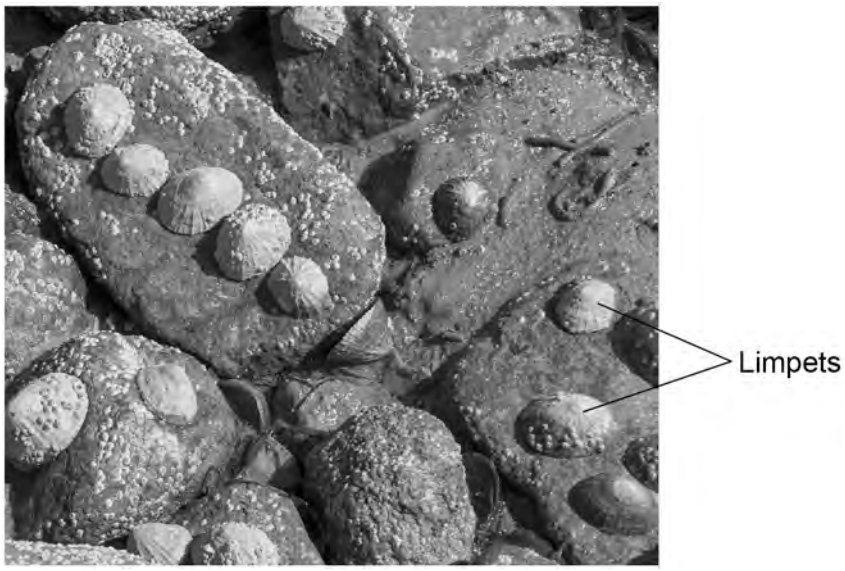
Do not write outside the box

0 5 Limpets are small animals with shells.

Limpets attach to rocks on sea shores.

Figure 9 shows limpets on rocks.

Figure 9



0 5 . 1 Limpets eat algae.

Limpets are prey for crabs.

Give the food chain for algae, crabs and limpets.

[1 mark]

Question 5 continues on the next page

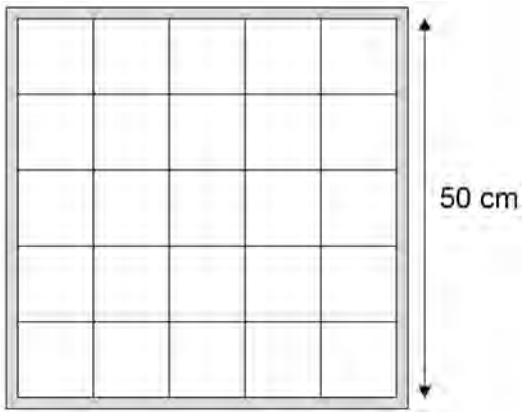
Do not write outside the box

Students estimated the population of limpets on a sea shore.

The students were given a square quadrat.

Figure 10 shows the quadrat.

Figure 10



0 5 . 2 Calculate the area of the quadrat in m^2.

[2 marks]

Area of quadrat = _____ m^2

Do not write outside the box

0 5 . 3 The total area of the sea shore was 1800 m^2.

The students sampled 2% of the total area of the sea shore.

Calculate the number of times the students needed to use the quadrat for the 2% sample.

Use your answer from Question **05.2**

[2 marks]

Number of times = _____

0 5 . 4 Explain why throwing a quadrat is **not** a random method to estimate population size.

Do **not** refer to safety in your answer.

[2 marks]

Question 5 continues on the next page

Do not write outside the box

0 5 . 5 Describe **one** method the students could use to plan where the quadrat should be randomly placed each time.

[2 marks]

0 5 . 6 Suggest **one** hazard the students should be aware of when collecting data on the sea shore.

Do **not** refer to throwing quadrats in your answer.

[1 mark]

0 5 . 7 Populations of limpets are monitored to assess the impact of pollution in water.

Suggest **one** type of pollution in water that may affect the population of limpets.

[1 mark]

11

Do not write outside the box

0 6 Potatoes are a food crop.

0 6 . 1 Potato plants are classified as eukaryota.

What type of classification group is eukaryota?

[1 mark]

Tick (✓) **one** box.

Class ☐

Domain ☐

Kingdom ☐

Phylum ☐

0 6 . 2 Potato plants can reproduce by asexual reproduction.

Which statement is true for asexual reproduction?

[1 mark]

Tick (✓) **one** box.

Meiosis occurs. ☐

Offspring are genetically identical. ☐

Pollen and egg cells are produced. ☐

Question 6 continues on the next page

Do not write outside the box

0 6 . 3 Flowers of potato plants contain gametes for sexual reproduction.

How is a gamete different from other cells in a potato plant?

[1 mark]

Tick (✓) **one** box.

A gamete contains one-quarter of the number of chromosomes. ☐

A gamete contains half of the number of chromosomes. ☐

A gamete contains double the number of chromosomes. ☐

0 6 . 4 Plants in the same genus as potatoes have been studied by scientists.

Describe **one** way a new plant species could be identified as being in the same genus as potatoes.

[1 mark]

Do not write outside the box

0 6 . 5 Scientists have collected and stored seeds from species in the same genus as potatoes.

In the future, these seeds may be used for genetic modification of potato plants.

Genetically modified potato plants could help supply food to the human population as the climate changes.

Explain why genetic modification of crop plants may be important for the human population to survive climate change.

[6 marks]

10

END OF QUESTIONS

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

Question number	**Additional page, if required.** **Write the question numbers in the left-hand margin.**

Do not write outside the box

There are no questions printed on this page

DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED