Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **5090/22**

Paper 2 Theory **October/November 2022**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Section A: answer **all** questions.
- Section B: answer **all** questions.
- Section C: answer **either** Question 8 **or** Question 9.
- 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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Section A

Answer **all** questions in this section.

Write your answers in the spaces provided.

1 Organs in the human body produce substances which have specific functions.

Draw lines to link each organ with the substance it produces **and** to link each substance with the description of its function.

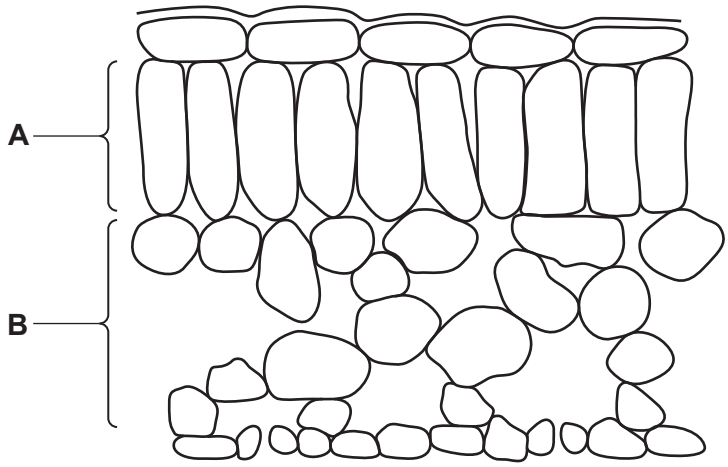
One line has been drawn for you.

Draw **five more** lines.

organ	**substance produced**	**function of substance**
adrenal gland	lipase	emulsification of fats in the small intestine
pancreas	bile	conversion of glycogen to glucose
liver	adrenaline	chemical digestion of fats

[5]

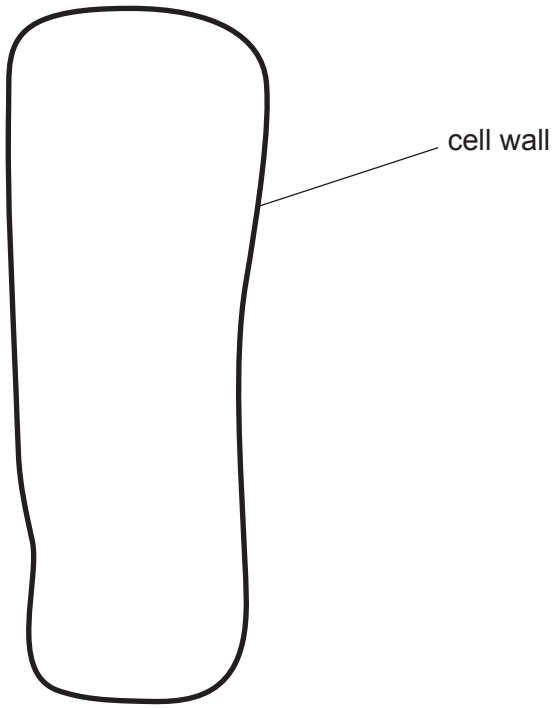
2 The diagram shows a cross-section through a leaf when viewed using a light microscope.



(a) **(i)** State the term used to describe a group of cells, such as those in part **A** or part **B** of the leaf cross-section.

..... [1]

(ii) The diagram shows an enlargement of one cell from part **A** of the leaf cross-section.



Complete the diagram of the cell by drawing and labelling to show the position of

- **one** chloroplast
- **three** other types of **named** cell component that will be visible.

[4]

(iii) Use a label line on the diagram of the cross-section through a leaf to name and label **one** cell in the lower epidermis that would also contain chloroplasts. [1]

(b) The cell wall of a plant cell can be removed by treating the cell with a digestive enzyme.

(i) Name the substrate for this enzyme.

..... [1]

(ii) Some plant cells from part **B** of the leaf cross-section were treated with this enzyme and then placed in distilled water on a microscope slide for one hour.

The cells were clearly visible using a light microscope at the start of the hour.

The cells were **not** clearly visible using the same light microscope at the end of the hour.

Explain changes to the structure of the cells that took place between these two observations.

