

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 **4WBI1/1BR**

Biology (Modular)

UNIT 1: 4WBI1

PAPER: 1BR

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.

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** The photograph shows pneumococcus bacteria, seen using an electron microscope.



(Source: © Kateryna Kon/Shutterstock)

- (a) (i) Which group does pneumococcus belong to?

(1)

- ☐ **A** eukaryotes
- ☐ **B** fungi
- ☐ **C** prokaryotes
- ☐ **D** protoctists

- (ii) State the word used to describe an organism that causes a disease.

(1)



(b) Pneumococcus bacteria may infect human lungs and cause pneumonia.

The influenza virus may also infect human lungs.

(i) The table lists some features of cells and viruses.

Complete the table to show differences between a human lung cell, a pneumococcus cell and an influenza virus.

Place a tick (✓) if the feature is present.

Two rows have been completed for you.

(4)

Feature	Human lung cell	Pneumococcus cell	Influenza virus
ribosomes	✓	✓	
cell membrane	✓	✓	
cell wall			
nucleus			
protein coat			
plasmids			

(ii) Which of these is correct for the nucleic acid content of viruses?

(1)

- ☐ A DNA and RNA
- ☐ B DNA in all
- ☐ C DNA or RNA
- ☐ D none

(iii) Viruses are parasitic.

Explain the meaning of the word 'parasitic'.

(2)

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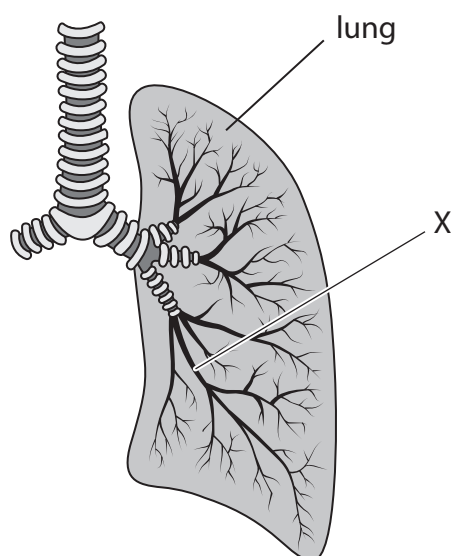
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(Total for Question 1 = 9 marks)

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- 2 The diagram shows parts of the human respiratory system with some structures labelled.



- (a) (i) Which of these is the structure labelled X?

(1)

- ☐ **A** alveolus
- ☐ **B** bronchiole
- ☐ **C** bronchus
- ☐ **D** trachea

- (ii) State why a lung is described as an organ.

(1)

- (iii) Explain how contraction of the diaphragm causes air to move into the lungs.

(3)



(b) The maximum rate of oxygen used during exercise is known as the VO_2 max.

The table shows the mean VO_2 max for a human who is a non-smoker and a human who is a smoker.

Human	Mean VO_2 max in 1 minute in cm^3 per kg
non-smoker	35
smoker	27

- (i) Calculate the maximum volume of oxygen used in 30 minutes by a non-smoker with a mass of 70 kg.

(2)

maximum volume = cm^3

- (ii) Explain the effect of cigarette smoking on VO_2 max.

(3)

