Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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5150136867

BIOLOGY **5090/22**

Paper 2 Theory **May/June 2023**

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 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 **16** pages.

[Turn over

1 Table 1.1 lists three of the gases present in the atmosphere.

Table 1.1

gas	percentage
oxygen	.....
carbon dioxide	.....
nitrogen	.....

(a) Complete Table 1.1 to state the percentage of each gas in the atmosphere. [3]

(b) Some foods are packaged in a sealed container that contains a mixture of the same gases, with percentages that are different from those found in atmospheric air.

Fig. 1.1 shows a diagram of food packaged in this way.

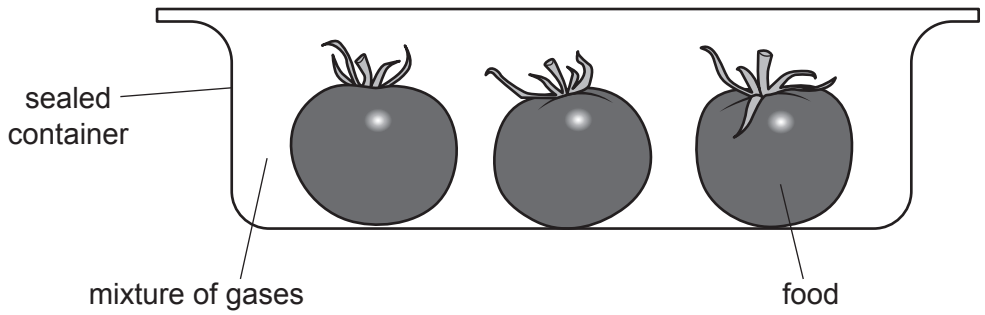

Fig. 1.1

This method of food packaging slows down decomposition of the food.

(i) Suggest how the percentage of **one** gas named in Table 1.1 is changed when used to package food in this way.

..... [1]

(ii) Explain how this change will slow down decomposition of the food.

.....

.....

.....

.....

..... [3]

(iii) Suggest **two** advantages of slowing down decomposition of packaged food.

1 .....

2 .....
[2]

[Total: 9]

2 **(a)** Describe physical digestion in humans and explain its importance.

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..... [4]

(b) **(i)** State the name of the chemical present in the stomach that kills many ingested bacteria.

..... [1]

(ii) Bacteria that are not killed in the stomach may cause disease.

State the term used to describe:

- organisms that cause disease.

  .....

- the type of immunity gained after infection by organisms that cause disease.

  .....

[2]

(c) Disease can be caused by viruses.

Yellow fever is an example of a disease caused by a virus.

Outline how a weakened form of the virus that causes yellow fever can be used to give a person long-term immunity against the disease.

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..... [3]

[Total: 10]

3 The nervous system coordinates and regulates body functions.

Fig. 3.1 shows two diagrams, each showing parts of the nervous system in a human.

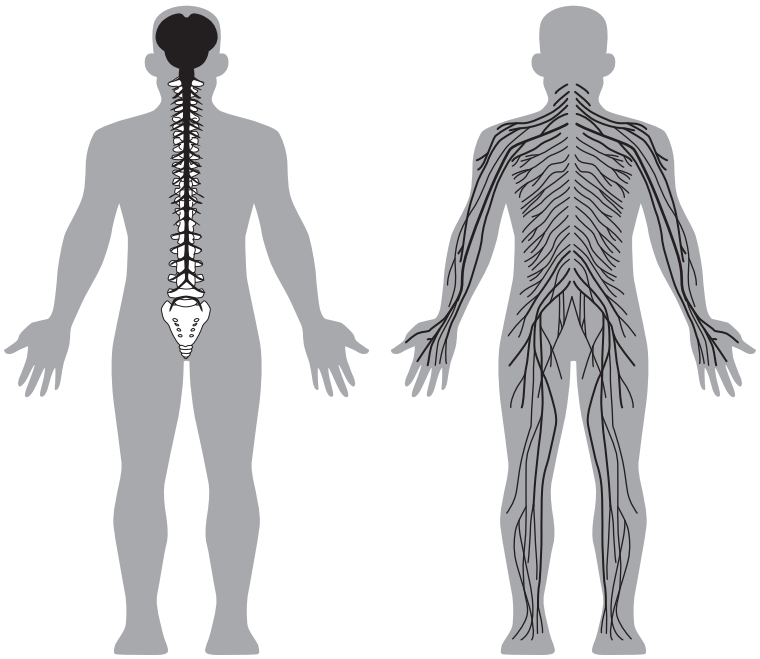

diagram **A** diagram **B**

Fig. 3.1

(a) Describe the parts of the nervous system shown in each diagram.

diagram **A** .....

.....

diagram **B** .....

.....

[4]

(b) Fig. 3.2 shows the junction between two neurones.

