Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

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.

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

View solution



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.

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

..... [1]

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(c) Fig. 1.3 shows the circulatory system of a fish.

View solution

Fig. 1.4 shows the circulatory system of an amphibian.

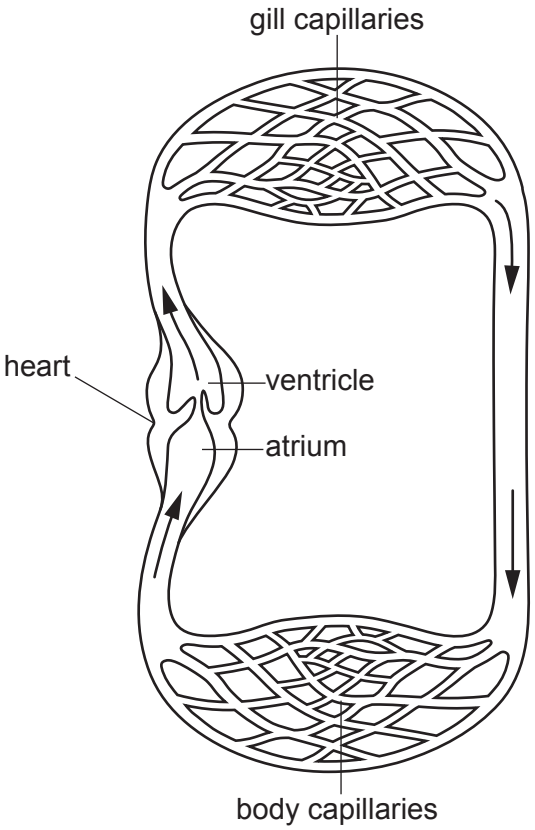

Fig. 1.3

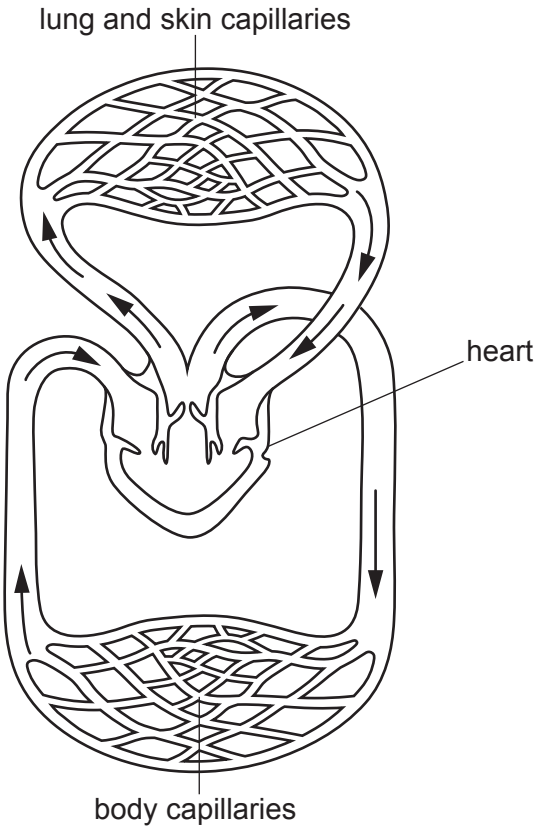

Fig. 1.4

Describe the similarities **and** the differences between the circulatory systems of the fish and the amphibian in Fig. 1.3 and Fig. 1.4.

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..... [4]

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(d) Explain the advantages of the type of circulatory system in **mammals** compared with the type of circulatory system in fish.

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..... [3]

(e) Explain how the structure of arteries and veins relates to the difference in the pressure of the blood transported by these vessels.

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..... [4]

View solution

(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.

View solution

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.

