AQA

Surname _____

Forename(s) _____

Centre Number _____

Candidate Number _____

Candidate Signature _____

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier

Biology Paper 2F

F

8464/B/2F

Friday 7 June 2024 **Afternoon**

Time allowed: 1 hour 15 minutes

At the top of the page, write your surname and forename(s), your centre number, your candidate number and add your signature.

[Turn over]

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.**
- **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.**

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

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**

[Turn over]

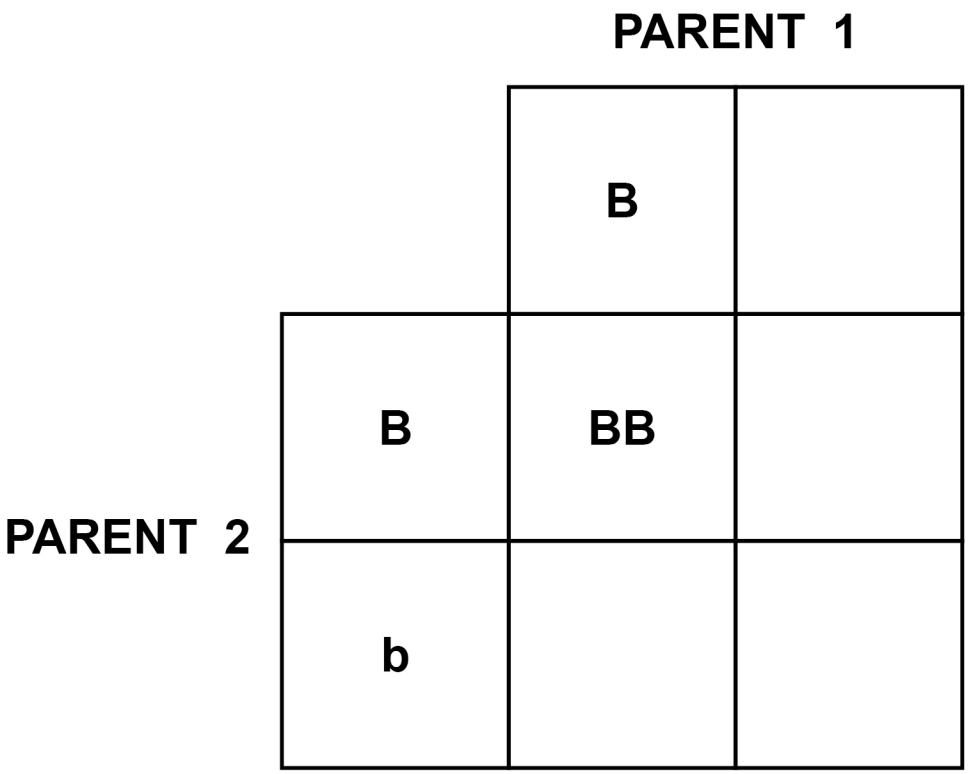
0 1 . 4

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%**

[Turn over]

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.

