Candidate surname | Other names

Centre Number | Candidate Number

Pearson Edexcel International GCSE (9–1)

Monday 3 November 2025

Morning (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 ▶

P81554RA

Pearson

Answer ALL questions.

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

The diagram shows *Amoeba* with some structures labelled.
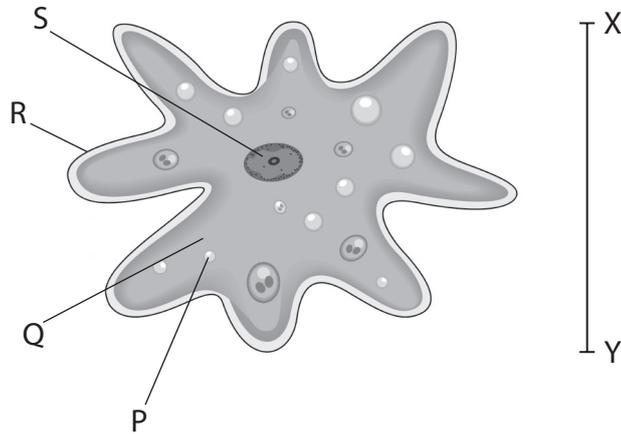
(Source: © Vecton/Shutterstock)

(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

P 8 1 5 5 4 R A 0 2 2 8

(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 ....

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....

2 ....

....

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3 ....

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(Total for Question 1 = 8 marks)

2 This question is about digestion and the alimentary canal.

(a) It is important that humans eat a balanced diet.

Complete the sentences by writing a suitable word in each gap.

(3)

A balanced diet should include appropriate amounts of carbohydrate,

protein and ...., as well as vitamins and minerals.

Humans also need .... and

dietary ....

(b) Name the process that moves digested food through the alimentary canal.

(1)

....

(c) The ileum is part of the alimentary canal.

Give one way the ileum is adapted to absorb digested food.

(1)

....

(d) The large intestine is also part of the alimentary canal.

The diagram shows the large intestine.

(Source: © Pearson Asset Library)

(i) Name the structure labelled Z.

(1)

....

(ii) Explain the function of the part labelled Y.

(2)

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....

(Total for Question 2 = 8 marks)

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

(a) A student uses this method to investigate if 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)

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

(2)

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(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)

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(b) Plants produce carbohydrates by photosynthesis.

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

(3)

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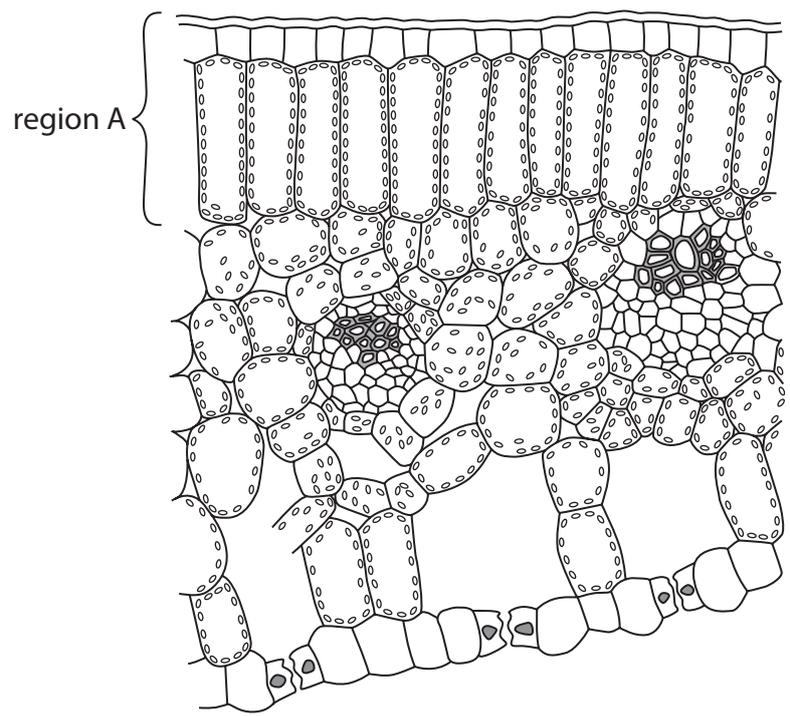
(c) The diagram shows a cross-section through a leaf.

region A

Explain how region A is adapted for photosynthesis.

