Please check the examination details below before entering your candidate information

Candidate surname	Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 3 November 2025

Morning (Time: 2 hours)

Paper reference **4BI1/1B 4SD0/1B**

Biology

UNIT: 4BI1
Science (Double Award) 4SD0
PAPER: 1B

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 110.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ▶

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M:1/1/1/1/1/1/1/1/1/1/1/1/1/1/1

P 7 5 9 4 3 R A 0 1 2 8

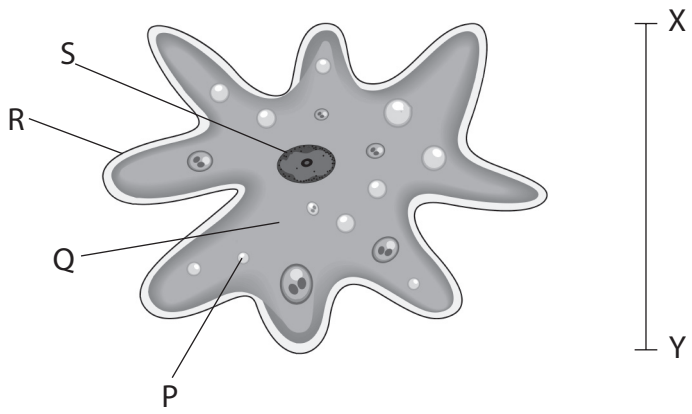
Pearson

Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

1 An *Amoeba* is a microscopic single-celled organism that lives in pond water.

The diagram shows an *Amoeba* with some structures labelled.



(Source: © Vecton/Shutterstock)

(a) (i) Which structure is the nucleus?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(ii) Which structure is the cytoplasm?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(iii) Which structure contains chromosomes?

(1)

☒ **A** P

☒ **B** Q

☒ **C** R

☒ **D** S

(iv) The magnification of the diagram is ×65.

Calculate the actual length of the *Amoeba* from X to Y.

[1000 μm = 1 mm]

(2)

length = ... μm

(b) Give three differences in structure between an *Amoeba* and a virus.

(3)

1 .....

.....

.....

2 .....

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3 .....

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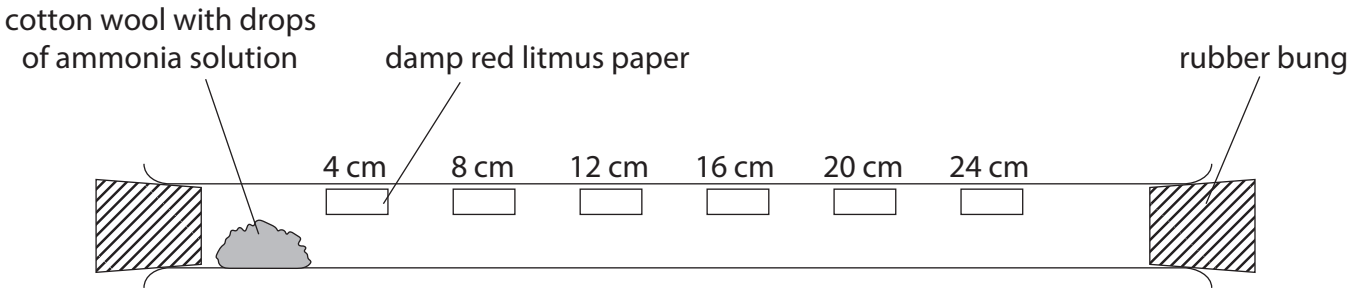
.....

(Total for Question 1 = 8 marks)

2 A teacher uses this apparatus to investigate the effect of concentration of a substance on the rate of diffusion.



This is the teacher's method.

- place six small squares of damp red litmus paper in a glass tube at 4 cm intervals
- put the glass tube in a fume cupboard
- add 1 drop of ammonia solution to some cotton wool
- place the cotton wool at one end of the glass tube
- close the tube with two bungs
- record the time taken for the ammonia to change the colour of each square of litmus paper

The teacher repeats the method with 3 drops of ammonia solution instead of 1 drop.

