Cambridge Assessment International Education

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CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5550183392

BIOLOGY **0610/31**

Paper 3 Theory (Core) **May/June 2022**

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 diagram of a plant cell.

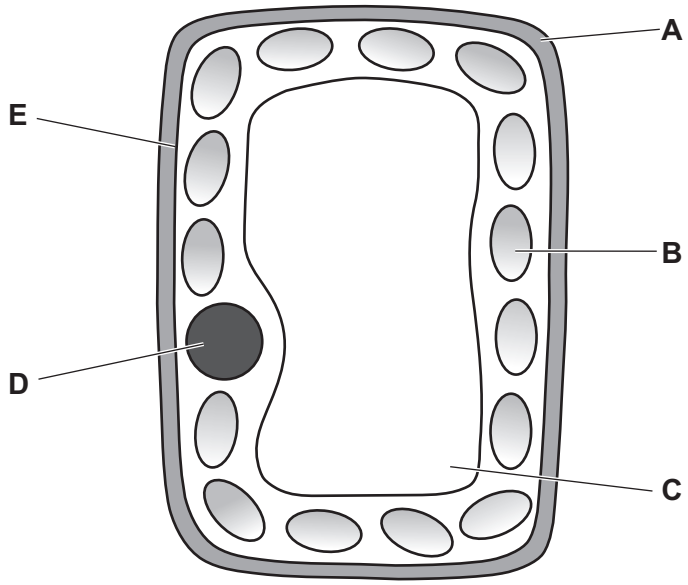


Fig. 1.1

The boxes on the left contain the letters that identify some parts of the plant cell in Fig. 1.1.
The boxes on the right show the functions of some parts of a cell.
Draw **five** lines to link each letter to its correct function.

letter from Fig. 1.1	**function**
	contains the genetic material
A	
	controls which substances enter and leave the cell
B	
	filled with sap to support the cell
C	
	strengthens the cell
D	
	transports nerve impulses
E	
	where photosynthesis occurs

[5]

(b) State the names of **two** different types of plant cell.

1 .....

2 .....

[2]

(c) A student used a potato as a source of plant tissue. The student cut six cylinder-shaped pieces from the potato. Each potato cylinder had the same diameter.

Each potato cylinder was immersed in either water or one of five different concentrations of sugar solution.

The student measured the length of the potato cylinders before immersion and after being immersed for 30 minutes.

Table 1.1 shows the results.

Table 1.1

concentration of sugar solution / mol per dm^3	length of potato cylinder before immersion / mm	length of potato cylinder after immersion / mm	change in length of potato cylinder / mm
0.0	49.5	52.0	+ 2.5
0.2	50.0	52.0	+ 2.0
0.4	50.5	51.5	+ 1.0
0.6	50.5	51.0	+ 0.5
0.8	50.0	49.0	
1.0	50.0	48.5	– 1.5

(i) Use the information in Table 1.1 to calculate the change in length of the potato cylinder immersed in the 0.8 mol per dm^3 sugar solution.

..... mm [1]

(ii) Use the information in Table 1.1 to calculate the percentage increase in length of the potato cylinder immersed in the 0.2 mol per dm^3 sugar solution.

..... %
[2]

(d) State the name of the process that causes water to enter or leave the potato cells.

..... [1]

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(e) Describe the expected change in appearance of a potato **cell** that was immersed in a 1.0 mol per dm^3 sugar solution.

.....

.....

..... [1]

[Total: 12]

2 **(a)** Fig. 2.1 is a pie chart showing the percentages of the different types of birth control that are used globally.

