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Cambridge Assessment International Education

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CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

3110803636

BIOLOGY **0610/43**

Paper 4 Theory (Extended) **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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[Turn over

1 **(a)** Fig. 1.1 is a diagram of the human digestive system.

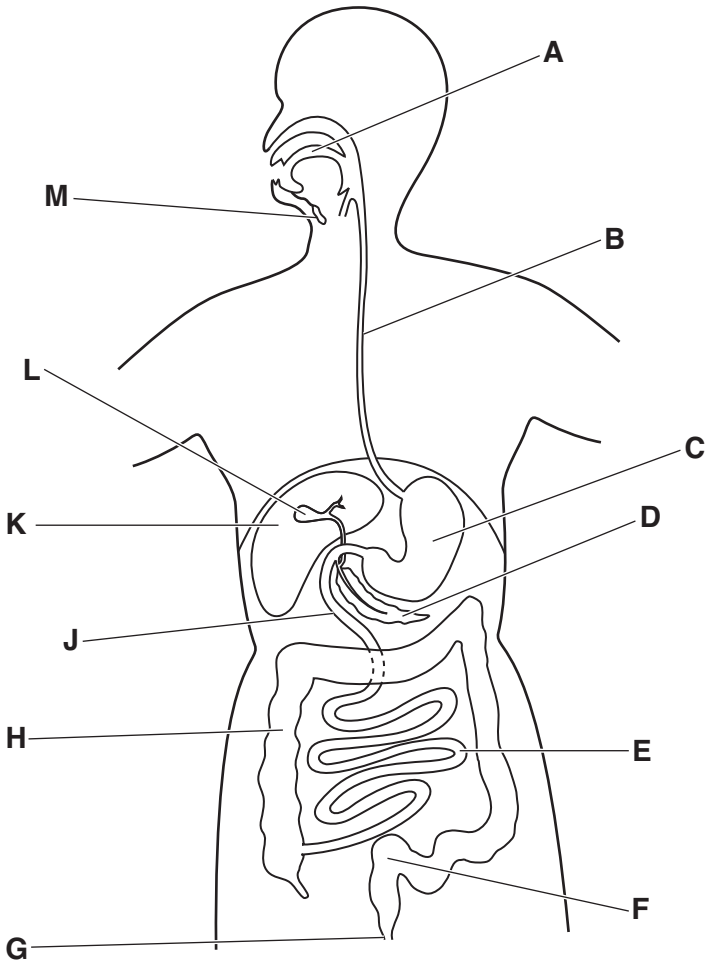


Fig. 1.1

Table 1.1 shows information about some of the structures shown in Fig. 1.1.

Complete Table 1.1, using Fig. 1.1.

Table 1.1

name of the structure	function	letter in Fig. 1.1
		G
	produces amylase	
gall bladder		
	transports food to the stomach	

[4]

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(b) (i) Describe the role of chemical digestion.

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..... [3]

(ii) Maltose is digested by maltase.

State the name of the product of this reaction.

..... [1]

(iii) Describe where maltose is digested in the small intestine.

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..... [1]

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(iv) Explain why amylase digests starch in the small intestine but does **not** digest starch in the stomach.

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..... [6]

[Total: 15]

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2 **(a)** Alveoli are the gas exchange surface in humans.

State **three** features of alveoli that make them an effective gas exchange surface.

1 .....

2 .....

3 .....

[3]

(b) Fig. 2.1 is a diagram of the human breathing system.