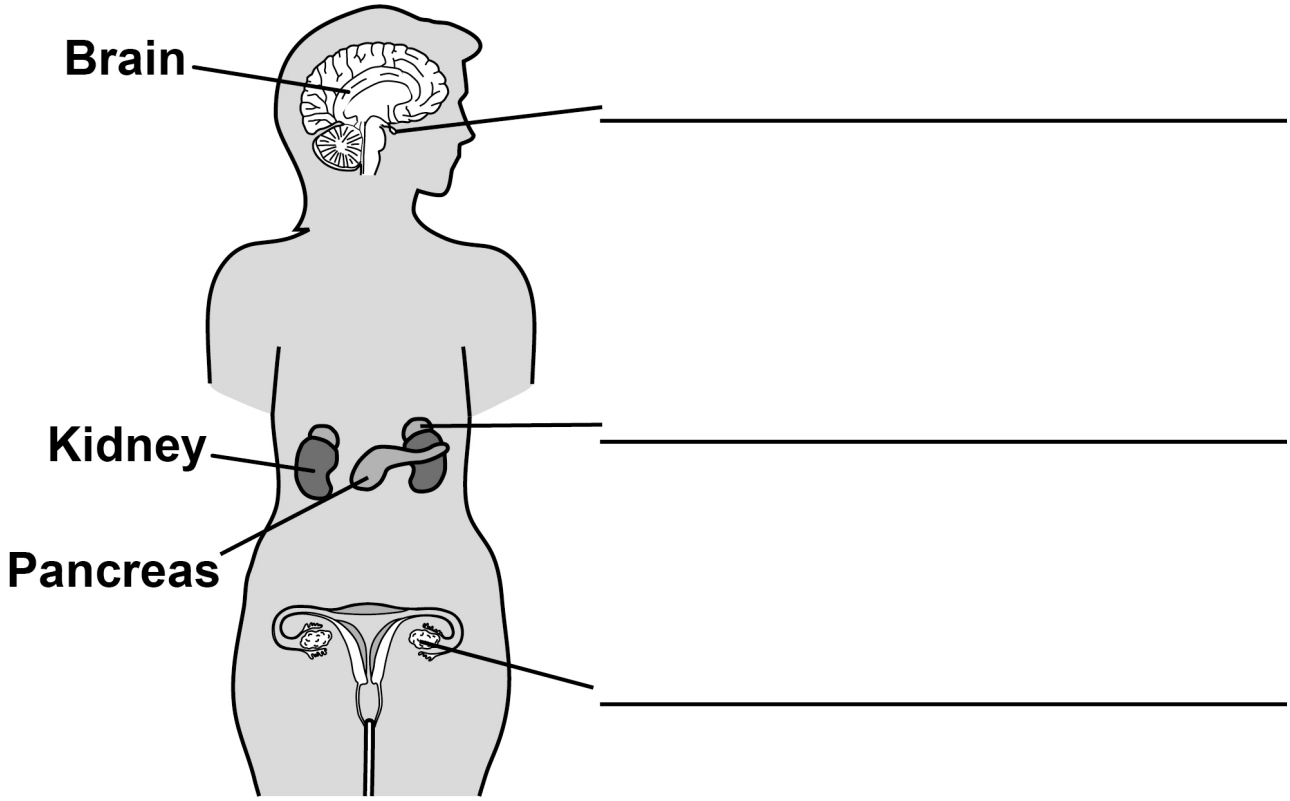
Do NOT refer to inheritance or to changes in DNA in your answer. [1 mark]

10

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 list. [3 marks]

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

[Turn over]

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]

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**

[Turn over]

Three people each ate similar meals.

