



Surname _____

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**GCSE
COMBINED SCIENCE: TRILOGY**

Higher Tier
Biology Paper 2H
8464/B/2H

H

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



4

0 1

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

0 1 . 1

Are the factors in TABLE 1 biotic or abiotic? [2 marks]

Tick ONE box for each factor.

TABLE 1

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.’

01.2 Explain why the students thought their hypothesis would be correct. [3 marks]

[Turn over]



6

0 1 . 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.**

7

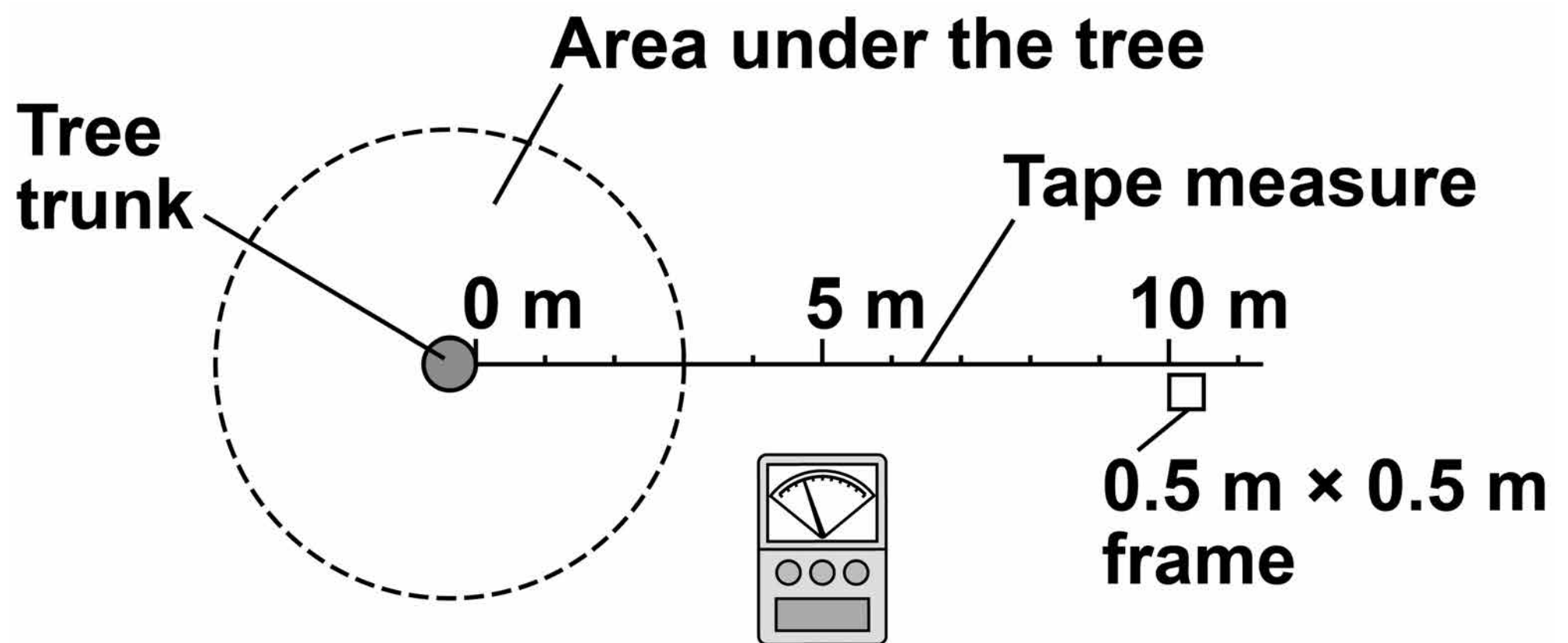
- 4. Identify all the plant species growing inside the frame.**
- 5. Estimate and record the percentage cover of each plant species.**
- 6. Measure the light intensity inside the frame.**
- 7. Put the square frame on the ground every 2 metres along the tape to 10 metres.**
- 8. Repeat steps 4 – 6 in every frame.**

[Turn over]



FIGURE 1 shows the equipment in this investigation.

