Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

4946100954

BIOLOGY **0610/43**

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.

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1 **(a)** The movement of molecules within an organism can occur by diffusion and active transport.

Complete Table 1.1 by placing ticks (✓) to show the correct features of each process.

Table 1.1

feature	active transport	diffusion
movement of particles always occurs across a cell membrane		
movement of molecules during gas exchange		
rate of movement of particles is higher when the concentration gradient is larger		
requires energy from respiration		

[4]

(b) Explain why active transport is important in root hair cells.

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.....

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..... [3]

[Total: 7]

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2 Transpiration is the loss of water vapour from the leaves of a plant.

(a) Complete the sentence describing transpiration.

Water evaporates from the surfaces of the ..... cells into the air spaces and then ..... out of the leaves, through the stomata, as water vapour.

[2]

(b) Explain how water moves upwards in the xylem.

.....

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..... [3]

(c) A student investigated the effect of wind speed on the rate of transpiration in a small *Pachira aquatica* tree.

They measured the rate of transpiration when the plant was placed in different wind speeds in both the light and the dark. The tree was given an adequate supply of water.

The results of this investigation are shown in Fig. 2.1.

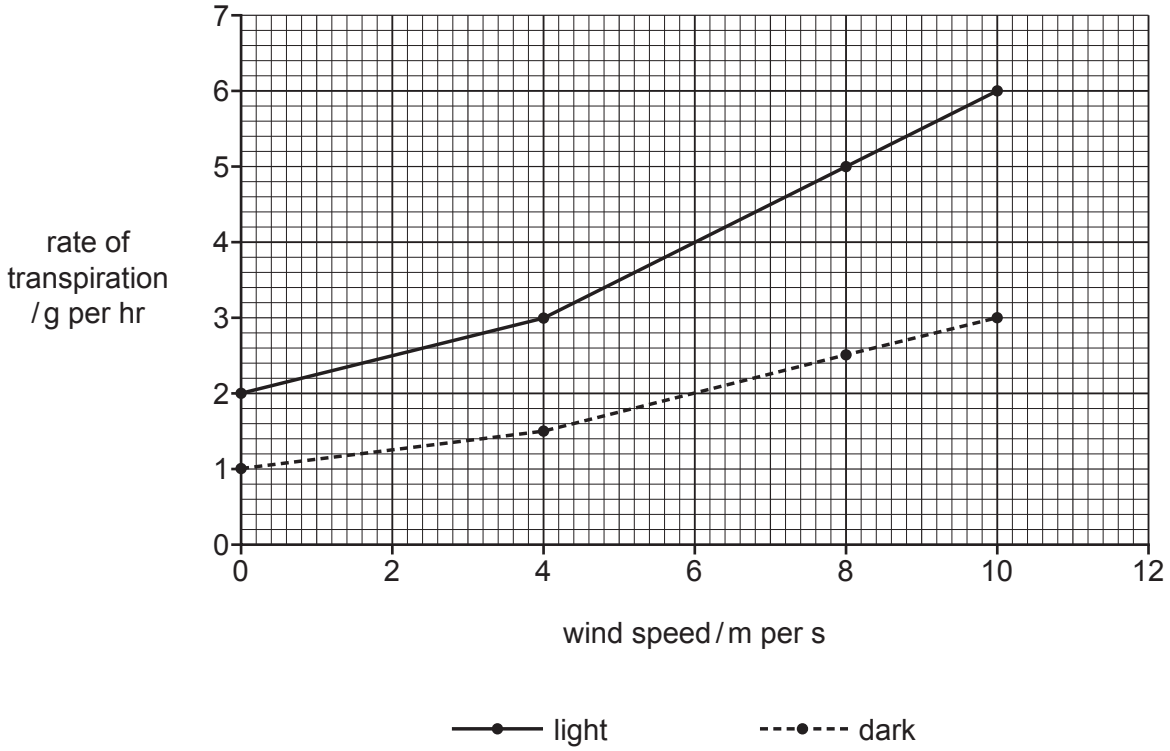


Fig. 2.1

(i) Describe and explain the results shown in Fig. 2.1.