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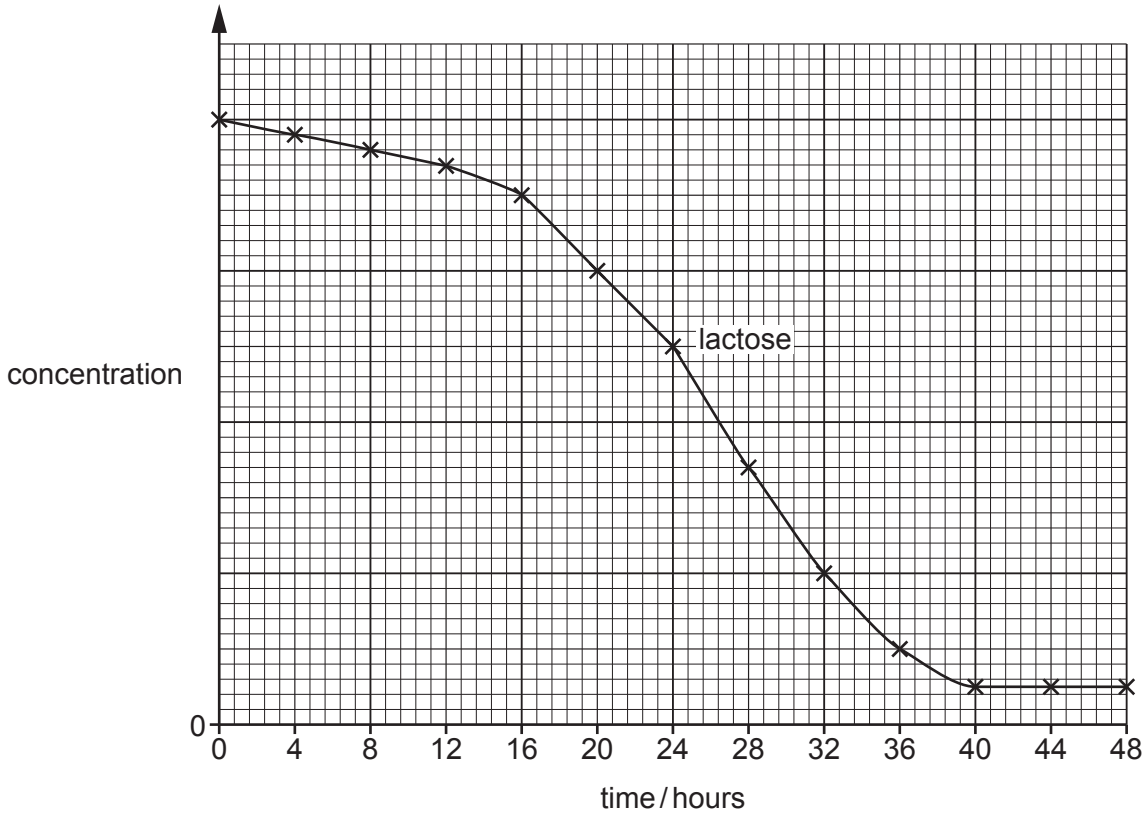
..... [4]

[Total: 11]

3 The graph shows how the concentration of lactose sugar changes during the formation of yoghurt from milk over a period of 48 hours.



(a) **(i)** Name the type of microorganism used in the production of yoghurt.

..... [1]

(ii) Name the type of cell division that causes the population of this microorganism to increase over the 48-hour period.

..... [1]

(iii) Name the acid produced by this type of microorganism in the formation of yoghurt.

..... [1]

(iv) Draw a line on the graph to show how the concentration of this acid will change during the 48-hour period. [2]

(b) Lactose intolerance is a medical condition that results from a genetic change. A person with the condition is unable to produce molecules of the correct enzyme to digest lactose sugar.

(i) Name this type of genetic change and explain how it can result in a person being unable to produce molecules of the correct enzyme.

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..... [3]

(ii) The low concentration of lactose sugar in yoghurt makes it a better food than milk for a person with lactose intolerance.

Outline the health benefits to some people with lactose intolerance of continuing to include a dairy product such as yoghurt in the diet.

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..... [2]

[Total: 10]

