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BIOLOGY

0610/41

Paper 4 Theory (Extended)

May/June 2024

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 (a) Fig. 1.1 is a photograph of a fish. Fig. 1.2 is a photograph of an amphibian.



Fig. 1.1



Fig. 1.2

State **two visible** features that distinguish the fish in Fig. 1.1 from the amphibian in Fig. 1.2.

1

2

[2]

(b) Fish, amphibians and mammals are all vertebrate groups.

State the name of **one other** vertebrate group.

..... [1]

- (f) Table 1.1 shows the names of some organs and the name of the main artery that brings blood to the organ.

Complete Table 1.1.

Table 1.1

| name of the organ | name of the artery that brings blood to the organ |
|-------------------|---|
| lung | |
| | renal artery |
| liver | |

[3]

[Total: 17]

- 2 (a) Fig. 2.1 shows the internal body temperature of a human and the external environmental temperature during six hours in one day.

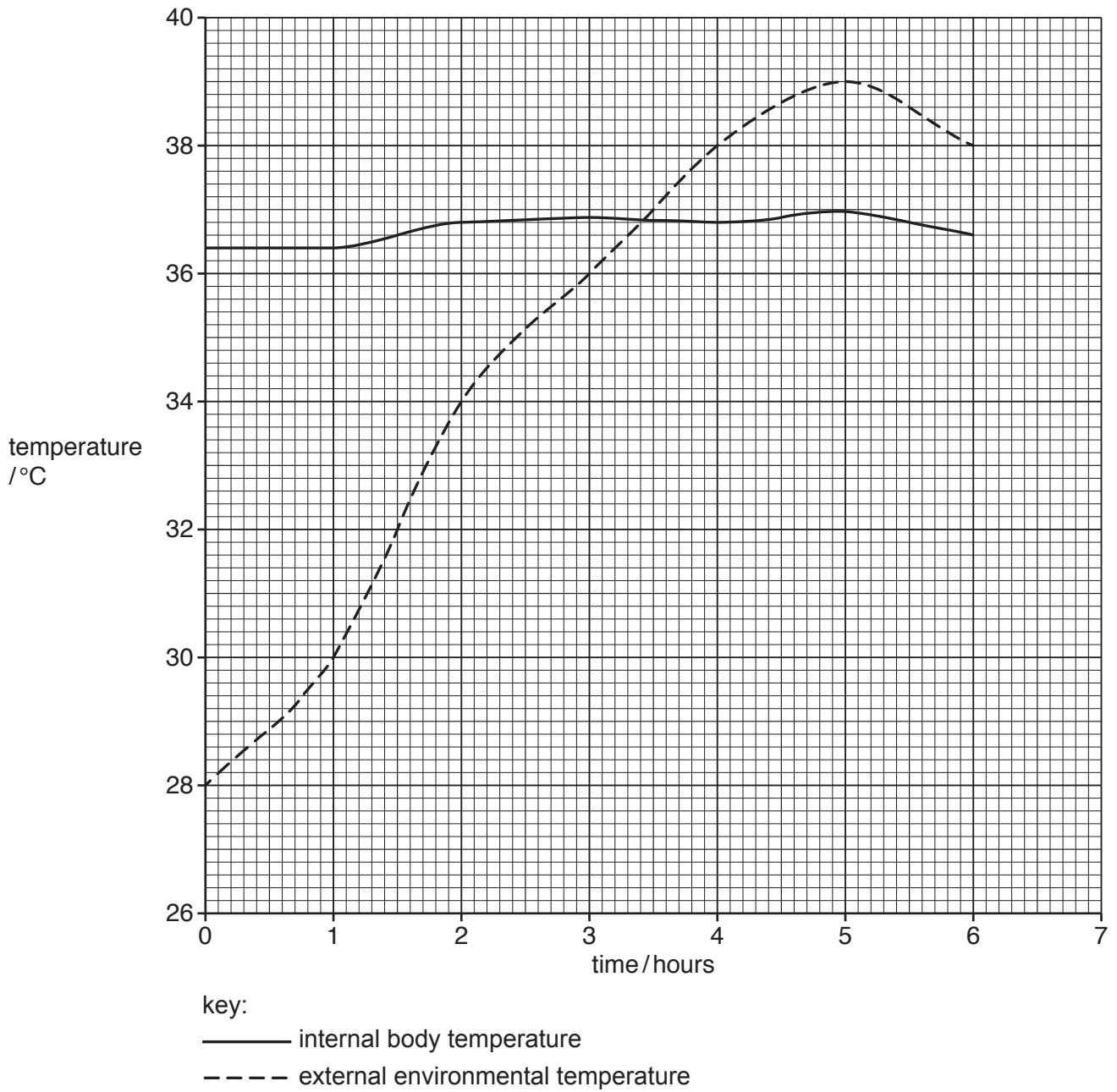


Fig. 2.1

(b) Fig. 2.2 shows a cross-section through human skin.

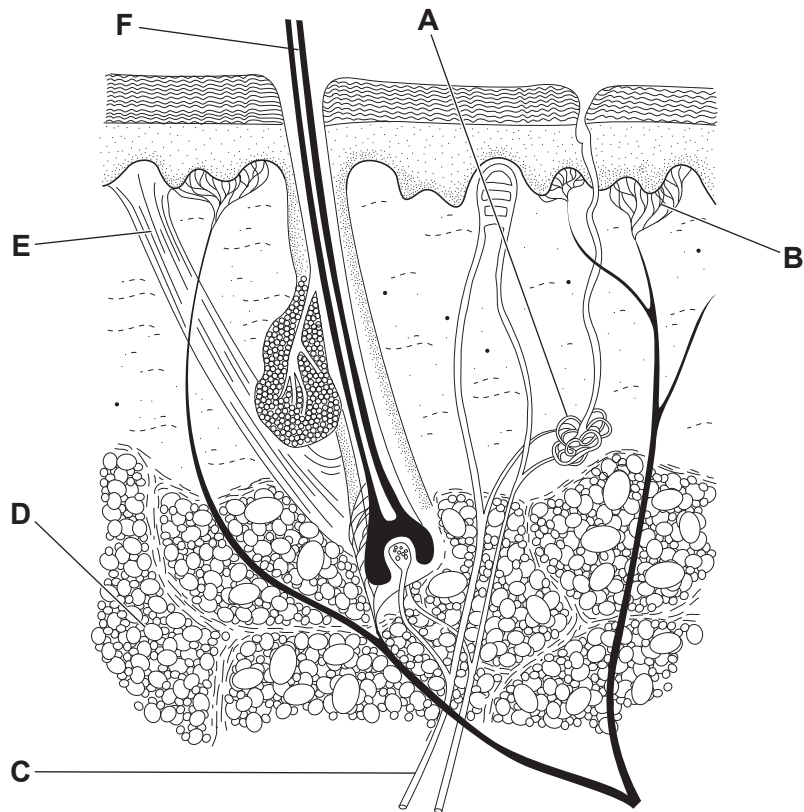


Fig. 2.2

Table 2.1 shows the names of some parts of the skin, the letter identifying the part in Fig. 2.2 and its role in maintaining internal body temperature.

Complete Table 2.1.

Table 2.1

| name of the part | letter in Fig. 2.2 | role in maintaining internal body temperature |
|------------------|--------------------|---|
| | | insulation |
| | E | |
| | | detect temperature changes |

[3]

[Total: 10]

3 (a) Fig. 3.1 shows a drawing of a root hair cell and Fig. 3.2 shows a drawing of a palisade cell.

