Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

1072432190

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **October/November 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **21** printed pages and **3** blank pages.

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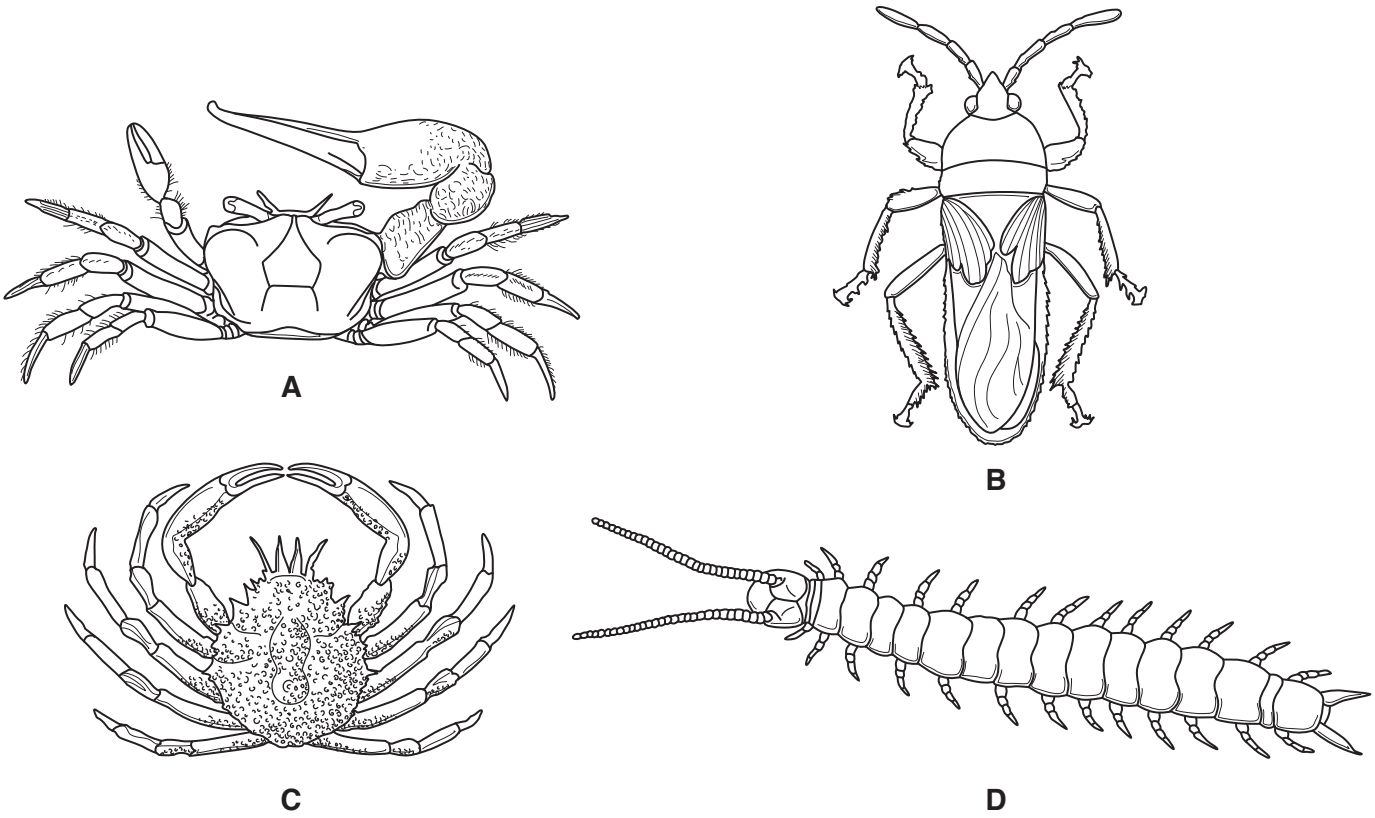
1 **(a)** Fig. 1.1 shows four arthropods.



not to scale

Fig. 1.1

(i) State **two** features, visible in Fig. 1.1, that are common to all arthropods.

1 .....

2 .....
[2]

(ii) Fig. 1.2 is a dichotomous key for the arthropods shown in Fig. 1.1.

Complete Fig. 1.2 by writing suitable statements in:

- box **2** to identify species **B**
- box **3** to separate species **C** and **A**.