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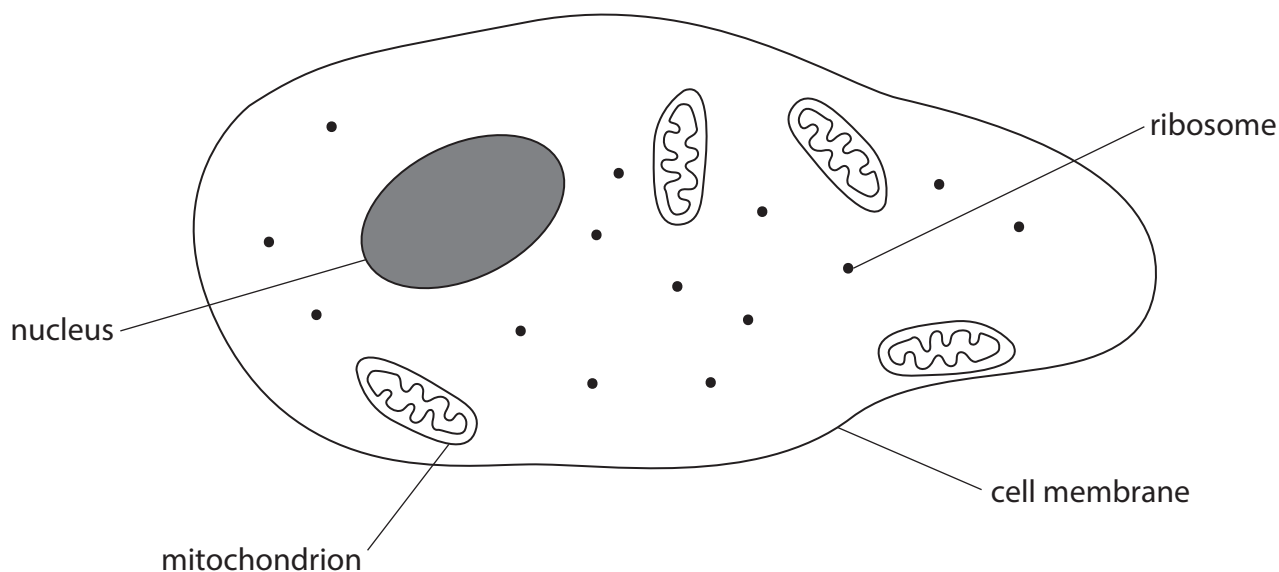
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(Total for Question 2 = 10 marks)



3 The diagram shows a human skin cell.



(a) (i) In which of the labelled structures does protein synthesis occur?

(1)

- ☐ **A** cell membrane
- ☐ **B** mitochondrion
- ☐ **C** nucleus
- ☐ **D** ribosome

(ii) All cells have cell membranes.

Which of the labelled structures are also found in plant cells?

(1)

- ☐ **A** mitochondrion and nucleus only
- ☐ **B** mitochondrion and ribosome only
- ☐ **C** mitochondrion, nucleus and ribosome
- ☐ **D** nucleus and ribosome only

- (b) The table shows information about the number of mitochondria in different types of human cells.

Type of human cell	Number of mitochondria in one cell	Number of mitochondria in $10\mu\text{m}^3$ of cell
skin	500	3
villus	2000	8
sperm	75	12

- (i) The volume of a villus cell is $2500\mu\text{m}^3$.

Calculate the ratio of the volume of a villus cell to the volume of a sperm cell.

Give your answer in the form $n:1$

(3)

ratio =:1

- (ii) Using the information in the table, comment on the importance of mitochondria to the activities of different cell types.

(4)

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(Total for Question 3 = 9 marks)



4 Fruit juice drinks contain a range of nutrients.

The table shows some of the nutrients in a fruit juice drink and the percentage of the recommended daily allowance (RDA) of these nutrients for a 16-year-old.

Nutrient	Mass of nutrient in 400 cm ³ of drink in g	Percentage of RDA in 400 cm ³ of drink
starch	2.8	2
sugar	6.4	4
fat	7.0	10
fibre	9.2	35

- (a) (i) Vitamins and minerals are not listed in the table.

Name one other component of a balanced diet that is not listed in the table.

(1)

- (ii) Calculate the RDA of fibre for a 16-year-old.

Give your answer in grams and to the nearest whole number.

(2)

RDA of fibre = g

- (iii) State the function of fibre in the human diet.

