Cambridge Assessment International Education

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CANDIDATE NAME

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2653506446

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **May/June 2023**

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.

1 Fig. 1.1 is a diagram of part of a cross-section of a leaf.

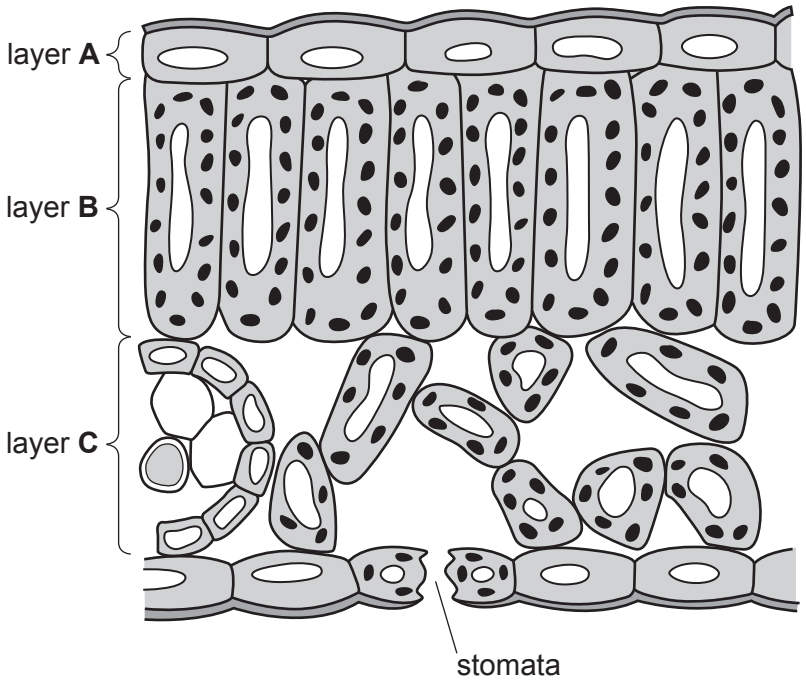

Fig. 1.1

(a) Explain why a leaf is considered to be an organ.

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..... [2]

(b) Explain how layer **B** and layer **C** in Fig. 1.1 are adapted for their functions.

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..... [6]

(c) A student placed a plant in a very hot room for 12 hours. There was a bright light in the room and the plant was not given any water during the 12-hour period.

Fig. 1.2 shows a series of sketches that the student made of the stomata during the investigation.

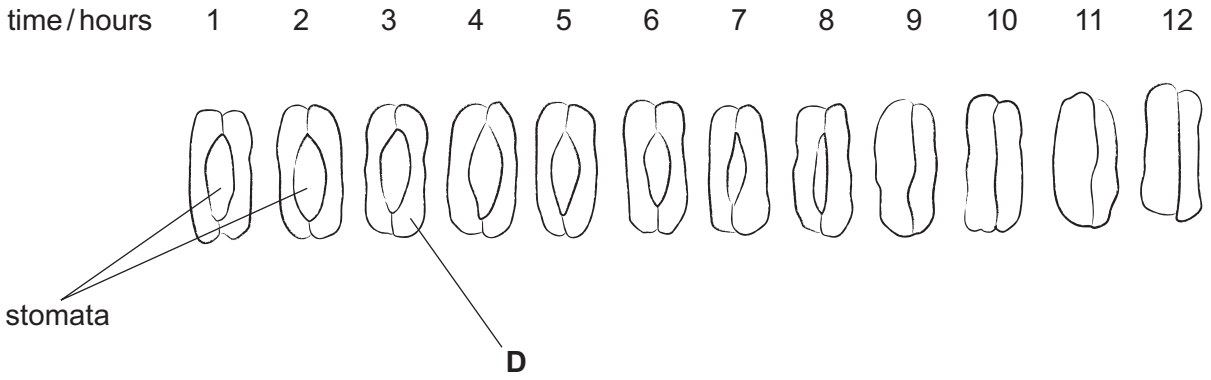

Fig. 1.2

(i) Identify the cell labelled **D** on Fig. 1.2.

..... [1]

(ii) State the main function of the stomata.

..... [1]

(iii) State the advantage to the plant of the change to the stomata shown in Fig. 1.2.

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..... [1]

(d) The student increased the humidity in the room and repeated the investigation.

Predict and explain the effect of high humidity on the stomata.

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..... [3]

[Total: 14]

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2 Fig. 2.1 is a diagram of part of a DNA molecule.

