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5707261105

BIOLOGY **0610/42**

Paper 4 Theory (Extended) **October/November 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)** Describe what is meant by the term physical digestion.

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..... [2]

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

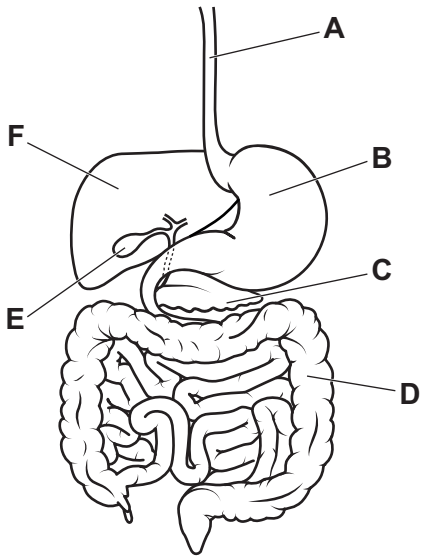


Fig. 1.1

State the letter from Fig. 1.1 that shows one part where:

physical digestion occurs .....

glucagon is produced .....

bile is produced. .....

[3]

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(c) Explain the role of bile in physical digestion.

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..... [3]

(d) Physical digestion also occurs in the mouth.

State the names **and** functions of **two** types of human teeth.

1 .....

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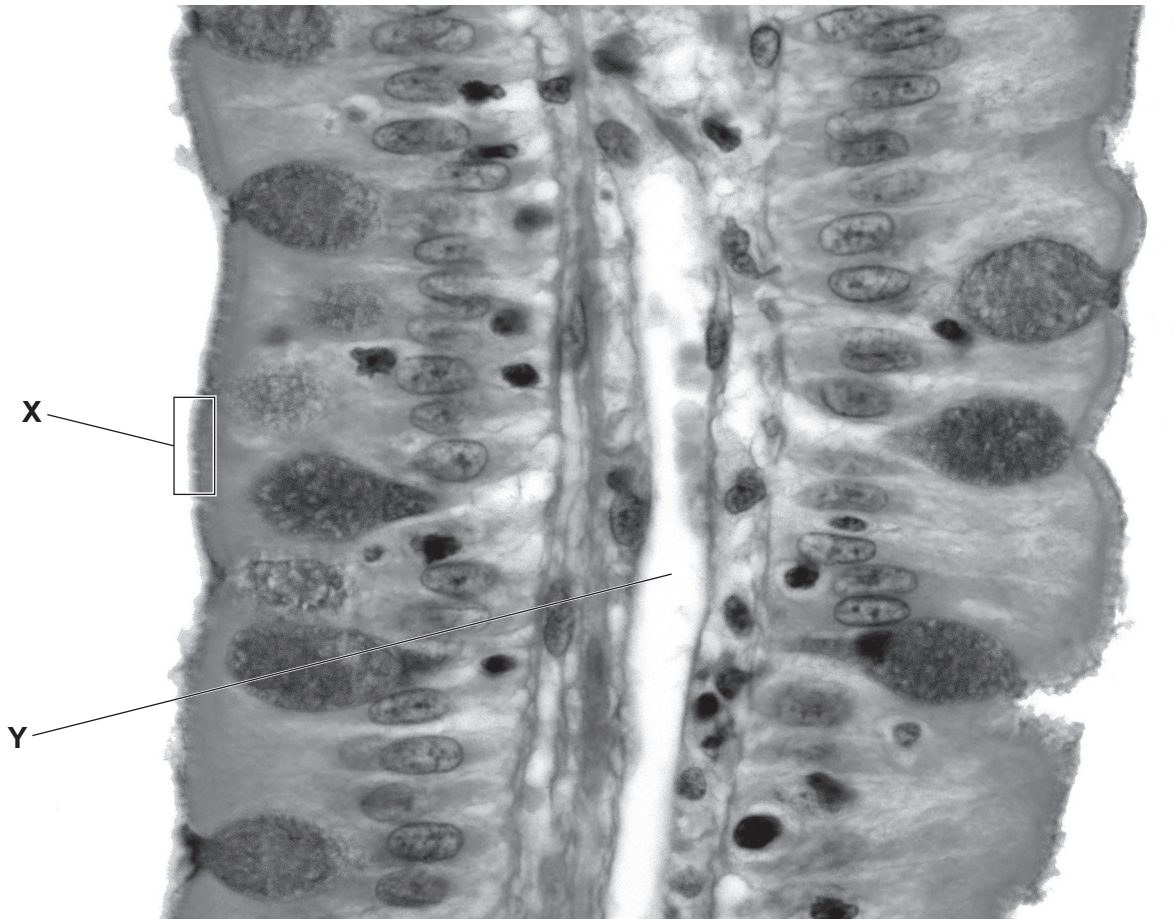
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[2]

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(e) Fig. 1.2 is a photomicrograph of part of one villus in the small intestine.



magnification ×800

Fig. 1.2

Identify **and** explain the roles of the parts labelled **X** and **Y** in Fig. 1.2.