FIGURE 1



01.4 Calculate the total area sampled. [1 mark]

Total area sampled =

m²

9

0 1 . 5 The whole investigation was done as quickly as possible on the same day.

Suggest ONE reason why.
[1 mark]

0 1 . 6 Give ONE way the investigation could be improved. [1 mark]

[Turn over]

TABLE 2 shows the results.

TABLE 2

	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

0 1 . 7 Which plant species in TABLE 2 will only grow at high light intensity? [1 mark]

11

[Turn over]



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12



12

01.8

What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from TABLE 2, on pages 10 and 11, in your answer. [2 marks]

13

[Turn over]



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15

01.9 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



16

0	2
---	---

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]



03

Scientists have removed microorganisms from inside rocks in caves in Mexico.

The microorganisms have been trapped there for between 10 000 and 50 000 years.

The caves are dark, very hot, humid and acidic.

03.1 Why are these microorganisms called extremophiles? [2 marks]

Tick TWO boxes.

They are thousands of years old

They survive in high humidity

They survive in high temperatures

They survive in the dark

They survive inside rocks

They survive where it is acidic

[Turn over]



The microorganisms have been inactive for thousands of years but the scientists have reactivated them.

FIGURE 2, on pages 22 and 23, shows the results of enzyme analysis on four enzymes, A, B, C and D.

Three of the enzymes were from microorganisms found in the soil near the caves.

One of the enzymes was from a reactivated microorganism from the caves.