(3)

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(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 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

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

(5)

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(Total for Question 4 = 10 marks)

P 8 1 5 5 4 R A 0 1 1 2 8

5 The diagram shows the human gas exchange system.

S

R
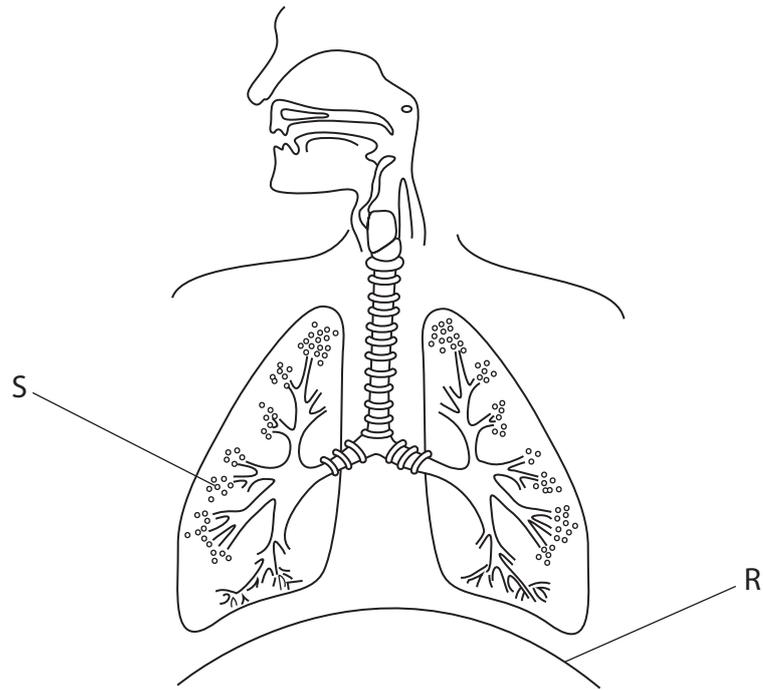
(a) (i) Which of these is structure S?

(1)

⊠ **A** alveolus

⊠ **B** bronchiole

⊠ **C** bronchus

⊠ **D** trachea

(ii) Name the membranes that cover the lungs and the inside of the rib cage.

(1)

....

(iii) Describe the role of structure R and intercostal muscles when breathing in.

(4)

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(b) Smoking tobacco is harmful to health.

Give one harmful effect of smoking tobacco.

(1)

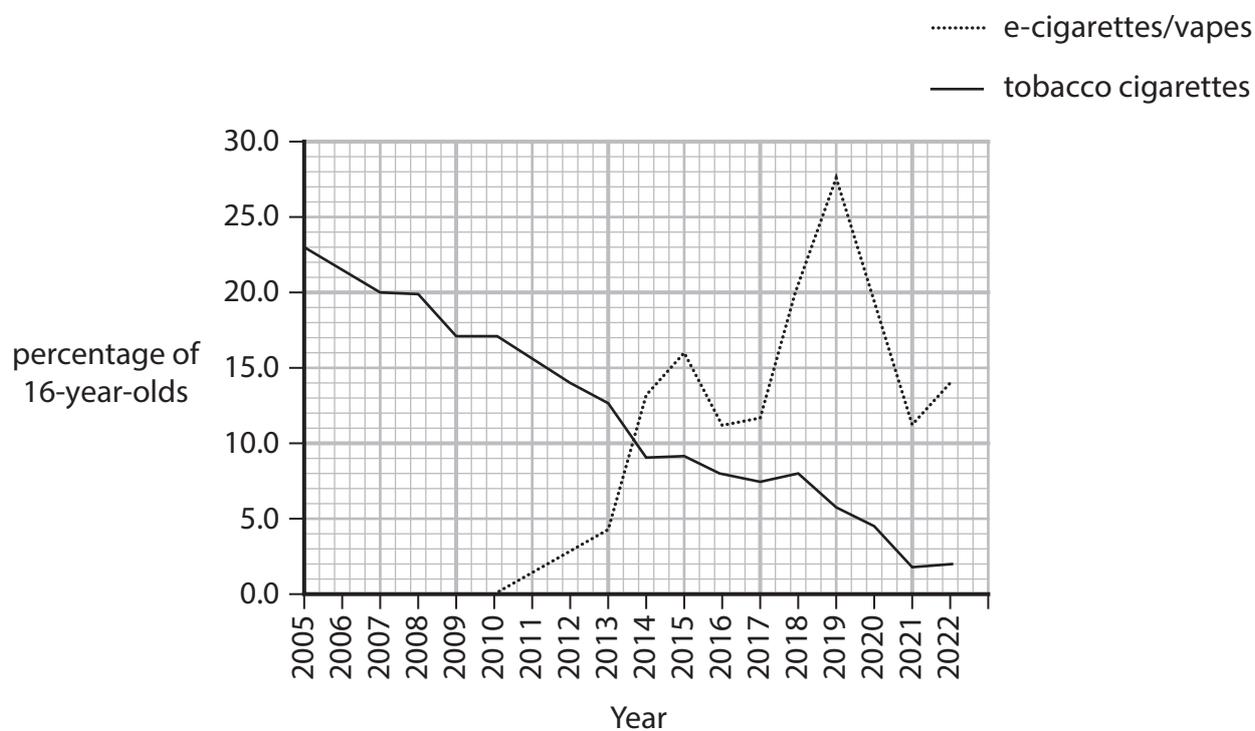..