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..... [4]

(ii) The investigation was repeated in the light with the same species of tree in an environment where the humidity was higher.

Draw a line **on Fig. 2.1** to predict the results in the **light** with increased humidity. [1]

(iii) The investigation described in **2(c)** was repeated (different wind speeds in both the light and the dark).

However, the tree was **not** given an adequate supply of water during the investigation.

Predict the result and explain your prediction.

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..... [4]

[Total: 14]

3 Fig. 3.1 is a diagram of a section through a human heart.

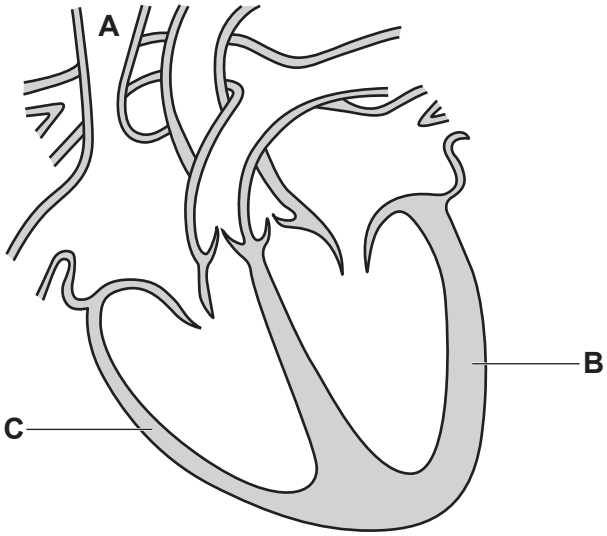


Fig. 3.1

(a) Draw an **X** on the septum in Fig. 3.1. [1]

(b) Explain the reason for the difference between the thickness of the walls at **B** and at **C** in Fig. 3.1.

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.....

..... [2]

(c) A red blood cell enters the vena cava at **A** in Fig. 3.1.

Explain how the red blood cell is moved from the vena cava to the aorta.

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..... [6]

(d) An athlete measured her heart rate during a running race. She recorded it before the race, during the race and during her recovery.

Her results are shown in Fig. 3.2.

