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0266219846

BIOLOGY **0610/33**

Paper 3 Theory (Core) **October/November 2025**

1 hour 15 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

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[Turn over

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1 **(a)** Enzymes are involved in all metabolic reactions.

The box on the left contains the word ‘Enzymes’.

The boxes on the right contain some sentence endings.

Draw lines to make **three** correct sentences about enzymes.

Enzymes	all have an optimum temperature of 20 °C.
	are biological catalysts.
	are carbohydrates.
	are changed by reactions.
	are found in plant cells.
	increase the rate of reactions.

[3]

(b) State the name of the substrate that protease enzymes act on and the name of the products formed.

substrate .....

products .....

[2]

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(c) Fig. 1.1 shows the activity of a protease enzyme at different pH values.

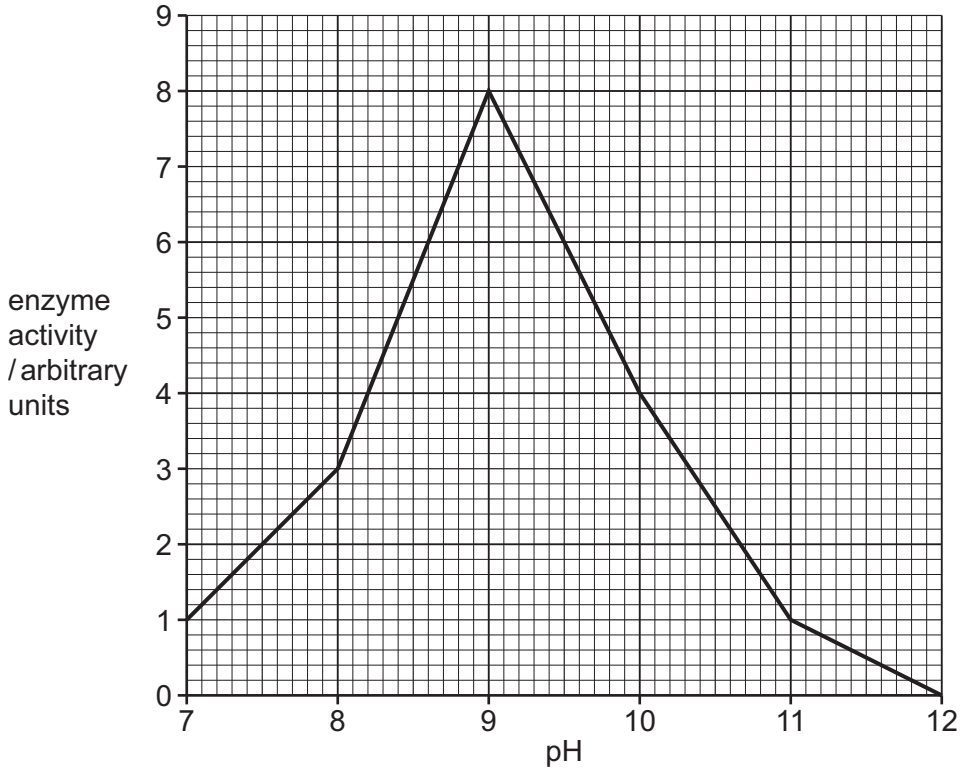


Fig. 1.1

Describe the activity of the enzyme shown in Fig. 1.1.

.....

.....

.....

.....

.....

.....

..... [3]

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(d) **(i)** Circle the name of an organ that secretes protease.

gall bladder **pancreas** **rectum** **salivary gland**

[1]

(ii) Circle the name of an organ where protease acts.

large intestine **mouth** **oesophagus** **small intestine**

[1]

(e) A different protease enzyme is found in the stomach.

The stomach contains hydrochloric acid.

Describe **two** functions of hydrochloric acid in the stomach.

1 .....

.....

2 .....

.....

[2]

(f) The stomach is also involved in physical digestion.

Describe the function of the stomach in physical digestion.

.....

.....

..... [1]

[Total: 13]

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2 **(a)** Fig. 2.1 shows a diagram of a cell found in the lungs of a human.