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

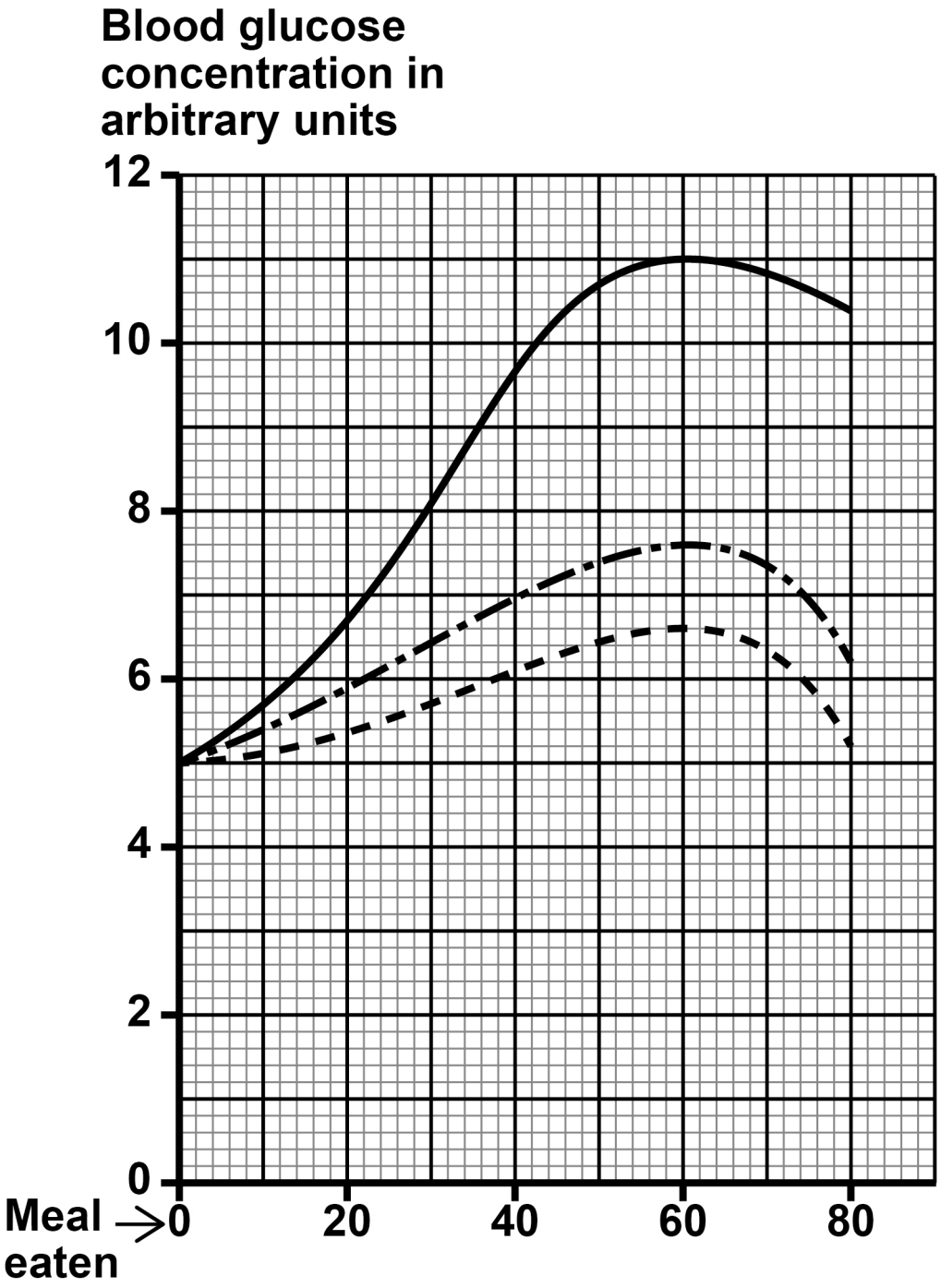
FIGURE 3, on the opposite page, shows the results.

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

FIGURE 3


Blood glucose concentration in arbitrary units
12
10
8
6
4
2
0
Meal eaten
0
20
40
60
80
Time after eating meal in minutes
KEY
Person A
Person B
Person C

BLANK PAGE

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, on page 15, 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 _____

_____

_____

[Turn over]

14

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]

_____

_____

_____

[Turn over]

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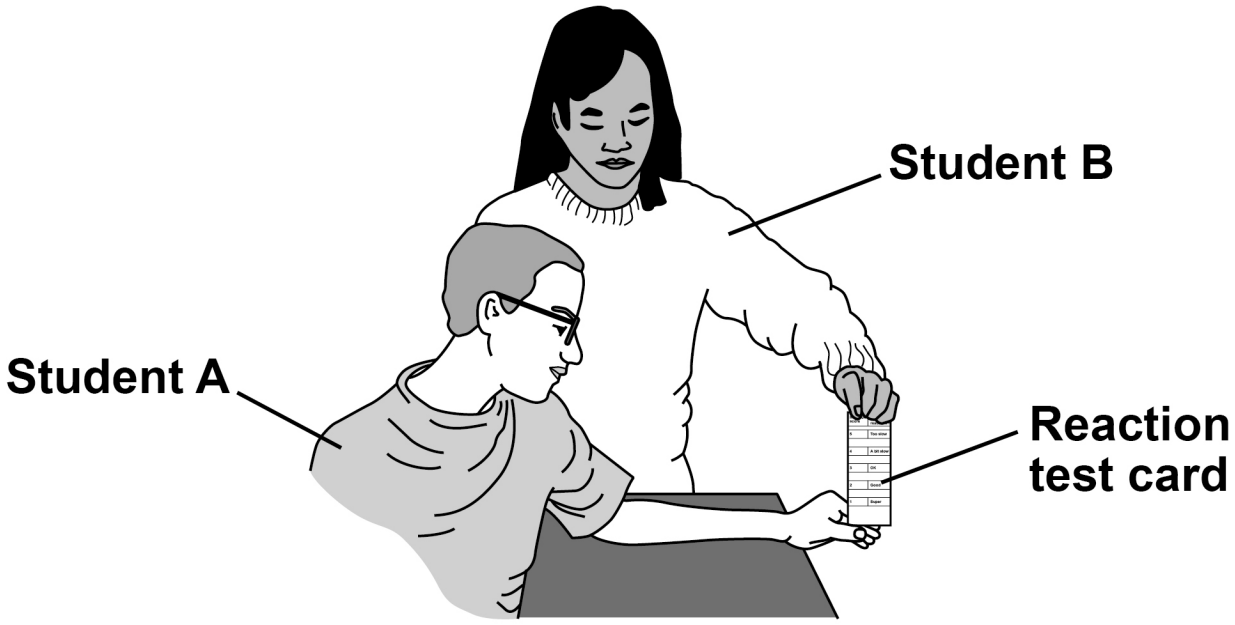
Students investigated the effect of number of hours of sleep on reaction time.