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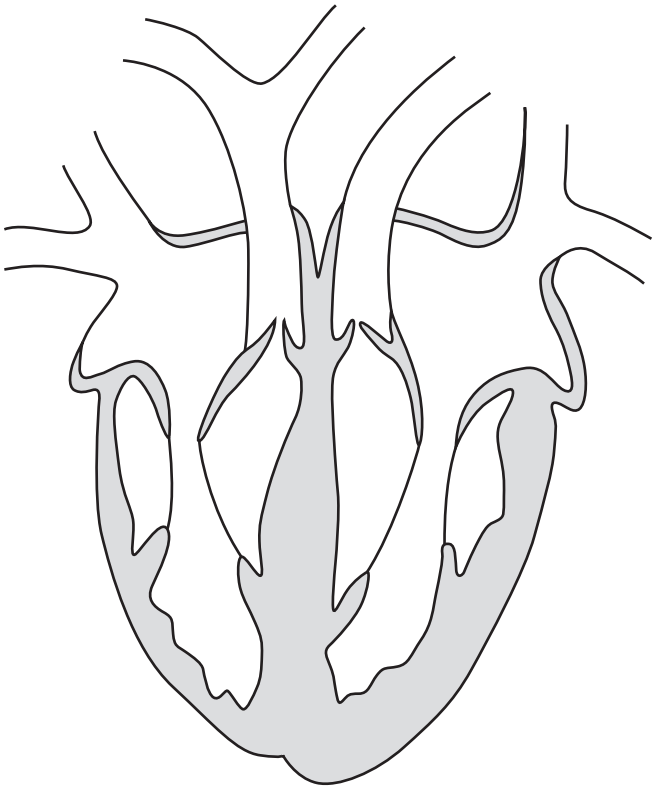
4 The diagram shows the internal structure of the human heart and associated blood vessels.



(a) Name **two** blood vessels shown in the diagram that carry oxygenated blood.

1 .....

2 .....

[2]

(b) Blood flows through a valve when the left ventricle of the heart contracts. Diagram 1 shows this valve in the open and closed positions.

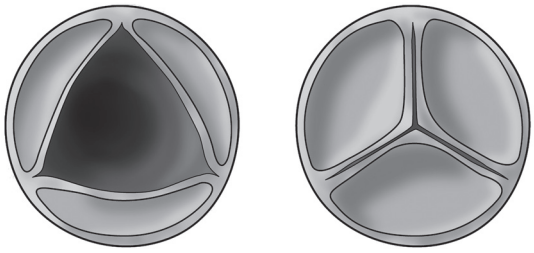
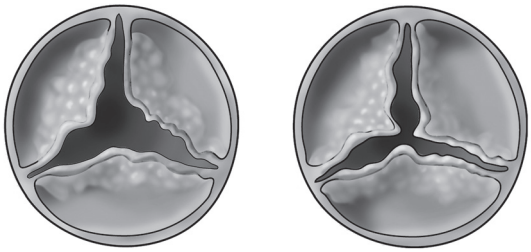


Diagram 1

(i) Label, using the letter **X** on the diagram of the heart, the location of this valve. [1]

A small number of people develop a medical condition that causes changes to this valve. Diagram 2 shows the same heart valve in the open and closed positions in a person with this condition.



valve open valve closed

Diagram 2

(ii) Explain how this medical condition will affect the flow of blood when the left ventricle contracts and relaxes.

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..... [4]

(iii) Describe and explain the effect of this condition on the ability of the person to exercise.

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..... [3]

(c) It is possible for the valve to be replaced by surgery. The human valve is removed from the patient and can be replaced with a valve containing tissue from another species. This tissue is treated with a chemical to prevent rejection by the human body.

Suggest how the cells of the tissue are modified by the chemical treatment and explain how this will prevent rejection by the human body.

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..... [4]

[Total: 14]

5 A group of scientists investigated the total mass of carbon dioxide released when animals and plants are farmed and then used as food for humans.

(a) The total mass of carbon dioxide released for each food in the study included the mass released

- during production of the food by farming
- after the food left the farm and before it was eaten.

Suggest and explain how human activity may result in the release of carbon dioxide **after** food has left the farm on which it was produced.

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..... [3]

(b) Some of the results of the investigation are shown in the table.

food produced	**mass of CO_2 released per kg of food produced / kg**
lamb	39.2
salmon	11.9
chicken	6.9
rice	2.7
beans	2.0
tomatoes	1.1

(i) A farmer decides to change production from lamb to beans.

Calculate the percentage change in carbon dioxide released per kg of food produced.

Space for working.

.....% [3]

(ii) An increasing number of people in some countries choose to eat a diet consisting **only** of plants.

Use the results in the table and your scientific knowledge to explain how this choice of diet may benefit the environment.

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..... [4]

