Cambridge Assessment International Education

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CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/31**

Paper 3 Theory (Core) **May/June 2025**

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 Fig. 1.1 shows some specialised cells.

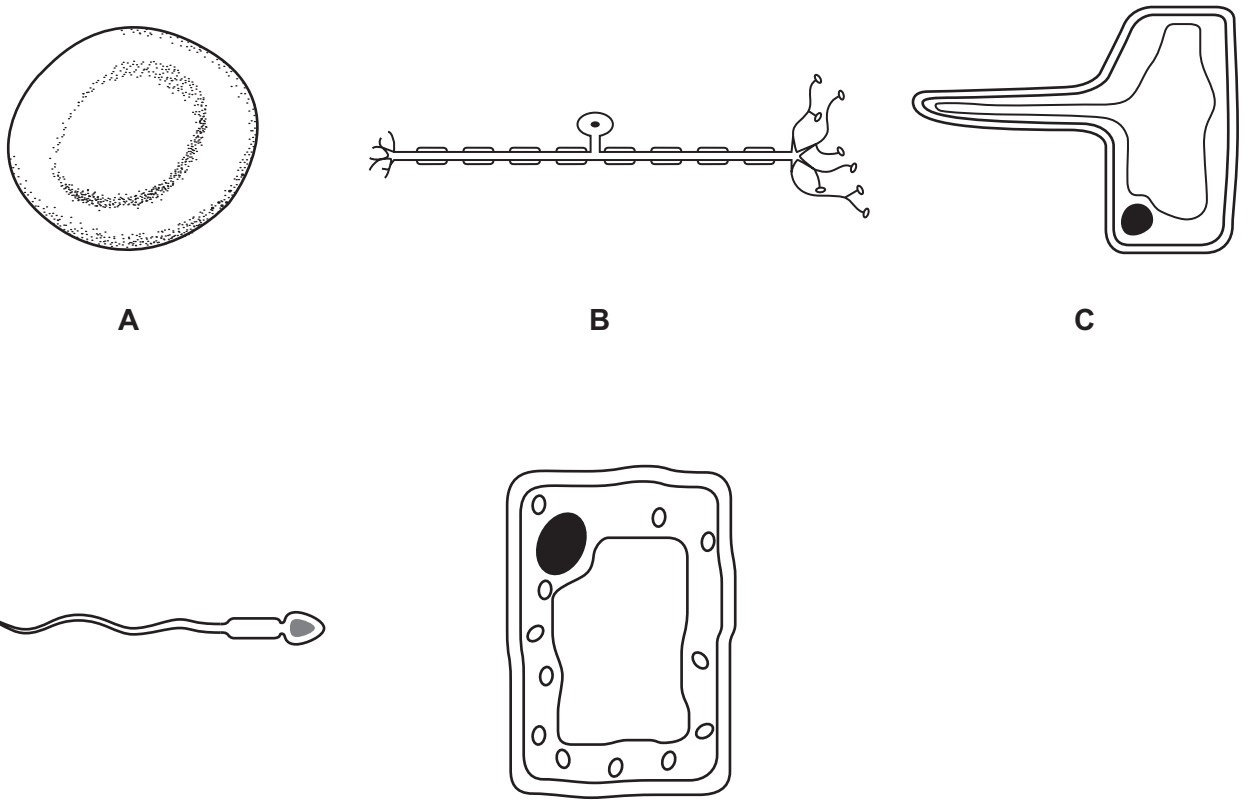

Fig. 1.1

(a) State the letters from Fig. 1.1 that identify the cell or cells that:

contain an acrosome .....

contain haemoglobin .....

are found in plants ..... and .....

are found in the peripheral nervous system. .....

[4]

(b) Cell **A** in Fig. 1.1 does **not** contain a nucleus.

(i) State the function of the nucleus.

.....

.....

..... [1]

(ii) State the names of **two** cell components that are present in **all** the cells shown in Fig. 1.1.