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..... [4]

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2 **(a)** Dicotyledons and monocotyledons belong to the plant kingdom.

(i) State **two** main features of plants.

1 .....

2 .....

[2]

(ii) State the names of **two** other kingdoms.

1 .....

2 .....

[2]

(b) Fig. 2.1 is a diagram of a cross-section of a monocotyledonous stem.

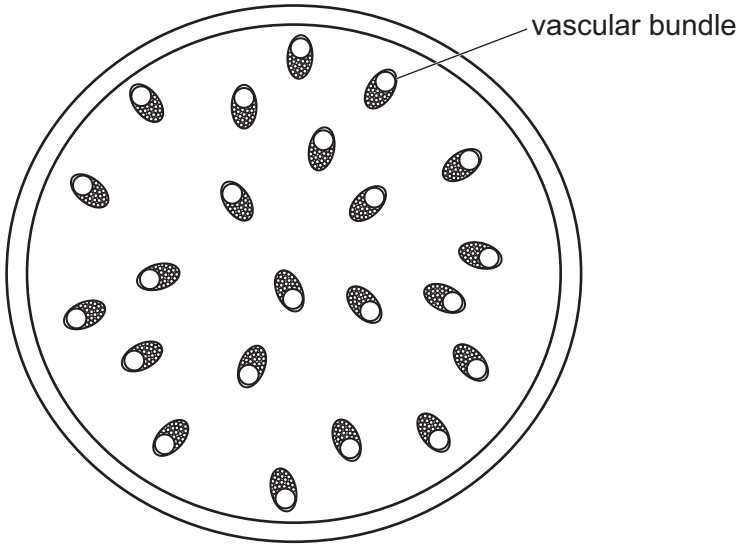


Fig. 2.1

Describe how the distribution of vascular bundles in a dicotyledonous stem would differ from the monocotyledonous stem shown in Fig. 2.1.

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..... [1]

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(c) Fig. 2.2 is an incomplete drawing of a cross-section of a dicotyledonous root.

Complete Fig. 2.2 by:

- sketching the distribution of phloem and xylem
- labelling the phloem, xylem and a root hair.

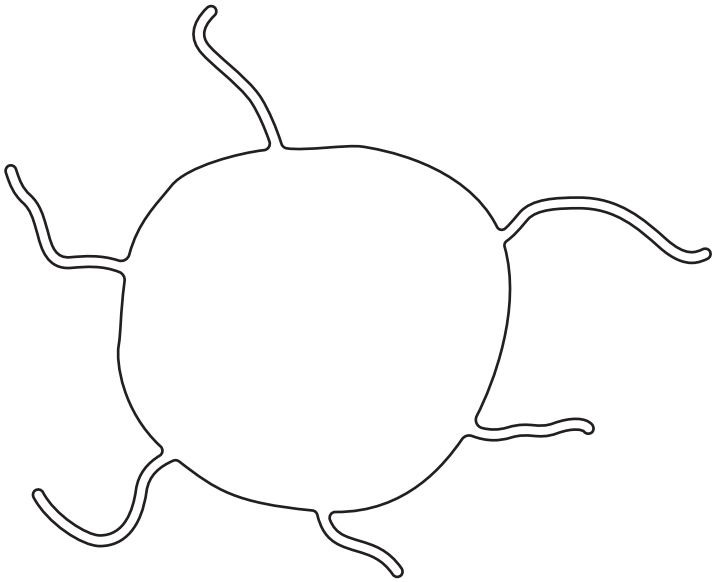


Fig. 2.2

[3]

(d) State **two** functions of xylem.

1 .....

2 .....

[2]

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(e) A farmer investigated the effect of girdling on the mass of apple fruit produced by apple trees.

The farmer removed a 3 mm strip of bark and phloem tissue from the branches that produce the fruit, as shown in Fig. 2.3.