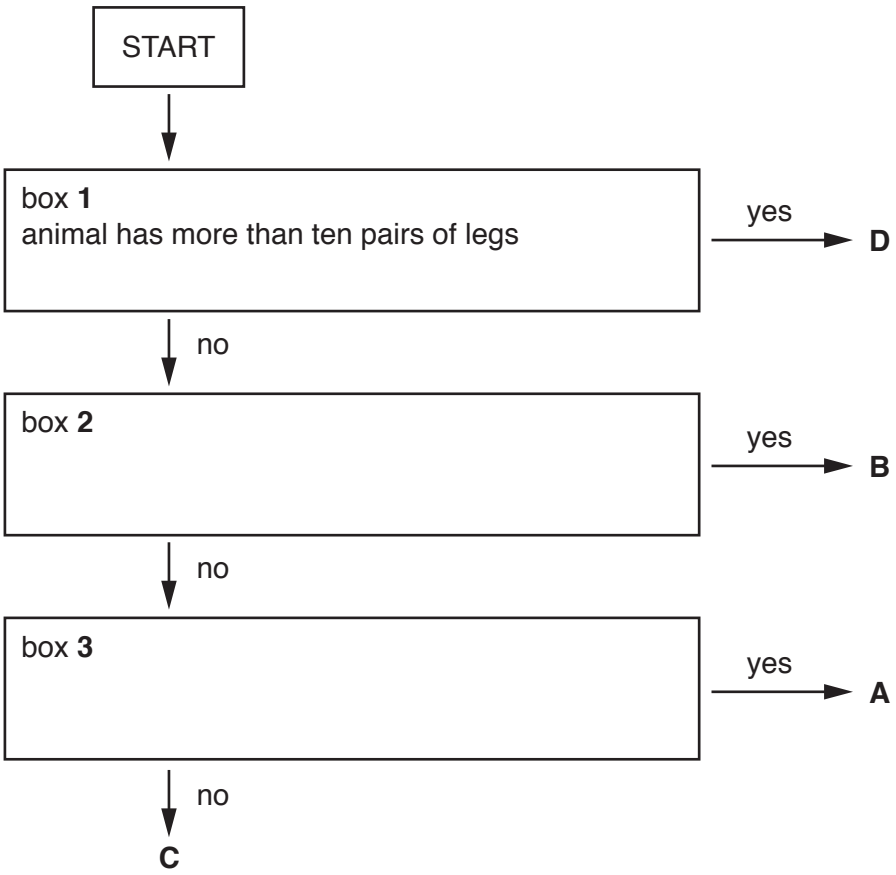


Fig. 1.2

[2]

(b) The Hawaiian happy-face spider, *Theridion grallator*, is found on several of the Hawaiian islands. Some of the spiders have a very distinctive pattern on their bodies as shown in Fig. 1.3.

Fig. 1.3

(i) State **one** feature, visible in Fig. 1.3, that identifies *T. grallator* as an arachnid.

..... [1]

(ii) Scientists think that the pattern on the bodies of the spiders is an adaptive feature.

Explain the term *adaptive feature* with reference to this pattern.

.....

.....

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..... [3]

(c) DNA can be extracted from the webs of spiders. This DNA can be used to identify the species of spider that made the web, and the species of prey caught in the web.

Explain how DNA extracted from spider webs can be used to identify different species.

.....

.....

.....

.....

..... [2]

(d) Many species of spider are thought to be endangered.

State **three** reasons why animal species such as spiders become endangered.

1 .....

.....

2 .....

.....

3 .....

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[3]

[Total: 13]

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2 Fig. 2.1 shows part of a cross-section of the stem of a young sunflower plant.