(1)

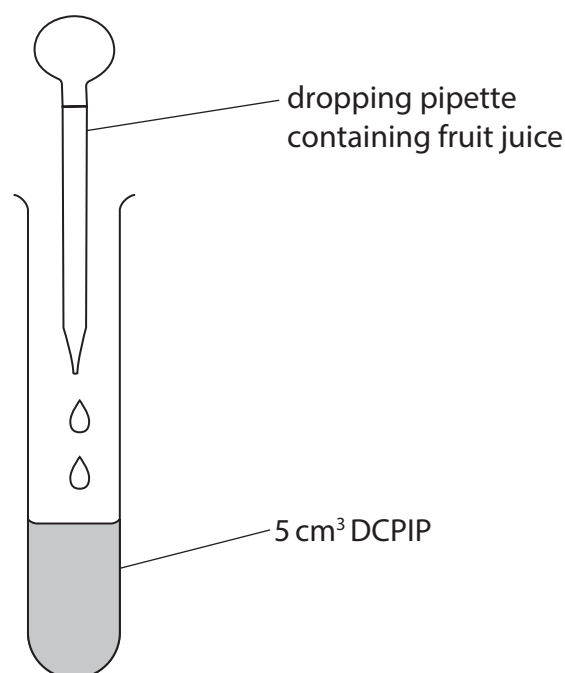


(b) Describe how starch is digested into glucose in the human alimentary canal.

(3)

(c) DCPIP is a blue solution that turns colourless when enough vitamin C is added.

A student uses this apparatus to compare the concentrations of vitamin C in different fruit juices.



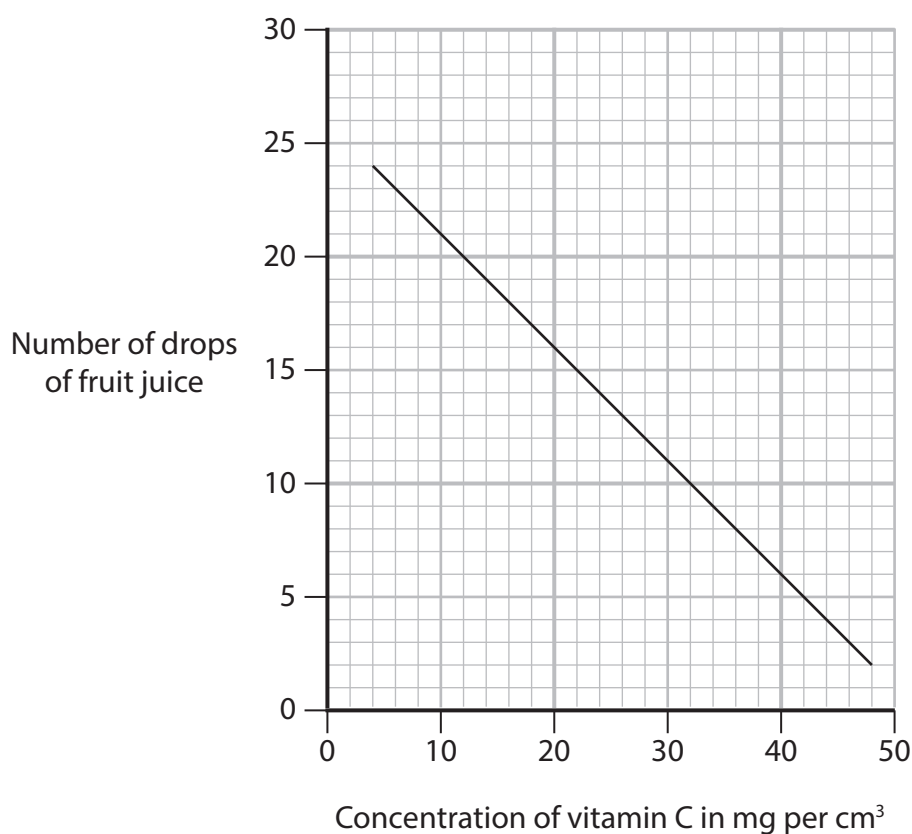
This is the student's method.

- place 5 cm³ of blue DCPIP solution in a test tube
- fill a dropping pipette with fruit juice
- add drops of fruit juice to the DCPIP solution
- record the number of drops added until the DCPIP solution turns colourless

The table shows the student's results.