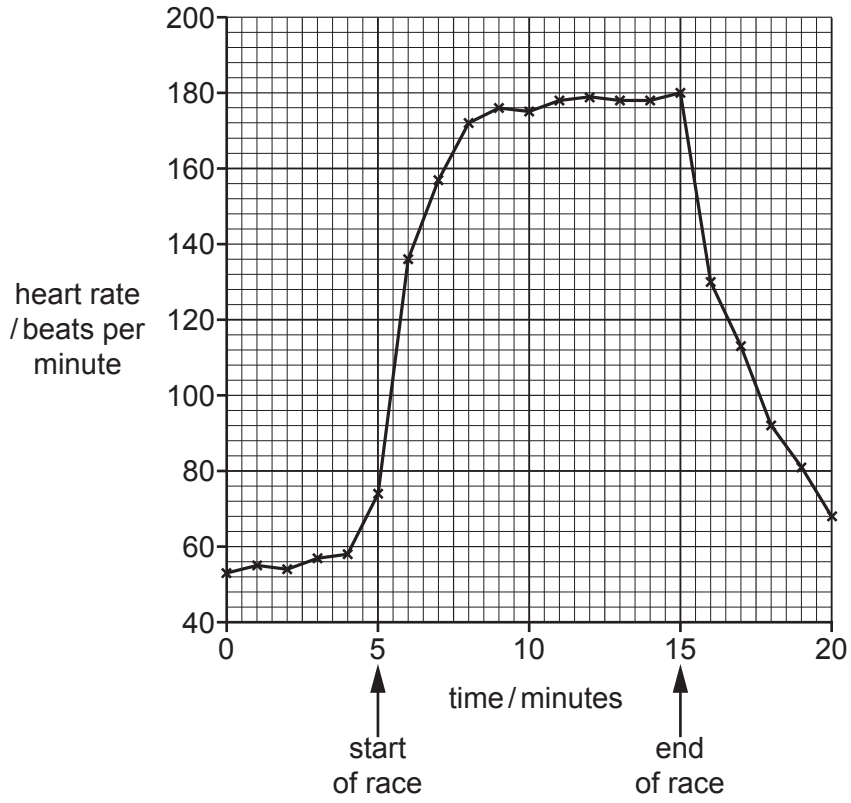


Fig. 3.2

(i) Suggest how the athlete could monitor the activity of her heart.

.....

.....

..... [1]

(ii) Calculate the percentage change in heart rate from the maximum heart rate reached during the race until the heart rate recorded at 18 minutes.

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

Space for working.

..... %
[3]

(iii) Explain why heart rate must increase during exercise.

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..... [3]

[Total: 16]

4 **(a)** Urea is a waste product.

(i) Describe how urea is formed.

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..... [3]

(ii) State the component of blood that transports urea.

..... [1]

(iii) State why urea must be excreted.

.....

..... [1]

(iv) State the name of the blood vessel that carries blood away from the kidney.

..... [1]

(b) Fig. 4.1 shows a drawing of a nephron in the human kidney and associated blood vessels.

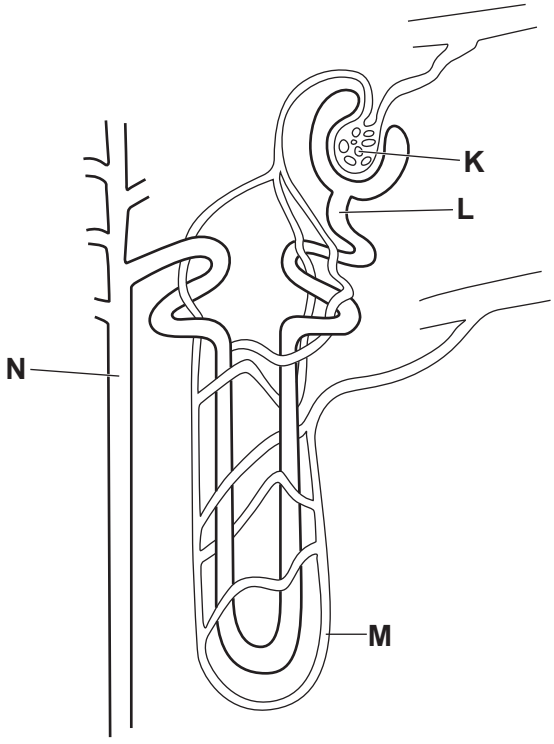


Fig. 4.1

Describe how the structures labelled in Fig. 4.1 produce urine.

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..... [4]

(c) Urea can be used as a fertiliser as it is a source of nitrogen.

Explain the importance of nitrate ions to plants.

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..... [1]

(d) A farmer applied fertiliser to a field next to a lake.

Suggest **two** precautions the farmer should take when applying fertiliser to reduce the risk of eutrophication occurring in the lake.

1 .....

2 .....
[2]

[Total: 13]

5 **(a)** Describe the role of progesterone in pregnancy.

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..... [3]

(b) Fig. 5.1 shows a drawing of a section of a human placenta. The arrows show the direction of blood flow.