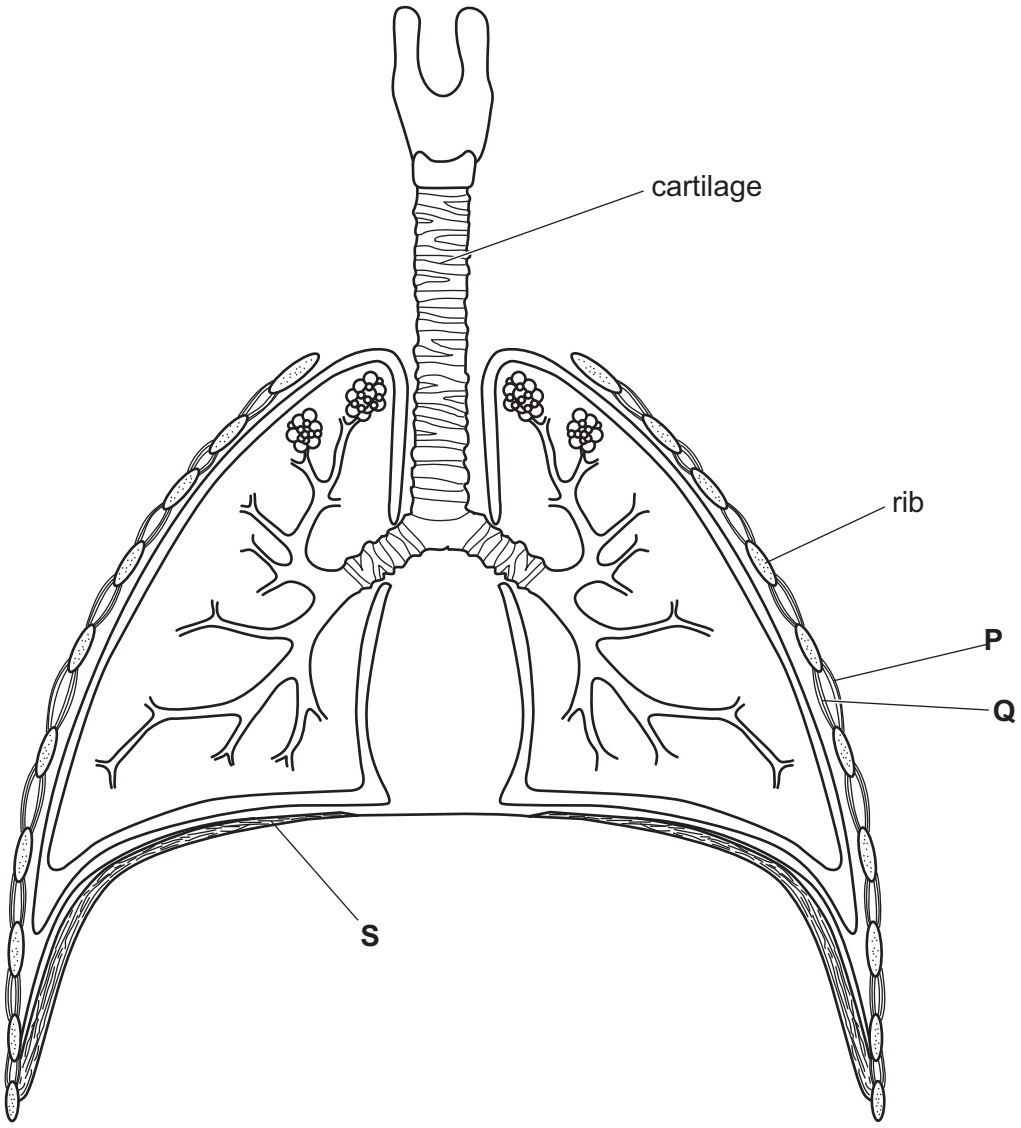


Fig. 2.1

(i) Three muscles involved in inspiration are labelled **P**, **Q** and **S** in Fig. 2.1.

Identify the letters in Fig. 2.1 that label the muscles which contract during inspiration.

..... [1]

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(ii) State the function of cartilage in the breathing system.

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..... [1]

(c) (i) State the balanced chemical equation for aerobic respiration.

..... [2]

(ii) During physical activity breathing changes.

Explain the mechanism that links the increase in physical activity to the changes in breathing.

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[Total: 10]

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3 **(a)** Complete the sentences about the control of blood glucose concentration.

Blood glucose concentration increases after a person eats a meal containing carbohydrates. This causes the ..... to release insulin. Insulin causes the ..... to remove glucose from the blood and convert it into ..... .

The control of blood glucose concentration is an example of ..... .
[4]

(b) Outline the treatment of type 1 diabetes.

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..... [2]

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(c) A scientist investigated the effect of an injection of glucose solution on blood glucose concentration in healthy people. The injection was given at 0 minutes.

Fig. 3.1 shows the results.