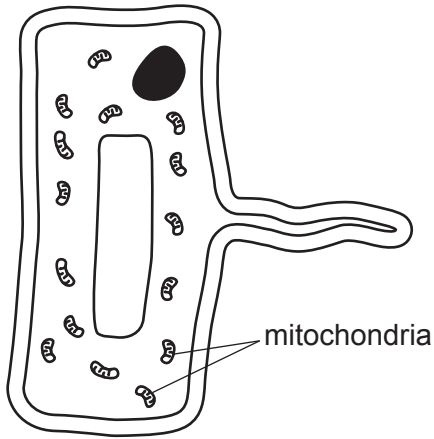


Fig. 3.1

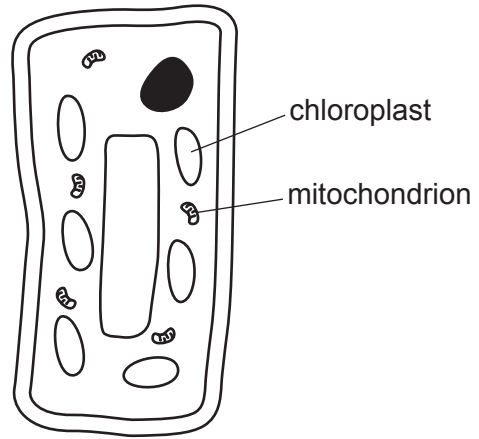


Fig. 3.2

Explain the reasons for the difference in the **numbers** of mitochondria and chloroplasts between the root hair cell and the palisade cell, shown in Fig. 3.1 and Fig. 3.2.

mitochondria

.....

.....

.....

.....

chloroplasts

.....

.....

.....

.....

[5]

(b) Fig. 3.3 is a photomicrograph of a cross-section of part of a xerophyte leaf.