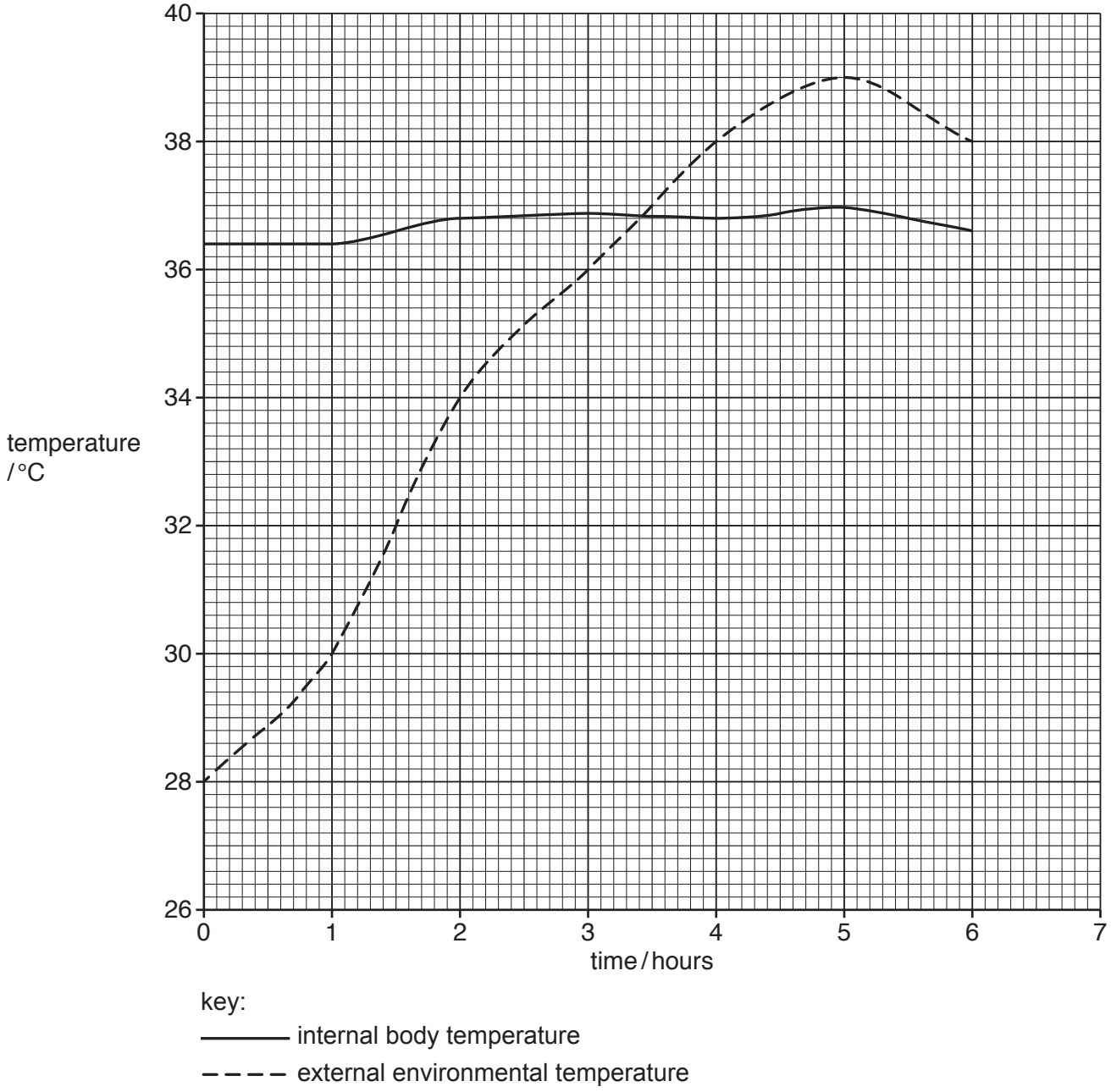

Fig. 2.1

(i) The internal body temperature range is from 36.4 °C to 37.0 °C.

State the range of the external environmental temperature shown in Fig. 2.1.

View solution

..... [1]

(ii) Explain the results for the internal body temperature shown in Fig. 2.1.