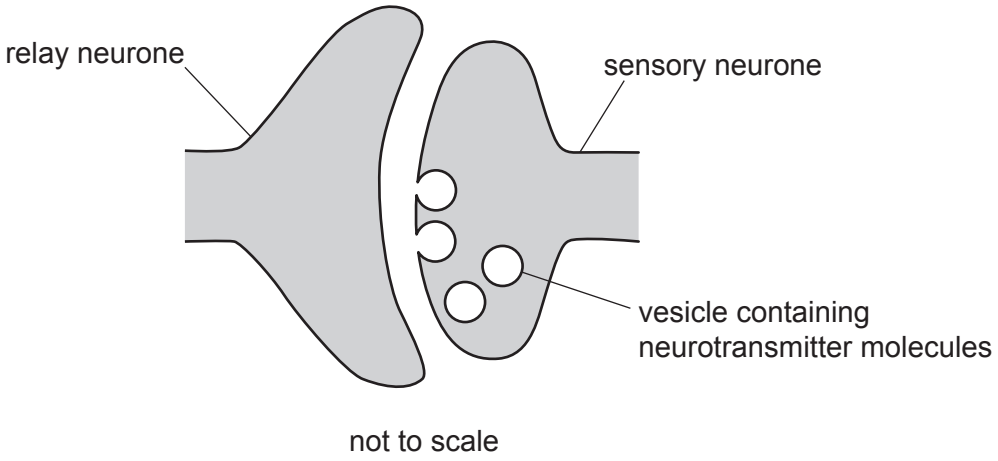

Fig. 3.2

(i) Name the junction shown in Fig. 3.2.

..... [1]

(ii) Draw an arrow on Fig. 3.2 to show the direction that an impulse will travel. [1]

(iii) The distance between the two neurones shown in Fig. 3.2 is 0.00003 mm.

State this distance in units of μm.

Space for working.

..... μm [1]

(c) Nicotine is a chemical found in cigarette smoke.

A molecule of nicotine has a similar shape to a molecule of neurotransmitter.

Suggest and explain the effect of nicotine at the junctions between neurones.

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.....

.....

.....

.....

..... [3]

[Total: 10]

4 Lake Washington in the United States of America is a large fresh water lake.

Between 1941 and 1963 an increasing amount of untreated sewage polluted the lake.

(a) Suggest and explain the effect of this untreated sewage on the lake ecosystem.

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..... [5]

Between 1963 and 1968 new sewage treatment facilities were constructed.

By 1968 the amount of untreated sewage entering Lake Washington was reduced to zero.

Fig. 4.1 shows how the transparency of water in the lake has changed over time.

Water transparency is a measure of how far light travels through water.

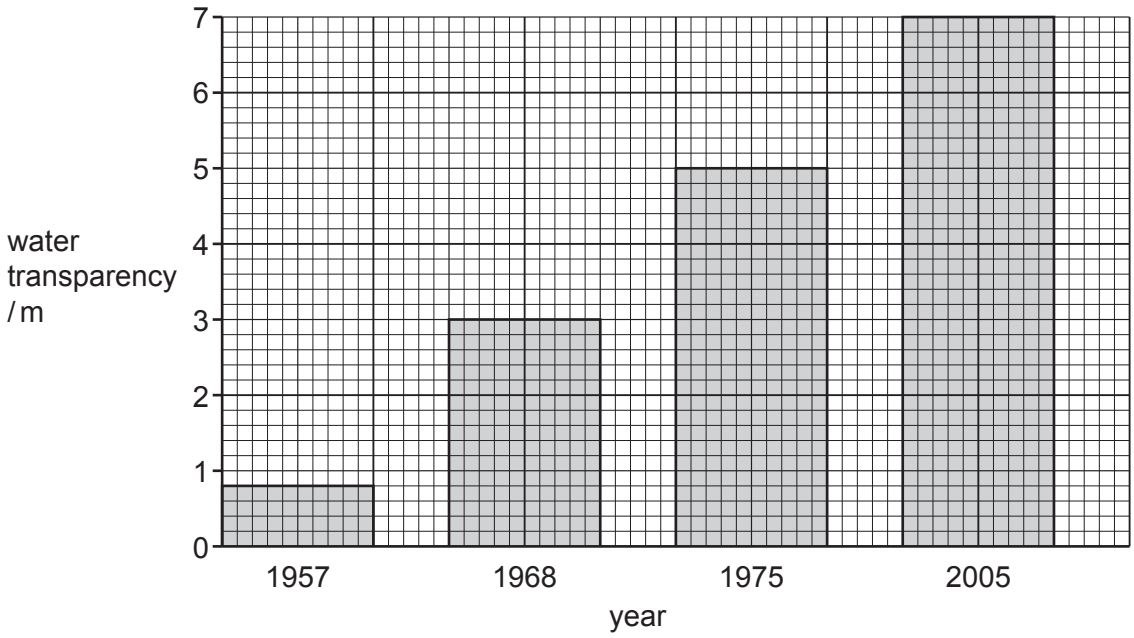

Fig. 4.1

(b) Calculate the percentage increase in water transparency between 1957 and 1968.