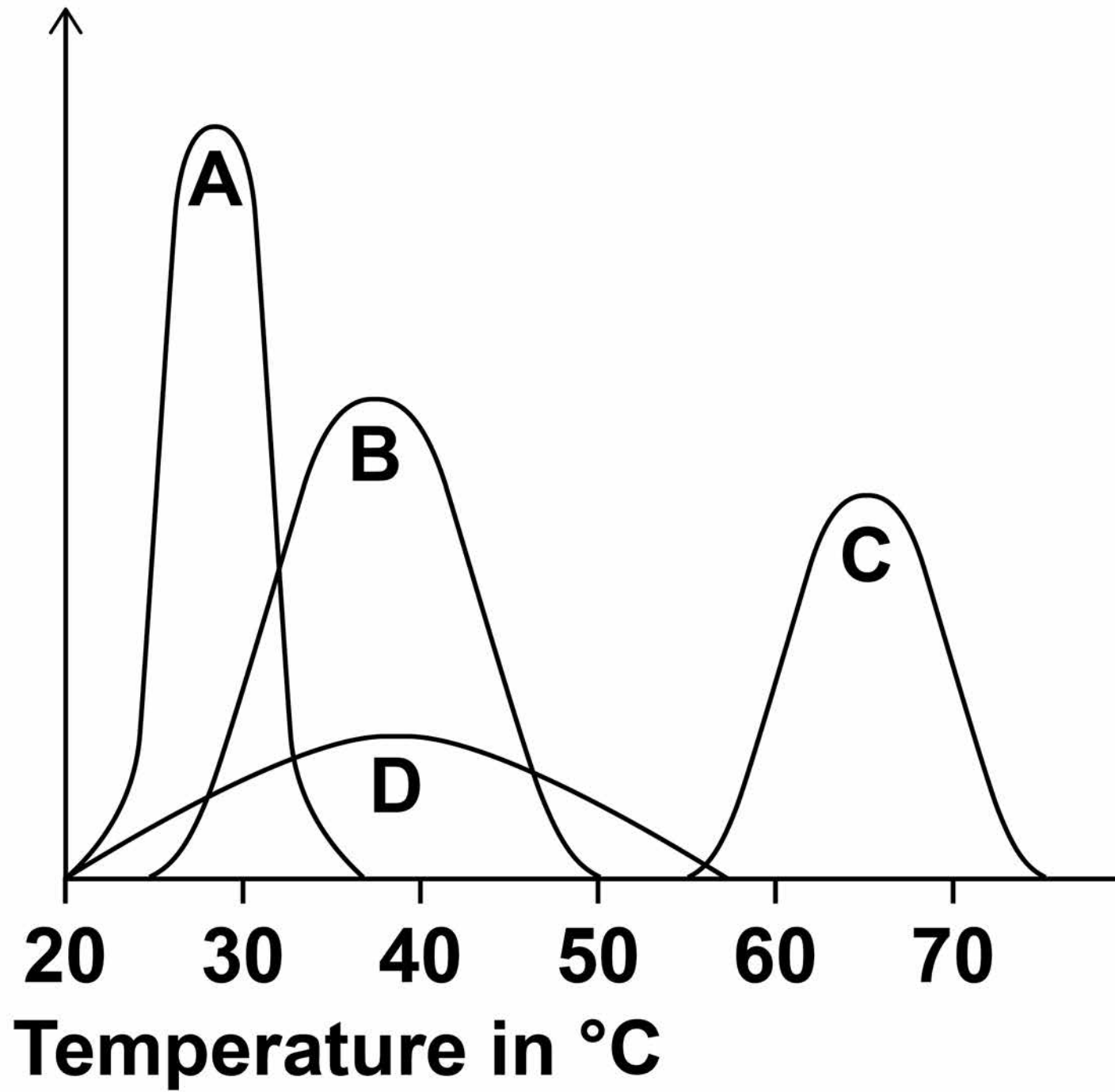
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