View solution

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..... [6]

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

View solution

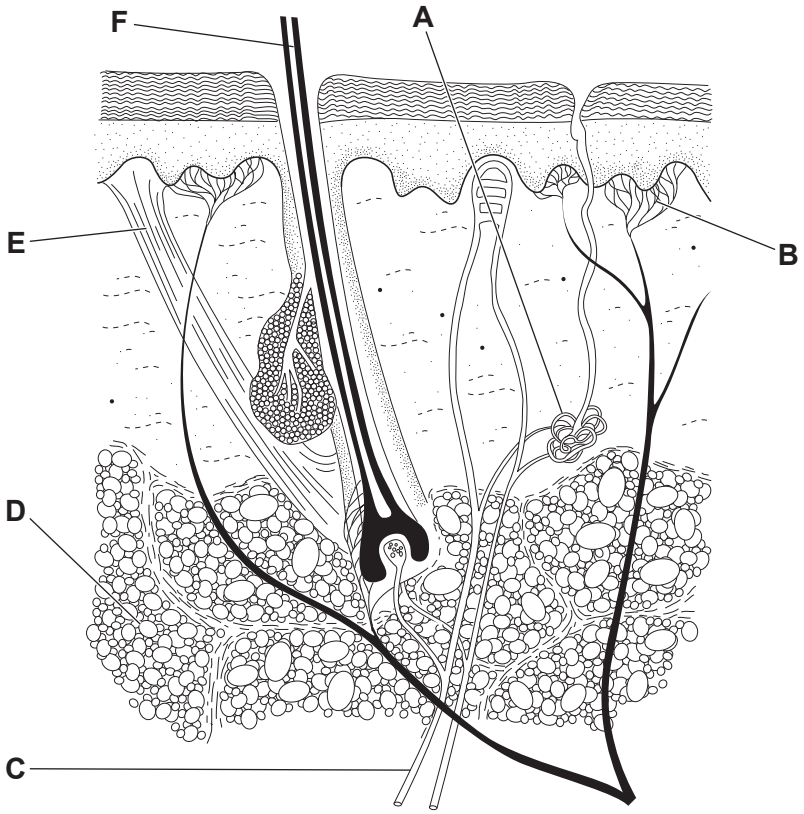

Fig. 2.2

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]

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

View solution

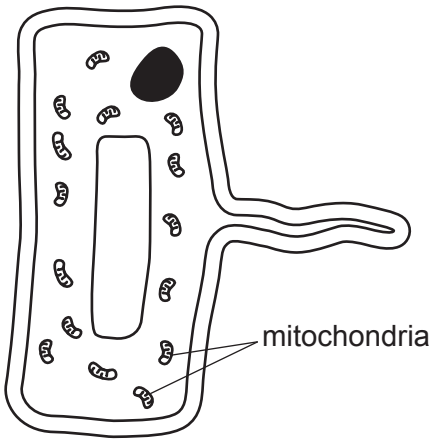

Fig. 3.1

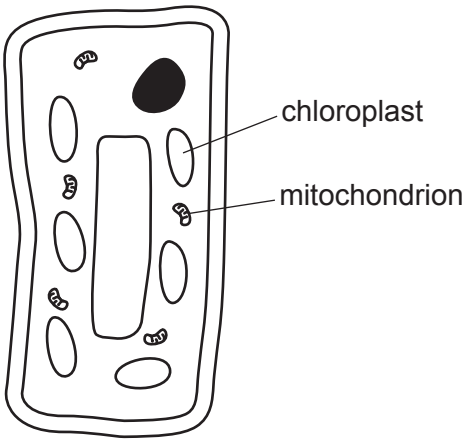

Fig. 3.2

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 .....

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chloroplasts .....