The students used the reaction test card shown in FIGURE 4 on page 20.

FIGURE 5 shows the method used.

FIGURE 5



[Turn over]

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.**

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

[Turn over]

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]

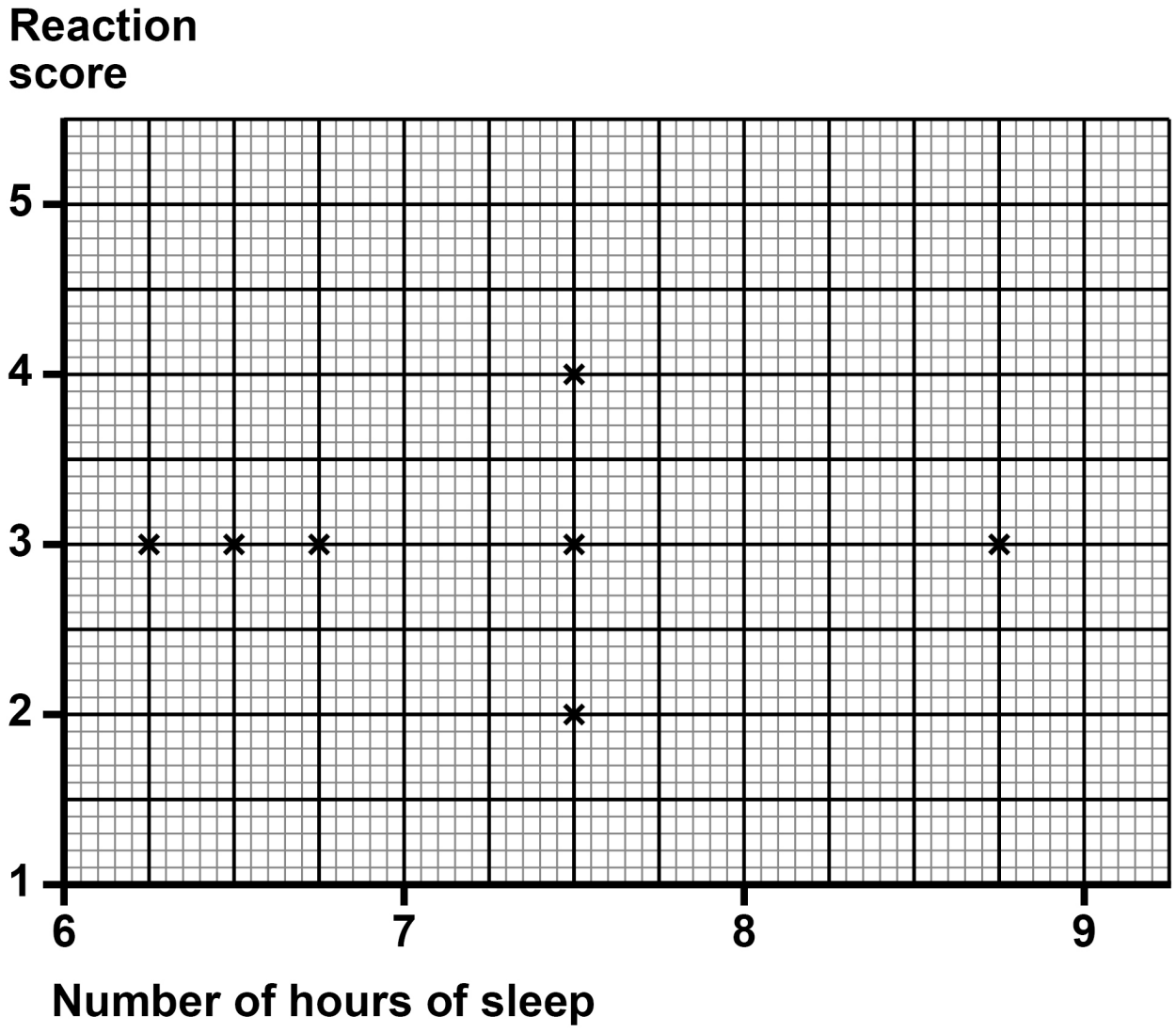
Tick (✓) ONE box.