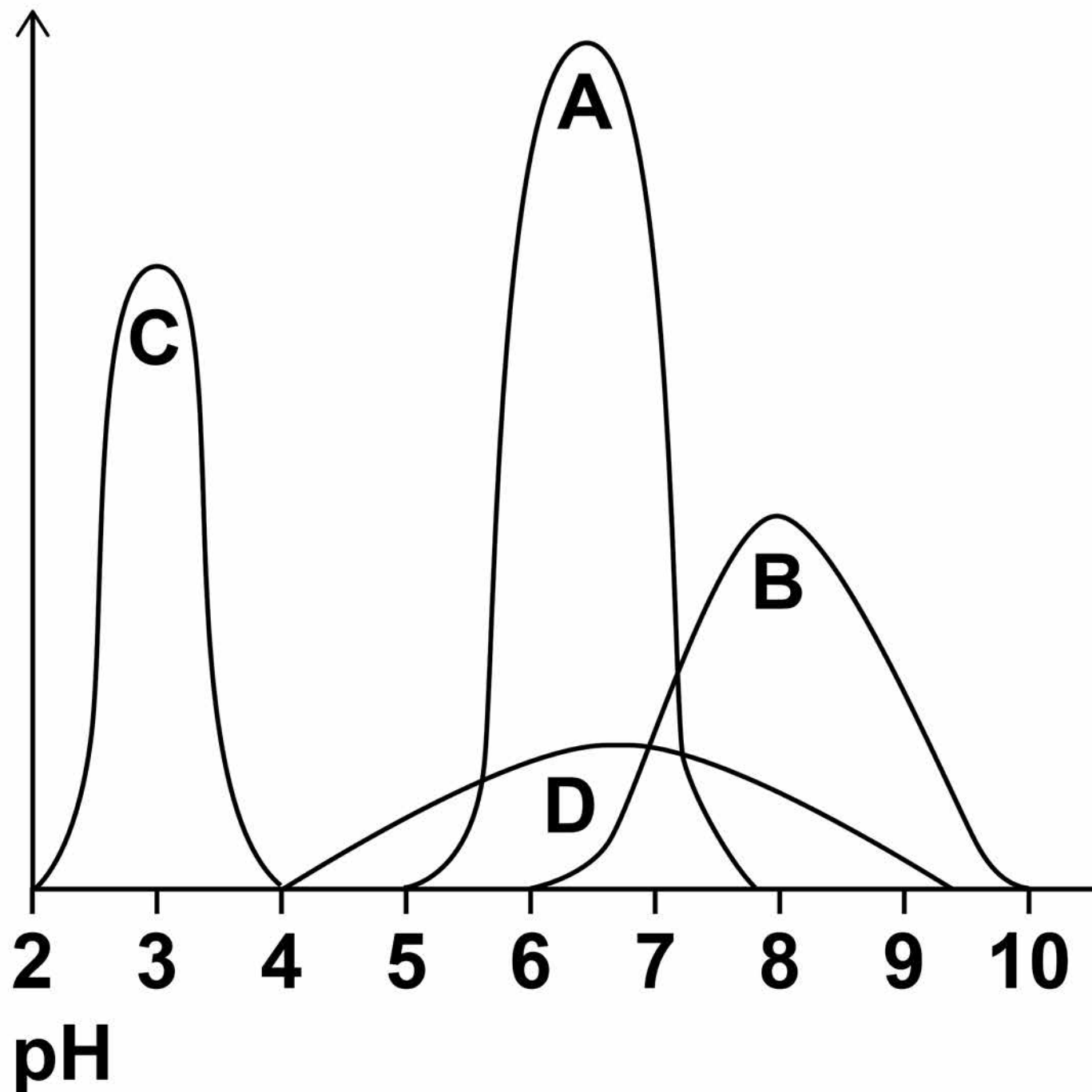


