

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)

Tuesday 13 May 2025

Afternoon (Time: 1 hour 40 minutes)

Paper reference **4WBI1/1B**

Biology (Modular)

UNIT 1: 4WBI1

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 the calculations and state the units where required.

Information

- The total mark for this paper is 90.
- 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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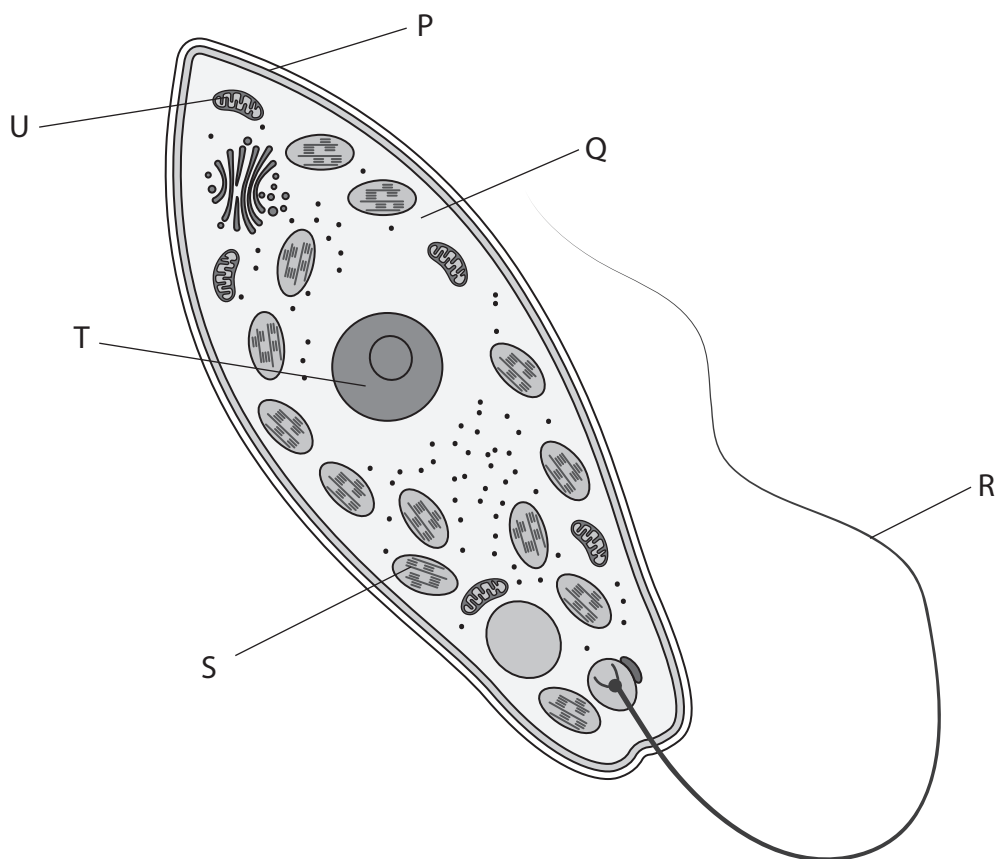


Answer ALL questions. Write your answers in the spaces provided.

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 *Euglena* is a microorganism that lives in water.

The diagram shows *Euglena* with some structures labelled.



- (a) (i) Which group contains *Euglena*?

(1)

- ☐ A bacteria
- ☐ B fungi
- ☐ C protocists
- ☐ D viruses

(ii) Which structure is the site of respiration ?

(1)

- ☐ **A** P
- ☐ **B** R
- ☐ **C** T
- ☐ **D** U

(iii) Which structure contains chromosomes?

(1)

- ☐ **A** P
- ☐ **B** Q
- ☐ **C** R
- ☐ **D** T

(iv) Which structure is the cell membrane?

(1)

- ☐ **A** P
- ☐ **B** Q
- ☐ **C** R
- ☐ **D** U

(b) *Euglena* has some structures that are found in plant cells but not in animal cells.

Which labelled structure is found in plant cells but not in animal cells?

(1)

- ☐ **A** P
- ☐ **B** Q
- ☐ **C** S
- ☐ **D** T

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(c) Some of the labelled structures are known as organelles.

State what is meant by the term **organelle**.

(1)

(d) Explain which two labelled structures allow *Euglena* to move through the water.

Refer to the diagram and your own knowledge in your answer.

(3)

1

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2

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(Total for Question 1 = 9 marks)



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- 2 A teacher uses Benedict's solution to investigate the concentration of glucose in four flavoured waters, A, B, C and D.

