



**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**

**[Turn over]**



J U N 2 4 8 4 6 4 B 2 F 0 1

**On the front of this book, write your surname and forename(s), your centre number, your candidate number and add your signature.**

## **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
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**Cystic fibrosis is a genetic disorder.**

0	1	.	1
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**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**

**[Turn over]**



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

**Tick (✓) ONE box.**

**Chromosome**

**Heterozygous**

**Phenotype**



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**[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**

		<b>PARENT 1</b>	
		<b>B</b>	
<b>PARENT 2</b>	<b>B</b>	<b>BB</b>	
	<b>b</b>		



**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]**



01.6

**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**



**01.7**

**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**

**[Turn over]**



**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]**

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<b>10</b>



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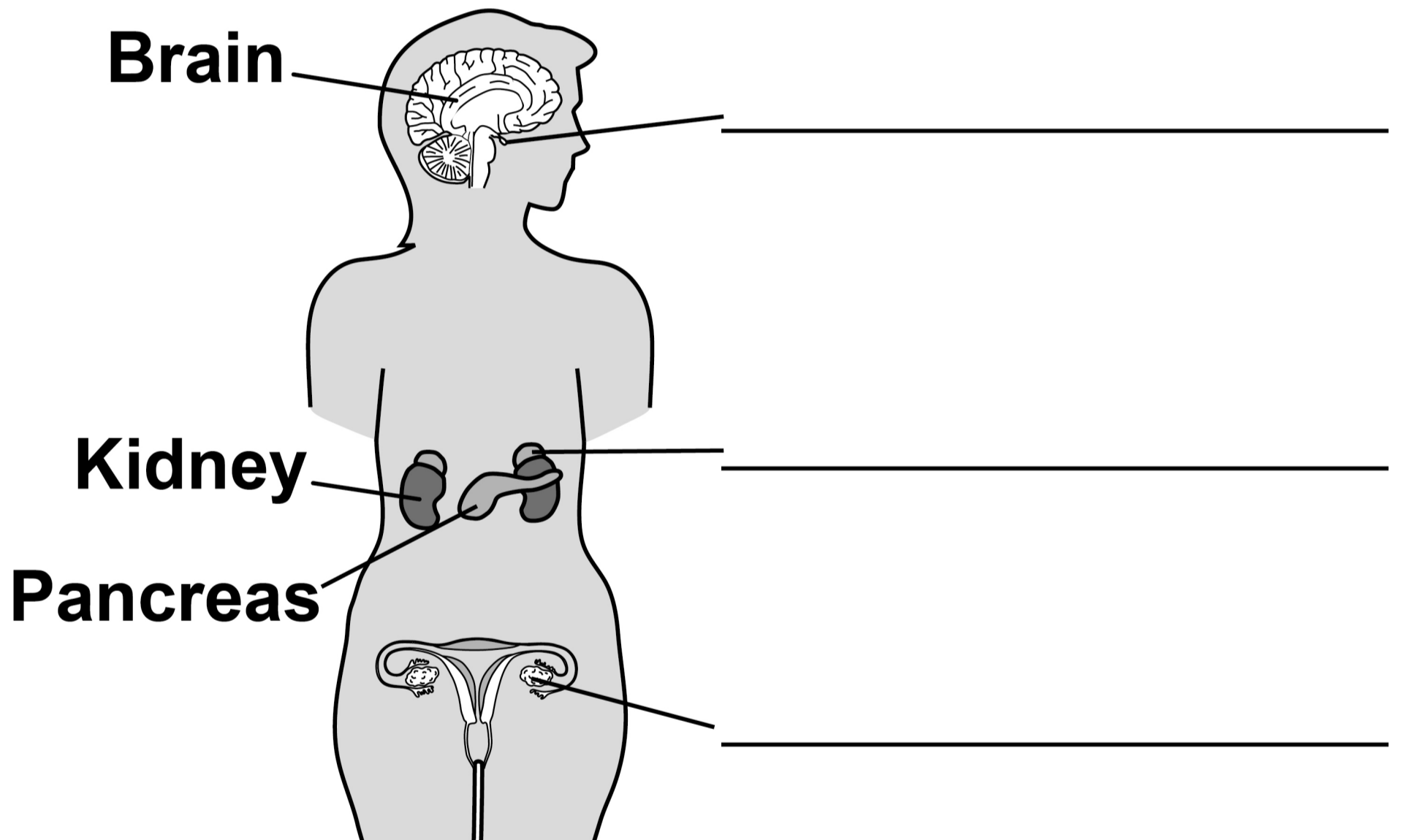
**[Turn over]**