(a) State what is meant by the term **diffusion**.

(1)

.....

.....

.....

(b) The table gives the teacher's results.

Number of drops of ammonia solution	Time taken for litmus to change colour in seconds					
	4 cm	8 cm	12 cm	16 cm	20 cm	24 cm
1	8	15	20	25	31	38
3	2	6	11	14	17	22

(i) Give the dependent variable in this investigation.

(1)

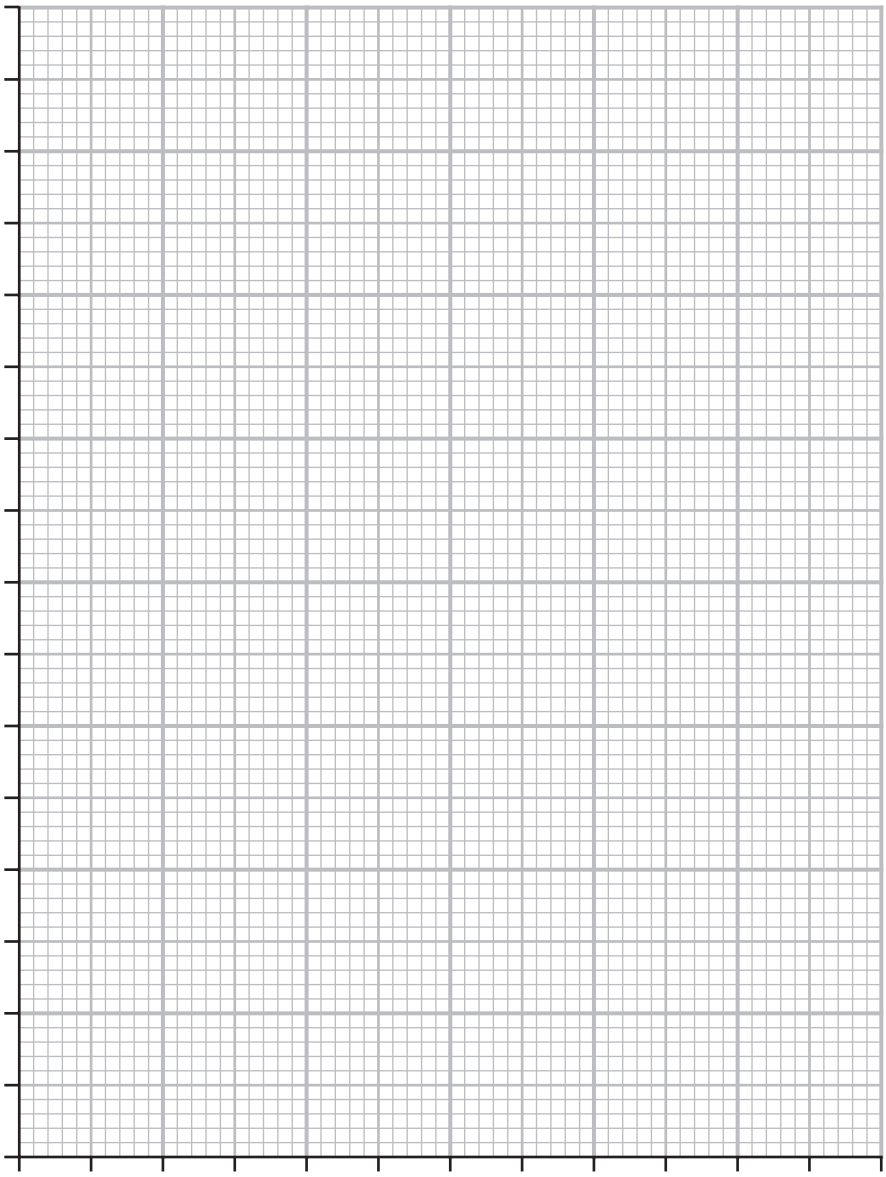
.....