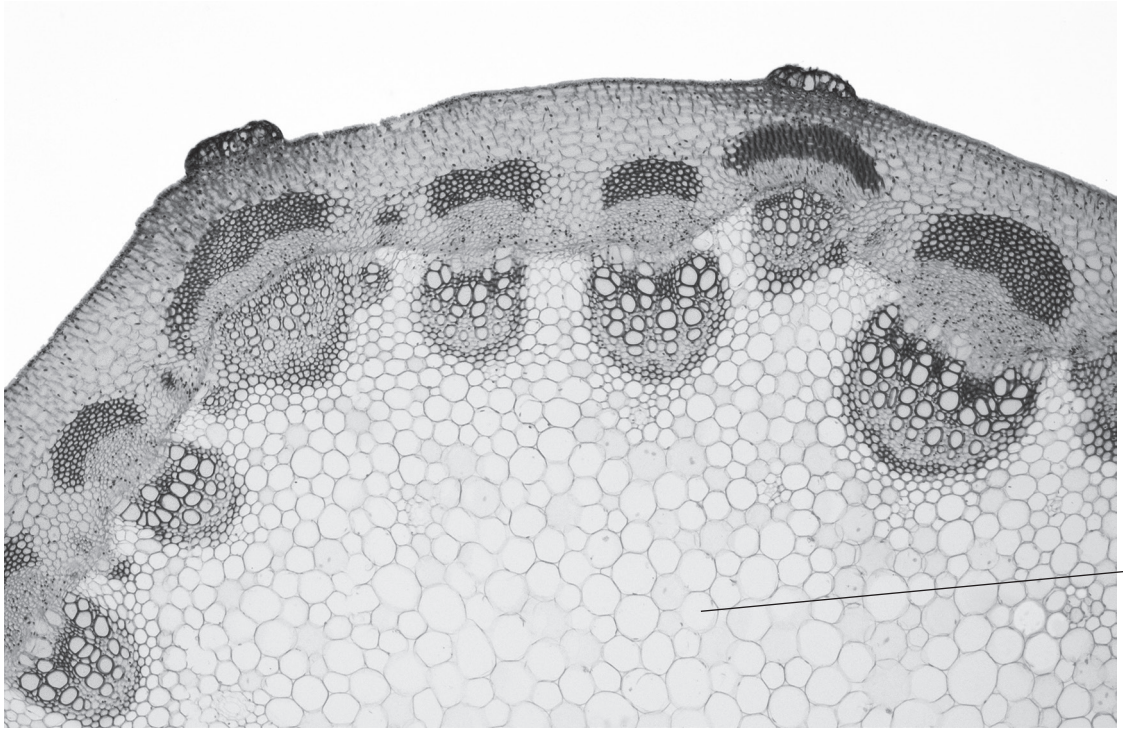

Fig. 2.1

(a) Draw a circle around **one** vascular bundle on Fig. 2.1.

Label the **xylem** in the vascular bundle with the letter **X**. [2]

(b) Explain how the cells in **area Y** are able to support the stem so that it stays upright.

.....

.....

.....

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..... [3]

(c) Researchers used carbon dioxide that contained a traceable source of carbon (^{13}C) to investigate translocation of sucrose from the leaves of bean plants, *Phaseolus vulgaris*.

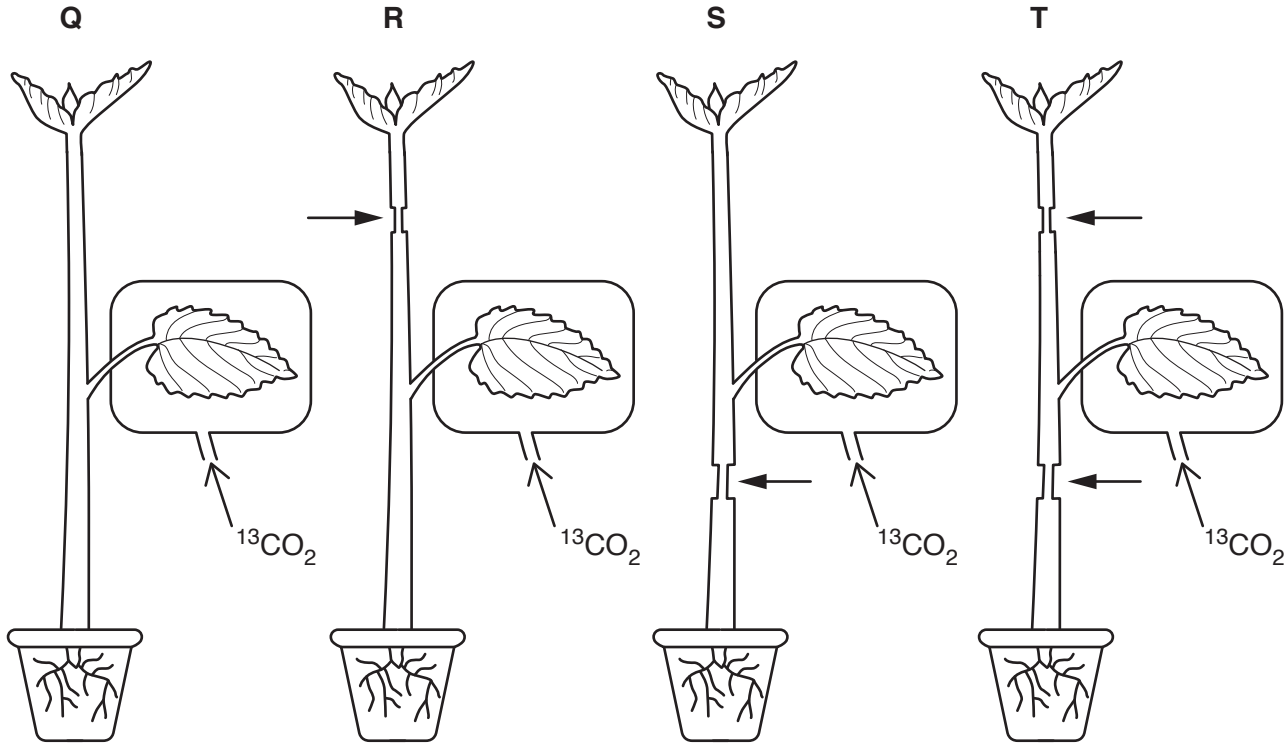
Fig. 2.2 shows that glucose produced in photosynthesis is converted to sucrose for translocation.