1 .....

2 .....

[2]

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(c) Describe how cell **C** in Fig. 1.1 is adapted for its function.

.....

.....

.....

.....

..... [2]

(d) State the **two** pieces of information needed to calculate the actual length of a cell when viewed using a light microscope.

1 .....

2 .....
[2]

[Total: 11]

View solution

2 **(a)** A student investigated the effect of carbon dioxide concentration on the rate of photosynthesis in an aquatic plant.

Sodium hydrogencarbonate was used to provide different concentrations of carbon dioxide in the water.

The student counted the number of gas bubbles released in one minute at different concentrations of carbon dioxide.

View solution

Fig. 2.1 shows the apparatus used.

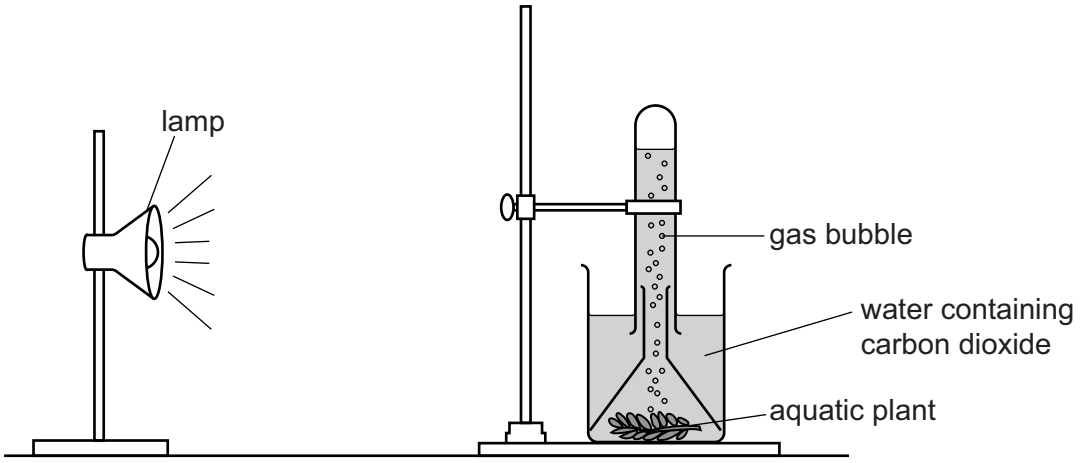

Fig. 2.1

Table 2.1 shows the results.

Table 2.1

carbon dioxide concentration / arbitrary units	number of gas bubbles released in one minute
0.1	5
0.2	10
0.3	15
0.4	21
0.5	21

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Complete the sentences to describe **and** explain the results shown in Table 2.1.

As the carbon dioxide concentration increases, the number of gas bubbles released in one minute ..... and then remains the same.

This is because carbon dioxide is a ..... material required for photosynthesis.

The number of gas bubbles released remains the same between the carbon dioxide concentrations of ..... and ..... arbitrary units.

Photosynthesis produces ..... gas which is released as bubbles.

The distance between the lamp and the aquatic plant is kept constant during the investigation so that the light ..... remains the same.

[5]

View solution

(b) Plants are usually green.

Explain the importance of the green pigment in plant nutrition.

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) State the name of the process that produces carbon dioxide in plants.

..... [1]

[Total: 10]

View solution

3 **(a)** The list shows some of the organs in the digestive system.

View solution

large intestine **liver** **oesophagus**

pancreas **salivary gland** **stomach**

The words in the list can be used once, more than once or not at all.

State the name of **one** organ from the list that:

is where physical digestion occurs .....

releases hydrochloric acid .....

secretes protease and amylase .....

secretes insulin. .....

[4]

(b) State **two** functions of hydrochloric acid in the digestive system.

View solution

1 .....

2 .....

[2]

(c) Describe the importance of protease in the digestive system.

View solution

.....

.....

.....

.....

.....

.....

..... [3]

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(d) A student investigated the effect of amylase on starch.