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[5]

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

View solution

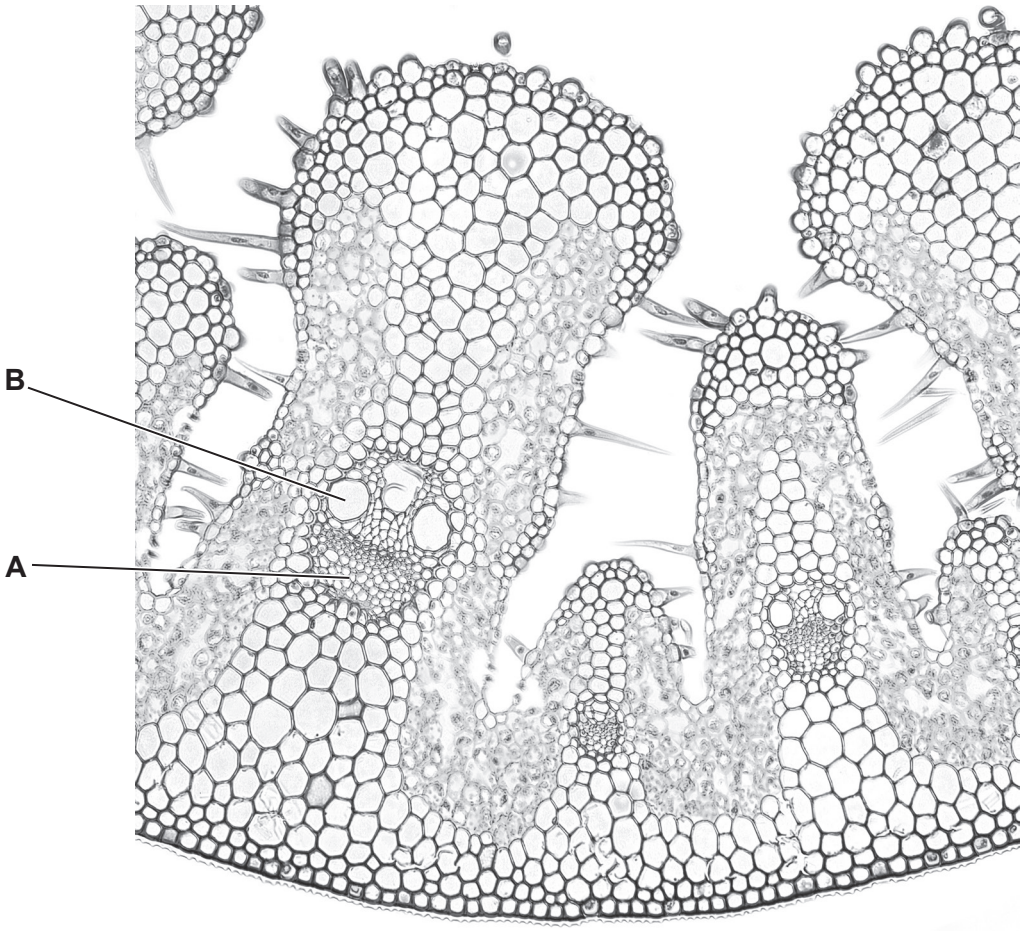

Fig. 3.3

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

.....

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..... [2]

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

View solution

1 .....

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2 .....

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[2]

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

.....

.....

..... [1]

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

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..... [1]

[Total: 11]

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

View solution

- 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.

.....

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.....

..... [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.

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..... [4]

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

View solution

(i) Suggest the dietary reasons for this advice.

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..... [2]

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

View solution

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..... [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.