FIGURE 2

Enzyme
activity



Enzyme
activity



03.2 Which enzyme comes from the microorganism from the caves?
[1 mark]

Tick ONE box.

A B C D

[Turn over]



03.3 Give the reasons for your answer to question 03.2
[1 mark]

03.4 Carl Woese developed the 'three-domain system' of classification.

Describe the 'three-domain system' of classification.
[3 marks]



03.5 Most of the microorganisms from the caves were classified as belonging to the Archaea domain of the 'three-domain system'.

Suggest why. [1 mark]

[Turn over]

8

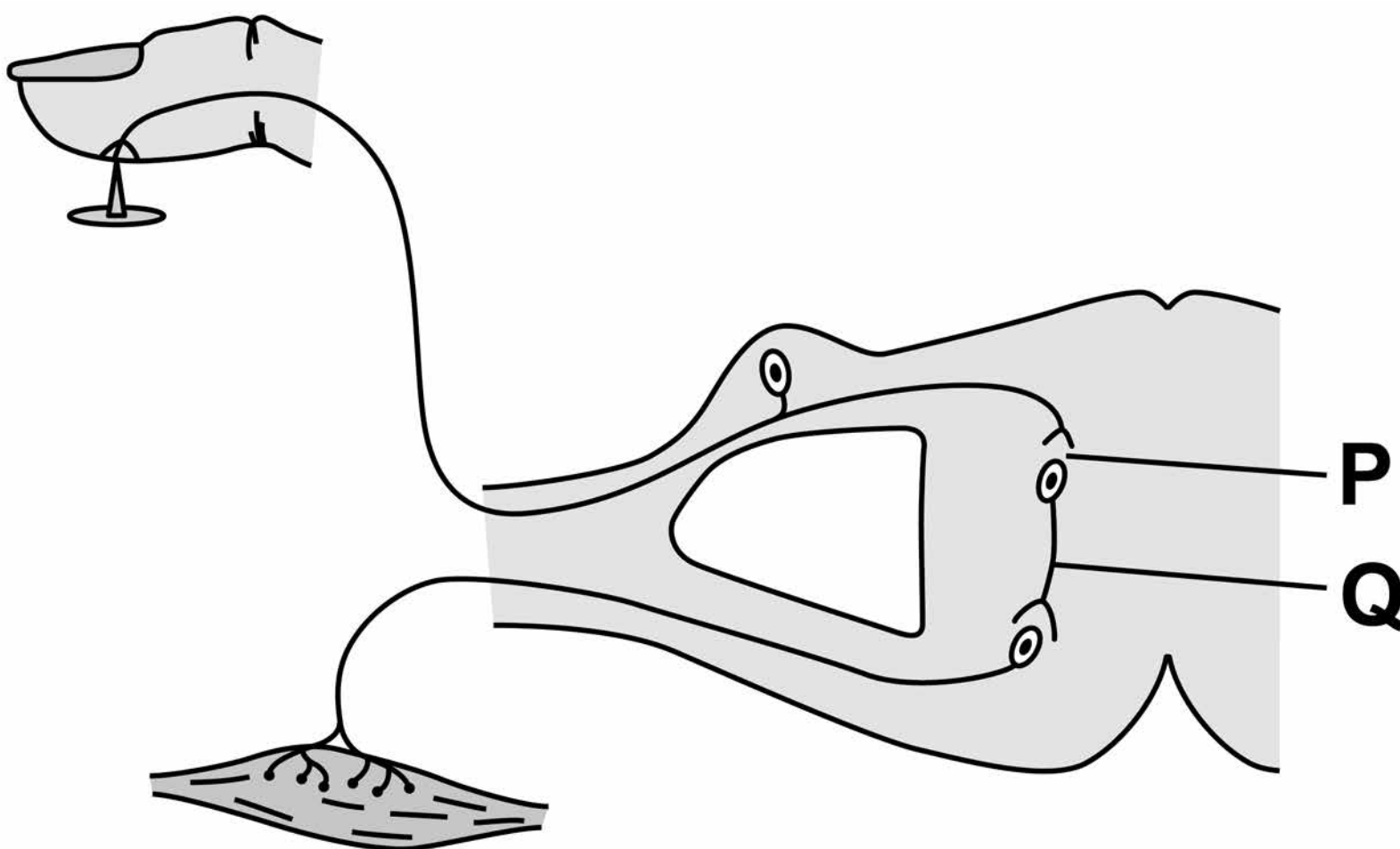


04

This question is about the nervous system.

FIGURE 3 shows a reflex arc.

FIGURE 3



04.1 Name parts P and Q shown on **FIGURE 3** [2 marks]

P

Q



0 4 . 2 Compare how information is transferred along a neurone with how information is transferred across gap P. [2 marks]

0 4 . 3 Why does a conscious action take longer than a reflex action? [1 mark]

[Turn over]



04.4 Information travels at 120 metres per second in neurones.

Calculate the time it would take for the information to travel 1.6 m along a neurone.

Give your answer in milliseconds. [3 marks]

Time _____ ms

04.5 Doctors tested people of different ages to time how long it took between touching a sharp pin and the arm muscle contracting.

TABLE 3, on page 29, shows the results.



TABLE 3

Age in years	Time for muscle to contract in milliseconds
30	18.9
40	20.2
50	23.1
60	26.7
70	31.3
80	37.0

Describe the relationship between age in years and time for the muscle to contract. [2 marks]

[Turn over]



0 5 Read the following.

In the 1950s farmers in India could not grow enough rice to feed the rapidly increasing population.

At the International Rice Research Institute (IRRI) scientists began a selective breeding programme with 10 000 different varieties of rice plants.

In 1966 the IRRI produced a new variety called IR8 which gave a yield of up to ten times the traditional varieties. IR8 has short stems and large rice grains.

IR8 was grown by farmers all over India so people had enough to eat.



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06

FIGURE 4, on page 35, shows how hormone concentrations vary during a normal human menstrual cycle if a woman does not become pregnant.

06.1

Calculate the rate of increase in LH concentration between day 9 and day 12

Give your answer in arbitrary units per hour.