Fruit juice	Number of drops of fruit juice needed to change DCPIP solution to colourless
apple	18
grape	22
lemon	4
lime	7
orange	3

- (i) The graph shows the effect of concentration of vitamin C on the number of drops needed to change DCPIP solution to colourless.



Determine the concentration of vitamin C in lime juice.

(1)

concentration of vitamin C = mg per cm³



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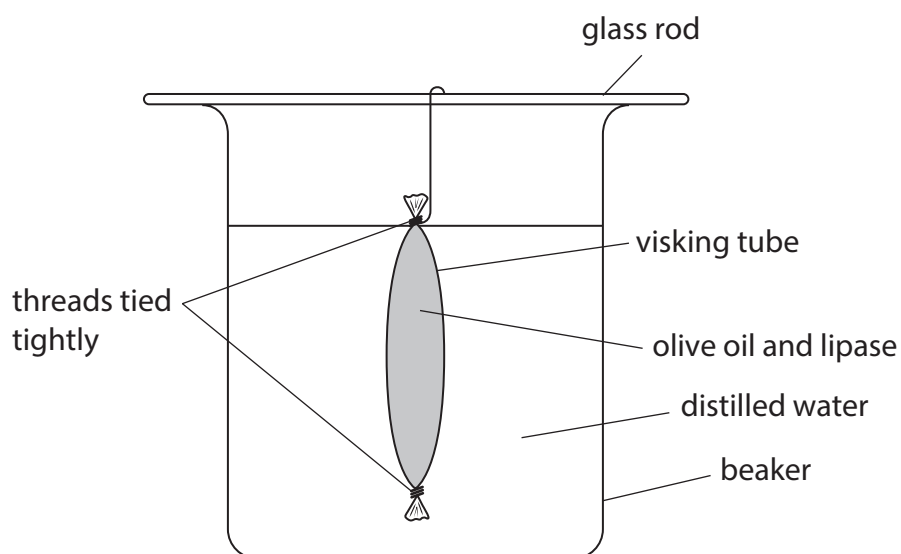
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(Total for Question 4 = 11 marks)



5 Visking tubing is made from partially permeable membrane.

A student uses this equipment to investigate the digestion of oil by lipase.



This is the student's method.

- tie one end of a piece of tubing and fill the tubing with olive oil and lipase
- tie the other end of the tubing and suspend the tubing from a glass rod
- lower the tubing into a beaker of distilled water
- add 5.0 cm^3 of the indicator, bromothymol blue, to the distilled water in the beaker
- record the colour of the indicator in the beaker every five minutes for 30 minutes

Bromothymol blue is blue at pH 8, green at pH 7 and yellow at pH values below 6.6.

The table shows the results of the student's investigation.

Time in minutes	Colour of indicator
0	green
5	green
10	yellow-green
15	yellow-green
20	yellow
25	yellow
30	yellow



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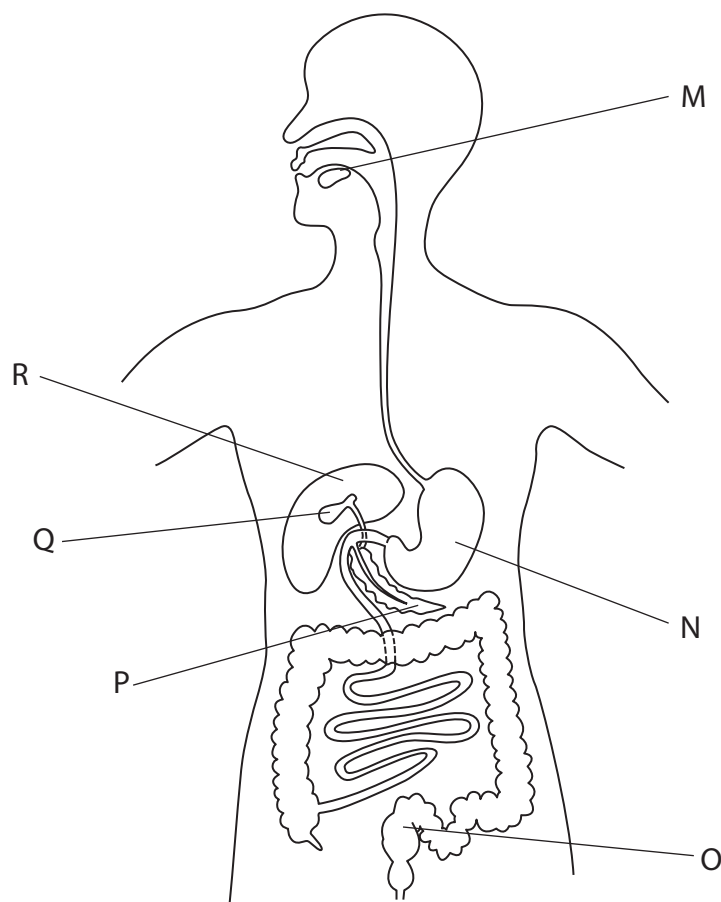
(4)