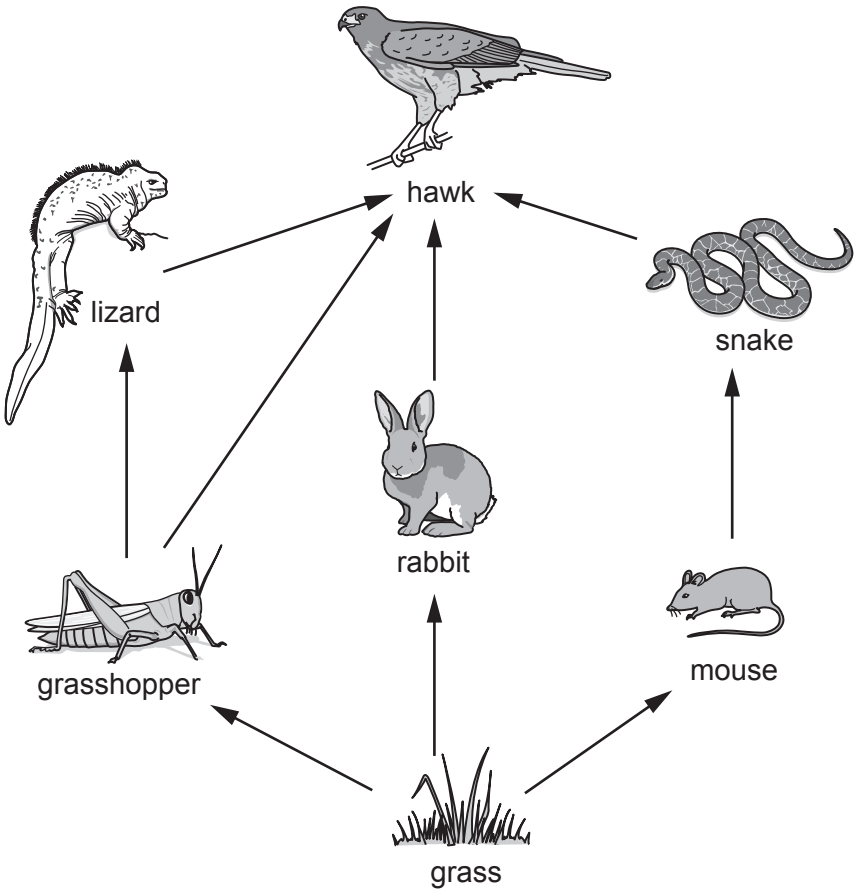
[Total: 10]

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided.

6 The diagram shows a food web in an area of grassland.



(a) Organisms in a food web can be classified into different trophic levels based on their feeding relationships.

Explain the feeding relationships of **named** organisms at different trophic levels in this food web.

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..... [5]

(b) Describe how energy flows into and through a food web. Explain how this will determine the biomass of organisms at different trophic levels.

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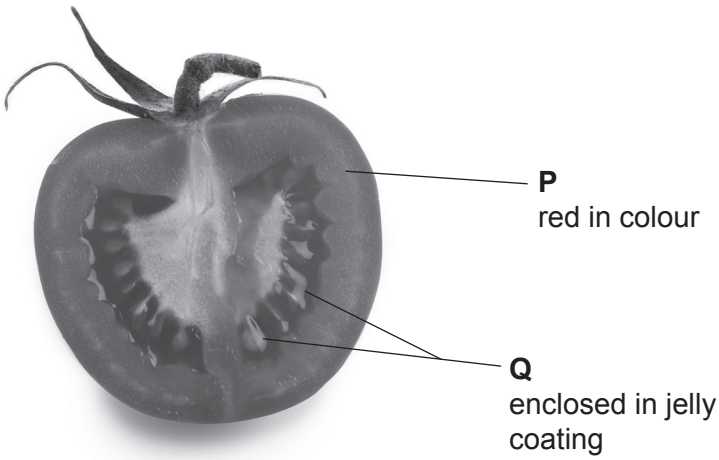
..... [5]

[Total: 10]

7 The photograph shows a fruit of the tomato plant.

The fruit has been cut in half to show the structures labelled **P** and **Q**.



(a) Before fertilisation, structures **P** and **Q** in the fruit were structures in a flower of the tomato plant.

Complete the table to name the structures in a flower that have developed into structures **P** and **Q**.

structure in fruit	structure in flower
P	
Q	

[2]

(b) **(i)** Suggest, with reference to the adaptations shown in the photograph, how the structures labelled **Q** are dispersed by animals.

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..... [4]

(ii) Outline advantages to the tomato plant species of **Q** being dispersed far from the parent plant.

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..... [4]

[Total: 10]

Section C

Answer **either** Question 8 **or** Question 9.

Write your answers in the spaces provided.

8 **(a)** Describe and explain the gas exchange that takes place between the leaf of a plant and the air in the atmosphere during a 24-hour period.

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..... [5]

(b) Outline the movement of water through a leaf during the process of transpiration.

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..... [5]

[Total: 10]

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9 **(a)** Explain the advantages and disadvantages of the use of insecticides in agriculture.

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..... [5]

(b) Describe the methods used to control the insect vector of malaria **other** than the use of insecticides. Explain the effect of each control method on the vector.

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..... [5]

[Total: 10]

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