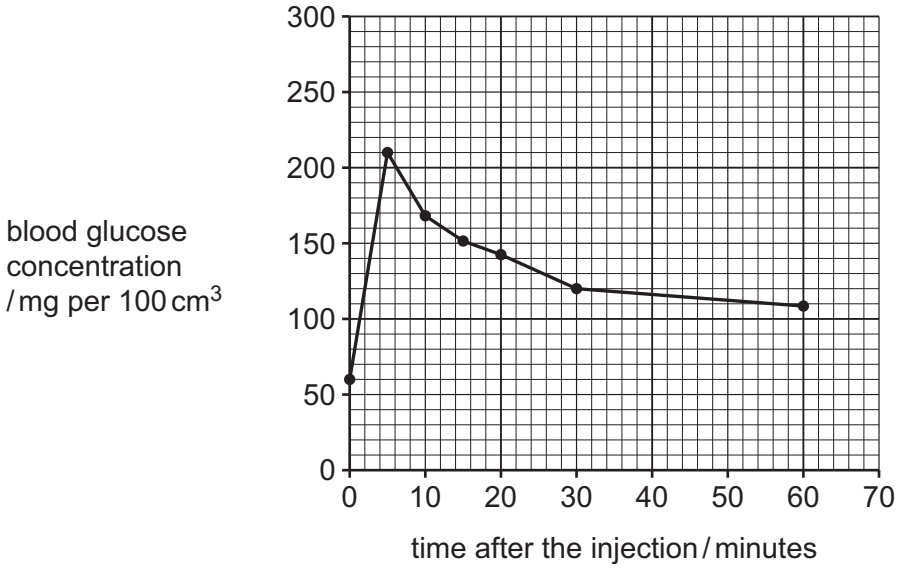


Fig. 3.1

Calculate the percentage change in the blood glucose concentration from 5 minutes after the injection to 30 minutes after the injection.

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

Space for working.

..... % [3]

(d) Adrenaline also affects blood glucose concentration.

Suggest how this is an advantage for the “fight or flight” response.

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.....[3]

[Total: 12]

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4 Fig. 4.1 is a photograph of a water lily, *Nymphaea alba*, in a lake.



Fig. 4.1

Fig. 4.2 is a photomicrograph of a cross-section of part of a water lily leaf.