[illegible]

(1)



(c) The diagram shows the human alimentary canal.



(i) Give the letter for the organ where bile is made.

(1)

(ii) Explain the role of bile in the digestion of lipids.

(3)

(Total for Question 5 = 9 marks)



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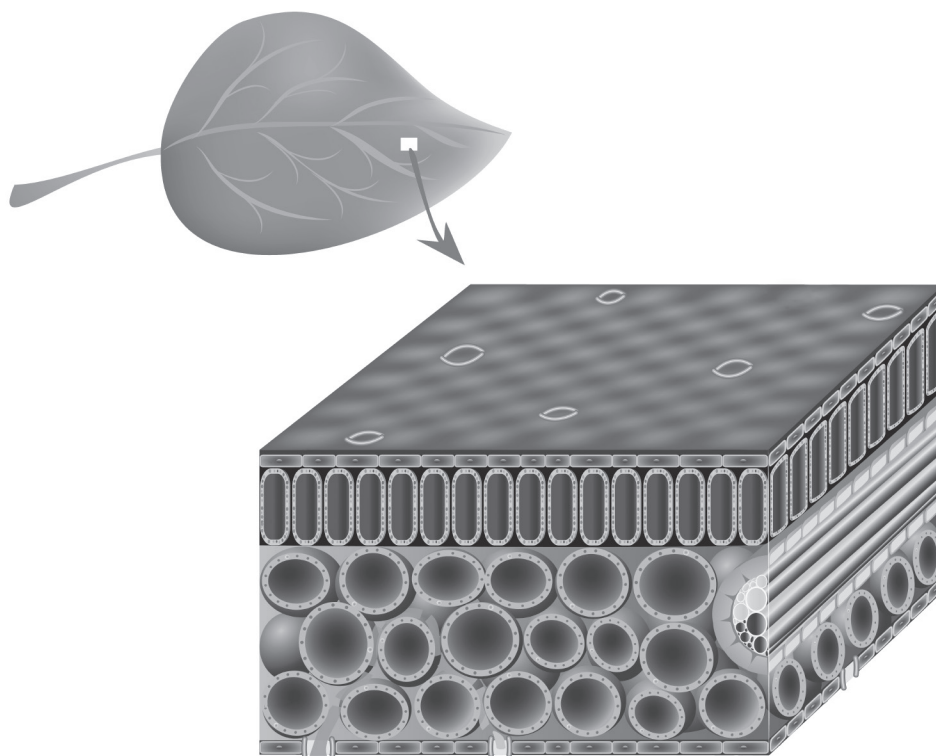
6 Photosynthesis is the process plants use to make food.

(a) Write the balanced chemical symbol equation for photosynthesis.

(2)

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(b) The diagram shows the external and internal structure of a leaf.



(Source: © Designua/Shutterstock)

Explain how a leaf is adapted for photosynthesis.

You may use information in the diagram to help you.

(4)

(c) Temperature can affect the rate of photosynthesis.