(ii) Plot a line graph to show the time taken for the litmus paper at each distance to change colour.

Use a ruler to join your points with straight lines.

Draw separate lines for 1 drop of ammonia solution and for 3 drops of ammonia solution.

(6)



(iii) Explain the effect that increasing the number of drops of ammonia solution has on the time taken for the litmus paper to change colour.

(2)

(iv) For 1 drop of ammonia solution, calculate the mean rate of diffusion of ammonia between the litmus papers at 4 cm and 24 cm.

Give your answer in cm per second.

(2)

rate = ... cm per second

(v) State how the teacher could improve the reliability of their investigation.

(1)

(c) Describe how the teacher could modify their method to investigate the effect of temperature on the rate of diffusion.

(3)

(Total for Question 2 = 16 marks)

3 Photosynthesis is the process green plants use to convert light energy into chemical energy.

(a) A student uses this method to show that carbon dioxide is needed for photosynthesis.

Step 1 place a plant in darkness for 48 hours

Step 2 remove a leaf and test it for starch

Step 3 enclose one leaf, still attached to the plant, in a flask containing a bag of solid sodium hydroxide (soda lime)

Step 4 place the plant in bright light for 24 hours

Step 5 test the leaf in the flask for starch

Step 6 test another leaf from the plant for starch

(i) Explain why a leaf is removed from the plant and tested for starch in step 2.

(2)

(ii) Explain the expected result of the starch test in step 5.

(2)

(iii) Light is also needed for photosynthesis.

Describe how the student's method could be modified to show that light is needed for photosynthesis.

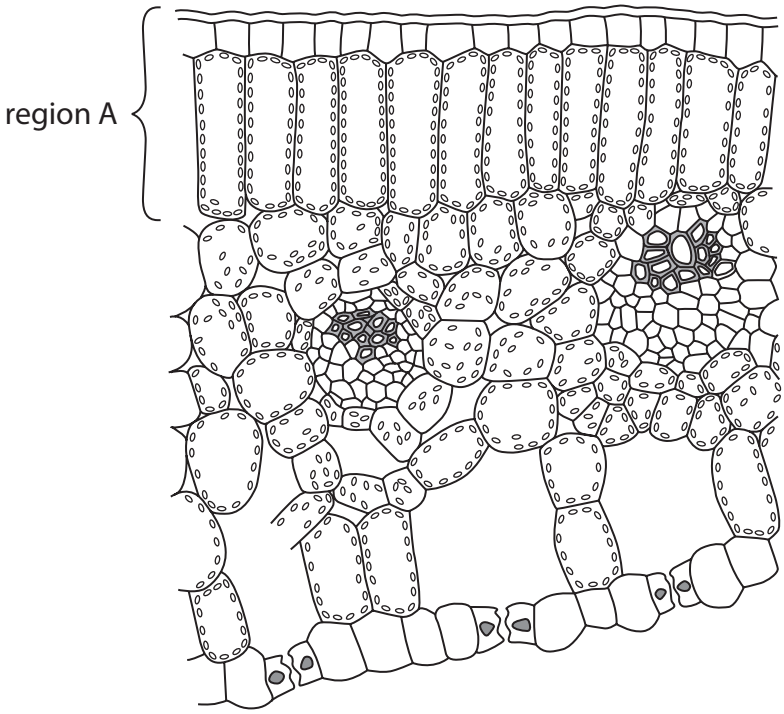
(2)

(b) Plants produce carbohydrates using photosynthesis.

Explain why mineral ions are also required for healthy plant growth.

(3)

(c) The diagram shows a cross-section through a leaf.



Explain how region A is adapted for photosynthesis.

(3)

(Total for Question 3 = 12 marks)

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4 Respiration is the process that provides energy for cells.