This is the teacher's method.

- Step 1 add 5 cm^3 of flavoured water to a boiling tube
Step 2 add 5 cm^3 of Benedict's solution to the boiling tube
Step 3 keep the boiling tube at 70°C for five minutes
Step 4 record the colour of the solution

The teacher uses this method for each of the four flavoured waters.

The table shows the teacher's results.

Flavoured water	Colour of the solution after heating for five minutes
A	yellow
B	brick red
C	blue
D	green

- (a) (i) Give one variable that the teacher controls in the investigation.

(1)

- (ii) Give a method that the teacher could safely use to keep the boiling tube at 70°C for five minutes in step 3.

(1)



- (b) An athlete wants to drink flavoured water to help them run a long-distance race.

Explain which flavoured water, A, B, C or D, would be most suitable for the athlete to drink during the race.

(4)

- (c) Some flavoured waters do not contain glucose.

Suggest why this may be an advantage for some people.

(2)

(Total for Question 2 = 8 marks)



3 Plant cells use photosynthesis to produce carbohydrates.

(a) Give the energy conversion that occurs during photosynthesis.

(2)

from energy to energy

(b) A student investigates whether carbon dioxide is needed for photosynthesis.

(i) Firstly, the student needs to remove all the starch from the plant's leaves.

Explain how the student could do this.

(2)

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- (ii) After the starch has been removed from the leaves, the student uses the apparatus in diagram 1 to prevent carbon dioxide from reaching part of one of the leaves.

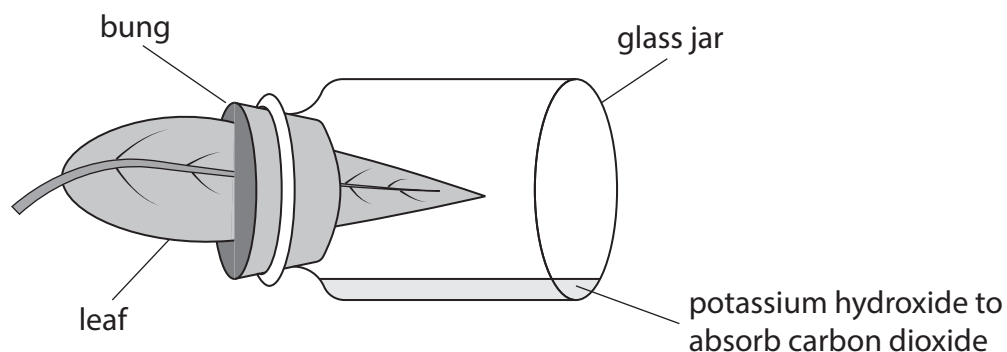


Diagram 1

The student places the apparatus in the light for 24 hours, and then tests the leaf for starch.

Complete and label diagram 2 to show the results of the starch test.

(2)

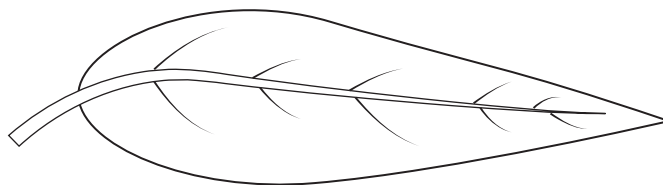


Diagram 2

- (c) Plants need mineral ions as well as carbon dioxide and water.

Give the functions of two named mineral ions that a plant needs.

(4)

1

2



- (d) The concentration of mineral ions in the soil is often lower than the concentration in the plant.

Waterlogged soil does not contain air.

Explain why plants in waterlogged soil cannot absorb mineral ions.

(3)

(Total for Question 3 = 13 marks)



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- 4 The image shows a single-celled eukaryotic organism, *Amoeba proteus*, which lives in freshwater.



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These processes take place within the amoeba.

- water continually enters the amoeba
- water is also produced inside the amoeba
- excess water is stored in the contractile vacuole
- when full, the contractile vacuole is moved to the cell membrane and the water is released from the amoeba

- (a) (i) The diameter of the contractile vacuole in the image is 9.0 mm.

The true diameter of the contractile vacuole is 75.0 μm .

Calculate the magnification of the image.

[1mm = 1000 μm]

(2)

magnification =x



(ii) Name the process that allows water to enter the amoeba across its cell membrane.

(1)

(iii) Name a process taking place in the amoeba that produces water.

(1)

(iv) The contractile vacuole removes water from the amoeba, against the concentration gradient.

