CAMBRIDGE
International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2348163406

BIOLOGY **5090/22**

Paper 2 Theory **May/June 2026**

1 hour 45 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. Do **not** use correction fluid or tape.
- 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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Answer **all** questions.

Write your answers in the spaces provided.

1 There are millions of different species of organism living on Earth. Scientists classify these different species into groups.

(a) One way that scientists classify animals is by placing them into two groups: vertebrates and invertebrates.

(i) Define the term vertebrate.

..... [1]

(ii) Vertebrates are further classified into five smaller groups.

Complete the list of vertebrate groups.

mammals

fish

reptiles

.....

.....

[2]

(b) State **one** feature common to most reptiles.

..... [1]

[Total: 4]

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2 Figure 2.1 shows a photomicrograph of a human epithelial cell.



magnification ×900

Figure 2.1

(a) (i) Figure 2.2 shows structures of the epithelial cell and their functions.

On Figure 2.2, draw a line from each structure to its function.

structure	function
cell membrane	contains the cell's genetic material
mitochondria	protein synthesis
ribosomes	site of aerobic respiration
nucleus	controls entry and exit of substances

Figure 2.2

[3]

(ii) The structures named in Figure 2.2 are also found in plant cells.

Name **two other** structures that are found in most plant cells.

1 .....

2 .....

[2]

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(b) The photomicrograph of the epithelial cell in Figure 2.1 has a magnification of ×900.

The image of the epithelial cell has a diameter of 45 mm.

Calculate the actual diameter of the epithelial cell. Give your answer in μm.

Space for working.

..... μm [3]

[Total: 8]

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3 The jackfruit tree grows in hot climates around the world.

Figure 3.1 shows the cross-section of a leaf from the jackfruit tree.

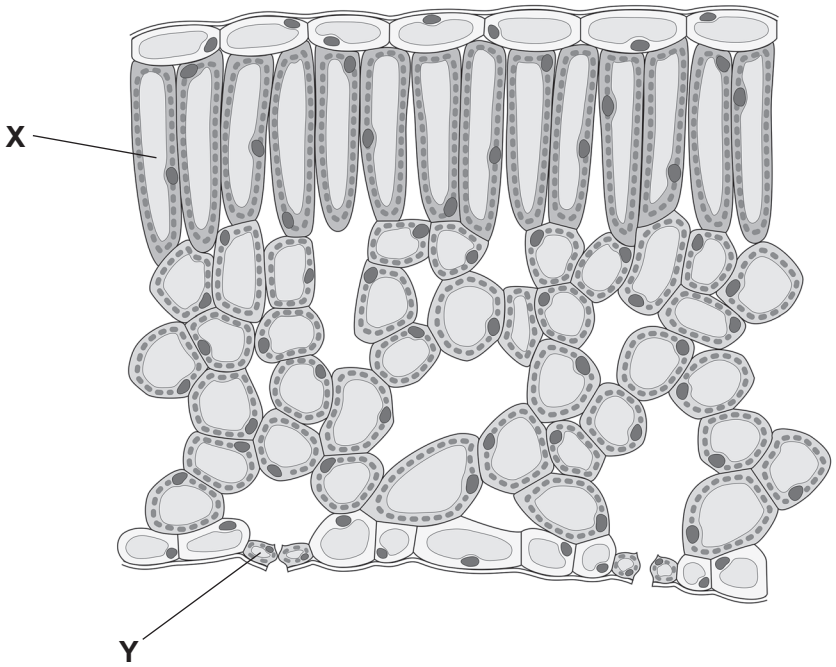

Figure 3.1

(a) From the diagram, identify cells **X** and **Y**

X .....

Y .....

[2]

(b) Like most leaves, the leaves of the jackfruit tree have a large surface area and are thin.

State how each of these features is an adaptation for photosynthesis.

large surface area .....

.....

thin .....

.....

[2]

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(c) The jackfruit tree can grow to be 20 metres tall. The tree takes in water through its roots.

Explain how water moves upwards from the roots to the leaves.

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..... [3]

(d) **(i)** The fruit from the jackfruit tree can be eaten by humans. The fruit is a source of dietary fibre.