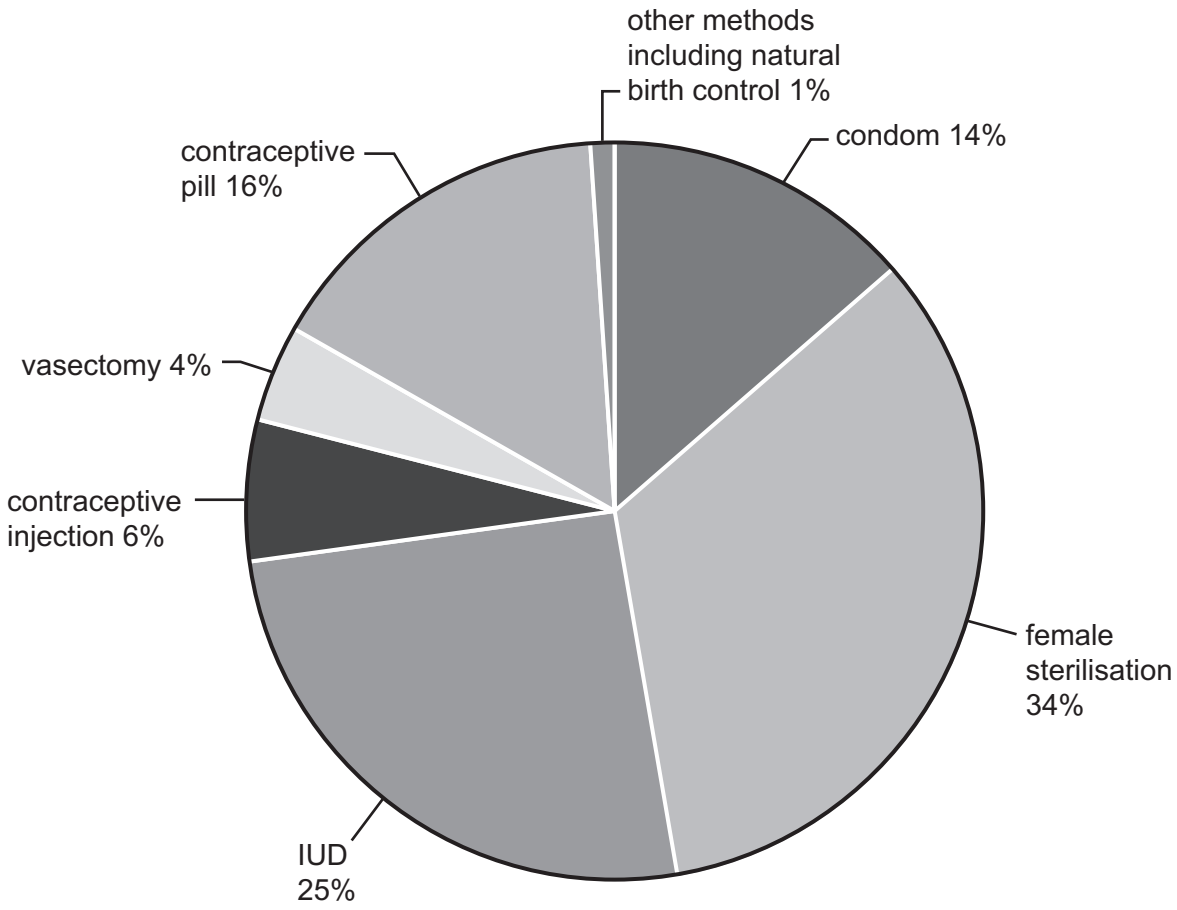


Fig. 2.1

(i) State the most commonly used form of birth control shown in Fig. 2.1.

..... [1]

(ii) State the total percentage using surgical methods of birth control in Fig. 2.1.

..... % [1]

(iii) State **two** forms of natural birth control.

1 .....

2 .....
[2]

(iv) State the type of contraception shown in Fig. 2.1, that also protects against the spread of sexually transmitted infections (STIs).

..... [1]

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(b) HIV infection is an example of an STI.

(i) State the name of the type of pathogen that causes an HIV infection.

..... [1]

(ii) Describe how HIV can be transmitted.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 9]

3 The inheritance of coat texture in guinea pigs is controlled by a single gene.

(a) Define the term gene.