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

(c) Electronic cigarettes, or vapes, were made available to help people stop smoking tobacco.

The graph shows the percentage of 16-year-olds vaping and smoking tobacco from 2005 to 2022.

.... e-cigarettes/vapes

—— tobacco cigarettes

(i) Determine the year when the percentage of 16-year-olds smoking tobacco cigarettes became less than the percentage of 16-year-olds vaping.

(1)

....

(ii) Calculate the ratio of 16-year-olds vaping to 16-year-olds smoking tobacco cigarettes at the beginning of 2019.

Give your answer in the form of $n:1$

(1)

ratio = ... : 1

(iii) Use information from the graph to describe the overall trend in smoking tobacco cigarettes by 16-year-olds.

(2)

....

....

....

....

(Total for Question 5 = 11 marks)

6 The image shows an important cereal crop plant called sorghum.

sorghum seed

(Source: © Pearson Asset Library)

Diagram 1 shows a cell from a sorghum leaf after it has been placed in distilled water for 20 minutes.
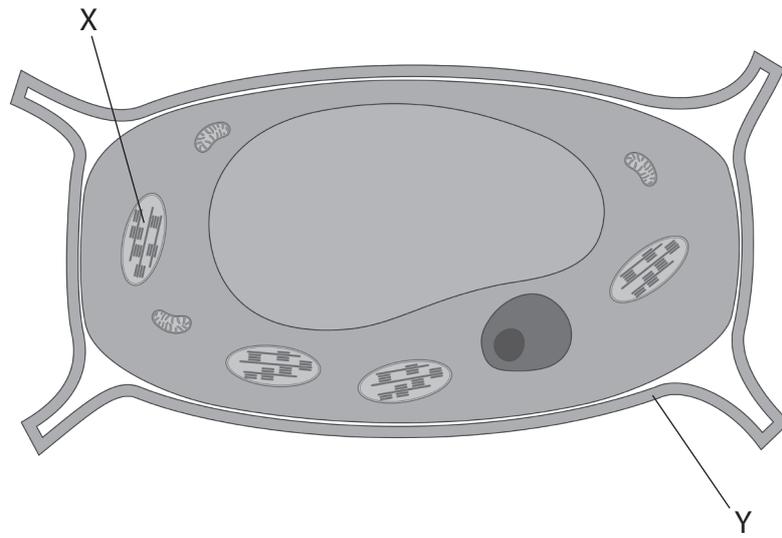
(Source: © Aldona Griskeviciene/Shutterstock)

Diagram 1

(a) (i) What is the function of structure X?

(1)

☒ **A** contains chlorophyll for photosynthesis

☒ **B** contains enzymes for aerobic respiration

☒ **C** contains all the genetic information of the cell

☒ **D** contains water, some nutrients and waste

(ii) Name the molecule that forms structure Y.