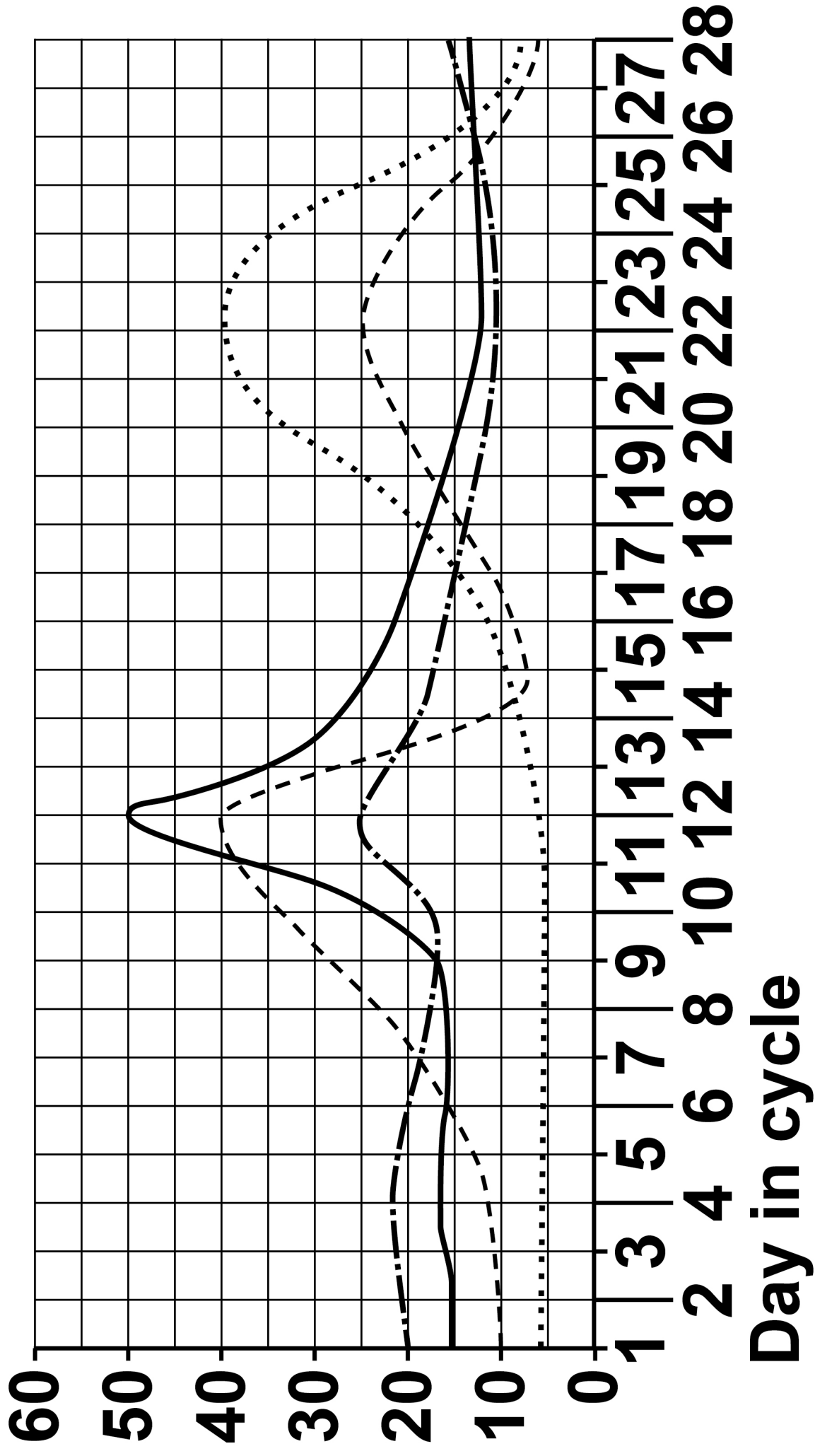
Give your answer to 2 significant figures. [2 marks]

Rate = _____ arbitrary units per hour



FIGURE 4

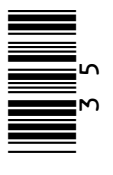
Hormone concentration in arbitrary units



KEY

----- FSH ——— LH - · - · - · - Oestrogen · · · · · Progesterone

[Turn over]



0 6 . 3 Progesterone is used in some contraceptives.

Suggest ONE advantage of using a progesterone patch rather than a progesterone oral contraceptive. [1 mark]

[Turn over]

8



07

Many people eat shellfish called oysters.

An oyster has 20 chromosomes in each body cell.

07.1

Which arrangement of chromosomes will a male oyster have in each body cell? [1 mark]

Tick ONE box.

One X and one Y chromosome and 8 pairs of other chromosomes

Two X and two Y chromosomes and 8 pairs of other chromosomes

One X and one Y chromosome and 9 pairs of other chromosomes

Two X chromosomes and 9 pairs of other chromosomes



07.2 Oyster gametes only contain half the amount of DNA compared to a normal oyster body cell.

**Describe the type of cell division that produces gametes.
[3 marks]**

[Turn over]

Biologists have discovered a way to produce oysters that have three sets of chromosomes (triploid) instead of the usual two sets (diploid).