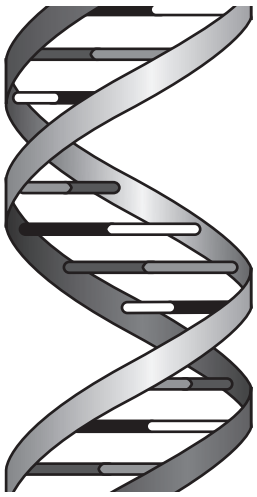

Fig. 2.1

(a) Draw a (circle) on Fig. 2.1 to identify **one** pair of bases. [1]

(b) The percentage of **T** bases in the DNA of a species is 29%.

Calculate the percentage of bases that would be base **G** in the DNA of this species.

Space for working.

G .....% [1]

(c) (i) State the name given to a length of DNA that codes for a protein.

..... [1]

(ii) Explain how proteins are made by a cell.

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..... [5]

(iii) DNA controls cell function by controlling the production of proteins.

State **two** types of cell membrane proteins.

1 .....

2 .....

[2]

[Total: 10]

3 **(a)** Antibiotic resistance is an increasing problem worldwide.

Erythromycin is an antibiotic.

Fig. 3.1 shows the daily doses of erythromycin per 1000 people over a 13-year period.

The number of bacterial infections resistant to erythromycin per 1000 people is also shown.

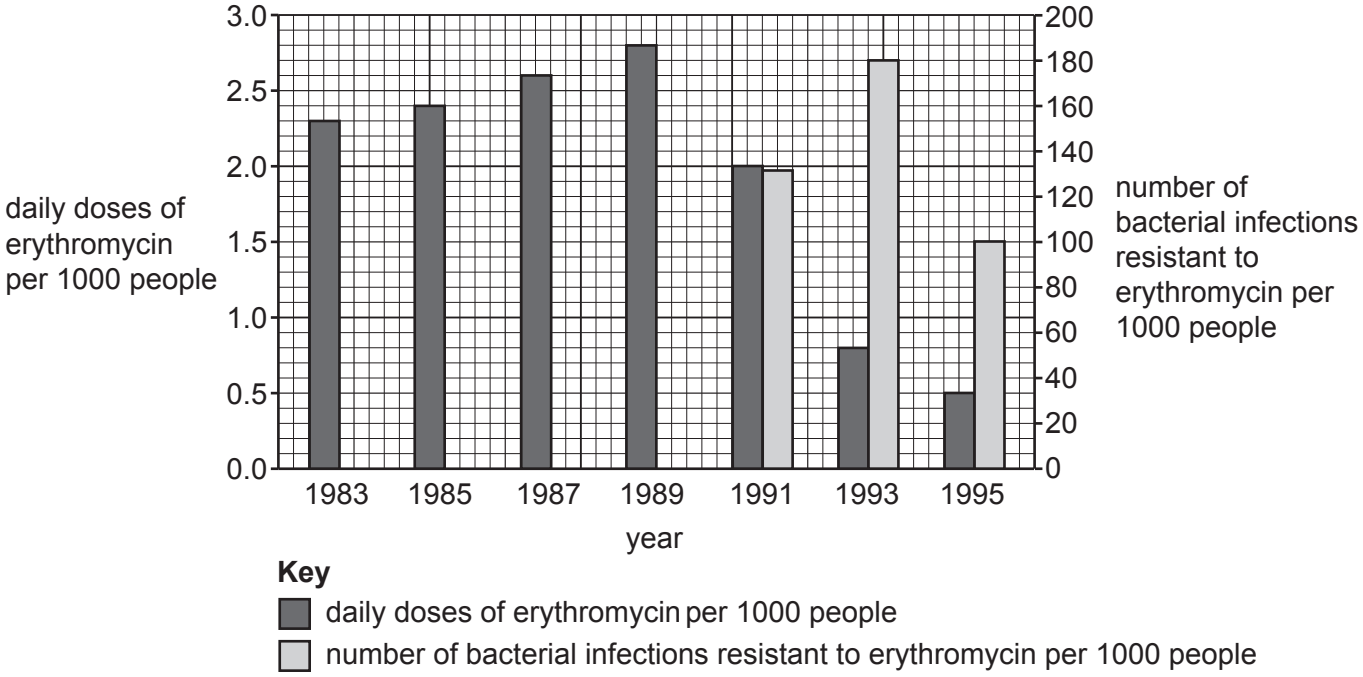

Fig. 3.1

(i) Calculate the percentage change in the number of bacterial infections resistant to erythromycin per 1000 people between 1993 and 1995.