(1)

....

(iii) What causes the cell to swell?

(1)

☒ **A** water enters the cell by active transport

☒ **B** water enters the cell by osmosis

☒ **C** water leaves the cell by diffusion

☒ **D** water leaves the cell by osmosis

(b) Diagram 2 shows the sorghum leaf cell after being placed in concentrated sugar solution for 20 minutes.
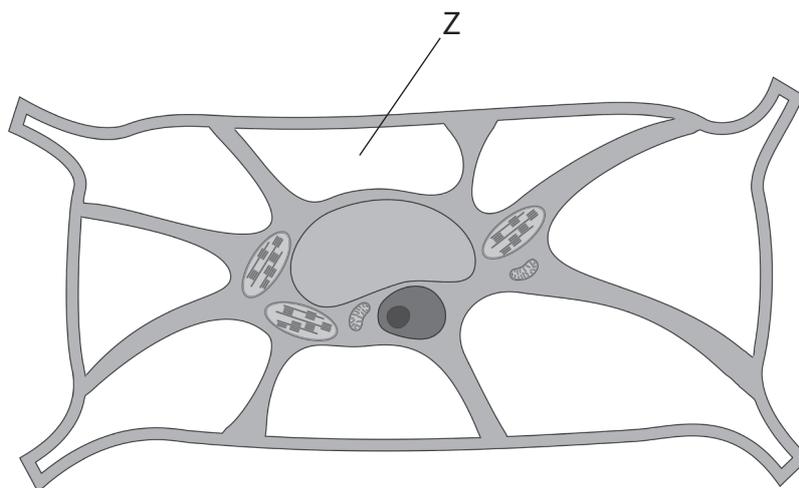
(Source: © Aldona Griskeviciene/Shutterstock)

Diagram 2

Which of these is in the region labelled Z?

(1)

☒ **A** air

☒ **B** cytoplasm

☒ **C** distilled water

☒ **D** sugar solution

(c) Plants need magnesium ions for healthy growth.

(i) Name a biological molecule that plants make using magnesium ions.

(1)

....

(ii) A farmer thinks that adding magnesium ions to the soil will increase the yield of sorghum seeds.

The farmer uses magnesium sulfate fertiliser to provide magnesium ions.

Design an investigation to determine whether using magnesium sulfate solution increases the yield of sorghum seeds.

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

(6)

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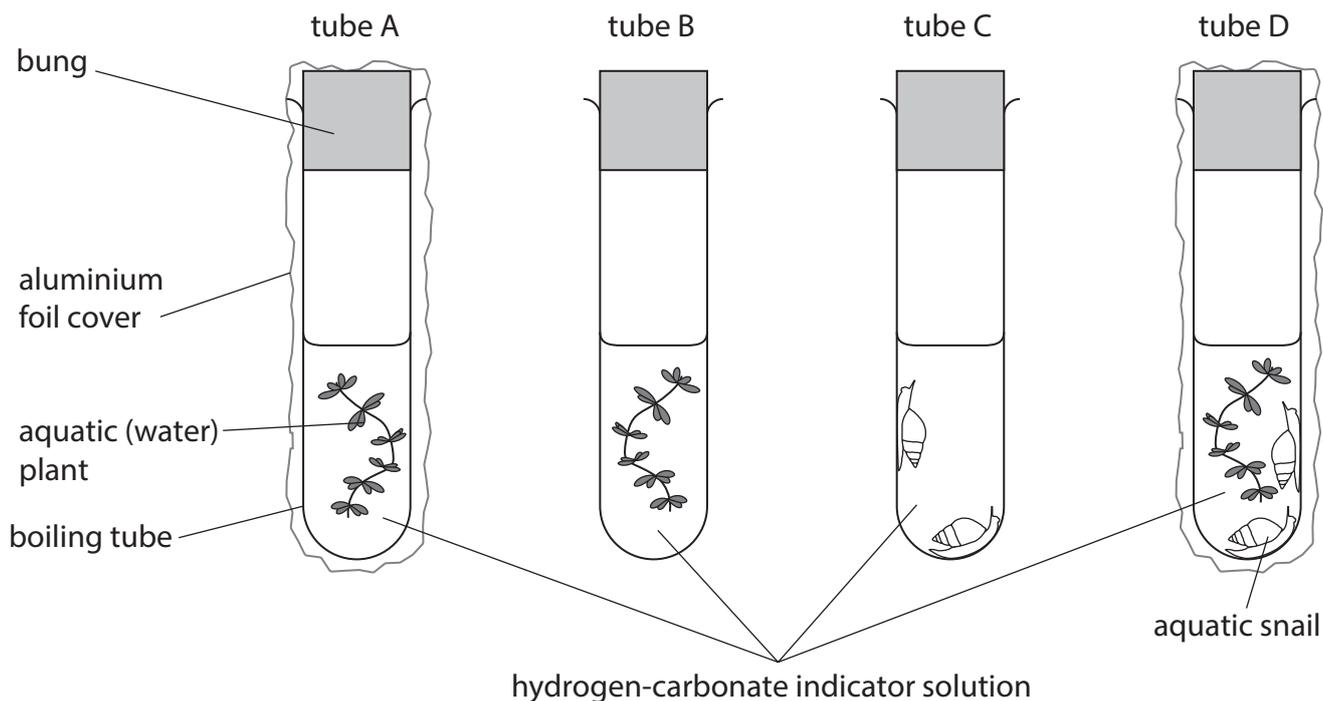..