View solution

Test-tube **X** contained starch only.

Test-tube **Y** contained starch and amylase.

After 30 minutes the contents of test-tubes **X** and **Y** were tested with iodine solution.

The contents of test-tubes **X** and **Y** turned different colours.

(i) Complete Table 3.1 with the expected results.

Table 3.1

test-tube	colour with iodine solution
X	
Y	

[2]

(ii) State the reason why the resulting colours were **not** the same for test-tubes **X** and **Y**.

View solution

.....

.....

..... [1]

[Total: 12]

4 The eye is a sense organ.

View solution

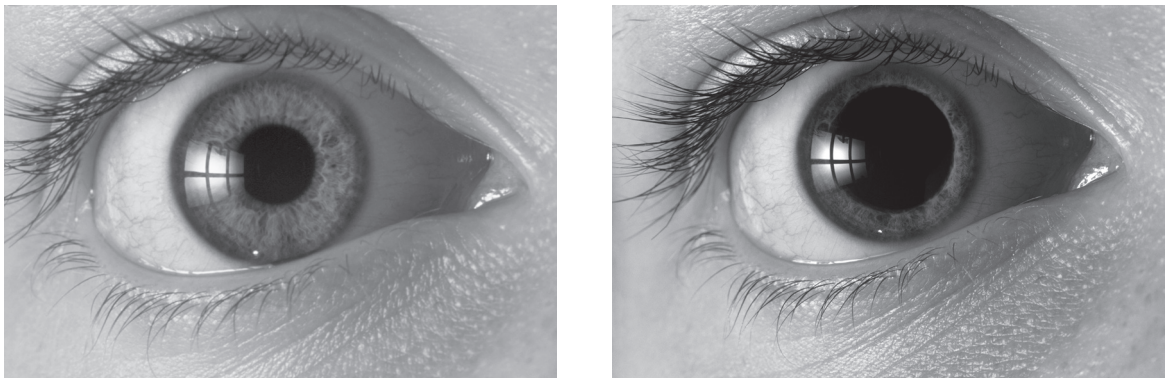
(a) Complete the sentence to describe sense organs.

Sense organs are groups of ..... cells responding to specific ..... such as light, ..., touch, temperature and chemicals.

[3]

View solution

(b) Fig. 4.1 shows the eye responding to a change in the environment.



before after

Fig. 4.1

Describe **and** explain the changes to the eye shown in Fig. 4.1.

.....

.....

.....

.....

..... [2]

(c) Fig. 4.2 is a diagram showing parts of the eye.