- ☐ **Students are familiar with a ruler but the card is new.**
- ☐ **Students have very fast reactions.**
- ☐ **Students may catch the card between scores.**

[Turn over]

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

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**

[Turn over]

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 _____

_____

_____

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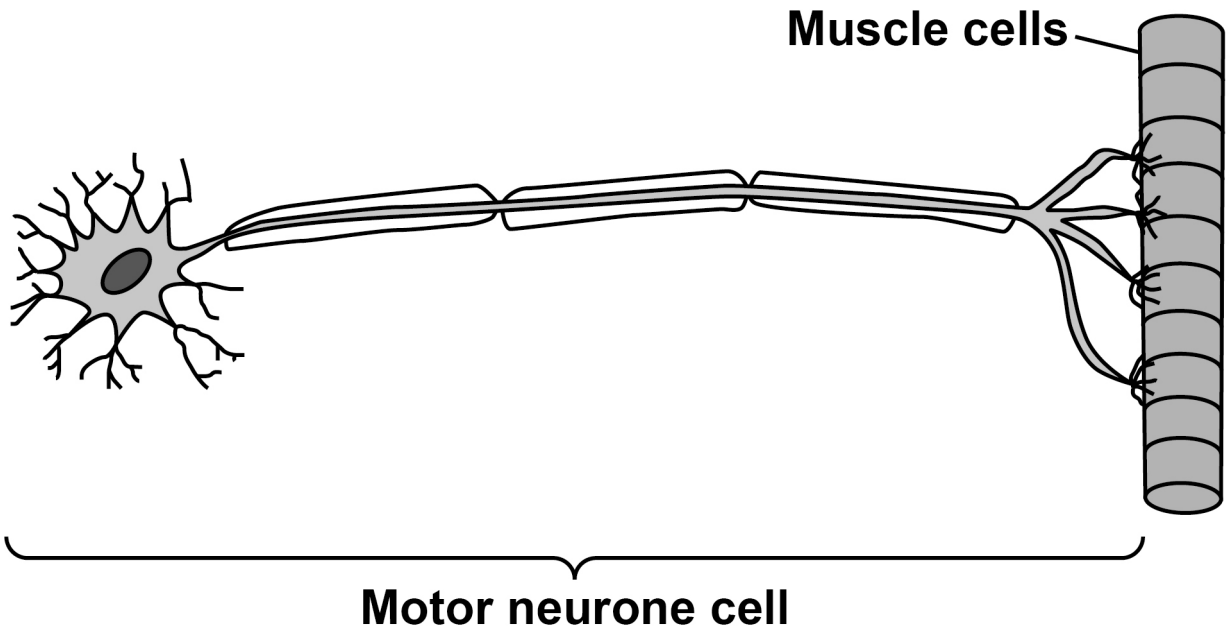
[Turn over]

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]