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(Total for Question 6 = 11 marks)

7 The diagram shows an investigation into gas exchange in animals and plants.

tube A   tube B   tube C   tube D

bung

aluminium
foil cover

aquatic (water)
plant

boiling tube

aquatic snail

hydrogen-carbonate indicator solution

The tubes are placed near a lamp for 12 hours.

(a) The table shows the results of the investigation.

Tube	Living organisms in the tube	Colour of hydrogen-carbonate indicator solution	
		at start	after 12 hours
A	aquatic plant	red	yellow/orange
B	aquatic plant	red	purple
C	aquatic snails	red	yellow/orange
D	aquatic plant and aquatic snails	red	bright yellow

Hydrogen-carbonate indicator solution becomes

• red when neutral, pH 7

• orange/yellow when acidic, below pH 7

• purple when alkaline, above pH 7

Identify the process or processes occurring in the living organisms in each of the tubes that cause the indicator solution to change colour.

(4)

tube A

....

tube B

....

tube C

....

tube D

....

(b) Suggest a control tube that should be included in the investigation.

(1)

....

....

....

....

(Total for Question 7 = 5 marks)

8 (a) Which of these shows the levels of organisation in organisms from the largest to the smallest?

(1)

largest ——————————————→ smallest

- ☒ **A** organ   organelle   tissue   cell
- ☒ **B** organ   tissue   organelle   cell
- ☒ **C** organ   tissue   cell   organelle
- ☒ **D** organ   cell   tissue   organelle

(b) Cells undergo differentiation.

(i) Give the word used to describe cells that have undergone differentiation.

(1)

....

(ii) Explain the importance of cells undergoing differentiation.

(2)

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(c) Adult stem cells or embryonic stem cells can be used in medical treatment.

Discuss the advantages and disadvantages of using these two types of stem cell.

(6)

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(Total for Question 8 = 10 marks)