carbon dioxide ⟶ glucose ⟶ sucrose

Fig. 2.2

Researchers selected four plants, **Q**, **R**, **S** and **T**, which had leaves that were of similar sizes. The leaves on the four plants were supplied with $^{13}CO_2$.

After the leaves had started to make sucrose, the researchers cut away a ring of tissue in different places as shown in Fig. 2.3. The rings of tissue that were removed from plants **R**, **S** and **T** contained the phloem.



Key: ⟶ the positions on the stems where rings of tissue containing phloem were removed.

Fig. 2.3

The quantities of sucrose containing ^{13}C in the shoot tips and in the roots were determined.

The results are shown in Table 2.1.

Table 2.1

plant	quantity of sucrose containing ^{13}C / arbitrary units	
	shoot tip	root
Q	3.24	0.94
R	0.00	0.44
S	4.14	0.00
T	0.00	0.00

Describe **and** explain the effect of removing the phloem on the translocation of sucrose in plants **Q**, **R**, **S** and **T**.

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..... [5]

[Total: 10]

3 Cells in the lining of the stomach secrete gastric juice, which contains hydrochloric acid and pepsin.

(a) **(i)** State **two** roles of hydrochloric acid in the stomach.

1 .....

2 .....
[2]

(ii) Describe the function of pepsin.

.....

.....

.....

..... [2]

(b) Define the term *assimilation*.

.....

.....

.....

..... [2]

(c) There are stem cells in the epithelial tissue that forms the lining of the stomach.

Explain why these stem cells are necessary.

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..... [2]

(d) The epithelial cells of the small intestine have many microvilli.

State the role of the microvilli.

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..... [2]

(e) *Lactobacillus* is a type of bacterium. A study was carried out to investigate the ability of *Lactobacillus* to attach to the epithelial cells that form the lining of the small intestine.

Researchers added *Lactobacillus* bacteria to epithelial cells that had been grown in Petri dishes.

Every 15 minutes, the researchers estimated the average number of bacteria that were attached to the epithelial cells in the Petri dishes.

The results are shown in Fig. 3.1.