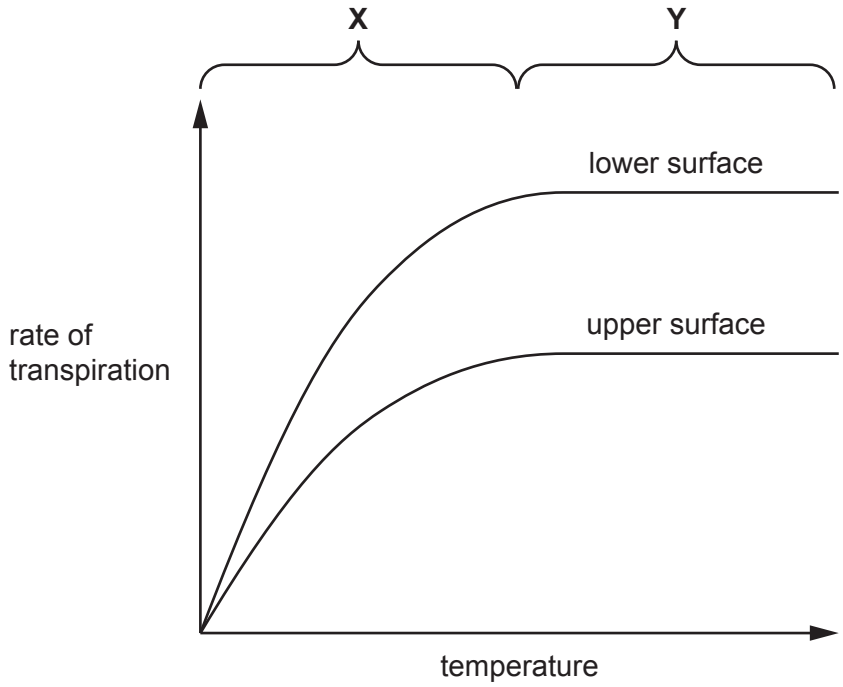

Fig. 5.1

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

View solution

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..... [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** .....

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.....

.....

.....

at **Y** .....

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[4]

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

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..... [1]

[Total: 8]

View solution

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

View solution

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.

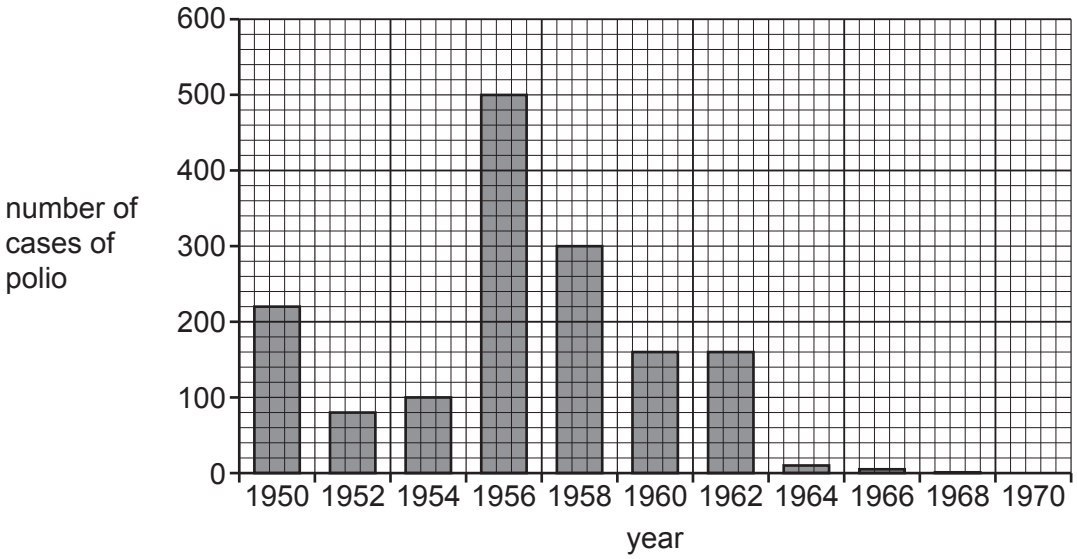

Fig. 6.1

(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]

(ii) Explain how vaccination causes the results shown between 1958 and 1970 in Fig. 6.1.

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..... [5]

(iii) Explain why the polio vaccine does **not** protect you from other diseases.

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..... [2]

(b) Blood clotting helps to prevent some infections.

View solution

Outline how a blood clot is formed **and** how it can prevent infections.