View solution

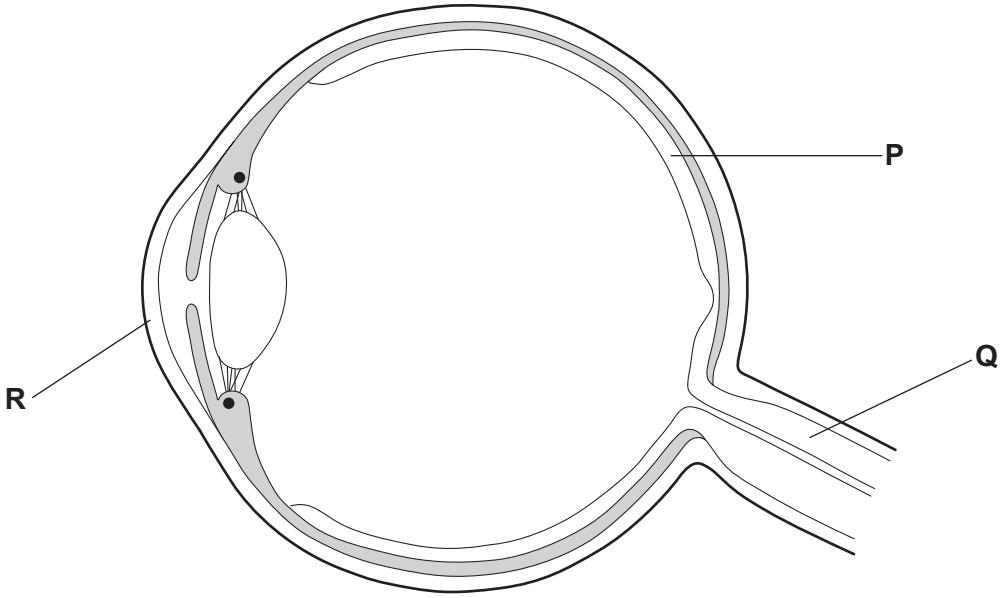


Fig. 4.2

(i) Draw an **X** on Fig. 4.2 to identify the position of the blind spot. [1]

(ii) The boxes on the left show the letters that represent some of the parts of the eye in Fig. 4.2.

View solution

The boxes on the right show the functions of the parts.

Draw lines to link each letter to its function.

letter in Fig. 4.2	function
	changes shape to focus light onto the retina
P	
	contains light receptors
Q	
	carries impulses to the brain
R	
	refracts light entering the eye

[3]

[Total: 9]

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5 **(a)** A student investigated the effect of immersing cylinders of potato tissue in different concentrations of sucrose solution.

The mass of a potato cylinder was measured before immersion and after being immersed for 60 minutes.

View solution

Table 5.1 shows the results.

Table 5.1

concentration of sucrose solution / mol per dm^3	mass of the potato cylinder before immersion in sucrose solution / g	mass of the potato cylinder after immersion in sucrose solution / g	percentage change in mass
0.10	5.30	5.70	+7.55
0.25	5.31	5.41	+1.88
0.50	5.30	5.23	–1.32
0.75	5.29	5.12	–3.21
1.00	5.30	5.02	–5.28

(i) The student has written several conclusions for the results shown in Table 5.1.

Tick (✓) all the correct conclusions.

The potato cylinder placed in 0.10 mol per dm^3 sucrose solution showed the largest percentage change in mass.	
The decrease in mass at 1.00 mol per dm^3 sucrose solution is caused by water leaving the potato cylinder.	
The 0.75 mol per dm^3 sucrose solution is the same concentration as the potato cylinder.	
The change in the potato cylinder mass is caused by water crossing the potato cell membranes.	
The potato cylinder immersed in a concentration of 0.25 mol per dm^3 sucrose solution decreases in mass.	
The higher the sucrose solution concentration, the larger the increase in the potato cylinder mass.	

[3]

(ii) State the name of the process that causes the results seen in Table 5.1.

..... [1]

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(iii) State **two** factors, other than concentration, that would influence the rate of the change in mass seen in Table 5.1.

1 .....

2 .....
[2]

(b) State the name of the part of the cell that prevents plant cells from bursting when immersed in distilled water.

..... [1]

(c) Water is important as part of a balanced diet.

View solution

(i) Circle **two** uses of water in the body.

as an enzyme **as genetic material** **as a solvent**

for phagocytosis **for transport**

[2]

(ii) State **two** other components of a balanced diet.

View solution

1 .....

2 .....
[2]

[Total: 11]

6 **(a)** Table 6.1 shows some information about three different types of blood vessel.

View solution

(i) Circle the correct name of the type of blood vessel in each row in Table 6.1.

Table 6.1

type of blood vessel	name of the type of blood vessel	relative thickness of the wall	relative diameter of the lumen
X	artery vein capillary	thin	large
Y	artery vein capillary	very thin	very narrow
Z	artery vein capillary	thick	narrow

[1]

(ii) State the name **and** function of the structures present in blood vessel **X** but absent in blood vessels **Y** and **Z** in Table 6.1.

name .....

function .....

.....

[2]

View solution

(b) Fig. 6.1 is a diagram showing a simplified circulatory system in a human.