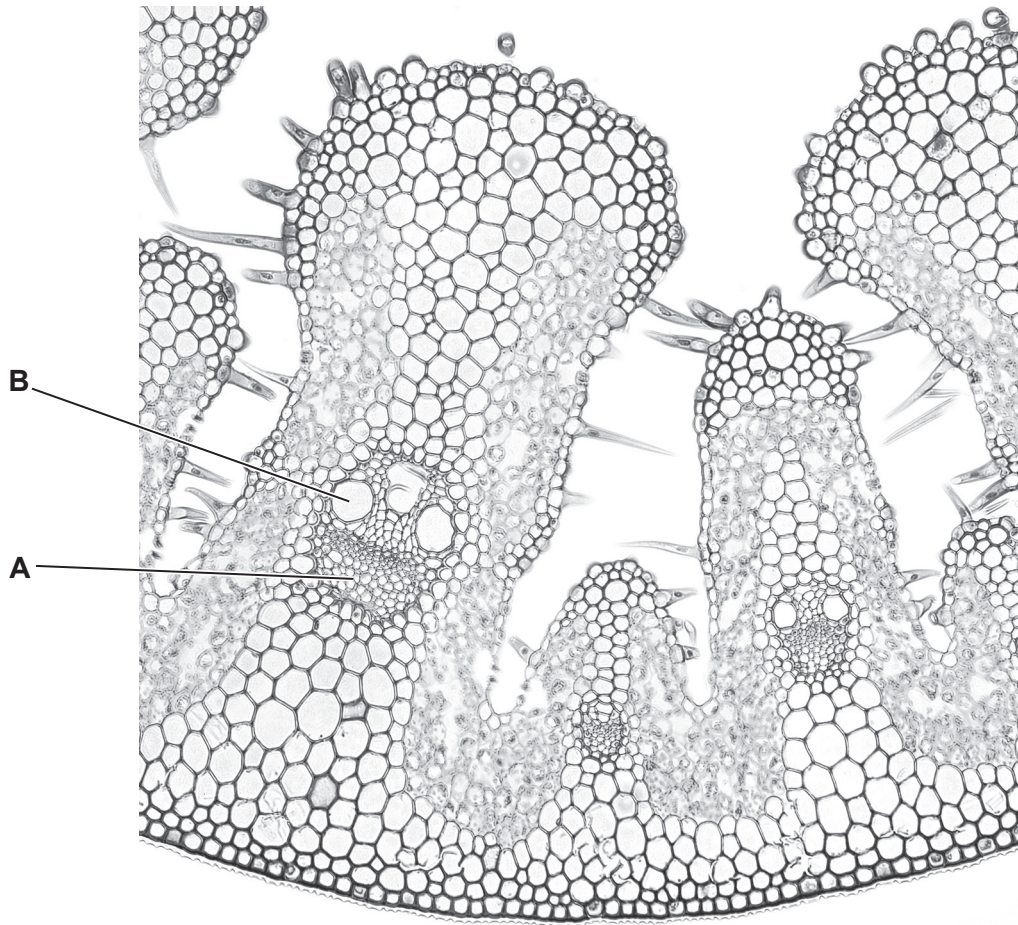


Fig. 3.3

(i) Explain why the part labelled **A** in Fig. 3.3 is a tissue.

.....

.....

.....

.....

..... [2]

(ii) Describe **two** ways the structure labelled **B** in Fig. 3.3 is adapted for its function.

1

.....

2

..... [2]

(iii) Describe **one** way the leaves of xerophytes are adapted to their environment.

.....
.....
..... [1]

(iv) Describe **one** way the roots of xerophytes are adapted to their environment.

.....
.....
..... [1]

[Total: 11]

4 (a) A student investigated the effect of lactase on three different liquids:

- milk
- lactose-free milk
- sucrose solution.

The student used an indicator to test for the presence of glucose. A sample of each liquid was tested before and after treatment with lactase.

The indicator turned brown in the presence of glucose. The indicator remained blue in the absence of glucose.

Table 4.1 shows the results of the tests.

Table 4.1

| liquid | colour before treatment with lactase | colour after treatment with lactase |
|-------------------|--------------------------------------|-------------------------------------|
| milk | blue | brown |
| lactose-free milk | brown | brown |
| sucrose solution | blue | blue |

(i) Explain the results for the three liquids shown in Table 4.1.

.....

.....

.....

.....

.....

.....

.....

..... [3]

- (ii) The student kept the solutions at a temperature that was close to the optimum during the investigation.

Using your knowledge of the effect of temperature on enzyme activity, explain why this was important.

.....
.....
.....
.....
.....
.....
.....
.....
.....
..... [4]

- (b) As part of a balanced diet, some governments recommend that children drink milk that has vitamin D added to it.

- (i) Suggest the dietary reasons for this advice.

.....
.....
.....
.....
..... [2]

- (ii) Describe what is meant by a balanced diet.

.....
.....
.....
.....
..... [2]

[Total: 11]

- 5 Fig. 5.1 is a graph showing the effect of temperature on the rate of transpiration from the upper and lower surfaces of a leaf that is provided with a constant supply of water.