State the importance of fibre in the human diet.

.....

..... [1]

(ii) The fruit from the jackfruit tree is also a source of Vitamin C.

State the name of the disease which is caused by a deficiency of vitamin C in the diet.

..... [1]

[Total: 9]

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4 Figure 4.1 shows a cross-section of the small intestine and the structure of a villus.

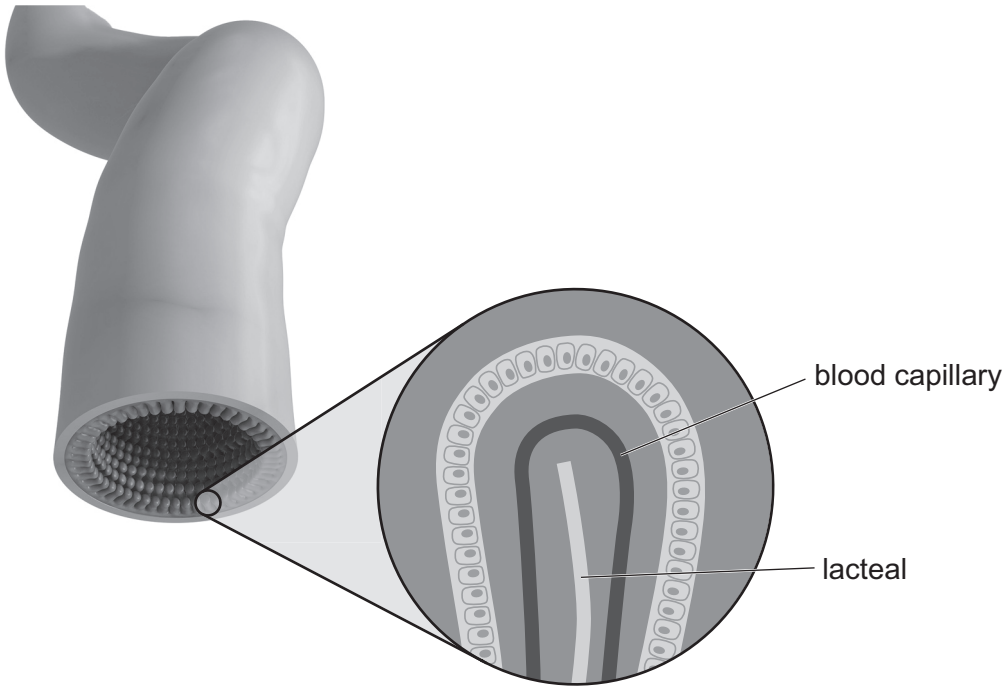

Figure 4.1

(a) (i) State the importance of the villi in the absorption of nutrients.

.....

..... [1]

(ii) Name the substances absorbed by the lacteals of the villi.

..... [1]

(iii) The blood capillaries in the villi join to form veins. The veins then join to form one large vein which carries blood from the intestines to the liver.

State the name of this large vein.

..... [1]

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(b) In coeliac disease, the body's own immune system damages the villi. In people with coeliac disease, the villi become flattened.

Suggest why children with coeliac disease often show poor growth.

.....

.....

.....

.....

.....

..... [3]

(c) *Vibrio cholerae* causes the disease cholera. The *Vibrio cholerae* microorganisms are found in water that is contaminated with sewage. The microorganisms enter the human digestive system through food and drink.

(i) Circle the type of microorganism that causes cholera.

bacterium fungus protoctist virus

[1]

(ii) Describe **two** ways that the spread of *Vibrio cholerae* can be controlled.

.....

.....

.....

..... [2]

(iii) When *Vibrio cholerae* enters into the body it reproduces in the intestines and releases a toxin. The toxin causes the epithelial cells to release chloride ions into the small intestine. This can result in diarrhoea.

Using your knowledge of osmosis, explain how the chloride ions cause diarrhoea.

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..... [3]

[Total: 12]

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5 Fruit flies feed on mangoes which are the fruit of the mango tree. Fruit flies are eaten by dragonflies, and dragonflies are eaten by frogs. Frogs are eaten by snakes.

(a) (i) Using this information, draw a pyramid of numbers for these organisms.