View solution

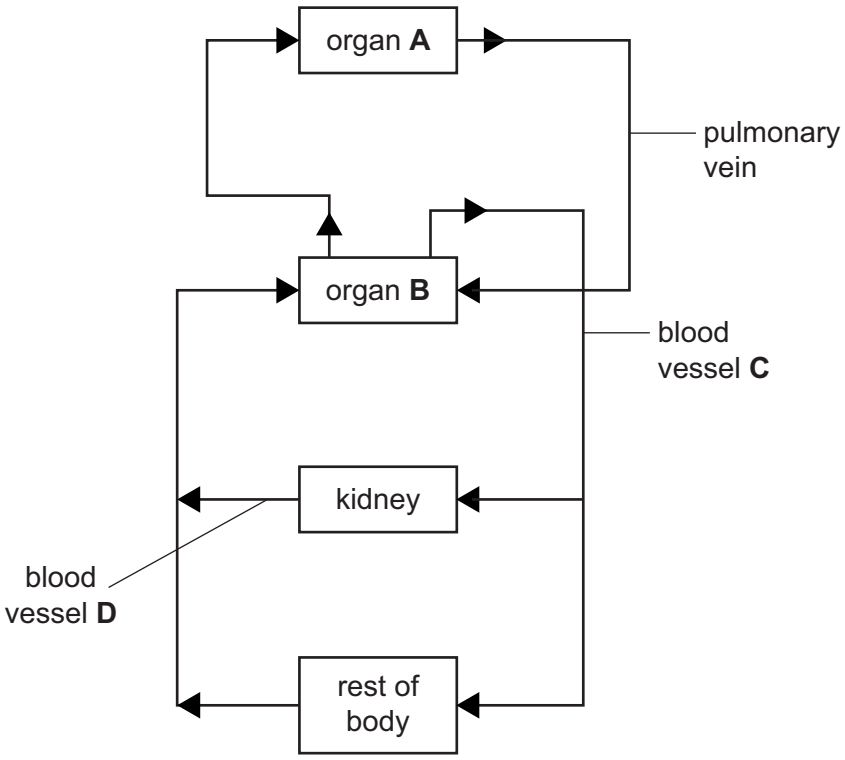

Fig. 6.1

Identify the names of the parts labelled in Fig. 6.1.

organ **A** .....

organ **B** .....

blood vessel **C** .....

blood vessel **D** .....

[4]

(c) State the names of **two** substances excreted by the kidneys.

View solution

1 .....

2 .....

[2]

(d) The circulatory and digestive systems are organ systems.

View solution

State the names of **two** other organ systems in humans.

1 .....

2 .....

[2]

[Total: 11]

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7 **(a)** Some pollution in oceans is caused by discarded plastics.