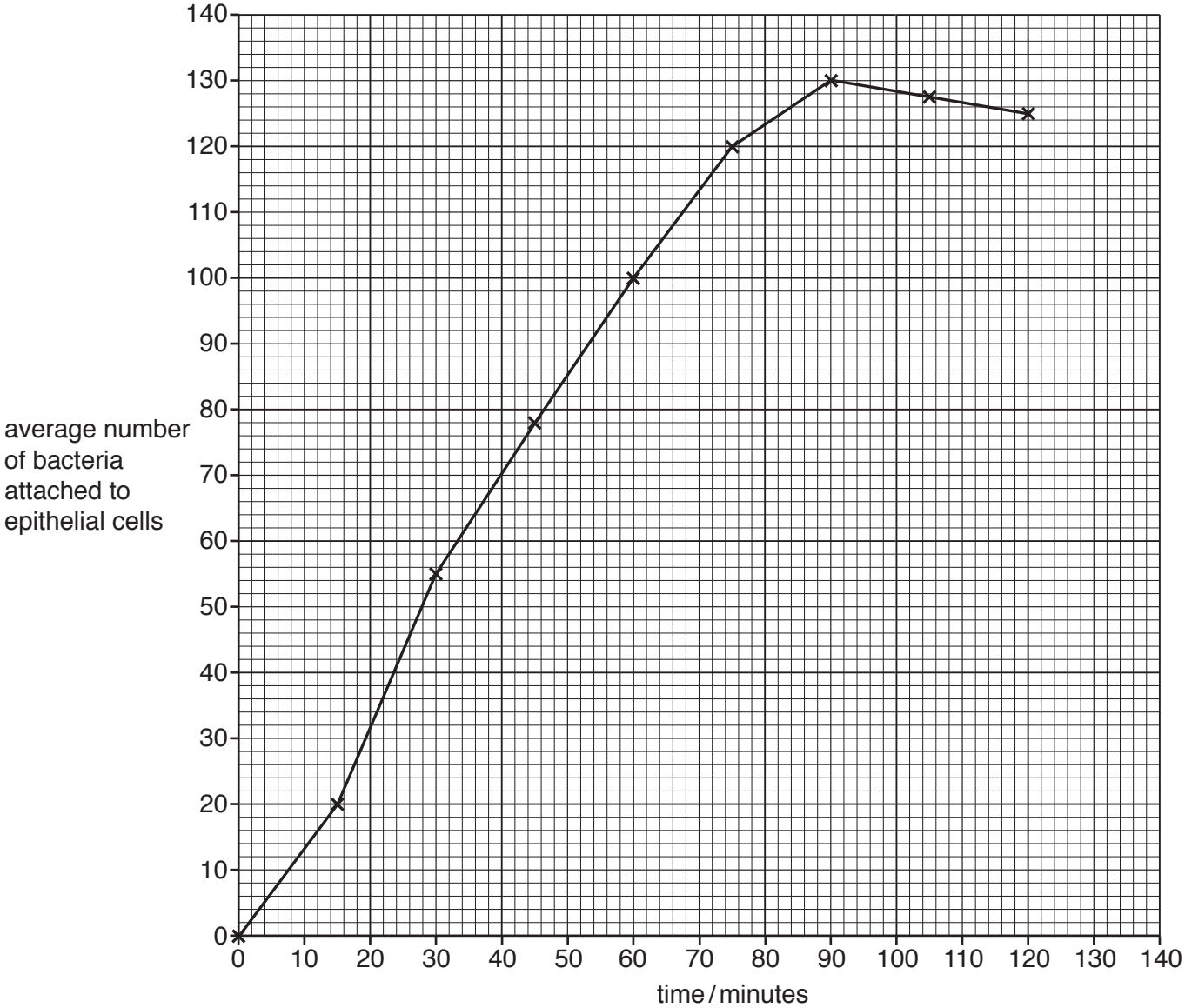

Fig. 3.1

Calculate the percentage increase in the average number of bacteria attached to epithelial cells from 45 minutes to 75 minutes.

average number of bacteria at 45 minutes ..... .

average number of bacteria at 75 minutes ..... .

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

[Total: 13]

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4 **(a)** Explain how the human gas exchange system is protected against pathogens.

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..... [4]

(b) Tuberculosis (TB) is a transmissible disease caused by a bacterial pathogen. The spread of this disease can be controlled by vaccination.

Explain how vaccination provides a defence against transmissible diseases.

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..... [4]

(c) TB is a disease that can be treated with antibiotics. HIV infection cannot be treated with antibiotics.

Explain why viral diseases **cannot** be treated with antibiotics.

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..... [2]

(d) Lung cancer is a disease that is strongly linked with smoking tobacco.

Fig. 4.1 shows some data about smoking and lung cancer in country **A** between 1900 and 2020 (2020 data has been estimated):

- percentage of the male population that smoke tobacco
- percentage of the female population that smoke tobacco
- number of deaths in males from lung cancer per 100 000 of the male population
- number of deaths in females from lung cancer per 100 000 of the female population.