.....

.....

.....

..... [2]

(b) Fig. 3.1 shows a photograph of a guinea pig with a rough coat and a guinea pig with a smooth coat.



rough coat smooth coat

Fig. 3.1

The allele for a rough coat is dominant and represented by the letter **R**.
The allele for a smooth coat is recessive and represented by the letter **r**.

Fig. 3.2 is a pedigree diagram showing the inheritance of coat texture in some guinea pigs.

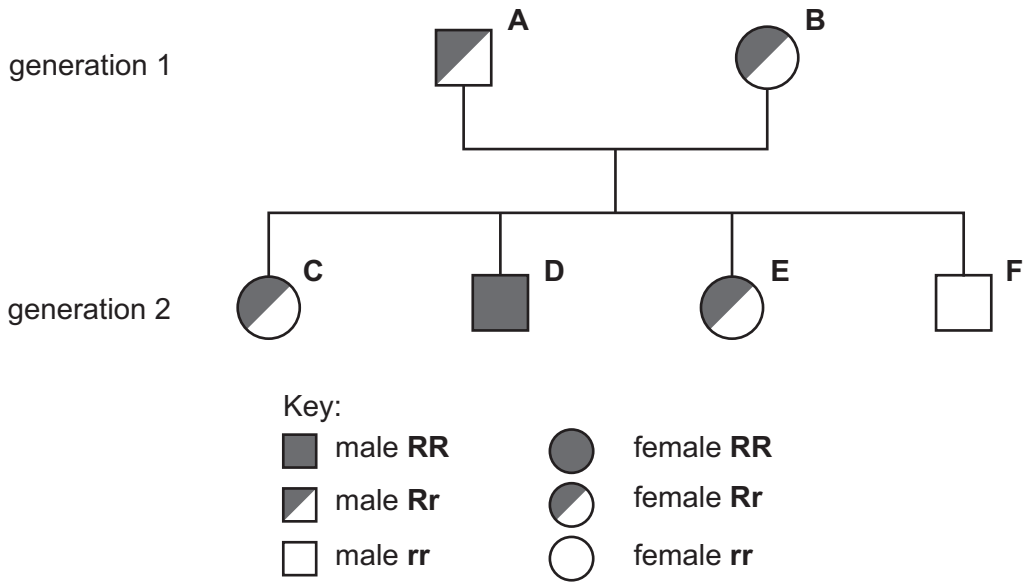


Fig. 3.2

(i) State the total number of guinea pigs with smooth coats in Fig. 3.2.

..... [1]

(ii) State the letter of a guinea pig that has a homozygous dominant genotype in Fig. 3.2.

..... [1]

(iii) State the total number of male guinea pigs in Fig. 3.2.

..... [1]

(c) Two guinea pigs are bred together.

- The genotype of the male guinea pig is **RR**.
- The genotype of the female guinea pig is **Rr**.

Complete Fig. 3.3 to show the:

- possible genotypes of the offspring from this cross
- the probability of offspring having a smooth coat.

		male	
		.....	.....
female	.....	.....	.....
	.....	.....	.....

probability of offspring having a smooth coat .....

Fig. 3.3

[3]

(d) Complete the sentence about breeding.

Two identical homozygous individuals that breed together will be

..... -breeding. [1]

[Total: 9]

4 **(a)** Fig. 4.1 is a diagram of the female reproductive system in humans.