View solution

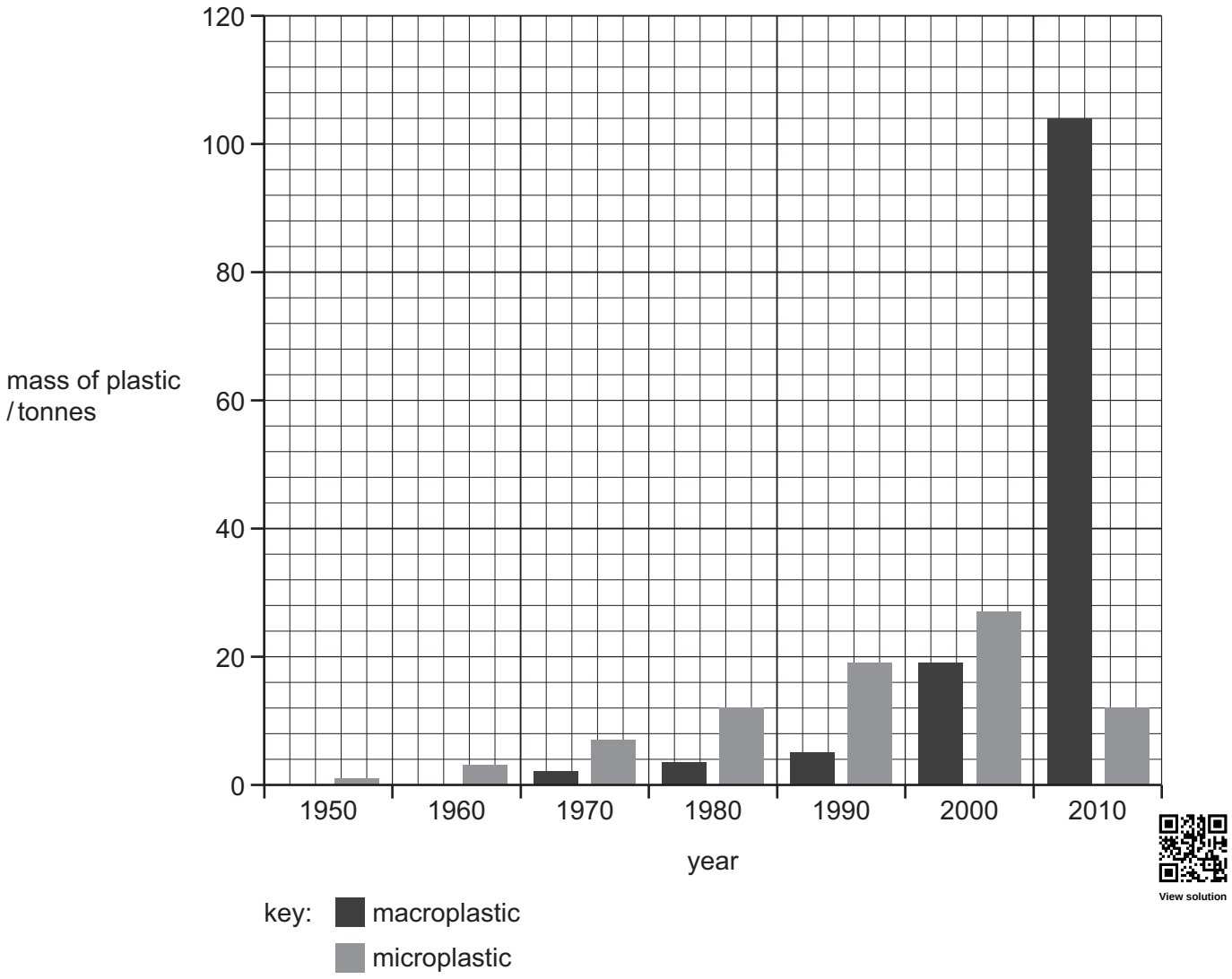
Macroplastics are 0.5 cm and greater in diameter.

Microplastics are smaller than 0.5 cm in diameter.

(i) State the smallest size of a macroplastic in millimetres.

..... .mm [1]

(ii) Fig. 7.1 shows the mass of plastic pollution caused by macroplastics and microplastics in shallow coastal waters between 1950 and 2010.



View solution

Fig. 7.1

Describe the changes in the masses of macroplastics **and** microplastics shown in Fig. 7.1.

.....

.....

.....

.....

.....

.....

..... [3]

(b) Describe **two** ways that plastics can harm animals in the ocean.

View solution

1 .....

.....

2 .....

.....

[2]

(c) Apart from plastics, state **one** other source of pollution in aquatic ecosystems.

..... [1]

[Total: 7]

View solution

8 Reproduction is one characteristic of living organisms.

(a) State **two** other characteristics.