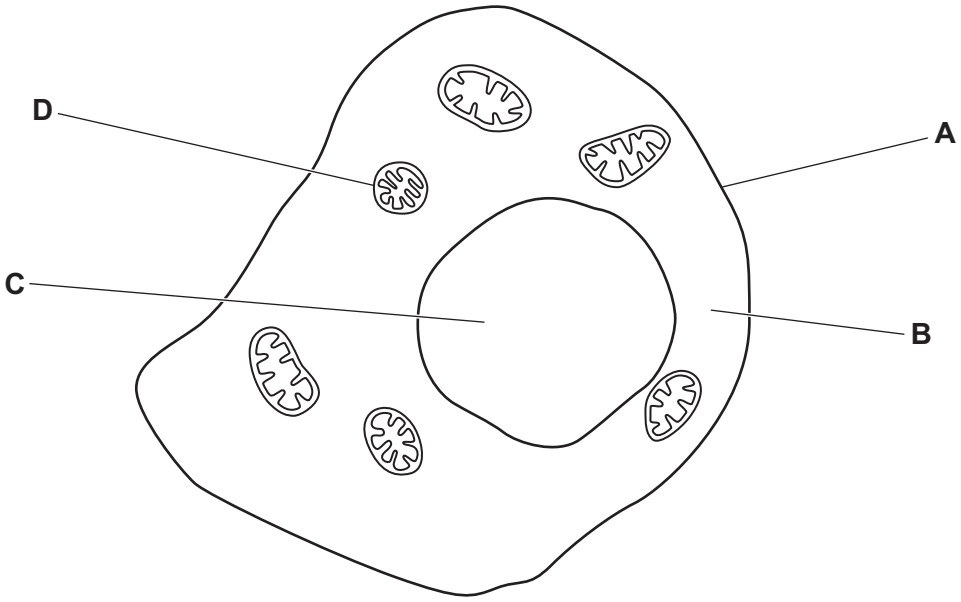


Fig. 2.1

(i) State the names of structures **A** and **B** in Fig. 2.1.

A .....

B .....

[2]

(ii) State the functions of structures **C** and **D** in Fig. 2.1.

C .....

.....

D .....

.....

[2]

(b) **(i)** State the name of the structures that form the gas exchange surface in the lungs.

..... [1]

(ii) State the name of the gas which is excreted by the lungs.

..... [1]

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(c) (i) Urea is excreted by the body.

Table 2.1 shows parts of the body that urea passes through during excretion.

The structures are **not** in the correct order.

Table 2.1

A	bladder
B	blood
C	kidney
D	ureter
E	urethra

Identify the order of parts of the body that urea passes through during excretion.

Write the letters from Table 2.1 in the correct order, in the boxes provided.

One has been done for you.

B				

[2]

(ii) State the names of **two** other substances that are excreted by the kidneys.

.....

..... [2]

[Total: 10]

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3 **(a)** Complete the sentences about transpiration.

Transpiration is the loss of water vapour from leaves.

Water evaporates from the surfaces of the ..... cells

into the ..... spaces.

Water vapour moves out of the leaves through the .....

by the process of ..... .

[4]

(b) A student investigated the effect of temperature on the rate of transpiration in a leafy shoot, using the apparatus shown in Fig. 3.1.

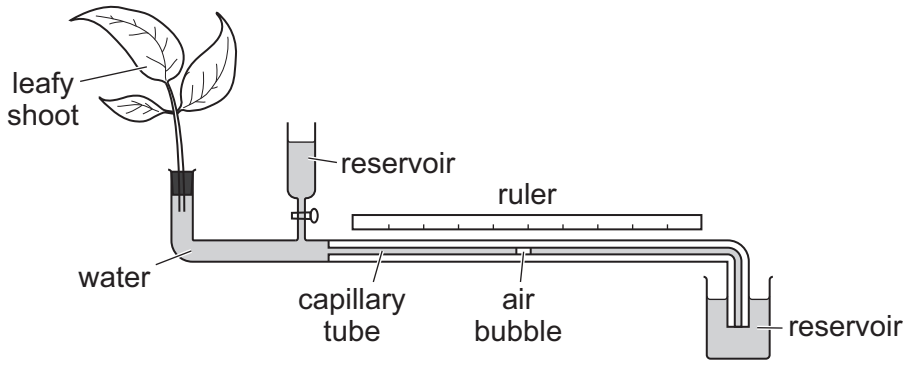


Fig. 3.1

The rate of transpiration was estimated by measuring the distance moved by the air bubble every 3 minutes.

This was repeated at six different temperatures.

The results are shown in Table 3.1.

Table 3.1

temperature / °C	distance moved by the air bubble in 3 minutes / mm	rate of transpiration / mm per minute
20	18	6
25	45	
30	54	18
35	66	22
40	69	23
45	69	23

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(i) Using the data in Table 3.1, calculate the rate of transpiration at 25 °C.

..... mm per minute [1]

(ii) The list shows six conclusions.