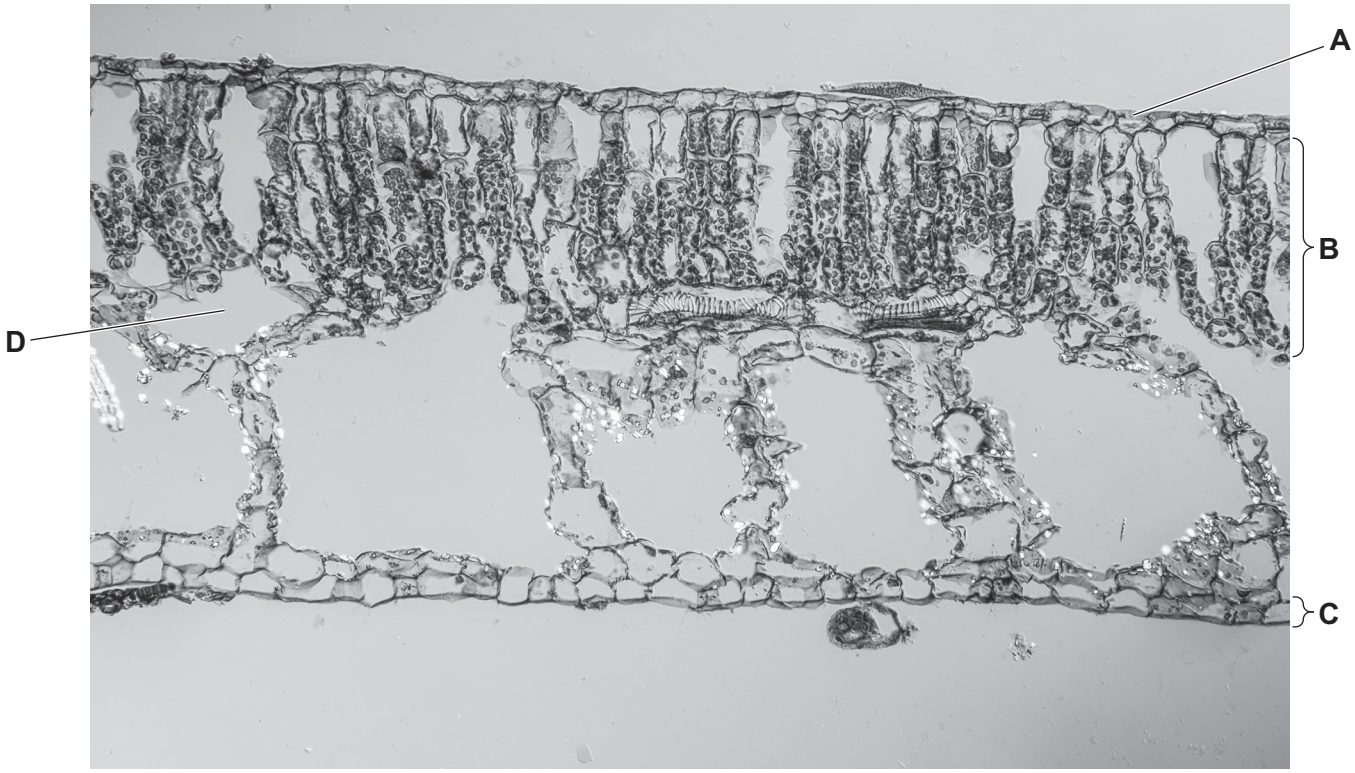


Fig. 4.2

(a) (i) Identify tissue **B** and tissue **C** labelled in Fig. 4.2.

B .....

C .....

[2]

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(ii) Describe **two** functions in water lilies of the area labelled **D** in Fig. 4.2.

1 .....

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2 .....

..... [2]

(iii) A green pigment is found in tissue **B** in Fig. 4.2.

Describe the function of this pigment.

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..... [2]

(iv) Water lilies have a very thin cuticle compared to a plant growing on land.

Explain how this is an adaptation for water lilies.

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..... [2]

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(b) Table 4.1 shows the stomatal density and habitat of two different hydrophytes.

Table 4.1

type of plant	habitat	stomatal density on upper leaf surface / stomata per mm^2	stomatal density on lower leaf surface / stomata per mm^2
pondweed	under the water	0	0
water lily	leaves on the surface of the water	573	0

(i) Convert the stomatal density of the upper leaf surface of the water lily to stomata per cm^2.

..... stomata per cm^2 [1]

(ii) Using the data in Table 4.1, explain the stomatal density found in the two different hydrophytes.

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..... [4]

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(c) Fig. 4.3 is a photograph of rice, *Oryza sativa*, a monocotyledonous crop plant grown in flooded fields in waterlogged soils.



Fig. 4.3

(i) Identify a characteristic visible in Fig. 4.3 that can be used to classify rice as a monocotyledonous plant.

..... [1]

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(ii) Waterlogged soil contains very low concentrations of oxygen.

Suggest how this limits the amount of proteins a plant can make.

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..... [3]

[Total: 17]

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5 Penicillin is an antibiotic.

(a) (i) State the type of organism that antibiotics are used to kill.

..... [1]

(ii) It is important to try and limit the development of antibiotic resistance.

Describe ways of limiting the development of antibiotic resistance.

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..... [2]

(b) Penicillin is produced by an organism called *Penicillium chrysogenum*.

Fig. 5.1 is a diagram of *Penicillium chrysogenum*.

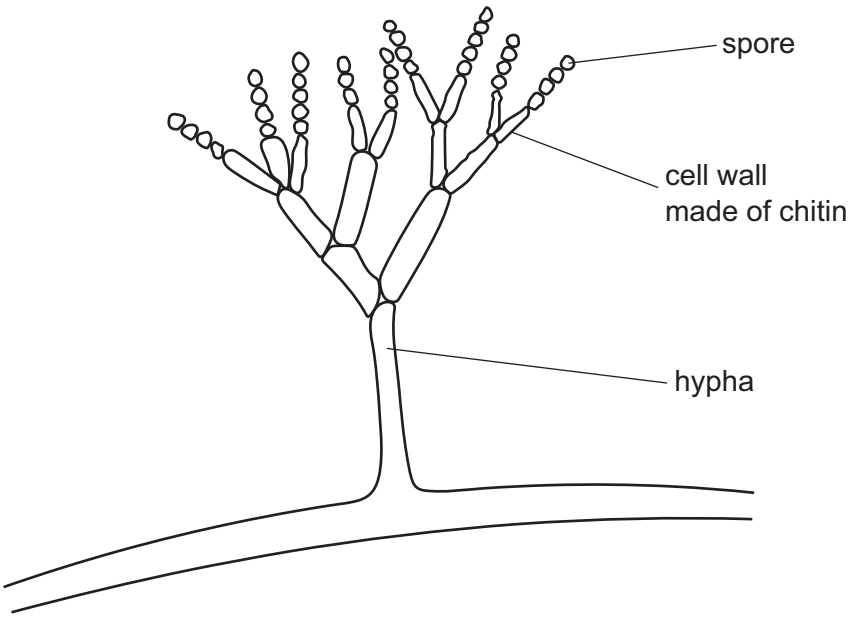


Fig. 5.1

(i) State what *Penicillium* in the scientific name of *Penicillium chrysogenum* represents in the binomial system.