Design an investigation to find how temperature affects the rate of photosynthesis of a plant.

Include experimental details in your answer.

(6)



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(Total for Question 6 = 12 marks)



- 7 (a) Tobacco mosaic virus (TMV) infects many plants.

Infected plants have yellow areas on their leaves.

Explain how TMV infection causes a reduction in crop yield.

(3)

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- (b) Insects are animals that may transmit viruses to plants.

Give two differences between the structure of an animal cell and the structure of a plant cell.

(2)

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- (c) Some plant diseases make leaves become yellow.

In some seasons, leaves may become yellow.

Explain one other cause of plant leaves becoming yellow instead of green.

(2)

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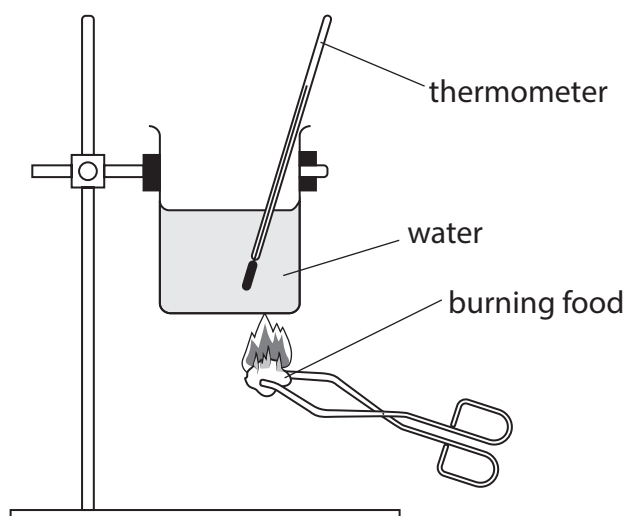
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(Total for Question 7 = 7 marks)



- 8 A student carries out an investigation to find the energy content in different foods.

This is the student's method.



- Step 1 pour 100 cm^3 of distilled water into a beaker and measure the temperature of the water
- Step 2 clamp the beaker of water into place as shown in the diagram
- Step 3 use similar sized pieces of dried meat and dried biscuit
- Step 4 weigh each food and record their masses
- Step 5 hold the dried meat, using tongs, and heat it in a Bunsen flame until it catches alight
- Step 6 quickly move the burning food so that it is under the beaker of water
- Step 7 stir the water and record the highest temperature reached by the water
- Step 8 repeat steps 5–7 using dried biscuit

The student calculates the energy content per gram of each food.

- (a) (i) Explain why it is important to use dried food in this investigation.

In your answer do not refer to ease of burning.

(2)

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(ii) State why, for each food, the energy content per gram is calculated.

(1)

(b) Explain two changes to the method that would improve the accuracy of the student's investigation.

(4)

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2

(c) A person's energy requirements depend upon many factors, including whether they are male or female.

State two other factors that are important for determining the energy requirements of humans.

(2)

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(Total for Question 8 = 9 marks)

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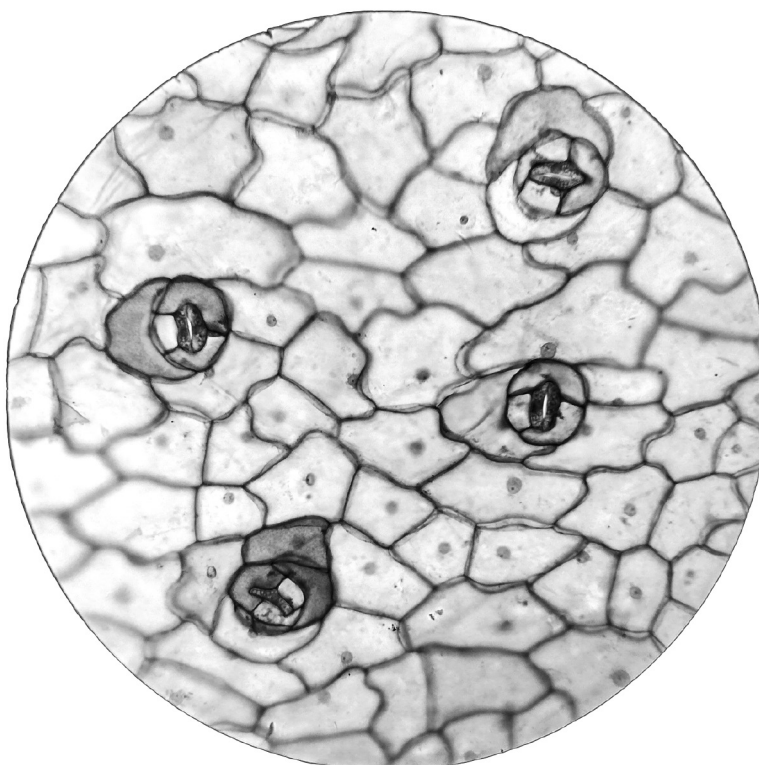