View solution

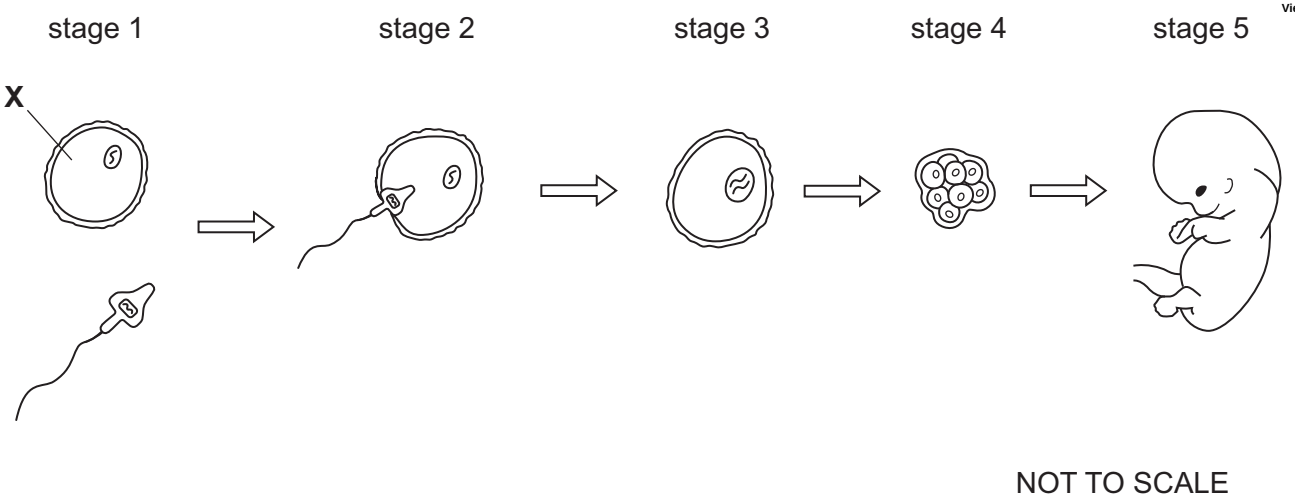
1 .....

2 .....

[2]

(b) Fig. 8.1 shows some of the stages of reproduction in humans.

View solution



NOT TO SCALE

Fig. 8.1

(i) State the name of cell **X** in stage **1** in Fig. 8.1.

..... [1]

(ii) State the name of the process occurring between stage **2** and stage **3** in Fig. 8.1.

..... [1]

(iii) State the name of the cell in stage **3** in Fig. 8.1.

..... [1]

(iv) State the number of the stage in Fig. 8.1 that implants into the uterus lining.

..... [1]

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(c) Fig. 8.2 shows some of the parts involved during pregnancy.

View solution

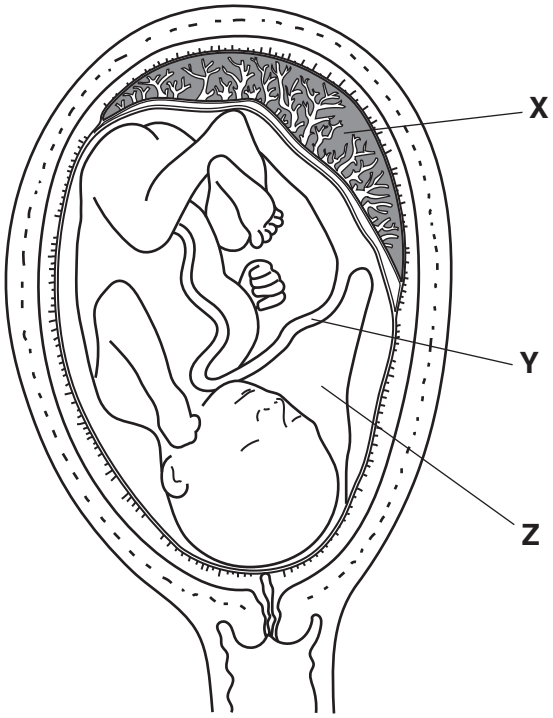

Fig. 8.2

(i) State the names of the parts labelled **X** and **Y** in Fig. 8.2.

X .....

Y .....

[2]

(ii) State the function of the part labelled **Z** in Fig. 8.2.

View solution

.....

.....

..... [1]

[Total: 9]

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