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

9 (a) The diagram shows the human alimentary canal.
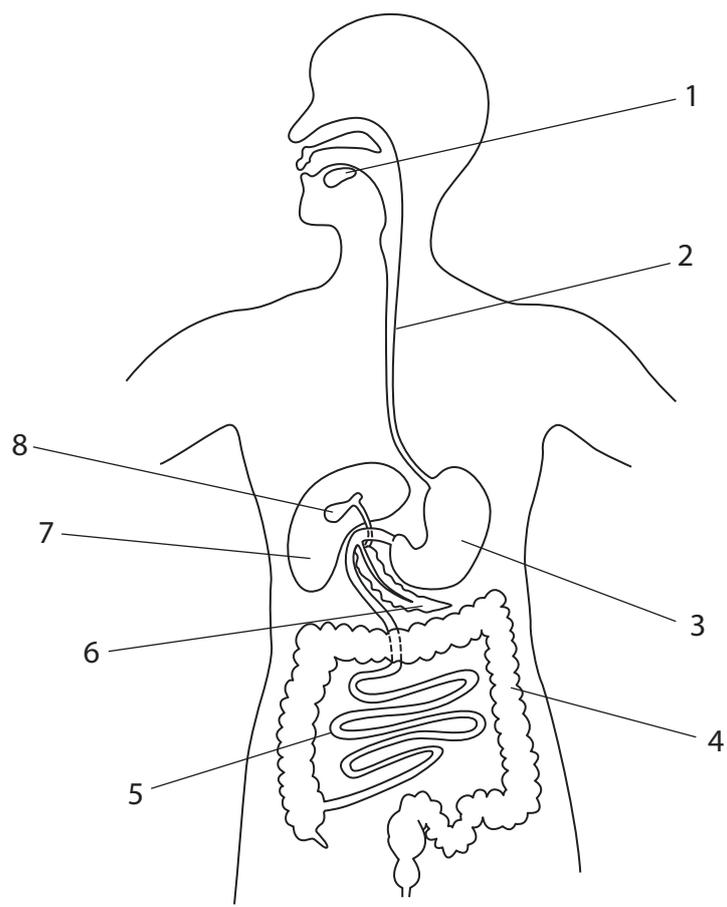
(i) Which labelled part produces bile?

(1)

☒ **A** 5

☒ **B** 6

☒ **C** 7

☒ **D** 8

(ii) Which labelled parts produce amylase?

(1)

☒ **A** 1 and 6

☒ **B** 2 and 6

☒ **C** 3 and 4

☒ **D** 4 and 5

(iii) The final product of the digestion of starch is glucose.

Describe a test for glucose.

(2)

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(b) Give the reaction catalysed by protease.

(1)

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(c) Albumen is a protein.

A suspension of albumen in water forms a cloudy mixture.

When the albumen is digested, the mixture becomes clear.

A student uses this equipment to investigate the effect of pH on a protease enzyme.
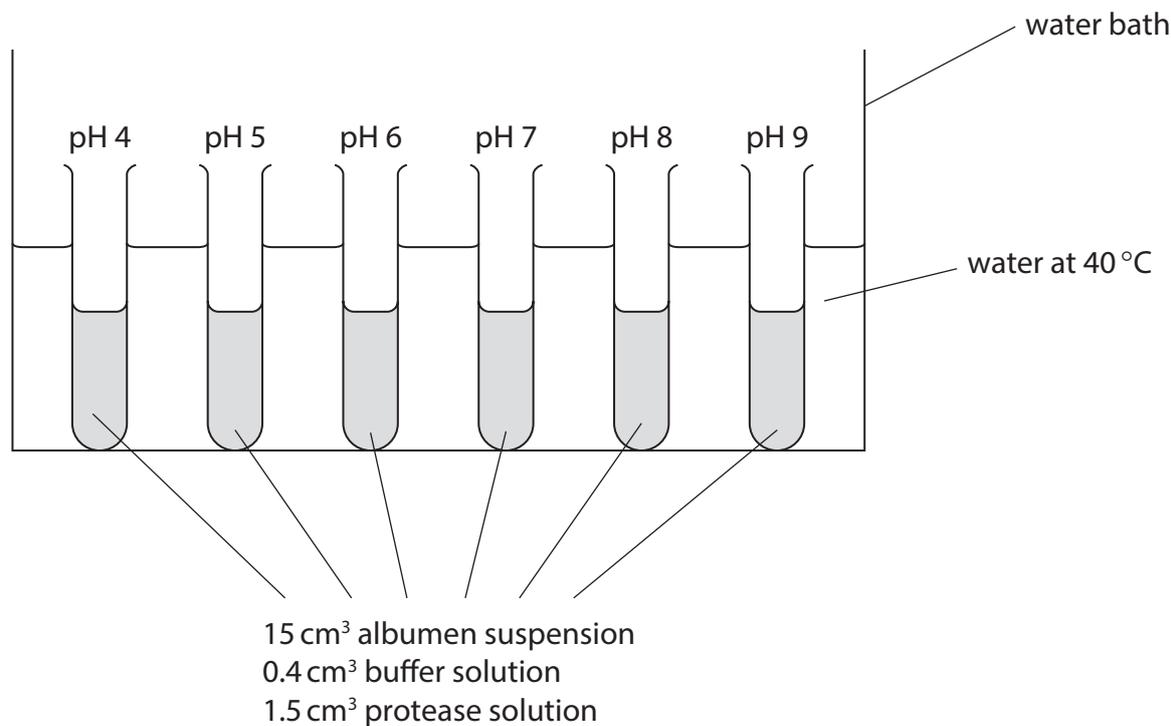

This is the student's method.