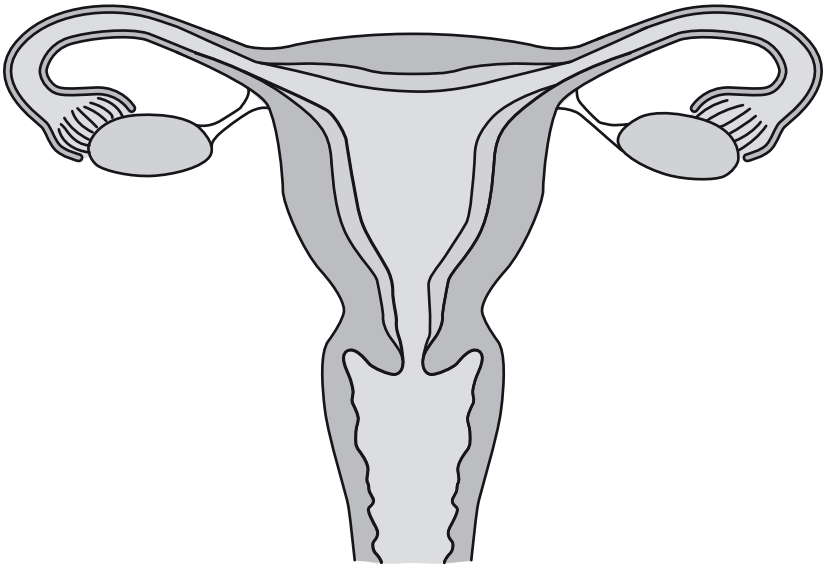


Fig. 4.1

(i) On Fig. 4.1:

- Circle a part that releases egg cells.
- Draw a label line and the letter **W** to show where fertilisation occurs.
- Draw a label line and the letter **X** to show where the fetus develops.

[3]

(ii) State the name of the process that produces egg cells.

..... [1]

(iii) State the names of **two** parts of the female reproductive system that sperm must pass through to reach the egg cell.

1 .....

2 .....

[2]

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(b) Fig. 4.2 is a graph showing the changes in the thickness of the uterus lining during a menstrual cycle.