Name the process that moves substances against a concentration gradient.

(1)

(b) The amoeba has many mitochondria.

Which of these explains why the amoeba needs many mitochondria?

(1)

- ☐ **A** for anaerobic respiration
- ☐ **B** for entry of water into the cell
- ☐ **C** for movement of the contractile vacuole
- ☐ **D** for diffusion of oxygen into the cell

(c) An amoeba is placed in varying concentrations of sodium chloride solution.

The temperature of the solution is maintained at 24 °C.

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The table gives information about the number of times a contractile vacuole is emptied from the amoeba.

Percentage concentration of sodium chloride	Number of times a contractile vacuole is emptied in one minute			
	trial 1	trial 2	trial 3	mean
0.0	29	31	30	30
0.6	16	15	15	15
1.2	10	10	10	10
1.8	6	5	7	5
2.4	2	2	2	2
3.0	2	0	1	1

- (i) Plot a line graph to show the mean number of times a contractile vacuole is emptied in one minute at each concentration of sodium chloride solution.

Use a ruler to join the points dot to dot with straight lines.

(5)



(ii) Explain the trend shown by these results.

(2)

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(d) The temperature of the water is reduced to 5 °C.

Explain what effect this has on the results.

(2)

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(Total for Question 4 = 15 marks)

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5 The fungus, *Aspergillus niger*, may infect maize and peanuts.

A. niger causes stems and seed pods to rot.

A. niger infects wounds that have been made on the plants by insects.

(a) *Bacillus amyloliquefaciens* is a type of bacterium that is a pathogen of some eukaryotic organisms.

The table gives information about the effect of *A. niger* and *Bacillus* bacteria on the mass of peanuts produced by peanut plants.

Condition of peanut plants	Mass of peanuts in one hectare in kg
uninfected peanut plants	1325.6
peanut plants infected with <i>A. niger</i>	833.5
peanut plants infected with <i>A. niger</i> and with <i>Bacillus</i> bacteria added	1079.4

(i) Calculate the percentage decrease in mass, of peanuts, between the uninfected peanut plants and the peanut plants infected with *A. niger*.

Give your answer to one decimal place.

(3)

percentage decrease =%

(ii) Suggest how adding the *Bacillus* bacteria, to plants infected with *A. niger*, increases the mass of peanut seeds produced by the plants.

(2)

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.....



(iii) Give two differences between the cells of *A. niger* and the cells of *Bacillus* bacteria.

(2)

1

2

(b) *A. niger* also produces toxins that may harm humans who eat the peanuts.

The toxins may cause cancer.

Spores of *A. niger* may be breathed in and infect the lungs.

Give two precautions that peanut growers should take when growing and harvesting peanuts that may be infected with *A. niger*.

(2)

precaution 1

precaution 2

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- (c) A peanut grower thinks that high humidity (high moisture in the air) increases the infection of peanut plants with *A. niger*.

Design an investigation to find the effect of humidity on the infection of peanut plants by *A. niger*.

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

(6)

(Total for Question 5 = 15 marks)



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- 6 Diagram 1 shows the equipment a student uses to investigate the effect of light intensity on gas exchange in a leaf.

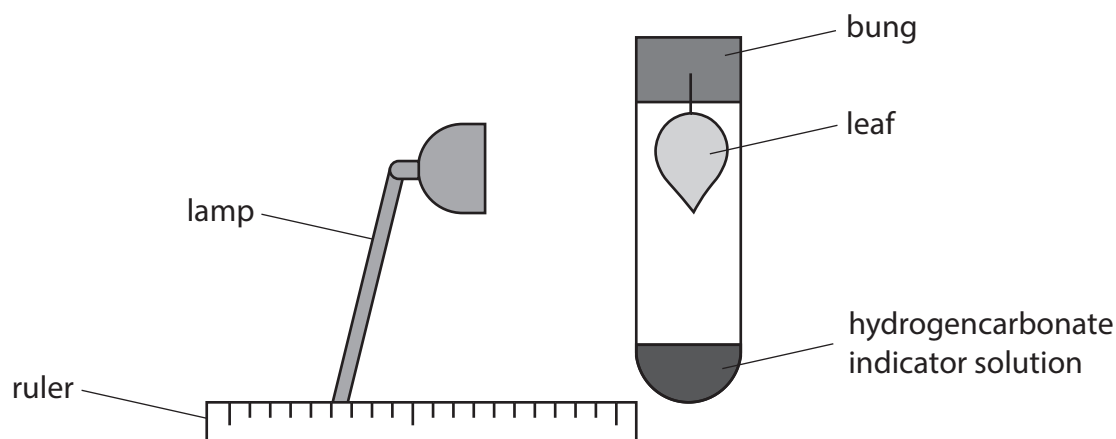


Diagram not to scale

Diagram 1

This is the student's method.