0 2

**FIGURE 2 shows organs and glands in a human body.**

**FIGURE 2**



02.1

**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**



02.3

**The pancreas produces insulin.**

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

**[1 mark]**

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**[Turn over]**



**02.4**

**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]

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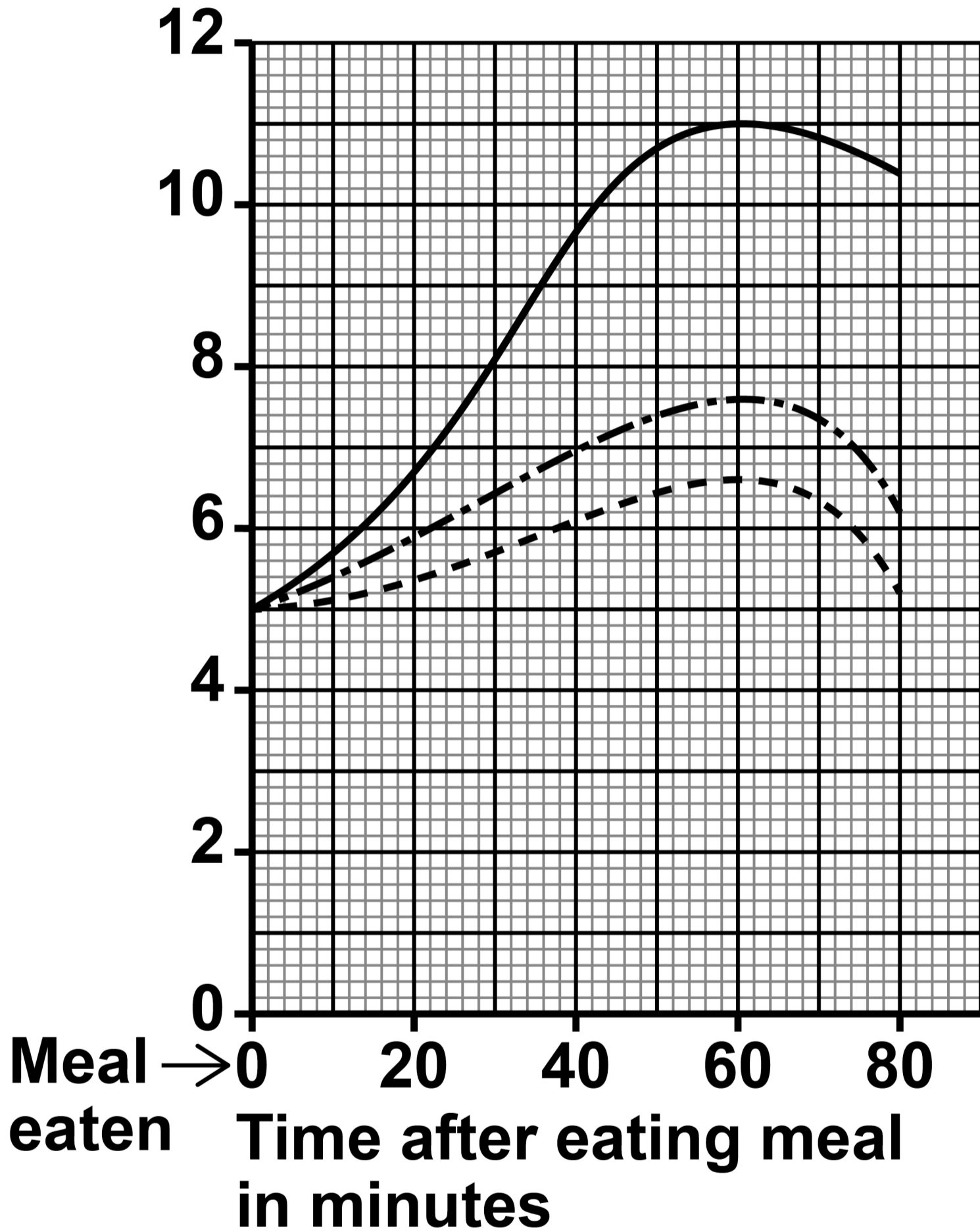
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Change = \_\_\_\_\_ arbitrary units



**FIGURE 3**

**Blood glucose concentration  
in arbitrary units**



**KEY**

- Person A
- · - · Person B
- - - - Person C



**[Turn over]**

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0 2 . 7

**Describe the TREND in the relationship between blood glucose concentration and time after the meal. [2 marks]**

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**[Turn over]**



0 2 . 8

**A student concluded:  
‘Person A has diabetes’.**

**Explain how FIGURE 3, on page 21,  
supports the student’s conclusion.**

**You should refer to insulin in your  
answer. [2 marks]**

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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
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**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, on the opposite page, shows the reaction test card.**