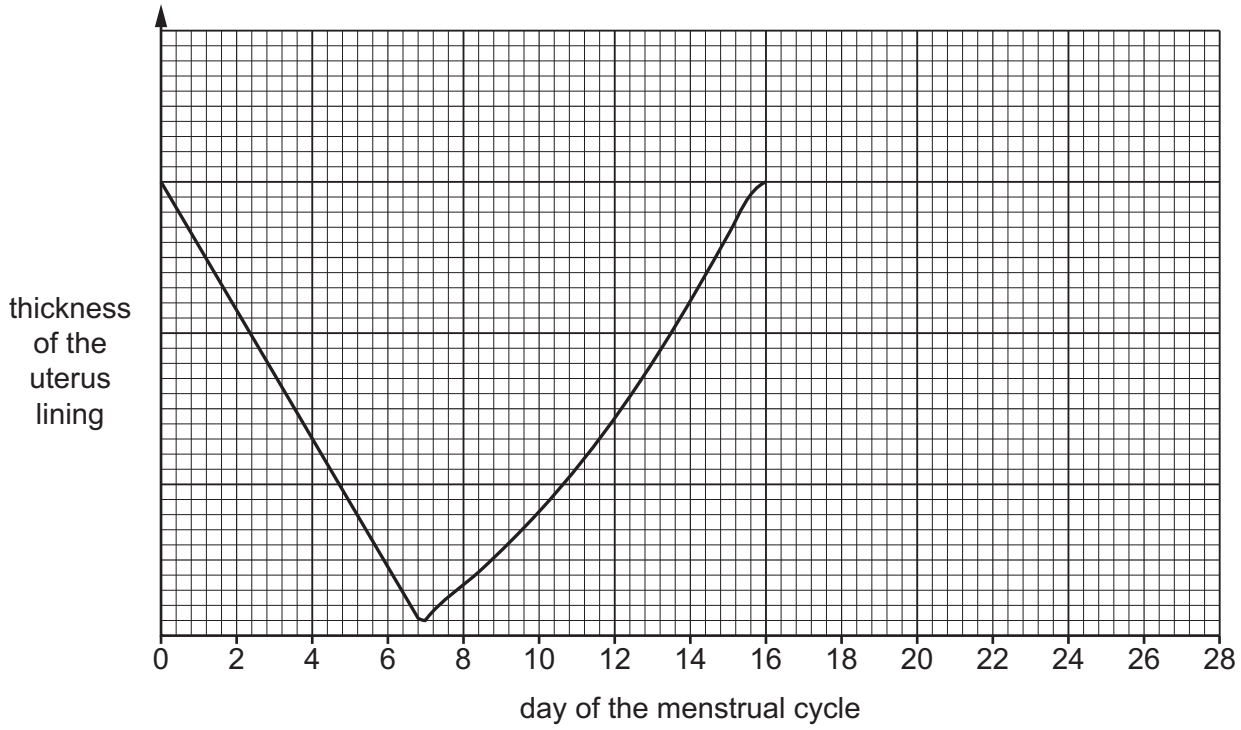


Fig. 4.2

(i) Use the information in Fig. 4.2 to state the number of days during which the uterus lining is shed.

..... [1]

(ii) Draw a line to complete the graph in Fig. 4.2 to show the thickness of the uterus lining between day 16 and 28. [1]

(iii) State the day of the menstrual cycle when eggs are released.

..... [1]

(c) The menstrual cycle is one of the changes that happens to girls during puberty.

Describe the changes that occur in boys during puberty.

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 12]

5 **(a)** Fig. 5.1 is a diagram of the human gas exchange system.

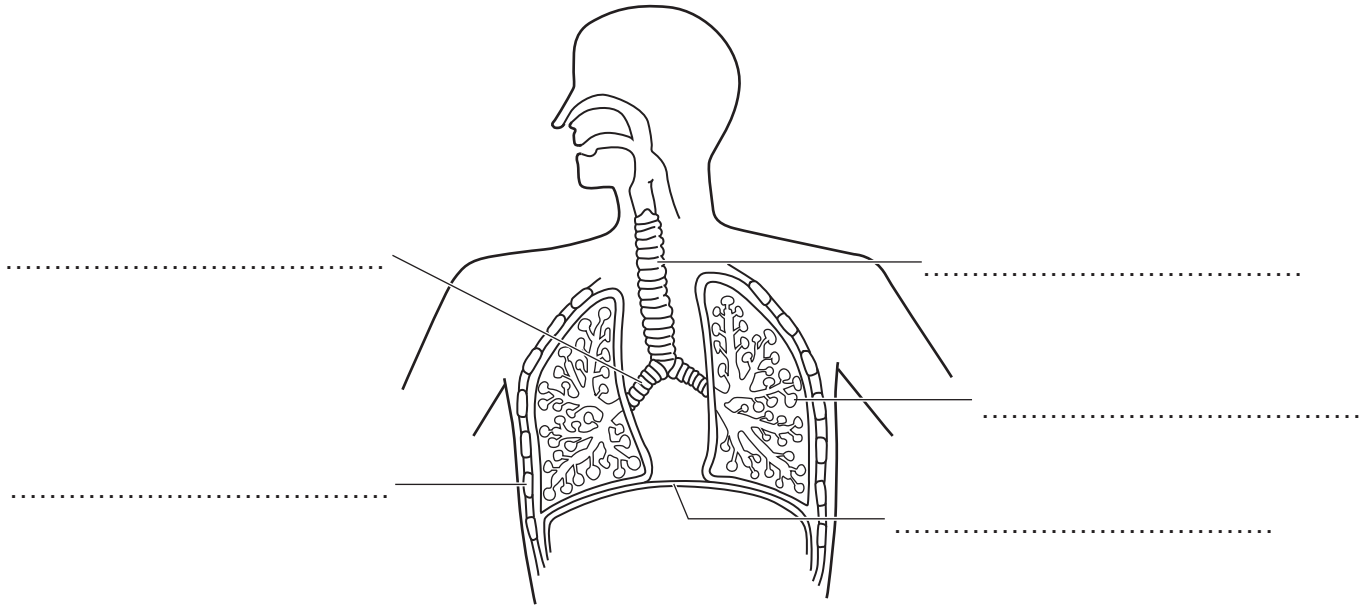


Fig. 5.1

The list shows the names of some of the parts of the human gas exchange system.

alveolus **bronchiole** **bronchus** **diaphragm**

larynx **rib** **trachea**

Use the words from the list to label Fig. 5.1.