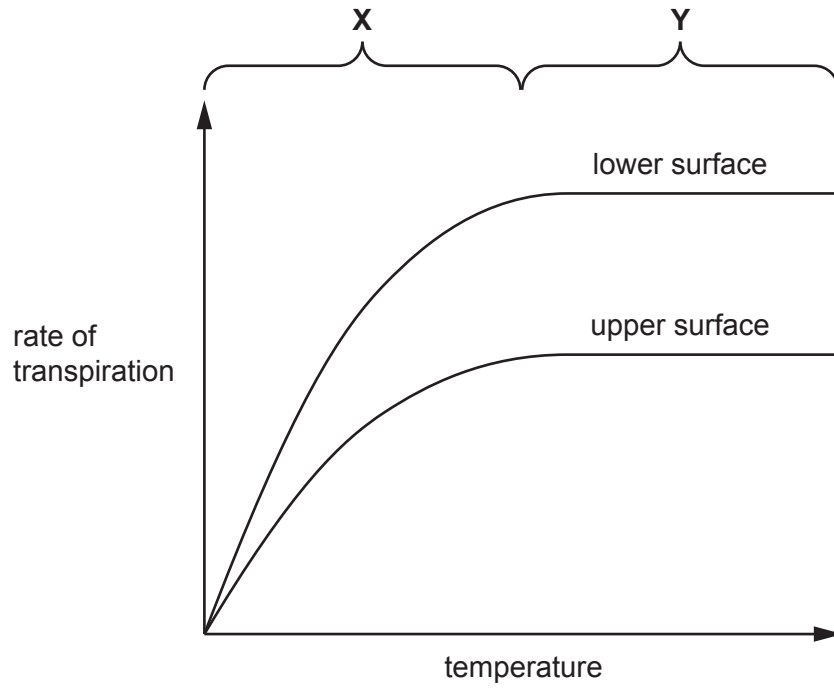


Fig. 5.1

- (a) Describe the results shown in Fig. 5.1.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(b) Explain reasons for the shape of the graph for the **upper** surface of the leaf at **X** and at **Y** in Fig. 5.1.

at **X**

.....

.....

.....

.....

at **Y**

.....

.....

.....

.....

[4]

(c) Suggest how the structure of the lower surface differs from the upper surface of the leaf used in this investigation.

.....

.....

..... [1]

[Total: 8]

- 6 (a) Polio is a viral disease that can cause nerve damage in humans.

In one area, polio vaccination began in 1957.

Fig. 6.1 shows the number of cases of polio in this area between 1950 and 1970.

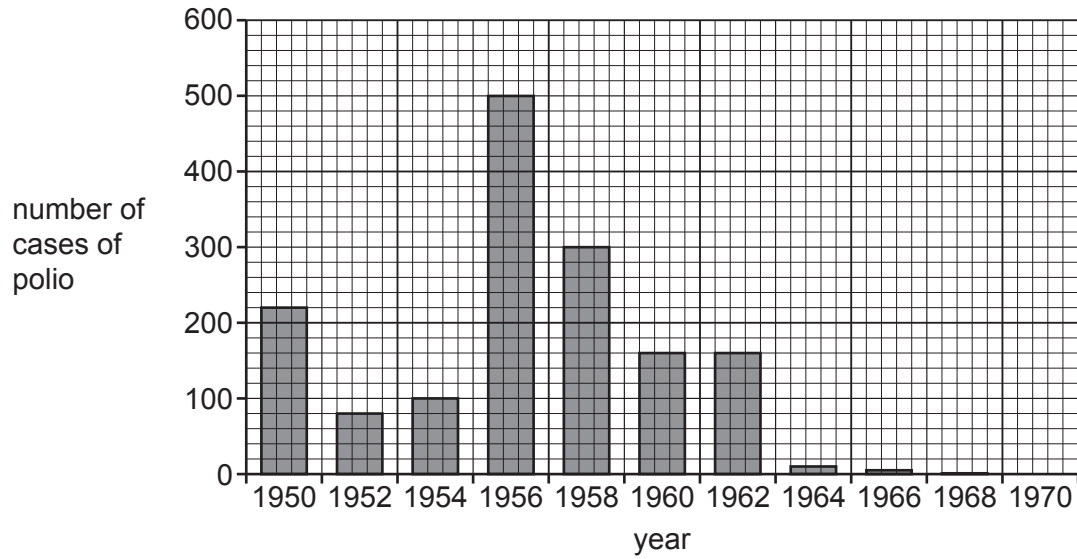


Fig. 6.1

- (i) Calculate the percentage change in the number of cases of polio between 1950 and 1952 in Fig. 6.1.

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

Space for working.

.....%

[3]

7 Fig. 7.1 is a flowchart showing the stages of eutrophication.

(a) Complete Fig. 7.1.