Give your answer to **two** significant figures.

Space for working.

.....%
[3]

(ii) Describe the data shown in Fig. 3.1.

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..... [3]

(iii) Suggest reasons for the change in the number of bacterial infections resistant to erythromycin from 1993 to 1995 shown in Fig. 3.1.

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..... [2]

(iv) Explain how bacteria become resistant to antibiotics.

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..... [5]

(b) (i) Bacteria are prokaryotes.

State **two** features of **all** prokaryotes.

1 .....

2 .....
[2]

(ii) Some bacteria have a flagellum.

State the function of a flagellum.

..... [1]

[Total: 16]

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4 **(a)** A student recorded the information about an aquatic habitat.

Fig. 4.1 shows the student's notes.

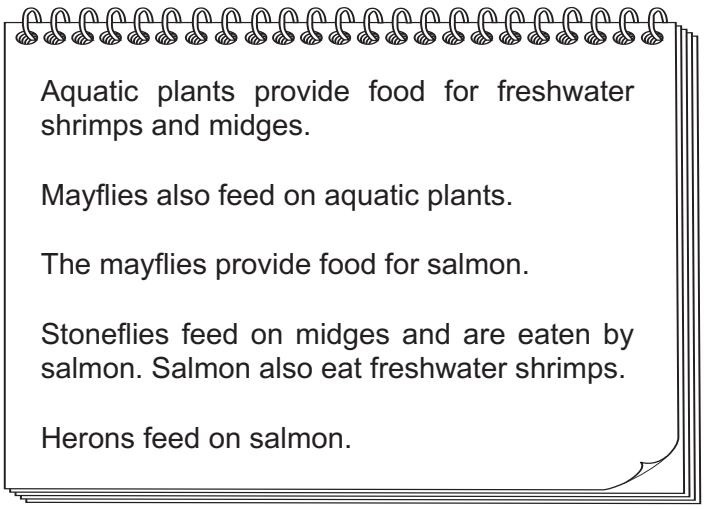

Fig. 4.1

(i) Construct a food web to show the feeding relationships described in Fig. 4.1.

Do **not** draw the organisms.

[4]

(ii) Complete Table 4.1 using the information in Fig. 4.1 by identifying the names of the missing trophic levels and **one** organism at each different trophic level.

Table 4.1

name of the trophic level	organism in Fig. 4.1
producer	aquatic plants
primary consumer	
secondary consumer	

[3]

(iii) Outline how the energy in the primary consumers in this aquatic food web is used to produce biomass in the secondary consumers.

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..... [3]

(iv) Humans also eat salmon.

Predict the impact on the feeding relationships shown in Fig. 4.1 of overharvesting of salmon.

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..... [3]

(b) Describe what is meant by the term decomposer.

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..... [1]

(c) Animals such as salmon can be farmed for meat.

Explain why it is more energy efficient for humans to eat crop plants than to eat livestock that have been fed on crop plants.

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..... [4]

[Total: 18]

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5 Fig. 5.1 is a photomicrograph of a structure found in animal and plant cells.

Fig. 5.1

(a) State the name and function of the cell structure labelled **A** in Fig. 5.1.

name .....

function .....

.....

[2]

(b) State the **two** pieces of information needed to calculate the actual length of cell structure **A** in Fig. 5.1.

1 .....

2 .....

[1]

(c) The actual length of cell structure **A** is 0.000 75 mm.

Convert this value to micrometres (μm).

..... μm [1]

[Total: 4]

6 **(a)** A student investigated plant growth responses in roots and shoots. They used this method:

- Damp cotton wool was placed in two Petri dishes.
- Three bean seedlings were attached to the cotton wool in each Petri dish.
- Each seedling was orientated so that the roots pointed in a different direction in each Petri dish.
- Petri dish 1 was kept on its side in a fixed position.
- Petri dish 2 was kept on its side and rotated constantly.
- Both Petri dishes were kept in the dark.
- Both Petri dishes were kept in these conditions for two days.
- After two days the seedlings were observed.

Fig. 6.1 is a diagram of the apparatus.