You do not need to use every word.

Write your answers on the answer lines provided in Fig. 5.1. [5]

(b) State the name of the part of the body through which air enters and leaves.

..... [1]

(c) Complete the sentences about the differences between inspired and expired air.

Inspired air contains ..... oxygen than expired air.

Inspired air contains ..... carbon dioxide than expired air.

The concentration of water ..... in inspired and expired air varies.

[3]

(d) Carbon dioxide is one of the components of inspired and expired air.

State the name of the chemical used to test for the presence of carbon dioxide.

..... [1]

[Total: 10]

6 Fig. 6.1 is a photograph of a section through a flower.

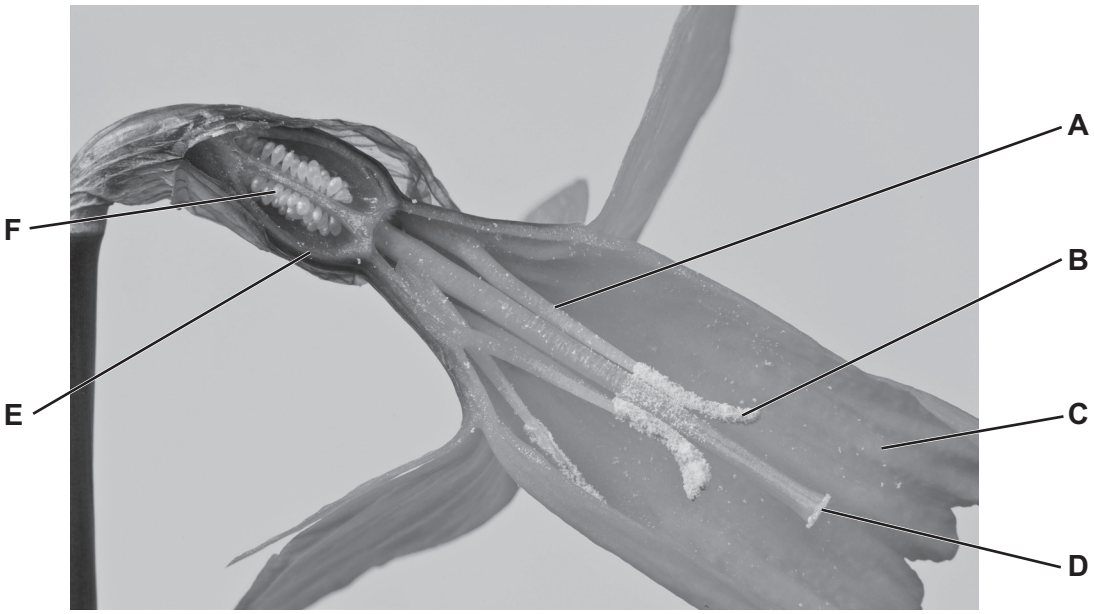


Fig. 6.1

(a) (i) State the names of the parts labelled **A**, **C** and **E** in Fig. 6.1.

A .....

C .....

E .....
[3]

(ii) State the function of the part labelled **B** in Fig. 6.1.

.....

..... [1]

(iii) State the letter of the part in Fig. 6.1 where pollination occurs.

..... [1]

(b) State **one** piece of evidence from Fig. 6.1 that shows this is an insect-pollinated flower.

.....

.....

..... [1]

(c) Describe the adaptations of the flower structure **and** pollen in a wind-pollinated flower.