0	3	.	1
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**Suggest why fast reactions are important for car drivers. [1 mark]**

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## FIGURE 4

<b>REACTION SCORE</b>	<b>HOW FAST ARE YOUR REACTIONS?</b>
<b>5</b>	<b>Too slow</b>
<b>4</b>	<b>A bit slow</b>
<b>3</b>	<b>OK</b>
<b>2</b>	<b>Good</b>
<b>1</b>	<b>Super</b>

**[Turn over]**

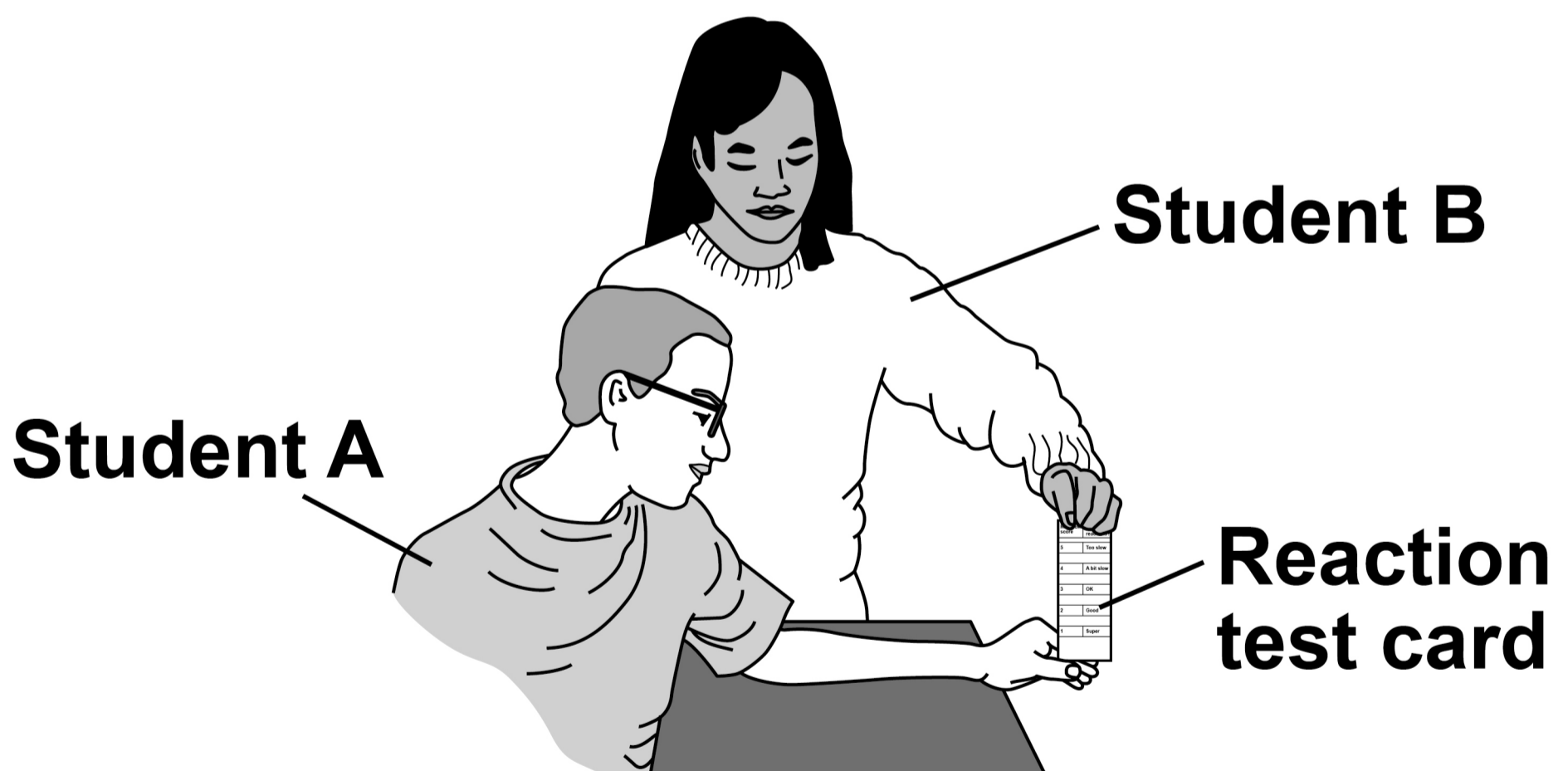


**Students investigated the effect of number of hours of sleep on reaction time.**

**The students used the reaction test card shown in FIGURE 4, on page 27.**

**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.**

**[Turn over]**



0	3	.	2
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**On the opposite page, draw ONE line from each type of variable to the example of that variable in the investigation.**