..... [1]

(ii) Using the information in Fig. 5.1, identify the kingdom that contains *Penicillium chrysogenum.*

..... [1]

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(c) Penicillin can be made in a fermenter.

(i) State the name of **one other** product made in a fermenter.

..... [1]

Fig. 5.2 shows a fermenter.

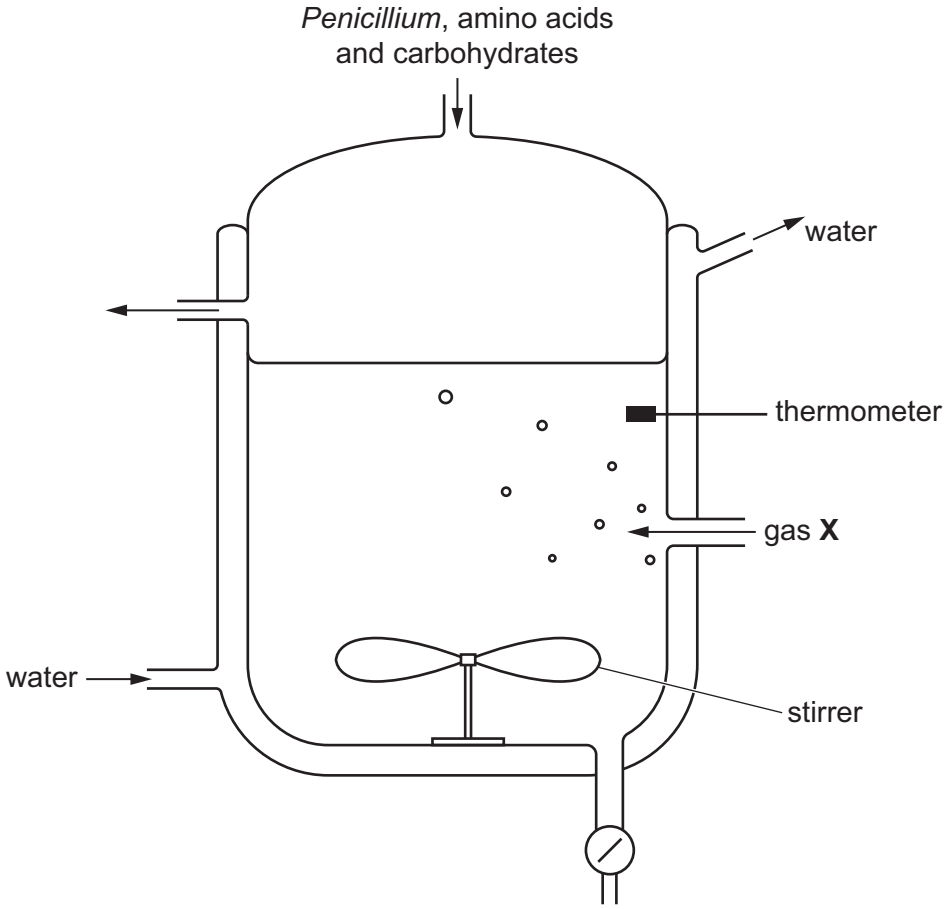


Fig. 5.2

(ii) Gas **X** in Fig. 5.2 is needed for the production of penicillin.

State the name of gas **X**.

..... [1]

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(iii) The concentration of gas **X** is one of the conditions that must be controlled to ensure that penicillin is produced.

State the **other** conditions required to produce penicillin **and** describe how they are controlled in the fermenter.

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..... [5]

(d) State the name of the organism that is used in bread-making **and** in biofuel production.

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[Total: 13]

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6 In Fig. 6.1, the diagrams of an island show the land covered by forest in 1982 and 2013.



Fig. 6.1

(a) (i) Describe the change in land covered by forest between 1982 and 2013 in Fig. 6.1.

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(ii) State **two** possible causes for the change in land covered by forest in Fig. 6.1.