Space for working.

.....% [2]

(c) One species of fish that lives in Lake Washington is the Three Spined Stickleback.

Fig. 4.2 shows three different distribution patterns of armour plates on the skin of these fish.

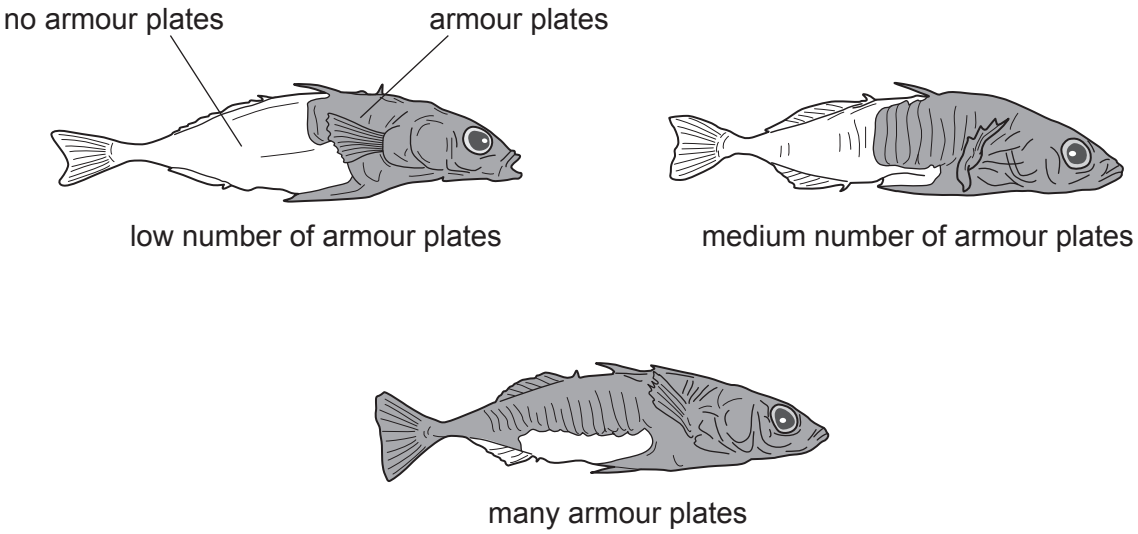

Fig. 4.2

Table 4.1 shows how the distribution patterns of armour plates on the skin of Three Spined Sticklebacks have changed over time.

Table 4.1

year	percentage of fish with each distribution		
	low number of armour plates	**medium number of armour plates**	**many armour plates**
1957	91	9	0
1968	69	25	6
1975	25	35	40
2005	16	35	49

(i) Use data from Table 4.1 to describe how the distribution patterns of armour plates have changed over time.

.....

.....

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..... [4]

(ii) Armour plates on the skin of a Three Spined Stickleback protect it from predators.

Describe how the process of natural selection may have caused these changes in the distribution of plates over time.

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..... [5]

[Total: 16]