Respiration can be aerobic or anaerobic.

(a) Give the word equation for anaerobic respiration in plants.

(2)

(b) A scientist uses a gas sensor to investigate the carbon dioxide produced by a sample of dry seeds, and the carbon dioxide produced by a sample of respiring seeds.

The sensor measures the concentration of carbon dioxide in parts per million (ppm) in the air surrounding the seeds.

The scientist measures the initial and final concentration of carbon dioxide for dry seeds, for respiring seeds and for air with no seeds.

The table shows the scientist's results.

Sample	Initial CO_2 concentration in ppm	Final CO_2 concentration in ppm	Change in CO_2 concentration in ppm	Time in s	Rate of CO_2 production in ppm per s
dry seeds	490	492	2	180.0	0.01
respiring seeds	564	1108		180.0	
air with no seeds	400	400	0	180.0	0.00

(i) Give one biotic variable the scientist should keep constant in this investigation.

(1)

.....

(ii) Calculate the rate, in ppm per s, of CO_2 production for the respiring seeds.

(2)

rate = ... ppm per s

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(iii) Comment on the scientist's method and results.

(5)

(Total for Question 4 = 10 marks)

5 Yeast is a fungus used in the production of bread.

(a) (i) State the part of a yeast cell that is made of chitin.

(1)

(ii) State the carbohydrate stored in the cytoplasm of a yeast cell.

(1)

(b) Describe the role of yeast in the production of bread.

(3)

(c) Yoghurt is another food that is produced using microorganisms.

(i) Explain the importance of controlling the temperature in the different stages of yoghurt production.

(3)

(ii) Explain the importance of changes in pH during yoghurt production.

(2)

(Total for Question 5 = 10 marks)

6 This is a food chain from a marine environment.

phytoplankton → krill → mackerel → cod → seal

(a) Which is the secondary consumer in this food chain?

(1)

- ☒ **A** cod
- ☒ **B** krill
- ☒ **C** mackerel
- ☒ **D** seal

(b) Draw a labelled pyramid of biomass for this food chain.

(2)

(c) Explain why a pyramid of number may be a different shape from a pyramid of biomass.

(2)

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.....

.....

(d) Explain why the numbers of each organism in the marine food chain vary depending on the time of year.

(4)

(e) Suggest why marine ecosystems may be more affected by climate change than land-based ecosystems.

(2)

(Total for Question 6 = 11 marks)

7 (a) Organisms are able to respond to changes in their environment.

Name the two systems in the human body that respond to changes in the environment.

(2)

1 .....

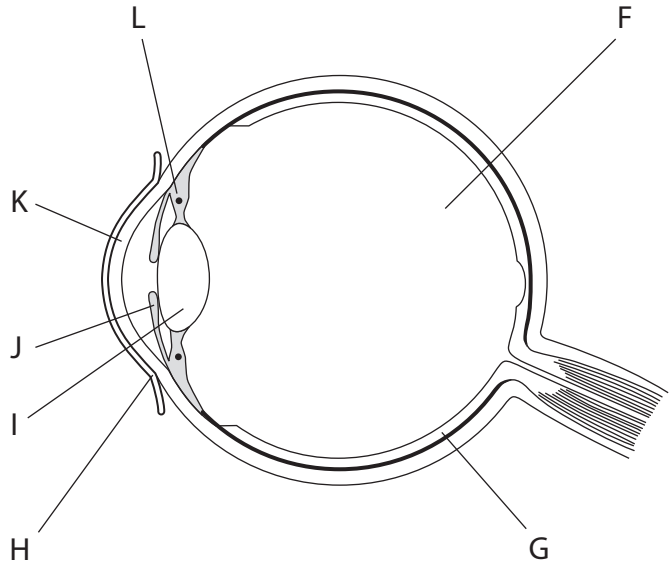
2 .....

(b) Which of these is an example of homeostasis?