Tick (✓) **three** conclusions for the data shown in Table 3.1.

As temperature increases, the distance moved by the air bubble decreases.	
As temperature increases, the rate of transpiration decreases.	
As temperature increases, the rate of transpiration increases and then remains constant.	
From 20 °C to 30 °C, the rate of transpiration triples.	
From 20 °C to 45 °C, the rate of transpiration increases by 17 mm per minute.	
The maximum rate of transpiration was 22 mm per minute.	

[3]

[Total: 8]

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4 **(a)** Describe what is meant by the term fertilisation.

.....

.....

..... [2]

(b) Fig. 4.1 is a diagram of a sperm cell.

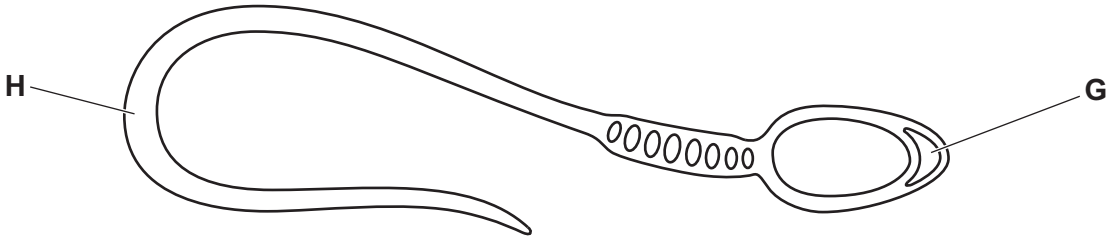


Fig. 4.1

(i) Complete Table 4.1 by stating the names and functions of the parts labelled **G** and **H** in Fig. 4.1.

Table 4.1

letter in Fig. 4.1	name	function
G		
H		

[4]

(ii) State the name of the organ that produces sperm.

..... [1]

(iii) State the sex chromosomes in a male human.

..... [1]

(iv) State the probability that a human baby will be a boy.

..... [1]

[Total: 9]

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5 Humans have increased food production over time.

(a) Fig. 5.1 shows how rice production increased from 1960 to 2010 in one country.