**[3 marks]**

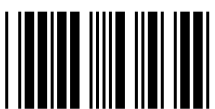


**TYPE OF  
VARIABLE****Control  
variable****Dependent  
variable****Independent  
variable****EXAMPLE****Number nearest  
top of thumb  
when student  
catches card****Number of hours  
of sleep****Number of  
students tested****Start with lower  
edge of card  
level with top of  
thumb****[Turn over]**

**FIGURE 4 is repeated below.**

**FIGURE 4**

<b>REACTION SCORE</b>	<b>HOW FAST ARE YOUR REACTIONS?</b>
<b>5</b>	<b>Too slow</b>
<b>4</b>	<b>A bit slow</b>
<b>3</b>	<b>OK</b>
<b>2</b>	<b>Good</b>
<b>1</b>	<b>Super</b>



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.**

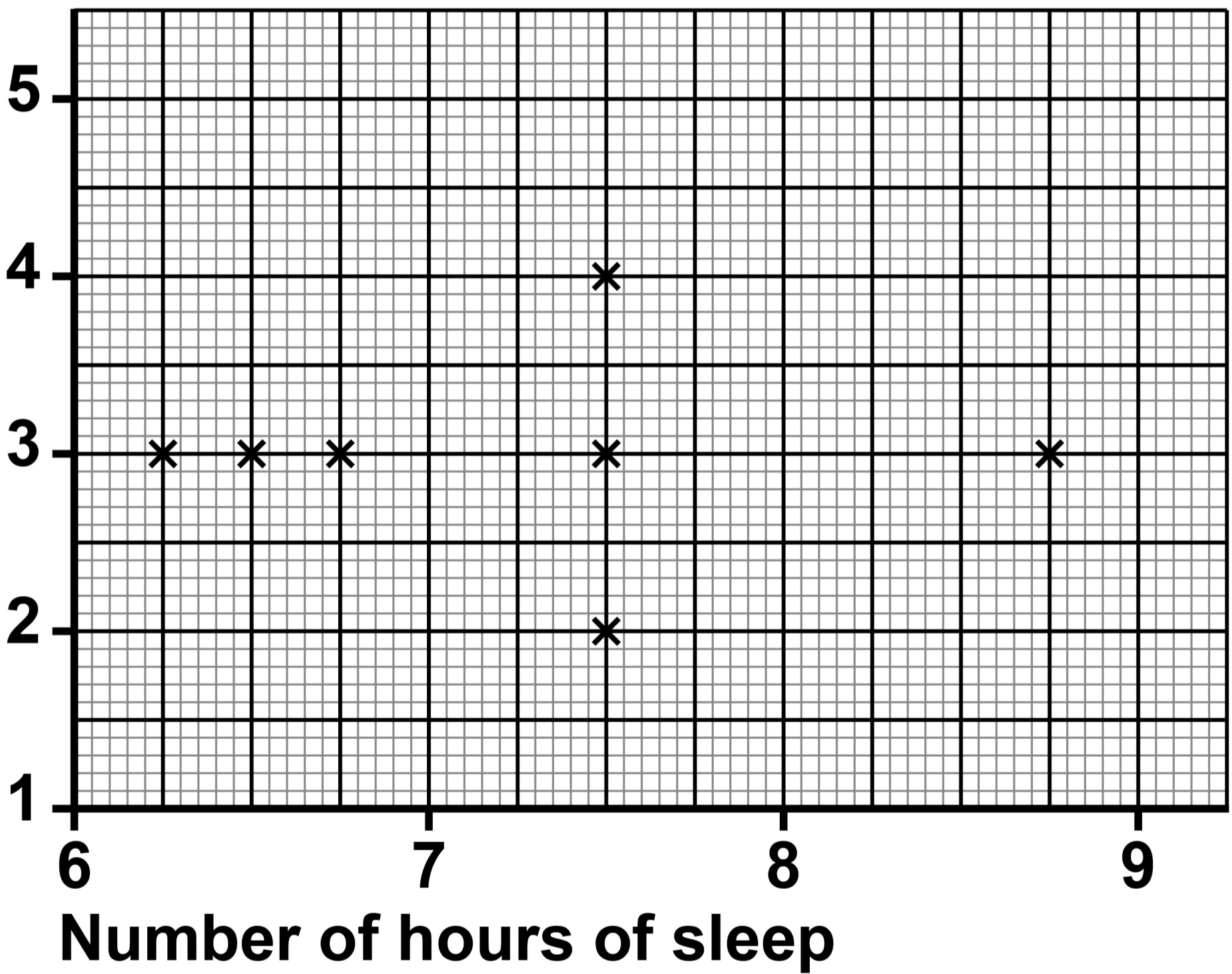
**[Turn over]**



**FIGURE 6** shows the results for the seven other students.

**FIGURE 6**

**Reaction  
score**



0	3	.	4
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**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**