(1)

- ☒ **A** lifting a weight
- ☒ **B** maintaining body temperature
- ☒ **C** releasing saliva
- ☒ **D** withdrawing your hand from a flame

(c) The diagram shows a section through the human eye with parts labelled F to L.



(i) Which structure detects light?

(1)

- ☒ **A** F
- ☒ **B** G
- ☒ **C** H
- ☒ **D** J

(ii) A person focuses on a near object.

Explain the changes that occur in the person's eye.

(4)

(d) When the eyes are exposed to dust or pollen, a liquid is secreted onto the eyes.

The liquid contains enzymes.

Suggest a function for this liquid.

(2)

(Total for Question 7 = 10 marks)

8 Plants respond to stimuli.

Some of these responses are called tropic responses.

(a) State what is meant by the term **tropic response**.

(1)

(b) Describe the role of auxin in plant responses to light.

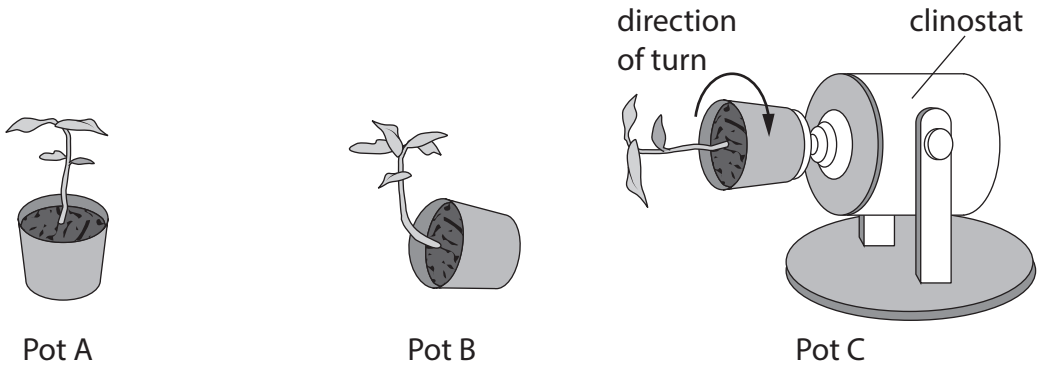
(2)

(c) Auxin is also involved in a plant's response to gravity.

A student uses this method to study plant responses to gravity.

- put similar plants in three identical pots, A, B and C
- place pot A upright
- place pot B on its side
- place pot C on a device called a clinostat that slowly rotates
- place the pots in evenly illuminated conditions
- leave the pots for six days

The diagram shows the plants after six days.



Pot A Pot B Pot C

(i) Explain the differences in appearance of the plants in pots A, B and C after six days.

Use information from the diagram and your own knowledge in your answer.

(5)

(ii) Describe how the student could modify this experiment to investigate the effect of gravity on plant roots.

(2)

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(Total for Question 8 = 10 marks)

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9 Human body cells contain a full set of chromosomes.

Human gametes contain a half set of chromosomes.

(a) Which of these could be the chromosomes in a fertilised human egg cell?

(1)

- ☒ **A** one X chromosome and 22 other chromosomes
- ☒ **B** one Y chromosome and 22 other chromosomes
- ☒ **C** two X chromosomes and 22 pairs of other chromosomes
- ☒ **D** two Y chromosomes and 22 pairs of other chromosomes

(b) (i) Use a genetic diagram to show how the sex of an embryo is determined at fertilisation.

(3)

(ii) Two parents have four children.

Determine the probability that all the children are male.

(2)

probability = ...

(c) The table gives the number of live births in England and Wales in 2021.

Year	Total number of live births	Number of live male births	Number of live female births
2021	624 828	320 122	304 706

Calculate the ratio of male to female live births in 2021.

Give your answer in the form n : 1

(2)

ratio male to female = ... : 1

(d) Explain the role of mitosis in reproduction.