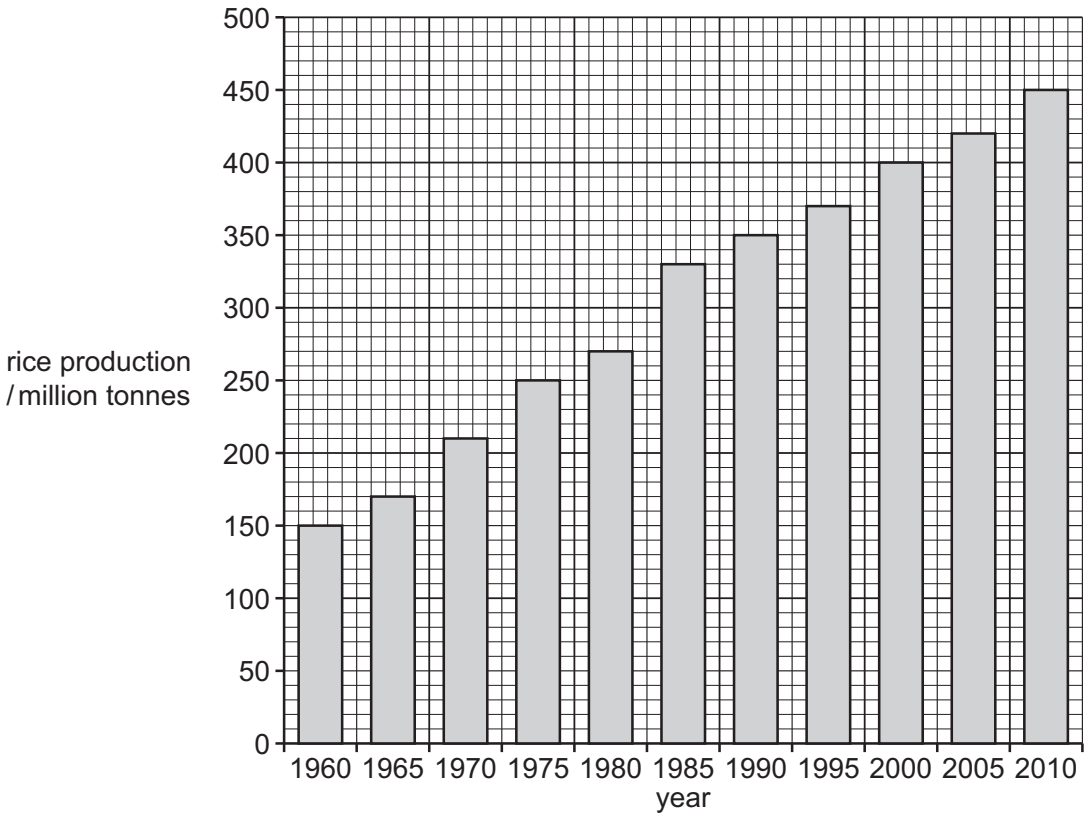


Fig. 5.1

(i) Using the information in Fig. 5.1, state the five-year period which shows the greatest increase in rice production.

from ..... to ..... [1]

(ii) Using the information in Fig. 5.1, calculate the percentage increase in rice production from 1960 to 1990.

Give your answer to the nearest whole number.

Space for working.

.....%
[3]

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(b) State **three** methods that humans use to increase crop plant production.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(c) Fig. 5.2 is a photograph of intensive farming of sheep.



Fig. 5.2

(i) Describe the advantages of intensive farming of livestock.

.....

.....

.....

.....

.....

.....

..... [3]

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(ii) One of the disadvantages of intensive farming of livestock is that untreated sewage from the animals can enter aquatic ecosystems.

State **two** effects of untreated sewage on aquatic ecosystems.

1 .....

.....

2 .....

.....

[2]

[Total: 12]

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6 **(a)** Yoghurt can be made by adding the bacteria *Lactobacillus bulgaricus* to milk.

(i) State the genus name for these bacteria.

..... [1]

(ii) State **two** reasons why bacteria are useful in biotechnology processes such as making yoghurt.

1 .....

.....

2 .....

.....

[2]

(b) Fig. 6.1 shows the nutritional information for 100 g of a type of yoghurt.

carbohydrate 4.7 g
fat 3.3 g
fibre 0.0 g
protein 3.5 g

Fig. 6.1

(i) A person wants to eat 45 g of protein.

The person ate 200 g of yoghurt.

Using the information in Fig. 6.1, calculate the mass of protein the person needs to eat, in addition to the yoghurt, to reach 45 g of protein.

mass of protein in 200 g of yoghurt ..... g

mass of additional protein the person needs to eat ..... g

[2]

(ii) State the importance of fats in the diet.

.....

.....

..... [1]

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(iii) Yoghurt does **not** contain fibre.

State **one** principal dietary source of fibre.

..... [1]

(c) Yeast is another microorganism that is used in biotechnology.

Anaerobic respiration in yeast is used in bread-making.

(i) State the word equation for anaerobic respiration in yeast.

..... [2]

(ii) Describe the role of anaerobic respiration in yeast during bread-making.

.....

.....

..... [1]

(iii) State **one** other use of yeast in biotechnology.

..... [1]

[Total: 11]

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7 **(a)** Fig. 7.1 shows a plant in a light-proof box.

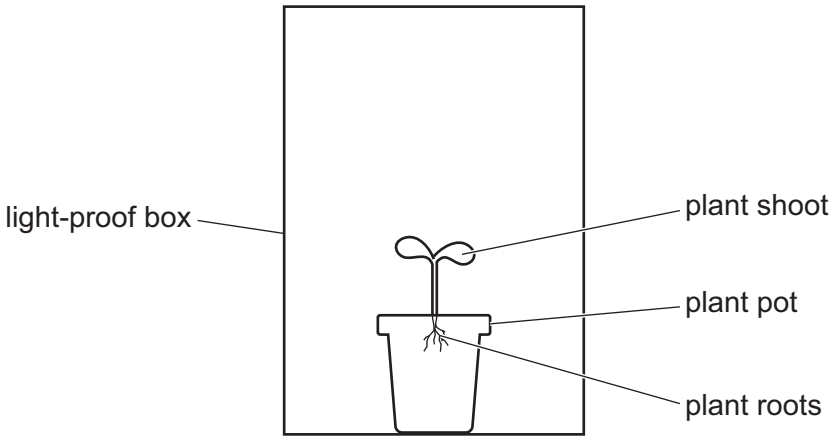


Fig. 7.1

The plant was placed on its side in the light-proof box.

(i) Complete Fig. 7.2 by drawing the expected appearance of the shoot **and** roots of the plant after a week.