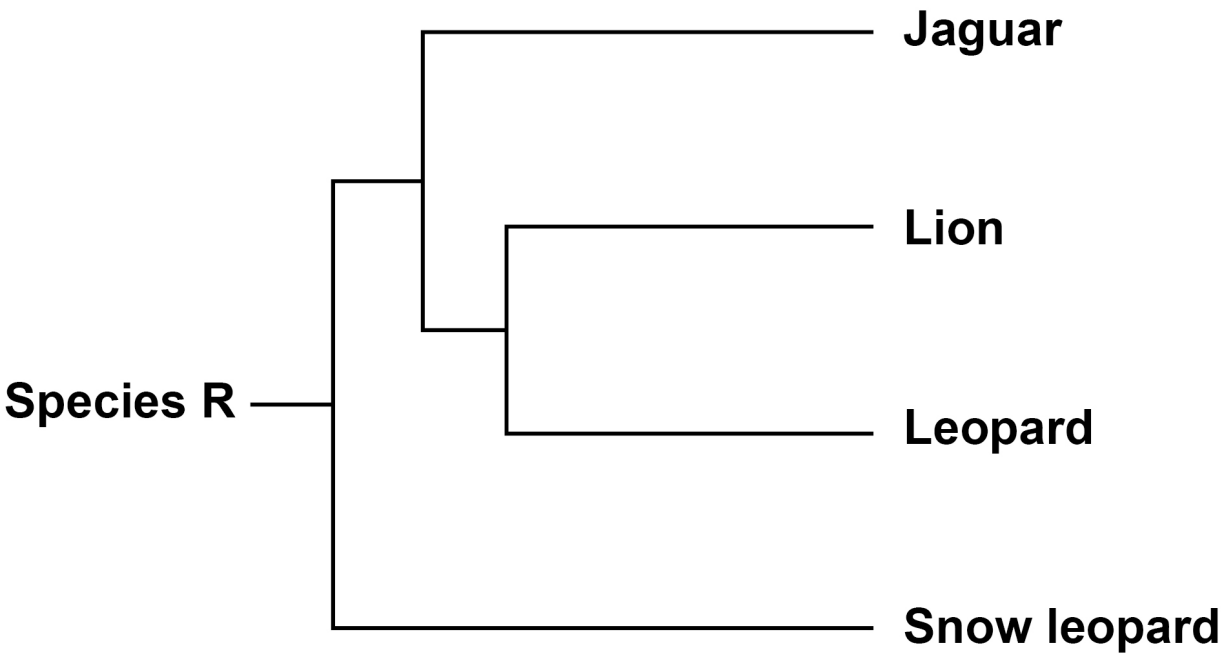
[Turn over]

13

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]

[Turn over]

0 4 . 3

What is represented by species R on FIGURE 8, on page 34 ? [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 list. [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 _____

_____

_____

[Turn over]

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 → _____ → _____ → _____ → _____

[Turn over]

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

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[Turn over]