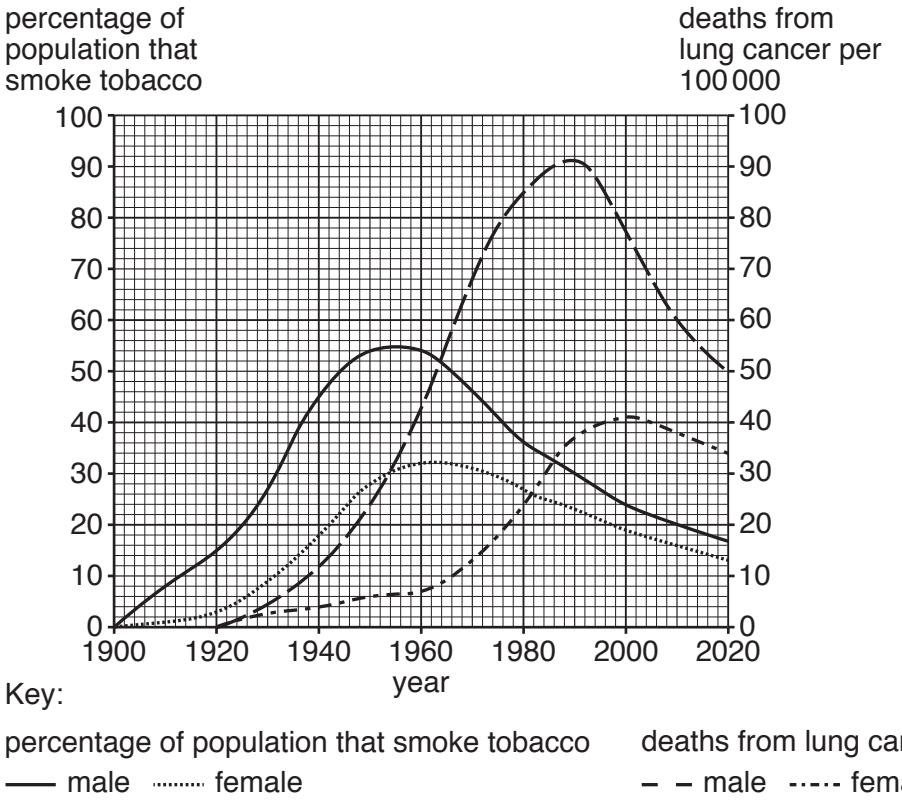

Fig. 4.1

(i) Describe the differences between the percentages of males and females in country **A** that smoke as shown in Fig. 4.1.

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..... [3]

(ii) Fig. 4.2 shows the same smoking statistics for country **B** between 1950 and 2020.

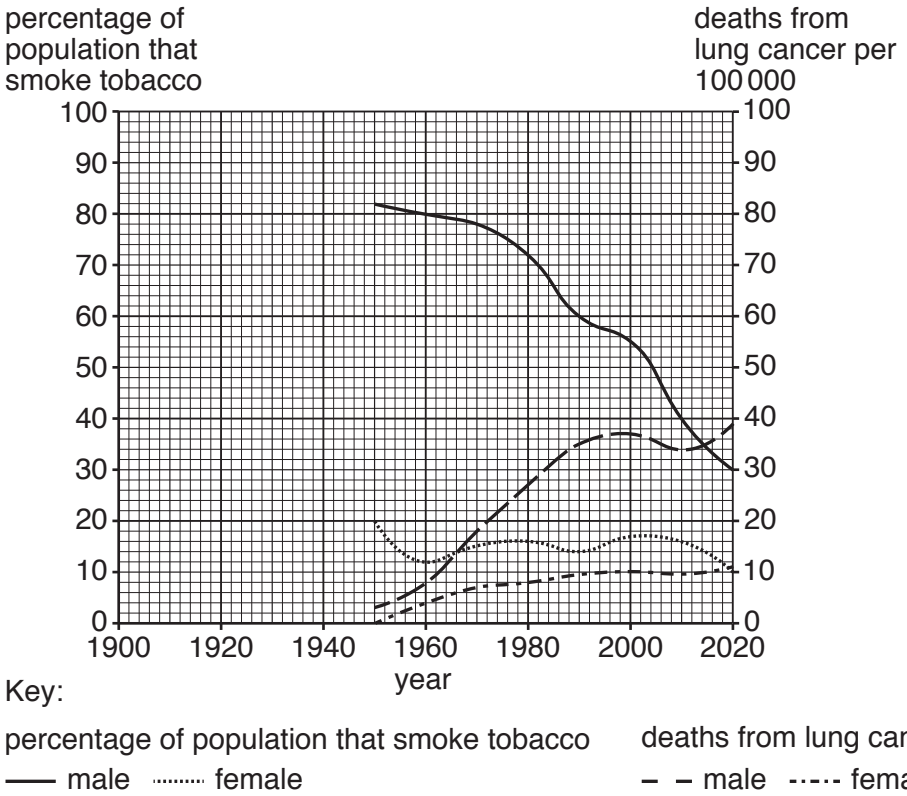

Fig. 4.2

Discuss the evidence **for** and **against** this statement:

'The changes in the percentage of the population that smoke tobacco, and the deaths from lung cancer per 100 000, follow the same trends in males and in females.'

Use the information for country **A** in Fig. 4.1 and country **B** in Fig. 4.2 in your answer.