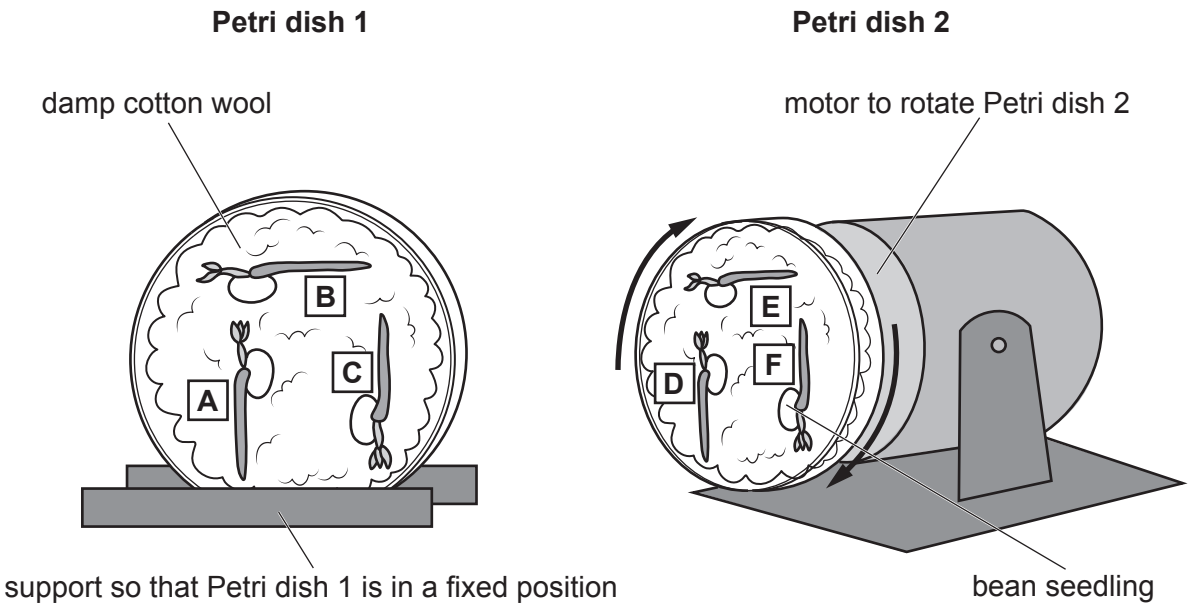

Fig. 6.1

Fig. 6.2 shows the seedlings after two days.

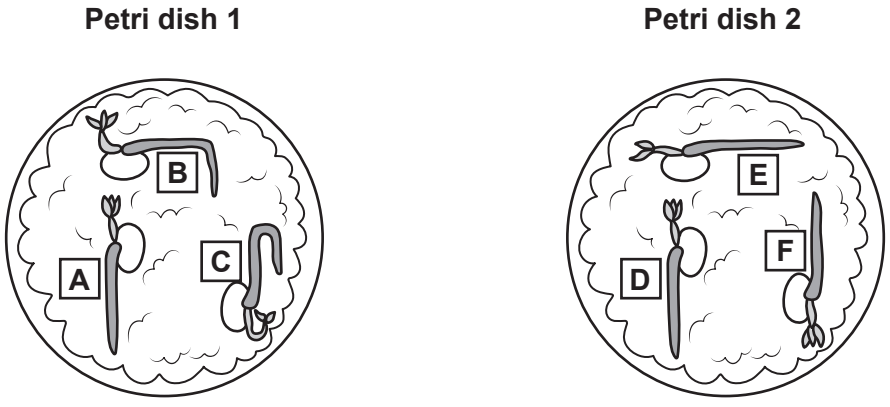

Fig. 6.2

(i) Describe the pattern of growth of the bean roots and shoots in Petri dish **1** shown in Fig. 6.2.

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..... [1]

(ii) State the name of the growth responses observed in the bean roots and shoots.

..... [1]

(iii) Explain how auxin causes the difference in the pattern of growth shown by the shoots of seedlings **B** and **E** shown in Fig. 6.2.

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..... [5]

(b) Seeds require oxygen and water to germinate.

(i) State **one** other environmental condition that affects germination.

..... [1]

(ii) Suggest why oxygen and water are required for germination.

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..... [2]

[Total: 10]

7 Complete the sentences about enzymes by writing a suitable word or phrase in each of the spaces provided.

Enzymes are involved in chemical digestion which produces small ..... molecules that can be absorbed into the blood.

Two examples of protease enzymes are pepsin and trypsin. Pepsin is produced by the ..... and requires acidic conditions. These conditions are created by the release of ..... , which provides the optimum pH for pepsin activity and also kills harmful ..... .

The ..... produces trypsin which breaks down protein in ..... pH conditions. These conditions are created by a substance called ..... , which neutralises the gastric juices and also has an important role in the ..... of fats and oils.

[8]