**[Turn over]**



**03.6**

**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, on page 34. [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 \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**[Turn over]**

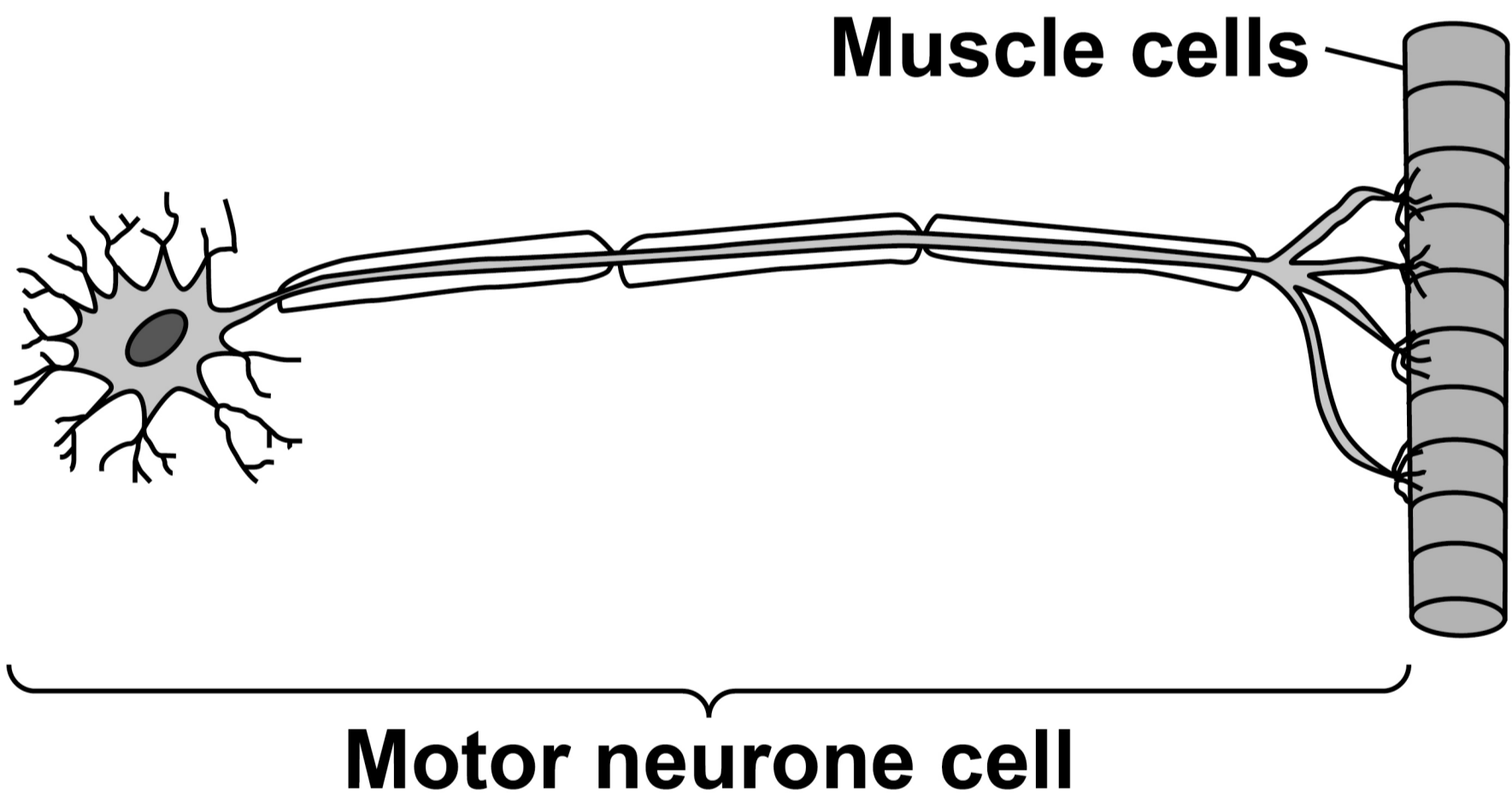


03.8

**Motor neurones are involved in reactions.**

**FIGURE 7 shows a motor neurone.**

**FIGURE 7**

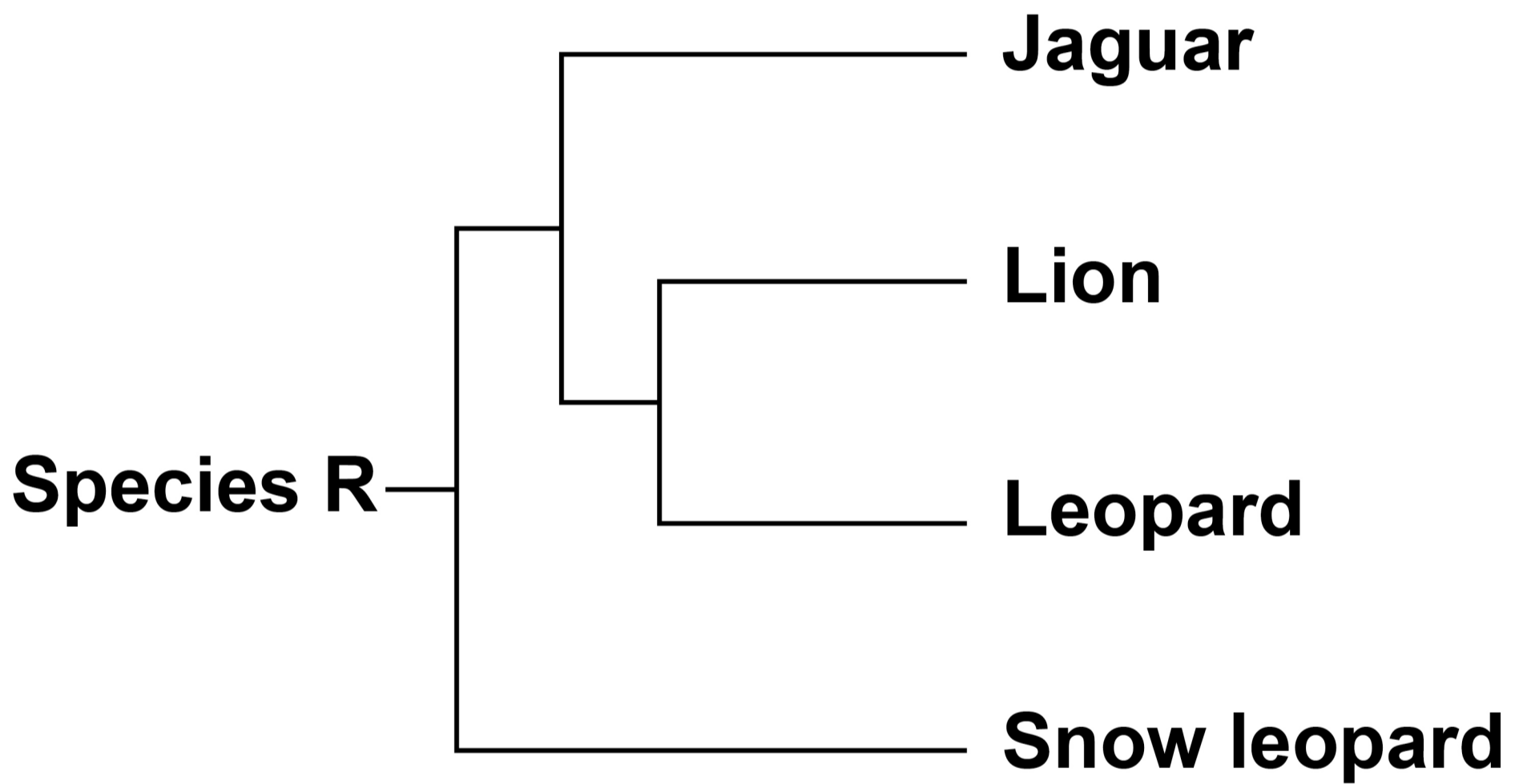




04

**FIGURE 8 shows an evolutionary tree.**

**FIGURE 8**



**04.1**

**Which species in FIGURE 8 is most closely related to lions? [1 mark]**

**Tick (✓) ONE box.**

**Jaguar**

**Leopard**

**Snow leopard**

**04.2**

**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]**



**04.3**

**What is represented by species R on FIGURE 8, on page 40 ? [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
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**Complete the sentence.**

**Choose the answer from the list.**

**[1 mark]**

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

**Evolution occurs by the process of**

\_\_\_\_\_ .