- 9 (a) A leaf of a plant is an organ.

State why the epidermis layer of a leaf is a tissue.

(1)

- (b) The photomicrograph shows stomata from the underside of a leaf, viewed through a microscope. The magnification is $\times 200$.



(Source: © lanxztan/Shutterstock)

The diameter of field of view at this magnification is 0.96 mm.

- (i) Calculate the area of the field of view.

Area of a circle = $\pi \times \text{radius}^2$
[$\pi = 3.142$]

(2)

area of field of view = mm²



(ii) Calculate the number of stomata on 1 mm^2 of the lower surface of this leaf.

(2)

number of stomata in $1 \text{ mm}^2 = \dots\dots\dots$

(iii) Describe the role of stomata in gas exchange.

(3)

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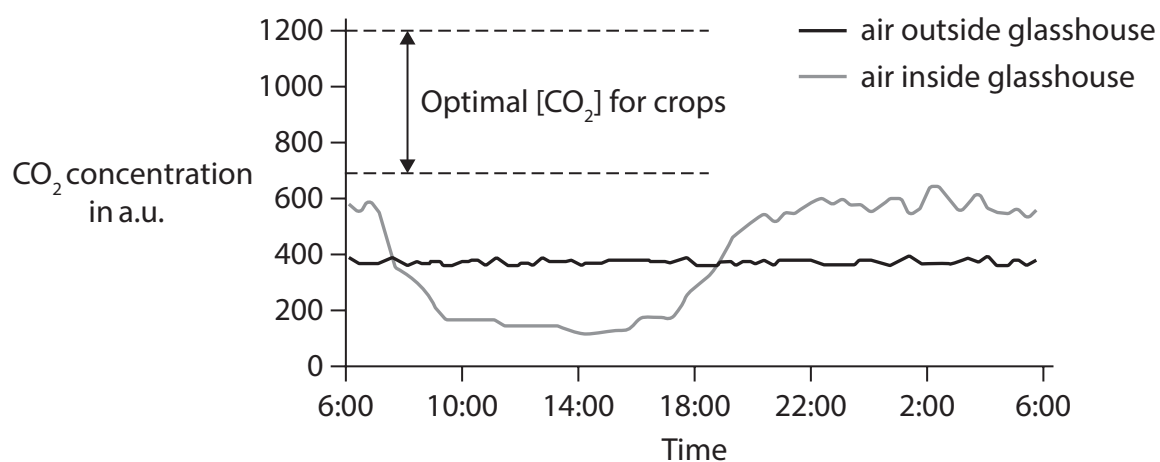
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- (c) The graph shows the carbon dioxide concentration in arbitrary units (a.u.) in the air of a glasshouse during 24 hours.



There are many crop plants inside the glasshouse.

The plants and soil are treated to remove pests.

Explain the changes in carbon dioxide concentration inside the glasshouse from 06:00 to 14:00 and from 14:00 to 22:00.

(6)

from 06:00 to 14:00

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from 14:00 to 22:00

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(Total for Question 9 = 14 marks)

TOTAL FOR PAPER = 90 MARKS



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