[2]

(ii) State the term used to describe an organism at the start of a food chain.

..... [1]

(iii) State the term used for each level within a food chain.

..... [1]

(iv) Explain why food chains usually have fewer than five levels.

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..... [2]

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(b) (i) Some of the mangoes drop to the ground and start to decompose.

Name **two** environmental conditions that would speed up the rate of decomposition.

1 .....

2 .....

[2]

(ii) Outline the role of bacteria in decomposition.

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..... [2]

[Total: 10]

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6 Figure 6.1 shows a section through human skin.

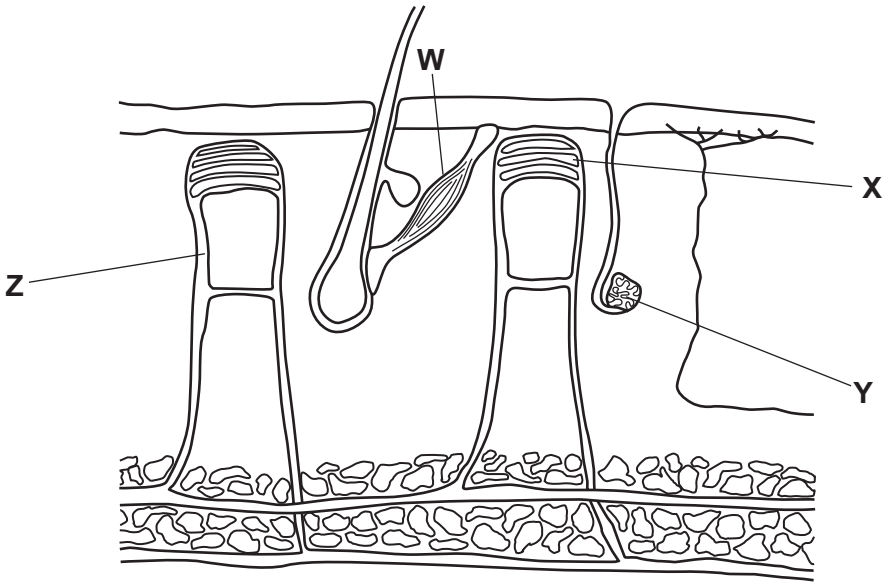

Figure 6.1

(a) Identify the parts labelled **W** and **Y**.

W .....

Y .....

[2]

(b) Parts **X** and **Z** help to maintain a constant internal body temperature. When a person starts exercising, their internal body temperature increases.

(i) Name the part of the brain which monitors body temperature.

..... [1]

(ii) Describe the roles of **X** and **Z** in reducing body temperature back to its normal level after exercise.

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..... [3]

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(c) A man is wearing shorts and a t-shirt on a sunny day. The weather becomes cloudy and the air temperature decreases. The man's internal body temperature also decreases. The man starts to shiver.

Explain how shivering increases the man's internal body temperature.

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..... [2]

[Total: 8]

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7 The Devon Rex is a breed of cat. Most breeds of cat have straight hair. Due to a gene mutation the Devon Rex has wavy hair.

(a) Explain what a gene mutation is, and how it has produced a change in the hair of the Devon Rex cat.

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.....

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..... [4]

(b) The wavy hair characteristic is caused by a recessive allele.

Define the term allele.

.....

..... [1]

(c) **(i)** A male Devon Rex cat has the genotype **bb**. A female straight-haired cat has the genotype **Bb**. They are bred together.

Complete the genetic diagram to calculate the probability that a kitten will have wavy hair.

		male Devon Rex cat	
female straight-haired cat			

probability = ...
[3]

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(ii) The male Devon Rex cat and the female straight-haired cat have seven kittens. Only one of the kittens has wavy hair; the others have straight hair.

Explain why the observed ratio of hair type in the kittens is different to the expected ratio.

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..... [2]

[Total: 10]

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8 Figure 8.1 shows a bacterial cell.