The triploid oysters cannot reproduce and so they grow more quickly.

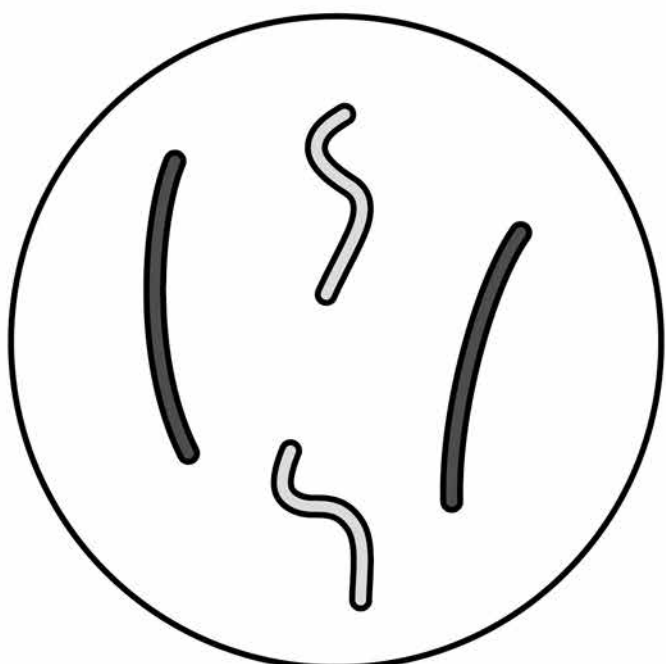
Diploid oysters do not taste good in the reproductive season. Triploid oysters taste good all year.

FIGURE 5 shows the chromosomes in a diploid cell and in a triploid cell.

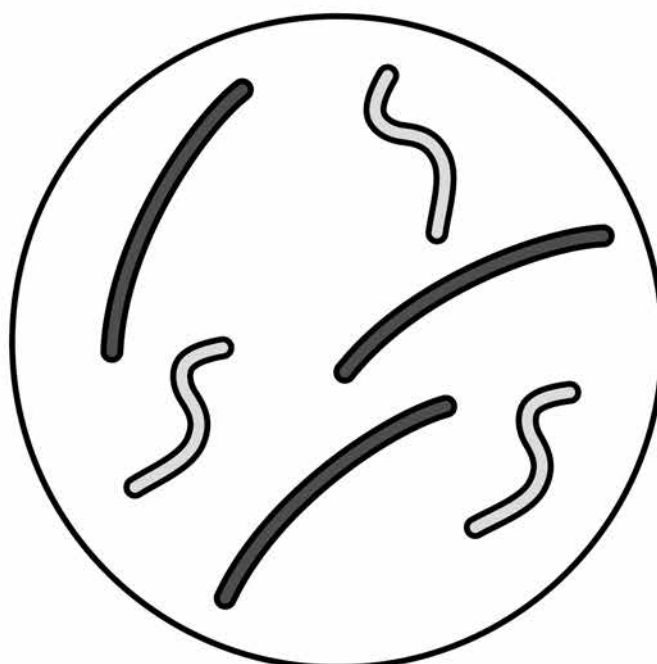
Only two sets of chromosomes are shown.

FIGURE 5

Diploid cell



Triploid cell



07.3 Suggest why the triploid oysters are NOT able to reproduce. [1 mark]

07.4 Explain why the triploid oysters grow more quickly than the diploid oysters. [2 marks]

[Turn over]



07.5 The population of diploid oysters growing in the wild has reduced by over 80% in the last 20 years.

Suggest TWO environmental factors which may be causing this reduction.

Give a reason why each factor may be causing the reduction in the population. [2 marks]

1

2

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[Turn over]



07.6 Oyster farmers grow the triploid oysters from young seed oysters.

The production of seed oysters involves the use of a chemical called cytochalasin B.

Cytochalasin B has been shown to cause cancer in mice.

Evaluate the production of triploid oysters for supermarkets and restaurants.
[6 marks]



END OF QUESTIONS

15



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There are no questions printed on this page

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Question	Mark
1	
2	
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TOTAL	

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