.....

.....

.....

.....

.....

.....

..... [3]

(d) Living organisms are classified into kingdoms. The organism shown in Fig. 6.1 belongs to the plant kingdom.

State the name of **one** other kingdom.

..... [1]

[Total: 10]

7 **(a)** A scientist measured the mass of carbon dioxide produced by anaerobic respiration in yeast cells for 1200 minutes.

Fig. 7.1 shows the results.

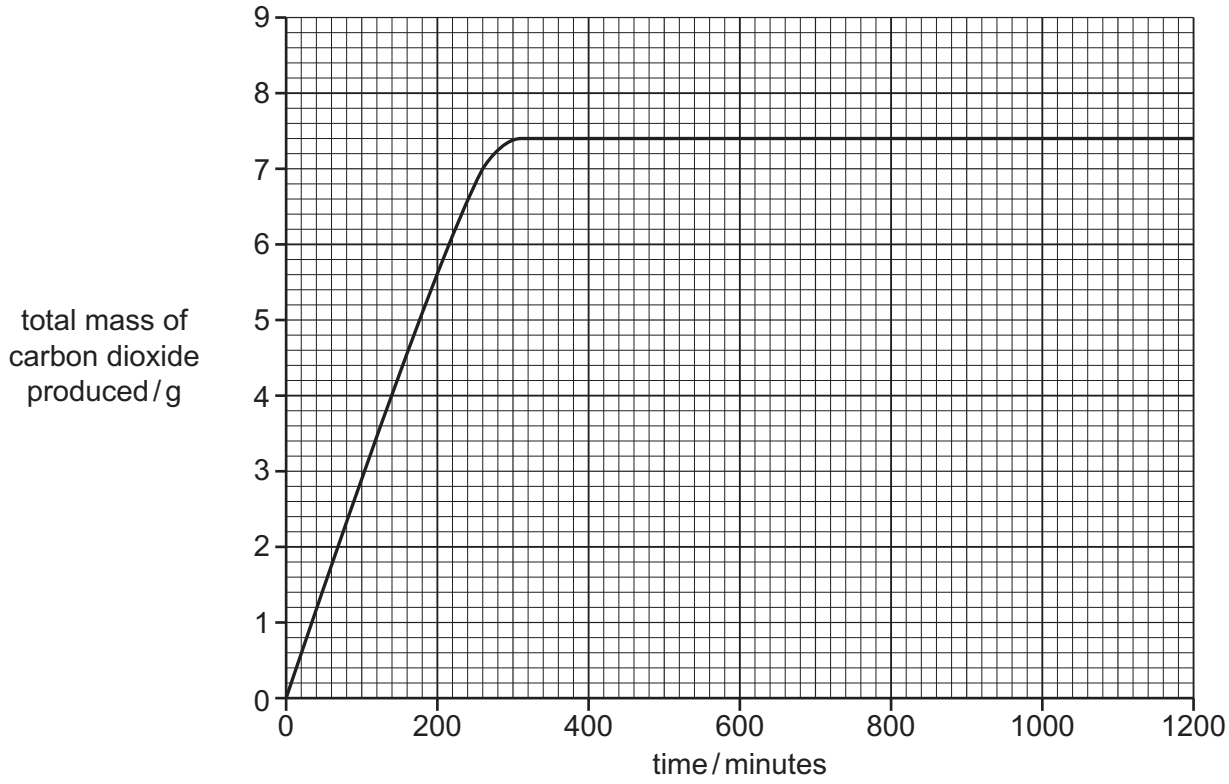


Fig. 7.1

(i) Complete the sentences to describe the results shown in Fig. 7.1.

The yeast cells produced a total of ..... g of carbon dioxide during 1200 minutes.

The yeast cells stopped producing carbon dioxide at ..... minutes.

[2]

(ii) The investigation was repeated with boiled yeast cells.