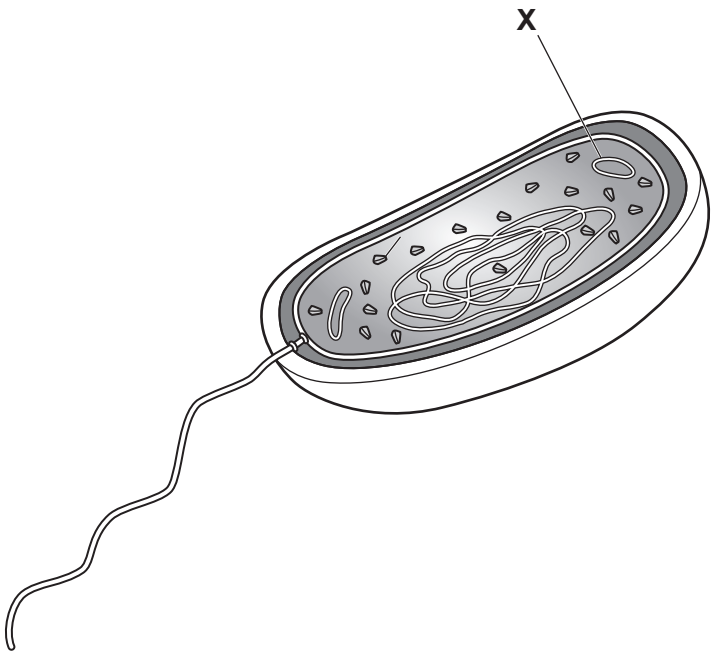

Figure 8.1

(a) (i) Identify structure **X** which is used in genetic modification.

Tick **one** box.

cytoplasm	☐
plasmid	☐
flagellum	☐
ribosome	☐

[1]

(ii) The process of genetic modification is used to produce bacteria that are able to make human insulin.

Number the steps below to show the correct sequence for this genetic modification. The first step has been completed for you.

☐	The gene for insulin is taken up by structure **X**.
1	The gene for human insulin is cut out from human DNA.
☐	Structure **X** is removed from a bacterial cell and cut open.
☐	Bacterial cell reproduces to produce cells that release human insulin.
☐	Structure **X** is returned into a bacterial cell.

[3]

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(b) *Bacillus thuringiensis* is a type of bacteria that lives in soil. It produces a toxin which can kill insects. *Bacillus thuringiensis* is used to genetically modify crop plants to give the plants resistance to insect pests.

(i) State the advantages to farmers of growing crops that have been genetically modified to have resistance to insect pests.

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..... [2]

(ii) Identify **two** risks involved in using genetically modified crops.

1 .....

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2 .....

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[2]

[Total: 8]

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9 Figure 9.1 shows a wasp flying towards a girl's eye.

The girl blinks her eyes in response. This is an example of a reflex action.



Figure 9.1

(a) State what is meant by reflex action.

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..... [2]

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(b) The reflex action occurs as a result of nerve impulses being sent through a reflex arc.

Describe the stages of the reflex arc that cause the girl to blink.

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..... [6]

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(c) Figure 9.2 shows a synapse which is a junction between two neurones. When the nerve impulse reaches a synapse, it triggers the release of neurotransmitter molecules into the synaptic gap.

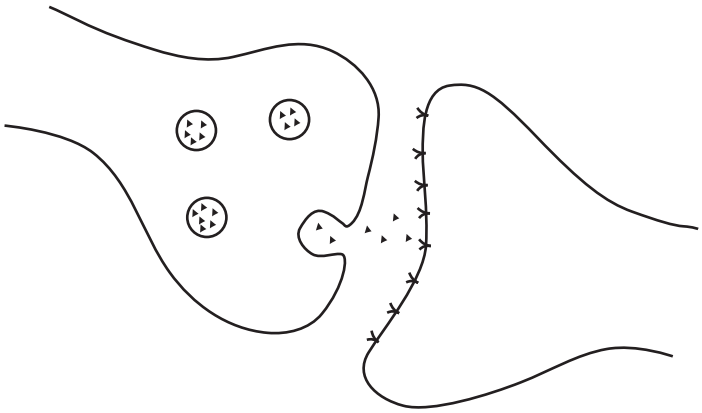

Figure 9.2

Describe how these neurotransmitter molecules enable the impulse to continue.

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..... [3]

[Total: 11]

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