**[Turn over]**



04.5

**Species can become extinct.**

**Give TWO possible causes of extinction.  
[2 marks]**

**1** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

**2** \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



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]**

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**[Turn over]**



**Some bacteria have evolved to be resistant to penicillin.**

**Penicillin is an antibiotic.**

**04.7**

**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, on the opposite page.**

**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.**



**[Turn over]**

0	4	.	8
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**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

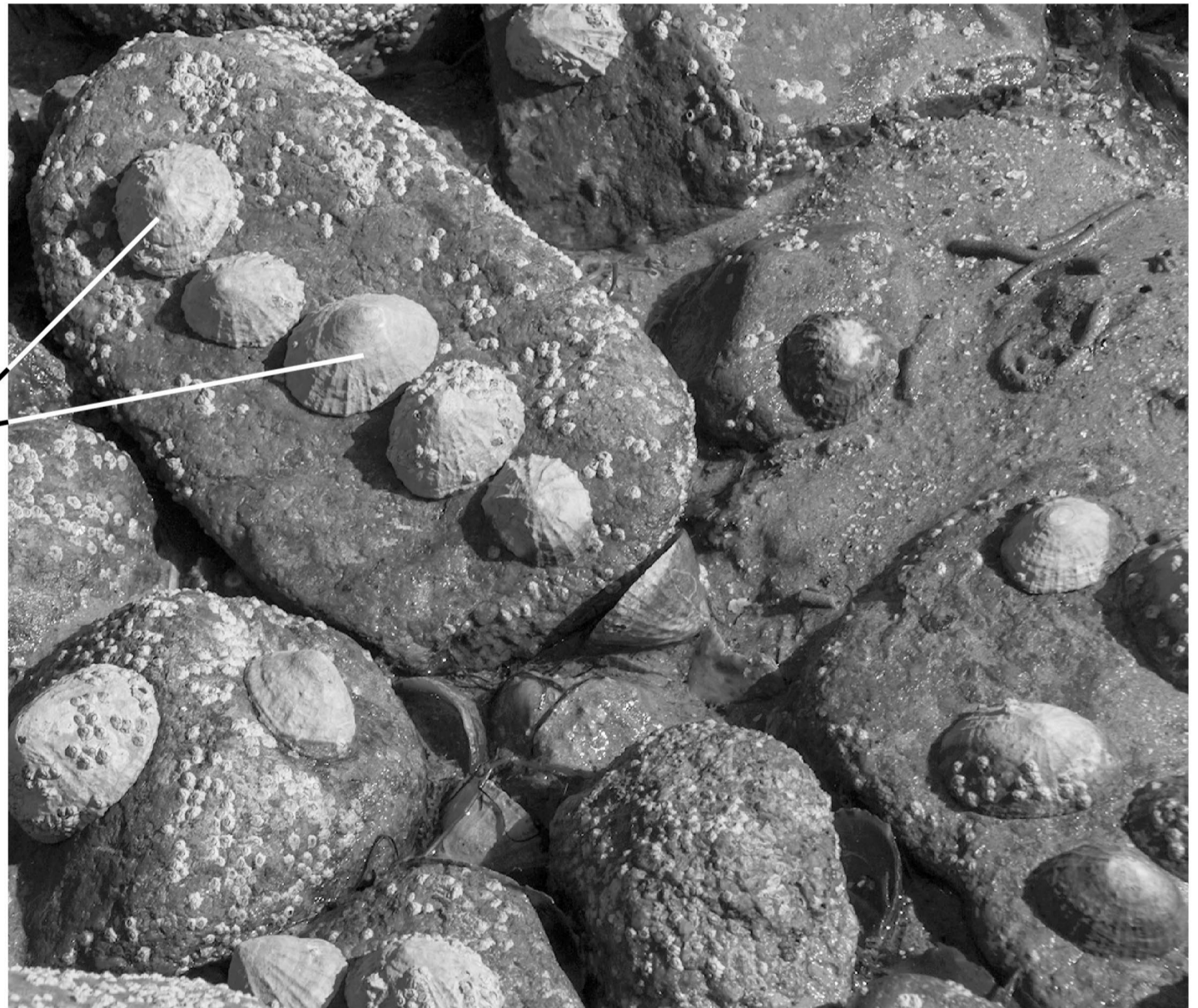
**Limpets are small animals with shells.**