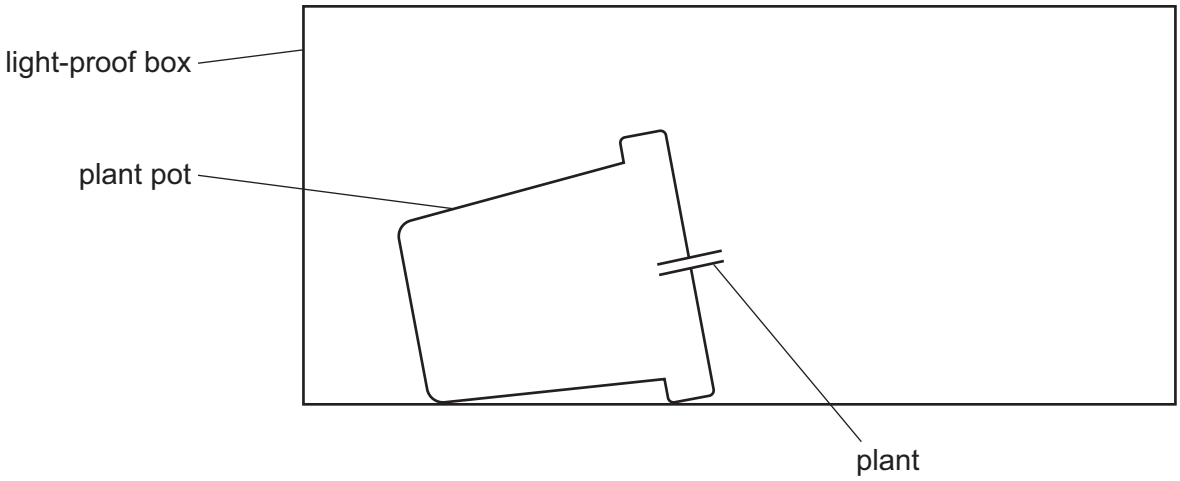


Fig. 7.2

[2]

(ii) State the name of the tropic response shown by the plant in Fig. 7.2.

..... [1]

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(b) State the function of a root hair cell, and describe how it is adapted for its function.

function .....

.....

.....

adaptation .....

.....

.....

.....

[4]

[Total: 7]

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8 **(a)** Fig. 8.1 is a photograph of a human eye.

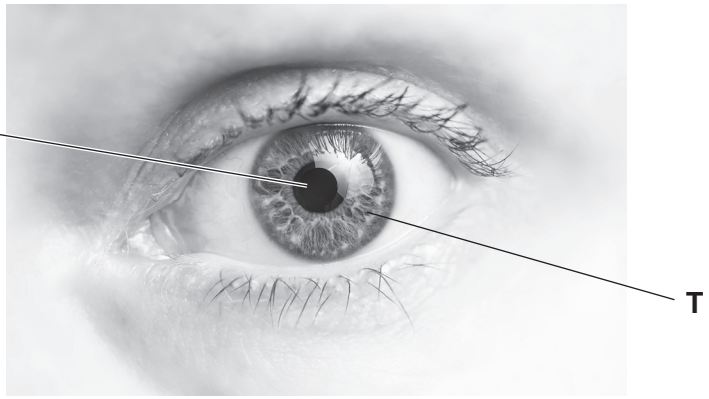


Fig. 8.1

(i) State the name of structure **S** in Fig. 8.1.

..... [1]

(ii) State the function of structure **T** in Fig. 8.1.

.....

.....

..... [1]

(b) Eyelash length is a human characteristic controlled by a single gene. People can have either short eyelashes or long eyelashes.

(i) Describe what is meant by the term gene.

.....

.....

..... [2]

(ii) Suggest **one** reason why eyelash length in humans could be an example of discontinuous variation.

.....

.....

..... [1]

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(c) The allele for long eyelashes is represented by the letter **E**.

The allele for short eyelashes is represented by the letter **e**.

- The genotype of a male was **ee**.
- The genotype of a female was **Ee**.

(i) Table 8.1 shows some terms used to describe these genotypes.

Place ticks (✓) in the boxes in Table 8.1 to show the correct descriptions for these genotypes.

Table 8.1

genotype	heterozygous	homozygous dominant	homozygous recessive
ee			
Ee			

[2]

(ii) A male with the genotype **ee** had a child with a female with the genotype **Ee**.

Complete the Punnett square to show the:

- gametes of the male and the female
- possible genotypes of the offspring from this cross
- ratio of long eyelashes to short eyelashes in the offspring from this cross.

		male	
		……..	……..
female	……..	……..	……..
	……..	……..	……..

The ratio of long eyelashes to short eyelashes in the offspring is ..... [3]

[Total: 10]

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