Predict the effect on the mass of carbon dioxide produced **and** explain your prediction.

.....

.....

.....

.....

..... [2]

(iii) State the name of **one other** product of anaerobic respiration in yeast cells.

..... [1]

(b) The box on the left contains the term 'Respiration'.

The boxes on the right contain sentence endings.

Draw **two** lines to join the term 'Respiration' to two boxes on the right to make **two** correct sentences.

	always produces carbon dioxide.
	is necessary for diffusion.
Respiration	occurs only in animals.
	releases energy.
	uses glucose.

[2]

(c) State **one** substance required for aerobic respiration that is **not** required for anaerobic respiration.

..... [1]

(d) Respiration is one of the characteristics of living things.

Tick (✓) **two** boxes to show two other characteristics of **all** living things.

breathing	
excretion	
growth	
photosynthesis	
sexual reproduction	

[2]

[Total: 10]

8 **(a)** Fig. 8.1 is a diagram showing part of the carbon cycle.

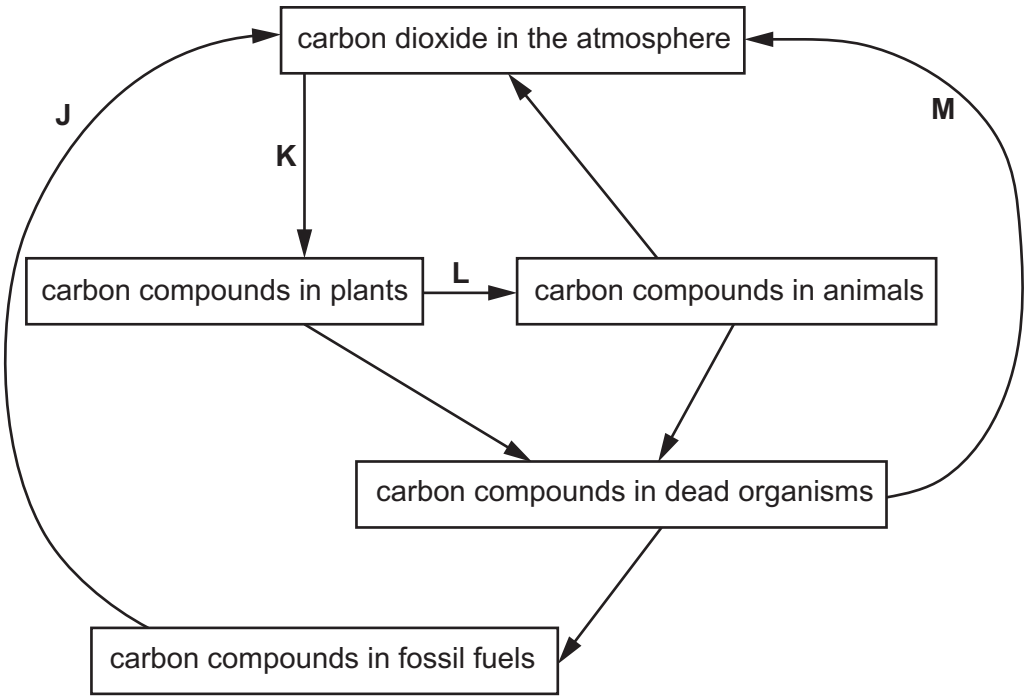


Fig. 8.1

(i) Draw **one** arrow **on Fig. 8.1** to represent respiration in plants. [1]

(ii) Identify the processes labelled **J**, **L** and **M** in Fig. 8.1.

J .....

L .....

M .....
[3]

(b) Photosynthesis is the process occurring at **K** in Fig. 8.1.

State the **two** products of photosynthesis.

1 .....

2 .....
[2]

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(c) Explain the effect of deforestation on the concentration of carbon dioxide in the atmosphere.

.....

.....

.....

.....

..... [2]

[Total: 8]

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