**Limpets attach to rocks on sea shores.**

**FIGURE 9 shows limpets on rocks.**

**FIGURE 9**

**Limpets**



0 5 . 1

**Limpets eat algae.**

**Limpets are prey for crabs.**

**Give the food chain for algae, crabs and limpets. [1 mark]**

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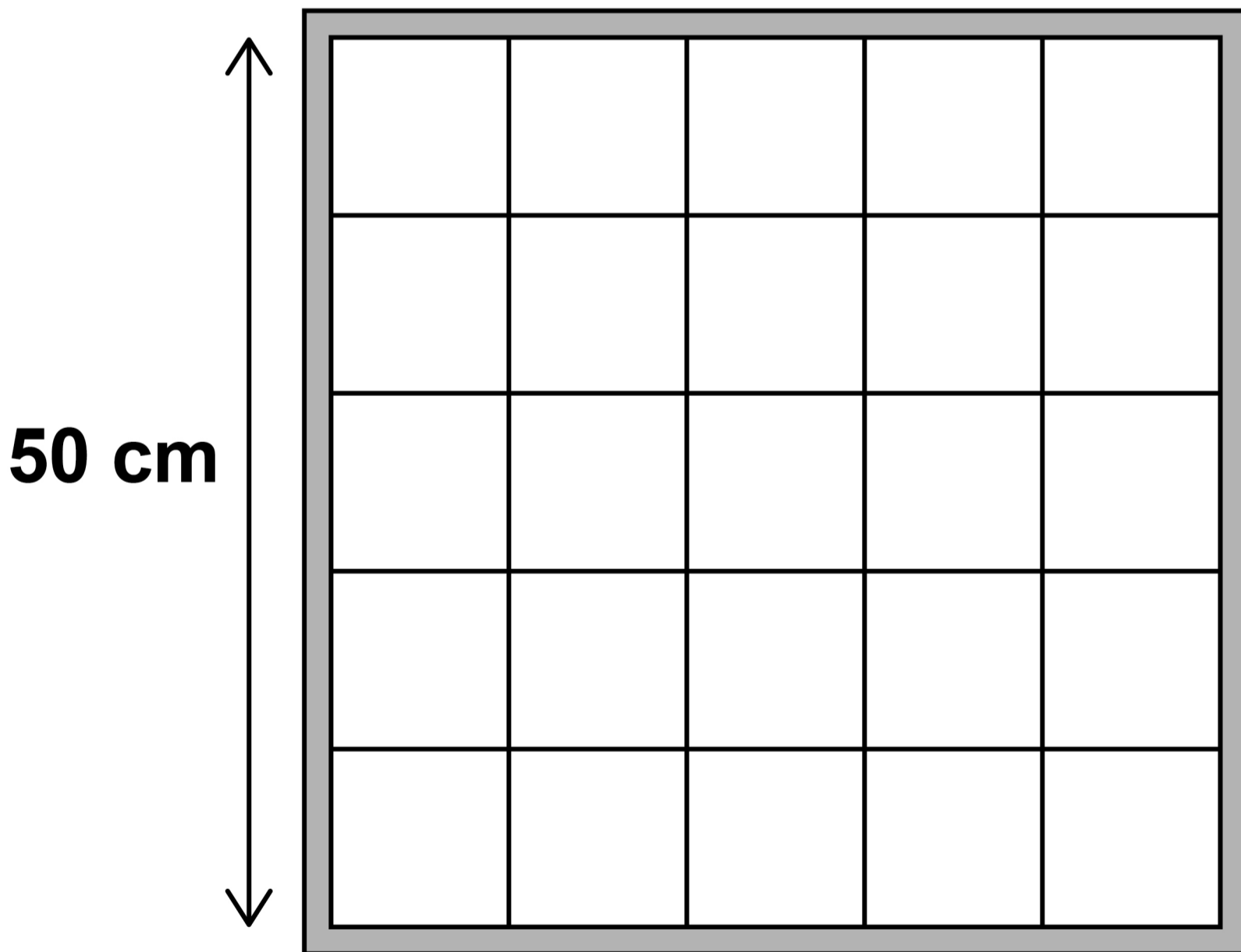
**[Turn over]**

**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
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**Calculate the area of the quadrat in m<sup>2</sup>.**  
**[2 marks]**

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**Area of quadrat = \_\_\_\_\_ m<sup>2</sup>**

**[Turn over]**



**05.3**

**The total area of the sea shore was 1800 m<sup>2</sup>.**

**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 53. [2 marks]**

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**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]**

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**[Turn over]**



05.5

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

**[2 marks]**

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05.6

**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]**

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**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]**

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**[Turn over]**



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**



**06.2**

**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]**

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**[Turn over]**



**06.5**

**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]**

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

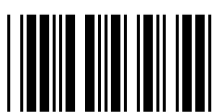
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**WP/M/CD/Jun24/8464/B/2F/G4005/V3**



6 8



2 4 6 G 8 4 6 4 / B / 2 F