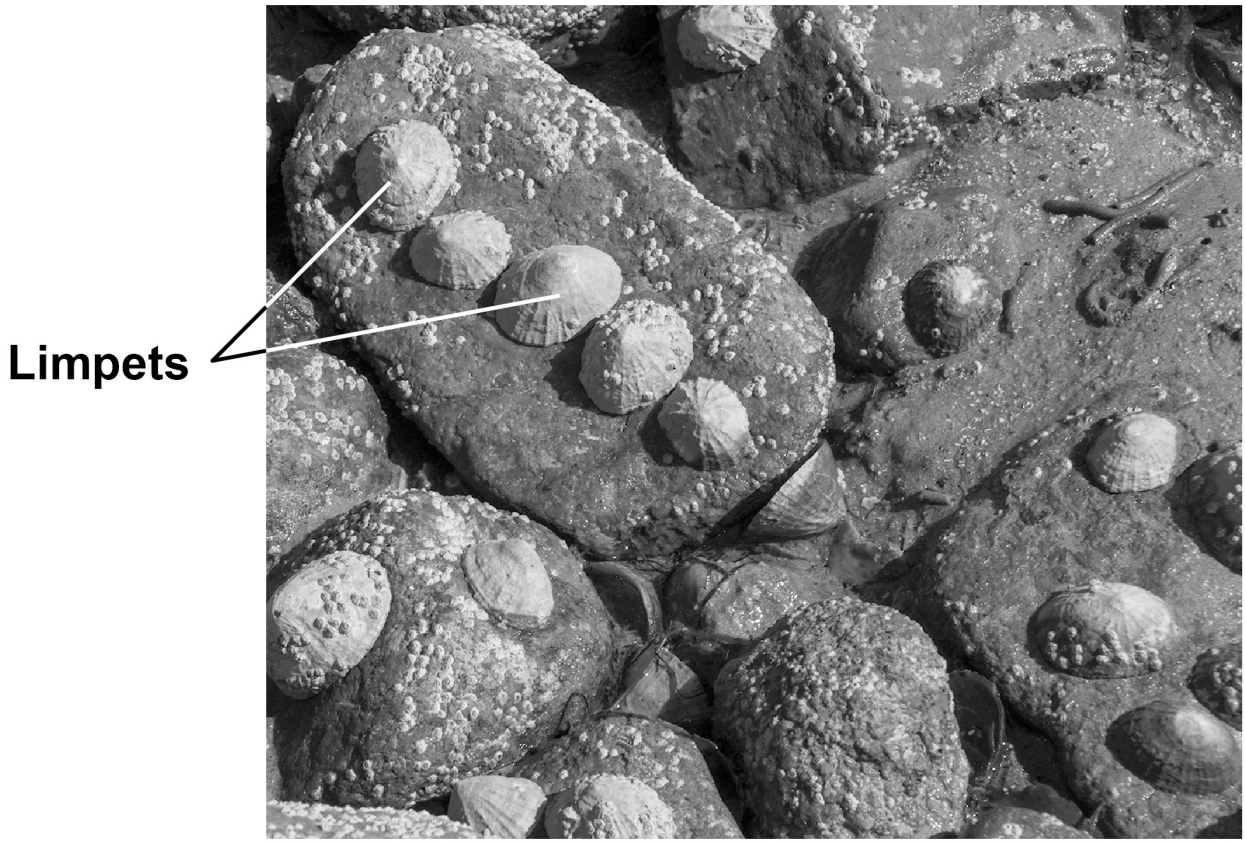
0 5

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]

_____

_____

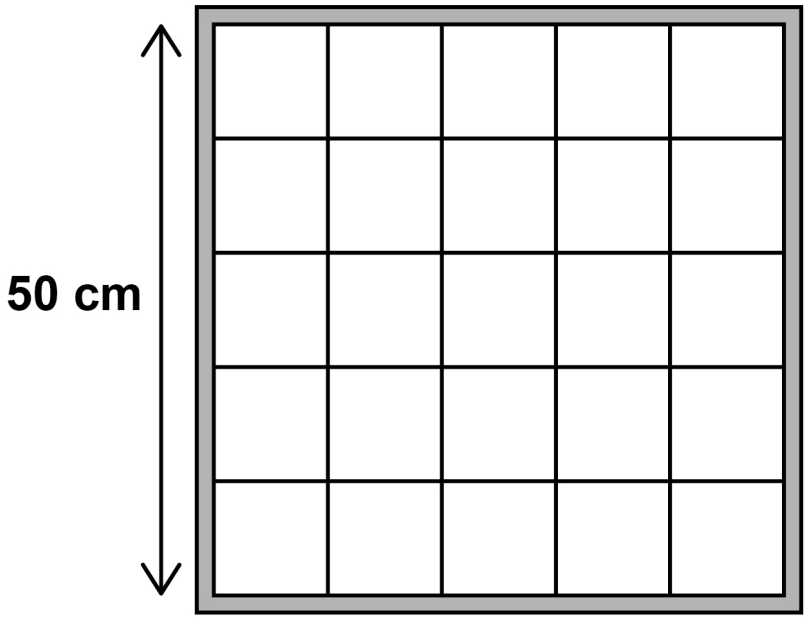
[Turn over]

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

[Turn over]

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, on page 45.
[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]

[Turn over]

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]

[Turn over]

11

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.**

[Turn over]

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]

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]

[Turn over]

END OF QUESTIONS

10

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

Additional page, if required.

Write the question numbers in the left-hand margin.

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