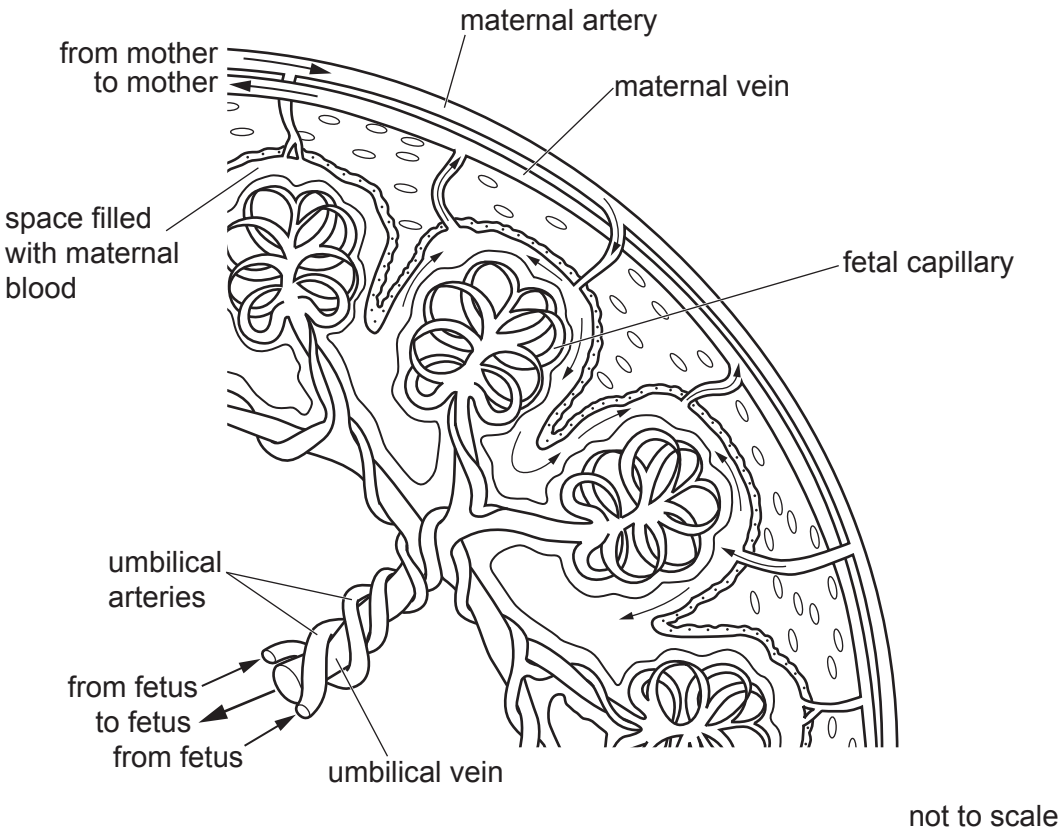


Fig. 5.1

Substances move across the placenta by diffusion.

(i) State the names of **two useful** substances that move from the blood of the mother to the blood of the fetus.

1 .....

2 .....
[2]

(ii) Using the information in Fig. 5.1, suggest how the placenta is adapted for efficient diffusion.

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..... [3]

(c) The Rhesus (Rh) factor is a protein that is found on the surface of red blood cells in some people. If the protein is present then the individual is Rh positive.

The allele for the presence of the Rh factor is dominant and is represented by the letter **D**. The recessive allele is represented by the letter **d**.

If a mother is Rh negative and the fetus is Rh positive there can be problems during pregnancy.

A Rh negative mother and a heterozygous Rh positive father have a child.

Complete the Punnett square and determine the probability of the child being Rh positive.

		father's gametes	
mother's gametes			

probability .....
[3]

[Total: 11]

6 **(a)** Fig. 6.1 shows the percentage of land covered by forest in a country from 1660 until 2000.