Step 1   place 15 cm³ of albumen suspension into each of six test tubes

Step 2   label the tubes 1–6

Step 3   add 0.4 cm³ of different buffer solutions to each of the tubes so that each tube has a different pH

Step 4   place all six tubes into a water bath set at 40 °C and leave for 12 minutes

Step 5   add 1.5 cm³ of protease solution to each of the tubes, stir and start timing

Step 6   record the time taken for the albumen suspension in each tube to become clear

(i) Give the independent variable in this investigation.

(1)

....

....

(ii) The graph shows the student's results.

Time taken for albumen suspension to become clear in seconds

pH
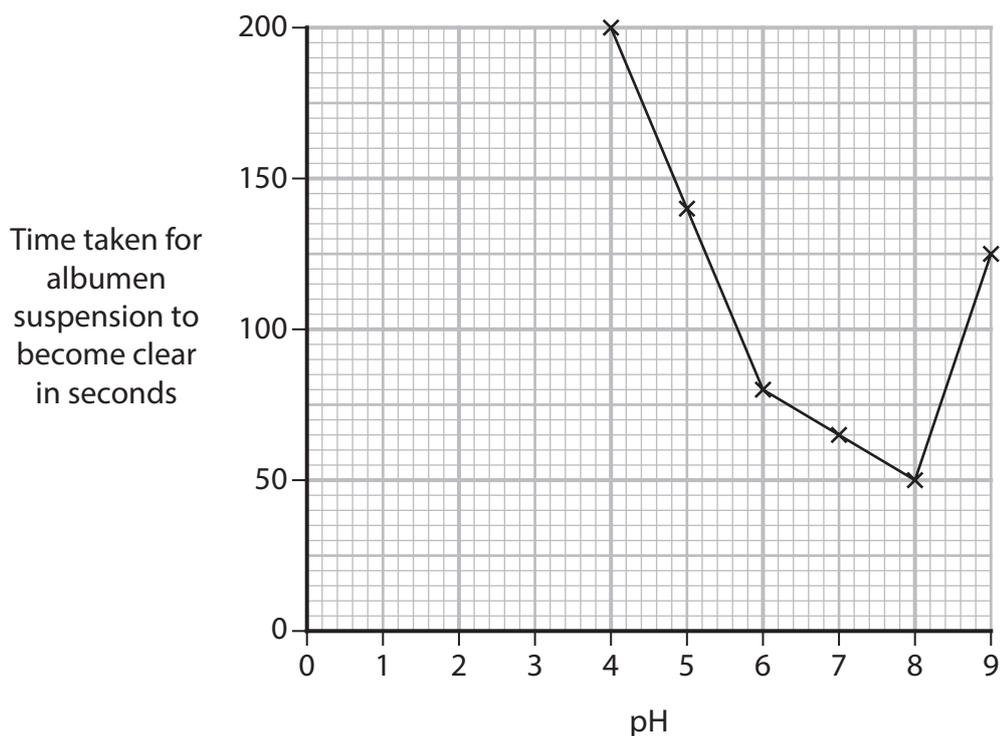
The rate of reaction can be calculated using this formula

$$\text{rate of reaction} = \frac{1}{\text{time}}$$

Using information from the graph, determine the rate of reaction at pH 7.

Give your answer to three decimal places.

(3)

rate of reaction = ... per second

Question 9 continues on the next page.

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

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

(iii) Explain why the optimum pH for this protease is pH 8.

Use evidence from the graph and your own knowledge in your answer.

(4)

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(d) Explain why protease enzymes cannot digest lipids.

(2)

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(Total for Question 9 = 15 marks)

TOTAL FOR PAPER = 90 MARKS