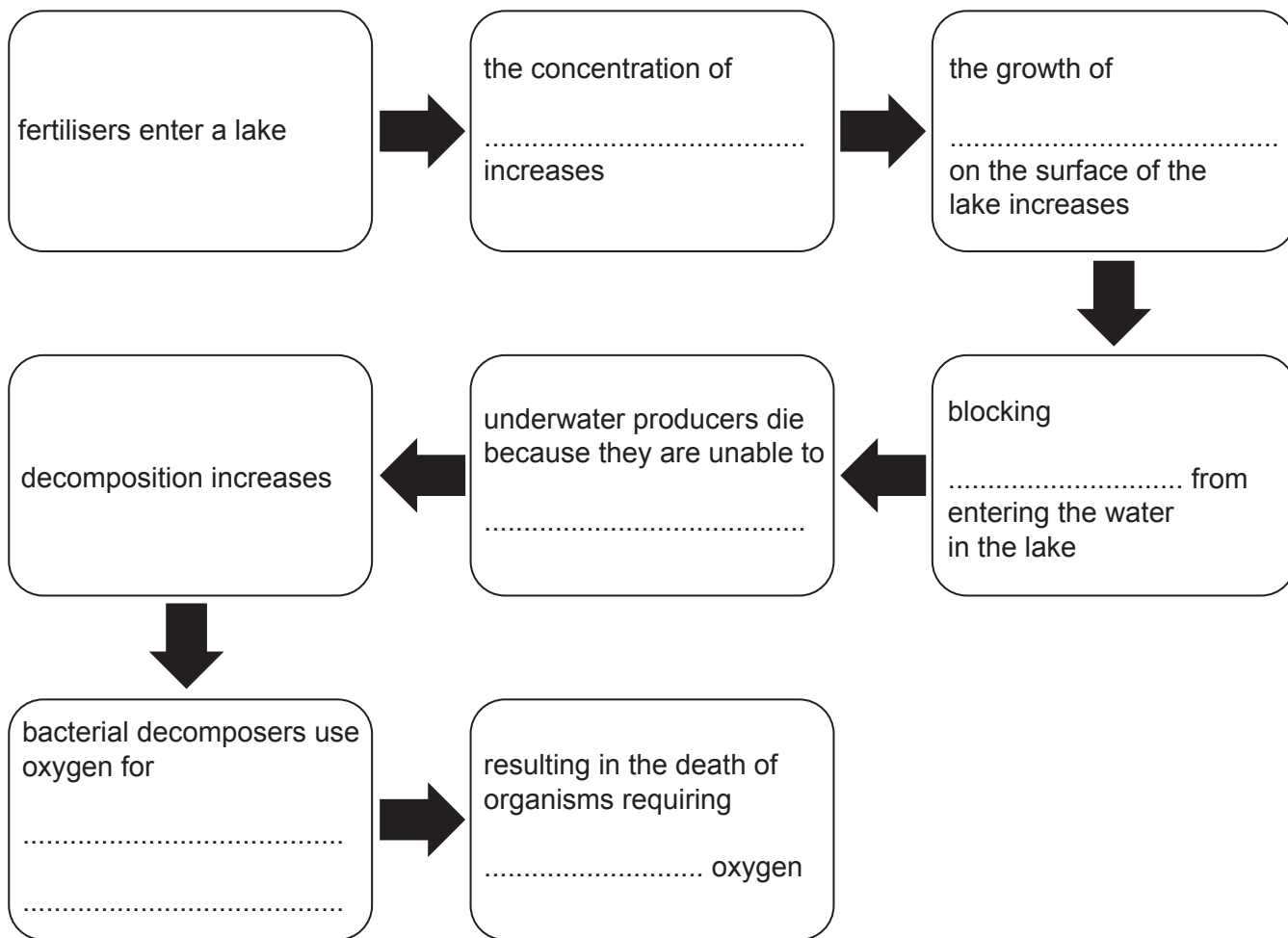


Fig. 7.1

[6]

(b) A scientist obtained a sample of the bacterial decomposers and grew them in a flask. The resources available for bacterial growth in the flask became limiting.

The size of the bacterial population was estimated during the investigation and these data were plotted on a graph.

(i) State the name of the expected shape of the population growth curve that would be drawn on the graph.

..... [1]

(ii) State the name of the initial phase of bacterial growth.

..... [1]

(iii) State **one** factor, other than a lack of resources, that would cause bacteria to die during the death phase.

..... [1]

[Total: 9]

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