- Step 1 place 20 cm³ of hydrogencarbonate indicator solution into seven boiling tubes and number the tubes 1 to 7
- Step 2 place a leaf into each of the tubes and secure with a bung
- Step 3 place each tube at a different distance from a lamp
- Step 4 record the time taken for the hydrogencarbonate indicator solution in each tube to change from red to purple

The table shows the student's results.

Tube number	Distance of tube from lamp in cm	Time taken for indicator solution to change from red to purple in minutes
1	10	20
2	11	20
3	12	20
4	13	20
5	14	30
6	15	35
7	16	40



Hydrogencarbonate solution is

- red when neutral, pH 7
- purple when alkaline, pH above 7

(a) Give two variables that should be kept constant in this investigation.

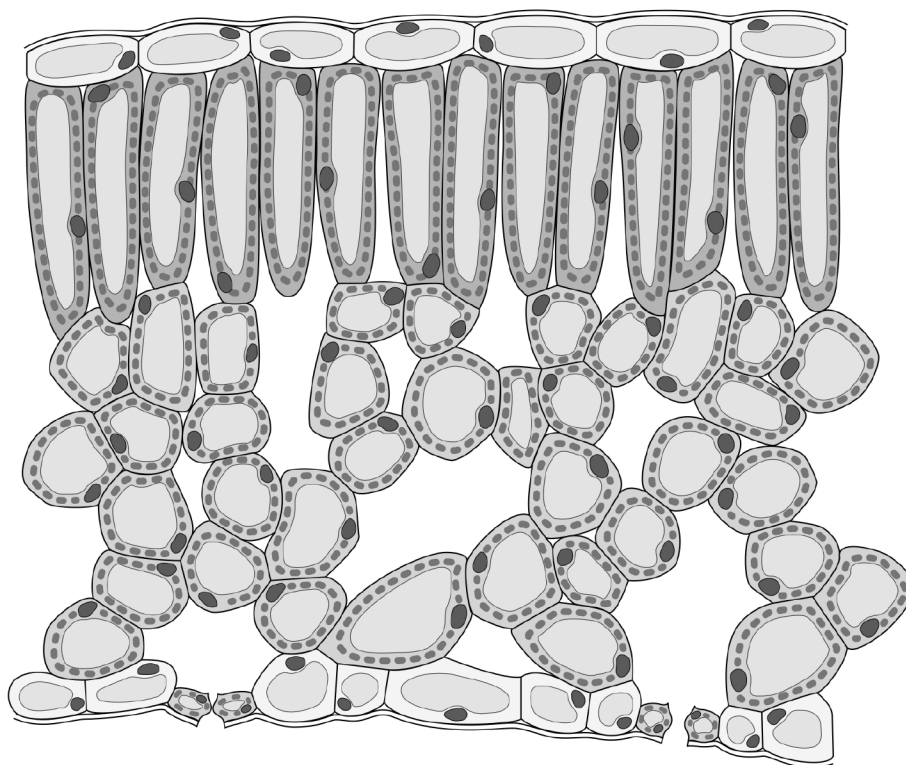
(2)

(b) Explain the results of this investigation.

(4)



(c) Diagram 2 show the internal structure of a leaf.



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Diagram 2

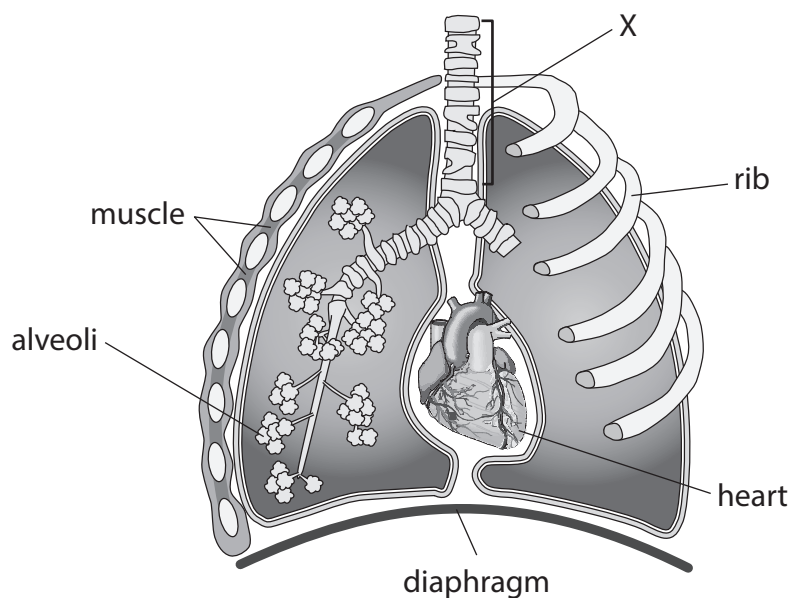
Explain how a leaf is adapted for gas exchange.