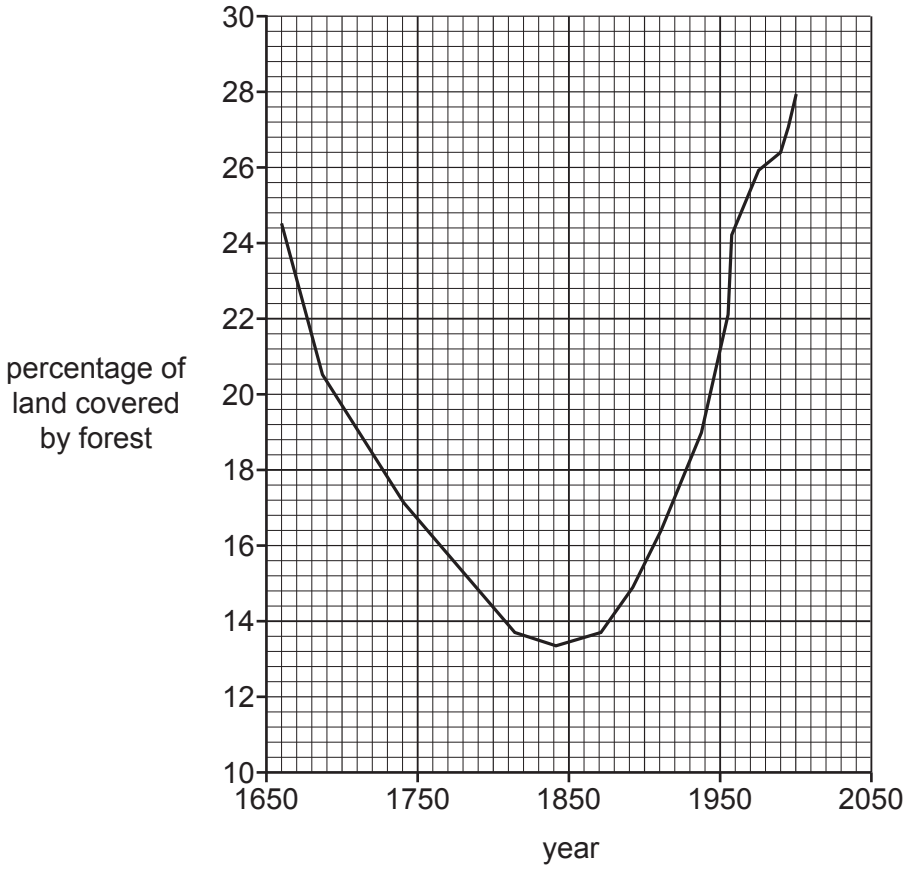


Fig. 6.1

(i) Using the information in Fig. 6.1, state which 10-year period had the highest increase in the percentage of land covered by forest.

..... [1]

(ii) Outline how human activities could cause the change in the percentage of land covered by forest from 1660 to 1800 shown in Fig. 6.1.

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..... [3]

(b) It is estimated that 40% of plant species are at risk of extinction.

Seed banks can store seeds from many species for a long time.

Table 6.1 shows some information about one plant species that is stored in a seed bank.

Table 6.1

mass of one seed / g	percentage oil content	percentage protein content
1.96	71	11

(i) Using the data shown in Table 6.1, calculate the mass of protein in one seed.

..... g [1]

(ii) Suggest why many plants can easily be conserved using seed banks.

.....

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..... [2]

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[Turn over

(iii) Describe why conservation projects such as seed banks are important.

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..... [5]

[Total: 12]

7 **(a)** State the name of a chemical element that is found in all proteins but **not** in carbohydrates or fats.

..... [1]

(b) Table 7.1 shows the names of some biological molecules, enzymes and the organs that produce the enzymes.

Complete Table 7.1.

Table 7.1

large biological molecule	products of the breakdown of the large biological molecule	enzyme that catalyses the breakdown of the large biological molecule	organ that produces the enzyme
oil			pancreas
glycogen		glycogen phosphorylase	liver
	maltose	amylase	
protein			stomach

[4]

(c) State **two** hormones that can affect the concentration of glycogen in the liver.

1 .....

2 .....

[2]

[Total: 7]

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