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..... [6]

[Total: 19]

5 Grass plants are wind-pollinated. Fig. 5.1 shows a flower from a species of grass plant.

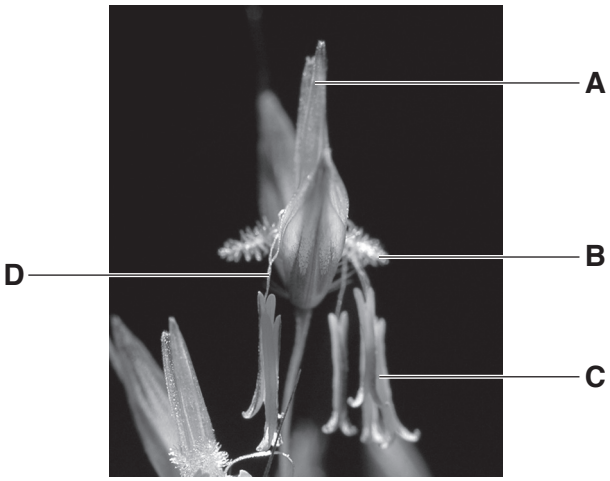

Fig. 5.1

(a) **(i)** Describe **and** explain how the features of the flower shown in Fig. 5.1 are adaptations for wind-pollination.

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..... [3]

(ii) State **one** letter in Fig. 5.1 that identifies a structure where meiosis occurs.

..... [1]

(b) Wheat has flowers similar to those in Fig. 5.1, but reproduces by self-pollination.

Explain the consequences of self-pollination for a population of plants.

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..... [4]

(c) Wheat is an important crop plant in many countries. Wheat can be infected by diseases leading to total loss of the crop which results in famine.

Outline factors, **other than** plant diseases, that can cause famines.

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..... [3]

(d) Black stem rust is a disease of wheat that is caused by a fungus.

Plant breeders used two varieties of wheat to produce a variety of wheat that is both rust-resistant and has a high yield.

Fig. 5.2 shows the breeding programme that was used.