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..... [3]

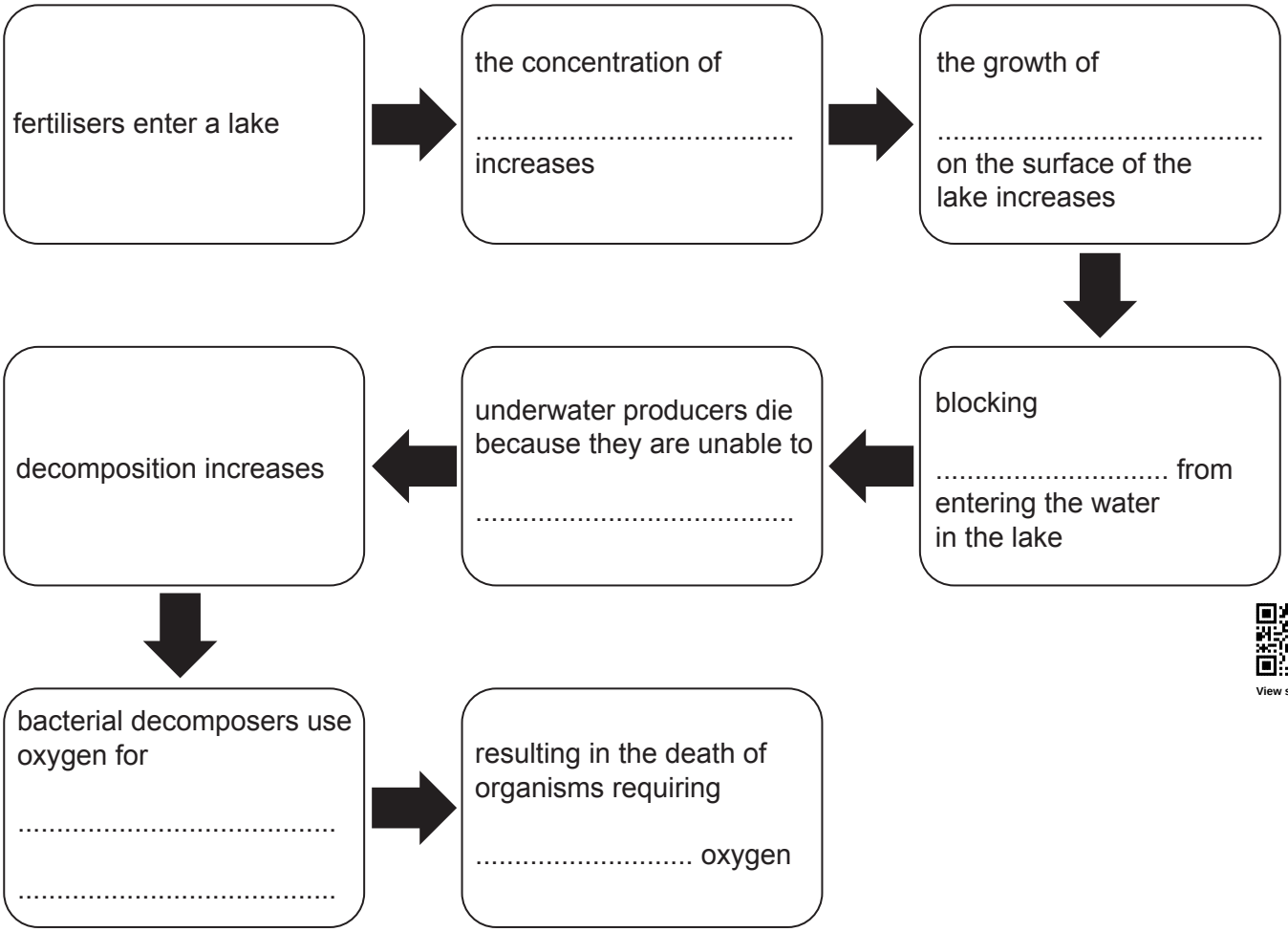
(c) State the name of the component of blood responsible for transporting blood cells.

..... [1]

[Total: 14]

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

(a) Complete Fig. 7.1.



View solution

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.

View solution

..... [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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