(3)

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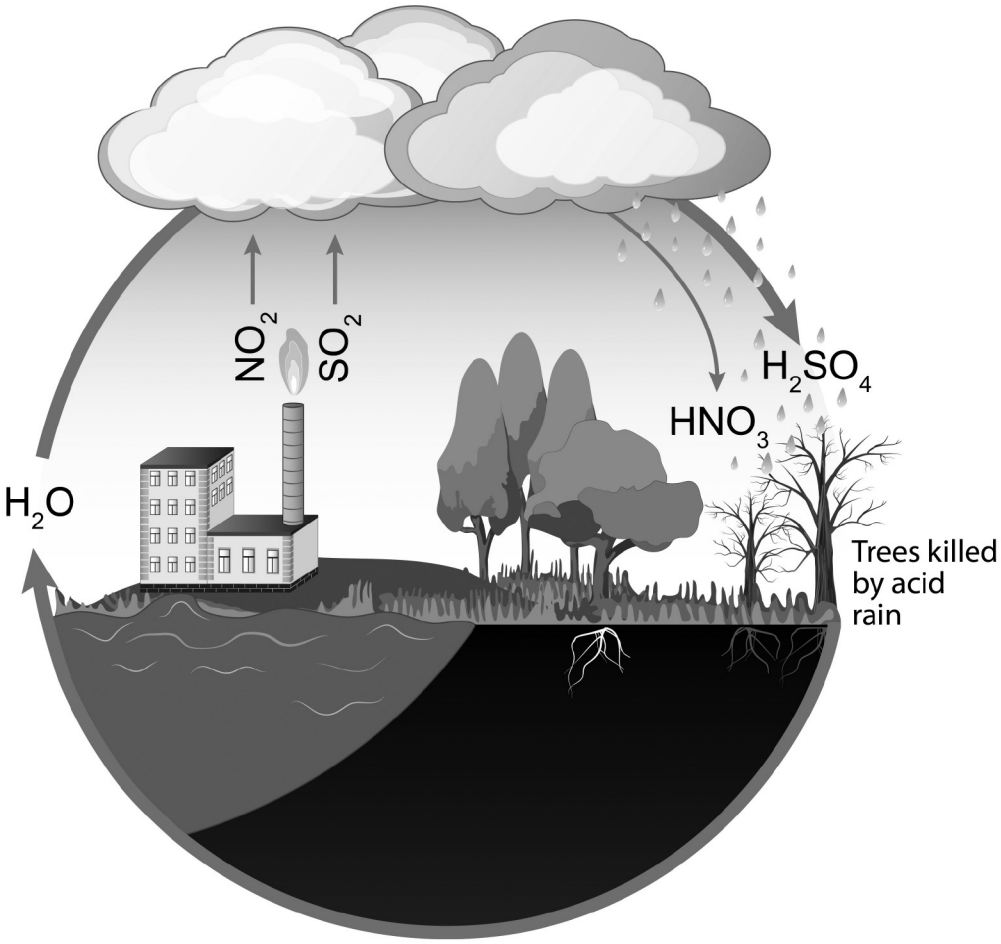
(Total for Question 9 = 11 marks)

10 The diagram shows pollution by sulfur dioxide, SO_2



(Source: © Pearson Asset Library)

(a) Explain how sulfur dioxide in the atmosphere can cause damage to ecosystems.

(3)

(b) The number of electric cars is increasing in many countries.

Explain the benefits to the environment of driving an electric car rather than a petrol or diesel car.

(3)

(Total for Question 10 = 6 marks)

QUESTION 11 BEGINS ON THE NEXT PAGE.

11 Some plants are wind-pollinated. These plants have flowers that release pollen into the air.

Design an investigation to find out if wind-pollinated plants release more pollen when wind speed increases.

Include experimental details in your answer and write in full sentences.

(Total for Question 11 = 6 marks)

TOTAL FOR PAPER = 110 MARKS