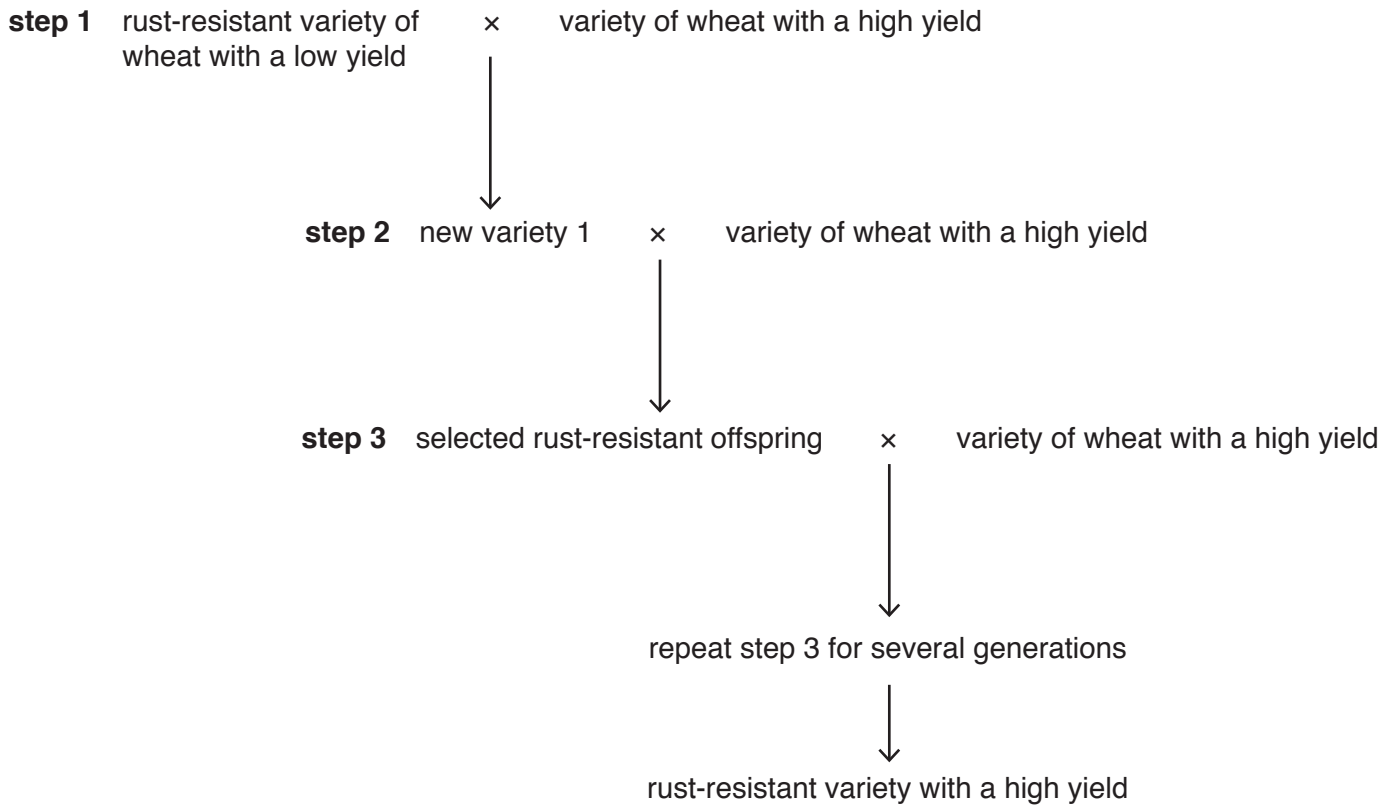

Fig. 5.2

(i) Suggest how plant breeders make sure that the plants that they use for step 3 are rust-resistant.

.....

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..... [2]

(ii) Suggest why step 3 is repeated for many generations before the new rust-resistant variety is made available for farmers to grow.

.....

.....

..... [1]

(e) Wheat plants are monocotyledons.

State **one** feature of monocotyledons that can be used to distinguish them from dicotyledons.

..... [1]

[Total: 15]

6 Carbon dioxide forms approximately 0.04% of the atmosphere.

Fig. 6.1 shows part of the carbon cycle.

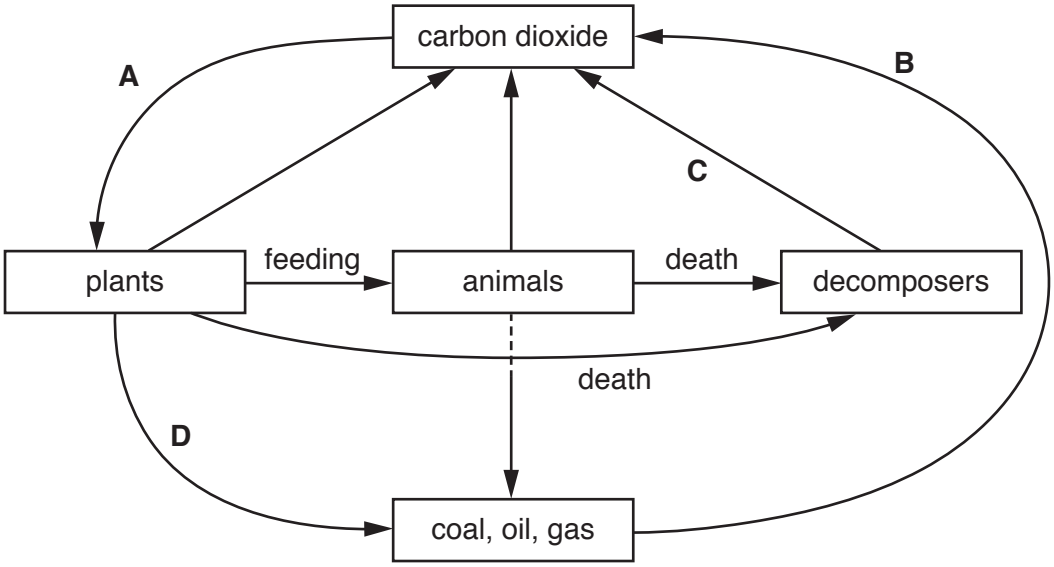

Fig. 6.1

(a) Complete Table 6.1 by naming the processes labelled **A** to **D** in Fig. 6.1.

Table 6.1

letter on Fig. 6.1	name of the process in the carbon cycle
A	
B	
C	
D	

[4]

(b) Complete the sentences by writing the missing words in the spaces.

Carbon dioxide is a greenhouse gas. Greenhouse gases trap ..... in the atmosphere. Water vapour is the most common greenhouse gas in the atmosphere. Another greenhouse gas is methane which is released from ..... and ..... . Carbon dioxide and methane released from human activities over the past 200 years have contributed to the ..... greenhouse effect.

Other atmospheric pollutants can cause acid rain. One of these is ..... which is a waste gas from some power stations.

One source of pollution in both aquatic and terrestrial ecosystems is ..... plastics. [6]

[Total: 10]

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