1 .....

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2 .....

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[2]

(b) Fig. 6.2 is a diagram of the carbon cycle.

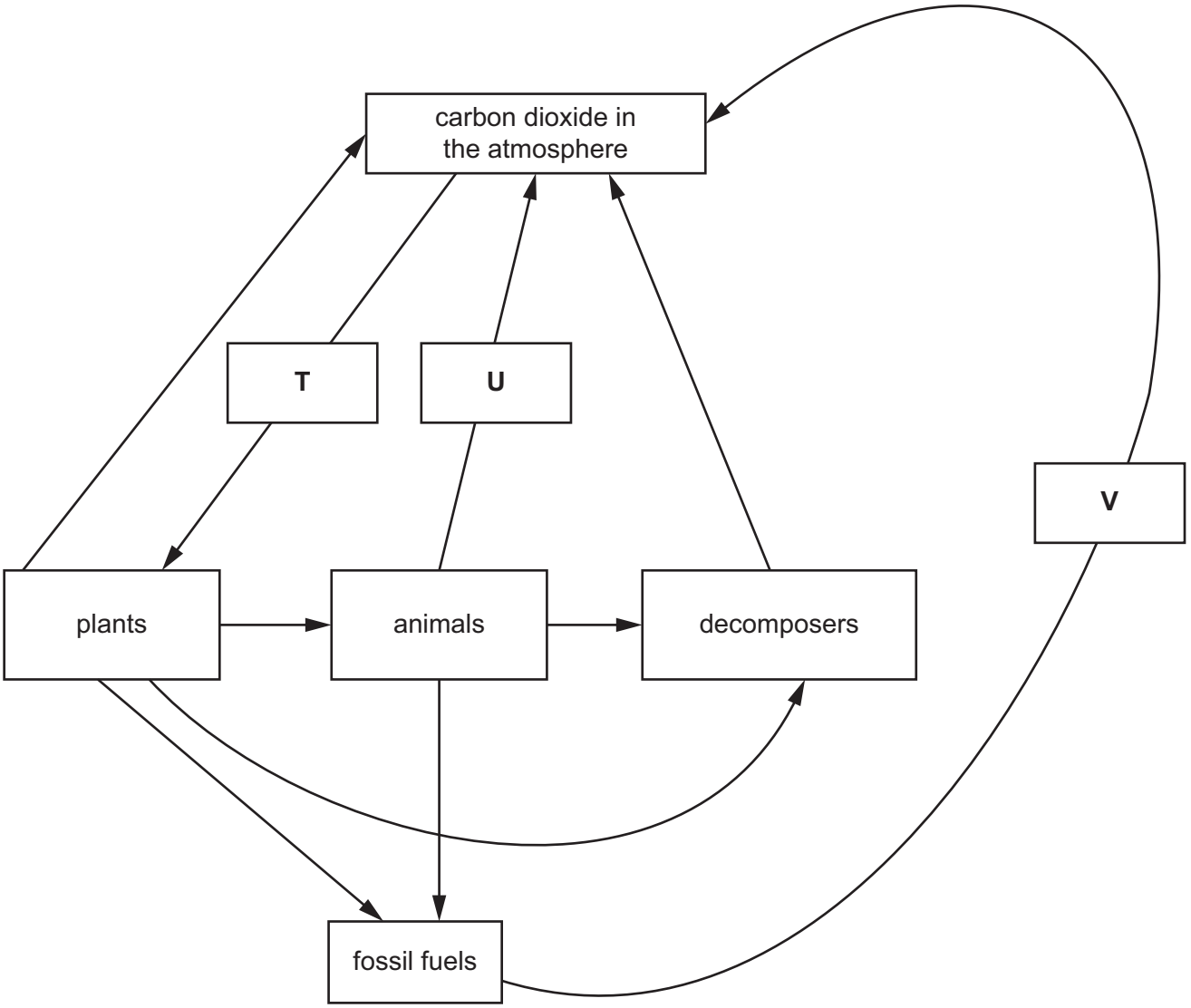


Fig. 6.2

State the names of the processes labelled **T**, **U** and **V** in Fig. 6.2.

T .....

U .....

V .....

[3]

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(c) Deforestation is linked to an increase in global temperatures.

(i) Explain how deforestation can contribute to an increase in global temperatures.

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(ii) Describe **other** undesirable effects of deforestation.

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[Total: 13]

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