5 Fig. 5.1 is a photomicrograph of the centre of a plant root.

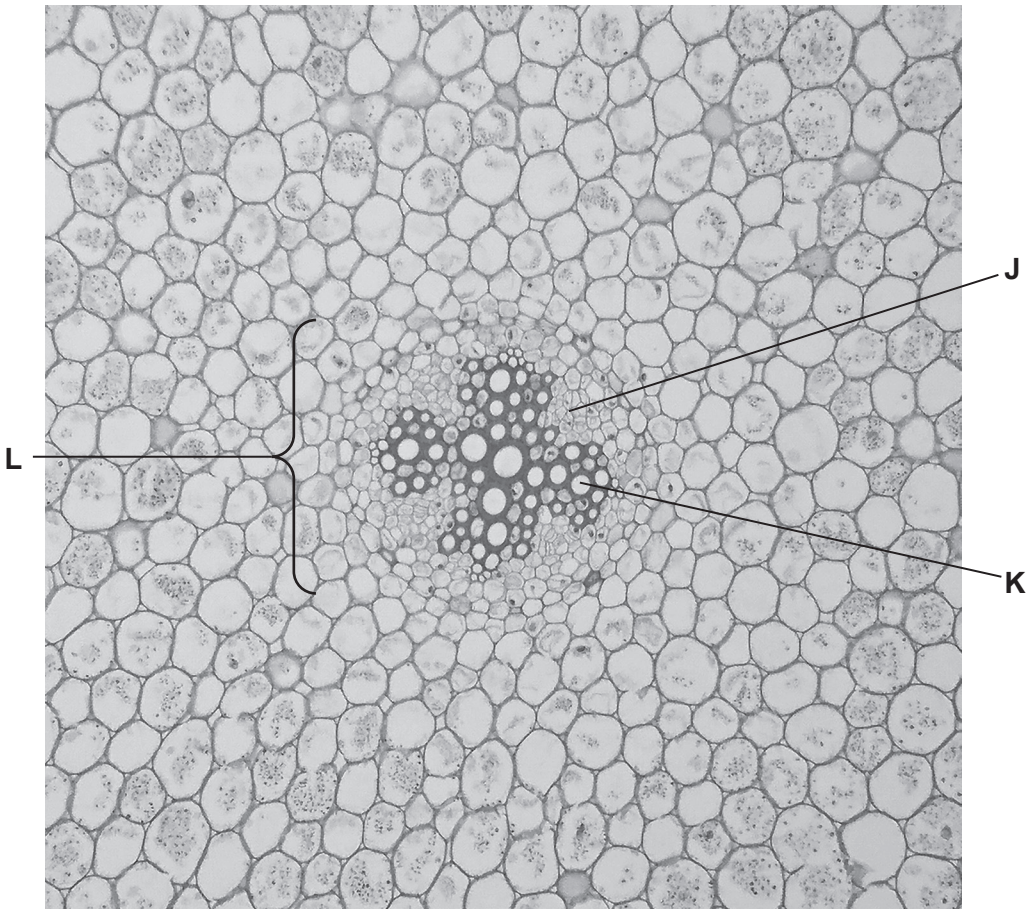

Fig. 5.1

(a) (i) Identify each of the tissues labelled **J** and **K**.

J .....

K .....

[2]

(ii) State the term used to describe the group of tissues labelled **L**.

..... [1]

(iii) State **two** ways in which the structure of a cell in tissue **K** will differ from a cell in tissue **J**.

1 .....

.....

2 .....

.....

[2]

(iv) Outline the function of tissue **J**.

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..... [4]

(b) (i) Name the type of response shown by a plant root when it grows down into soil after the seed has germinated.

..... [2]

(ii) Explain how this response shown by the plant root is necessary for the leaves to grow and to appear green.

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..... [4]

[Total: 15]

6 Fig. 6.1 shows the pattern of results from an investigation into the effect of increasing light intensity on the rate of photosynthesis.

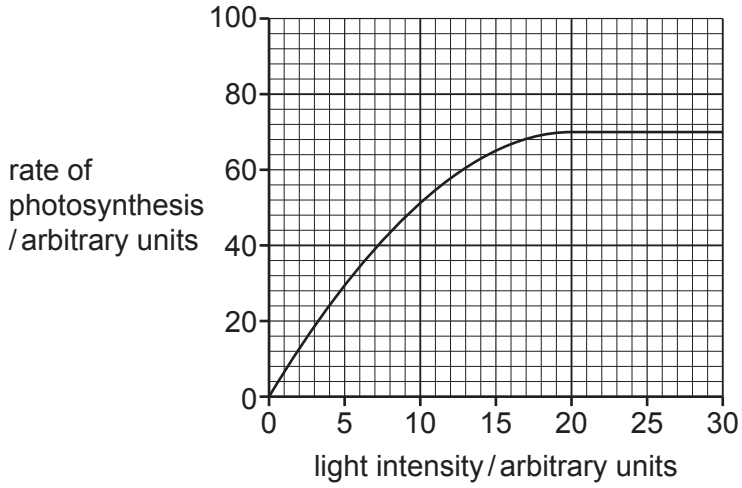

Fig. 6.1

(a) Describe and explain the pattern of results between a light intensity of 20 and 30 arbitrary units.

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..... [2]

(b) The investigation was repeated with an increased concentration of carbon dioxide in the atmosphere.

(i) Draw a curve on Fig. 6.1 to show the pattern of results that would be expected from this second investigation. [2]

(ii) State the name of the product of photosynthesis that contains carbon atoms.

..... [1]

(iii) Outline the uses made by a plant of named carbohydrates.

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..... [5]

[Total: 10]

7 DNA carries genetic information in the form of genes.

(a) The paragraph below describes the structure of a DNA molecule.

Complete the paragraph by writing the most appropriate word or letter in each space.

DNA contains the chemical elements carbon, hydrogen, oxygen, ... and ..... . Two strands of DNA coil together to form a double ..... . Each strand is made up of a chain of ..... . Bonds between pairs of bases hold the strands together. These bases always pair up in the same way: T with ..... and ..... with ..... .

[5]

(b) Explain how genetic modification can be used to change the function of an enzyme so that it acts on a different substrate.

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..... [5]

[Total: 10]