(3)

(Total for Question 6 = 9 marks)



- 7 (a) Diagram 1 shows some of the structures in a human thorax.



(Source: © Pearson Asset Library)

Diagram 1

- (i) Name the structure labelled X.

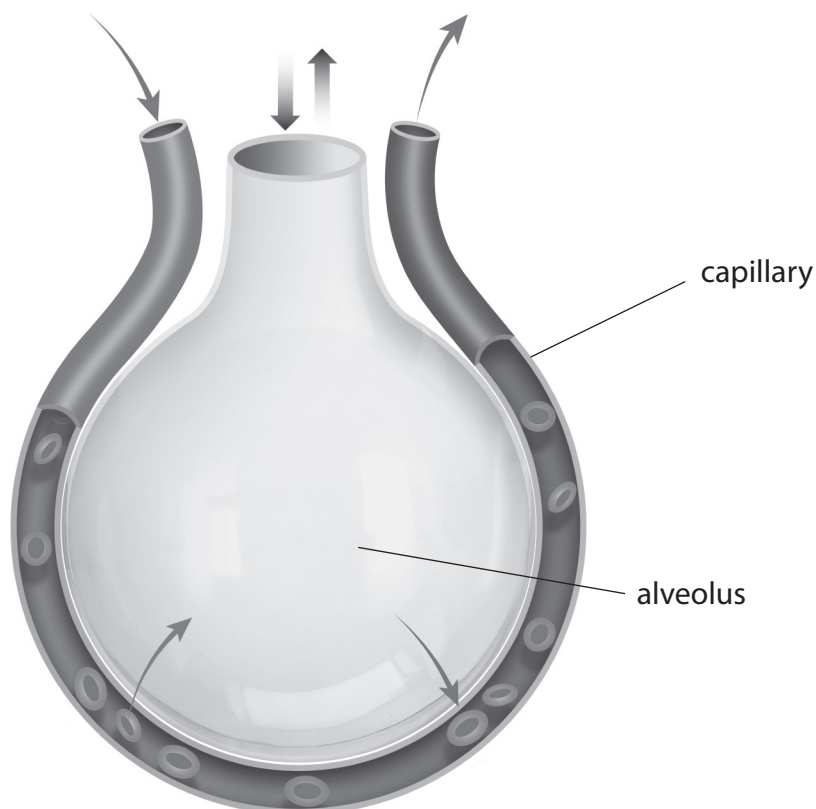
(1)

- (ii) Describe the role of the intercostal muscles and the diaphragm in breathing out.

(3)

(b) Diagram 2 shows the structure of one alveolus.

Alveoli are very small spheres.



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Diagram 2

(i) The radius of the alveolus is $150\text{ }\mu\text{m}$.

Calculate the surface area, in μm^2 , of the alveolus.

surface area of a sphere = $4\pi \times \text{radius}^2$

$[\pi = 3.142]$

(2)

surface area = μm^2



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total surface area = m²

(6)

Explain how the structures in the human lungs enable diffusion and efficient gas exchange.



8 (a) Both plants and animals can respire anaerobically.

(i) Complete the word equation for anaerobic respiration in plants.

(2)

glucose → +

(ii) Complete the word equation for anaerobic respiration in animals.

(1)

glucose →

(b) The table shows four different features of respiration in human muscle cells.

Complete the table by putting one tick (✓) in each row to show the type of respiration linked to each feature.

One row has been completed for you.

(3)

Feature	Aerobic respiration only	Anaerobic respiration only	Both aerobic and anaerobic respiration
produces ATP			✓
occurs in the mitochondria			
involves gas exchange between the cells and the blood			
produces an oxygen debt			

(Total for Question 8 = 6 marks)

TOTAL FOR PAPER = 90 MARKS



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