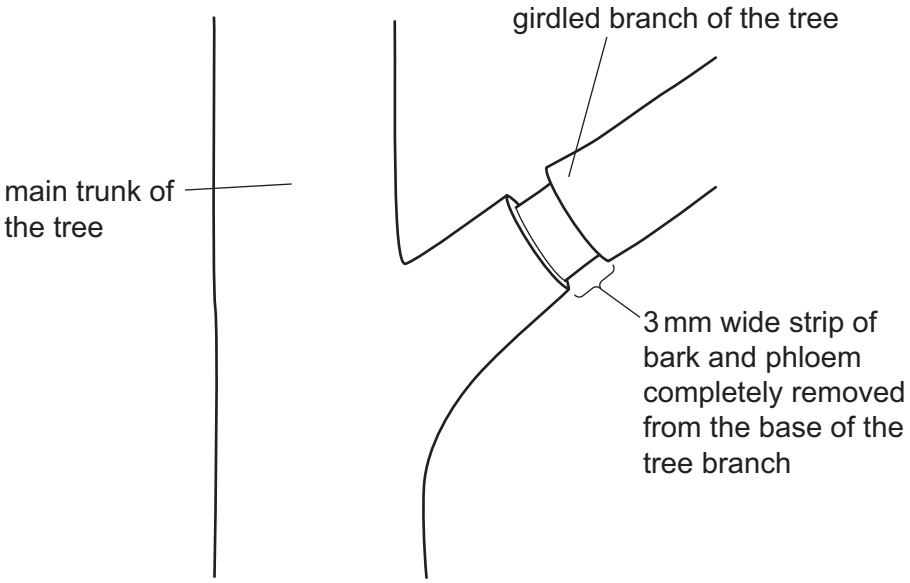


Fig. 2.3

The farmer girdled nine apple trees and left nine apple trees ungirdled.

The mass of ten fruits from the girdled trees and the mass of ten fruits from the ungirdled trees were compared.

Table 2.1 shows the results.

Table 2.1

treatment of trees	mass of ten fruits / g
girdled	1796
ungirdled	958

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Describe the results shown in Table 2.1 **and** suggest an explanation for them.

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..... [5]

(f) Apples are used to make apple juice.

State **one** enzyme used in fruit juice production.

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[Total: 16]

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3 Enzymes are biological catalysts.

(a) Describe what is meant by the term catalyst.

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..... [2]

(b) A student investigated the effect of temperature on enzyme activity.

A starch suspension was kept at 0 °C.

Amylase solution was added to the starch suspension.

Samples of the starch and amylase mixture were tested with iodine solution at 1-minute intervals for 15 minutes.

The student recorded the time at which the starch and amylase mixture stopped turning a blue-black colour.

The student repeated this investigation at different temperatures.

Table 3.1 shows the results.

Table 3.1

temperature / °C	time at which the starch and amylase mixture stopped turning a blue-black colour / minutes
0	stayed blue-black
10	12
20	8
30	5
40	3
50	10
60	stayed blue-black

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(i) Explain the results between 0 °C and **40 °C** in Table 3.1.

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..... [6]

(ii) This investigation was repeated with protease instead of amylase.

Explain why the samples from the mixture produced a blue-black colour at every temperature.

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..... [2]

(c) State **one** factor, other than temperature, that affects enzyme action.

..... [1]

[Total: 11]

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4 Steppe ecosystems are large areas of grasslands found in central Asia.

(a) Fig. 4.1 is a food web from a steppe ecosystem.

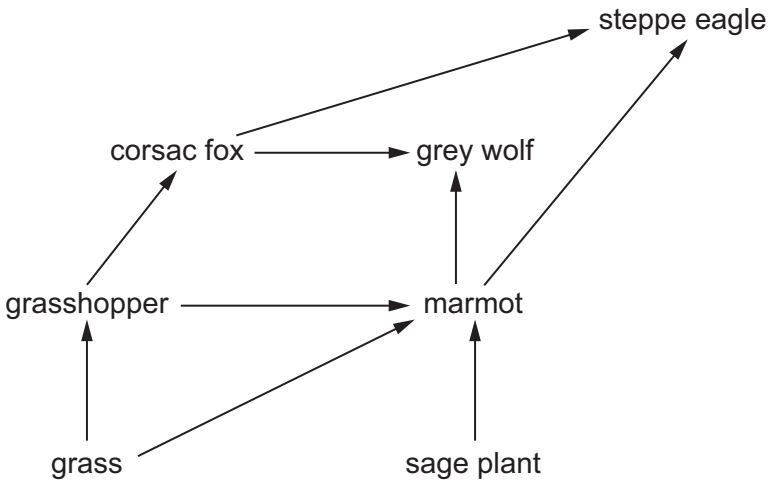


Fig. 4.1

(i) State the name of **one** primary consumer from Fig. 4.1.

..... [1]

(ii) Use the information in Fig. 4.1 to construct **one** food chain with four trophic levels that includes the steppe eagle.

[1]

(iii) There are fewer grey wolves than marmots in this ecosystem.

Explain why the population size of organisms decreases from one trophic level to the next trophic level in this ecosystem.

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..... [2]

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(b) Fig. 4.2 is a photograph of a wild horse. Przewalski's horse is a type of wild horse that nearly became extinct.



Fig. 4.2

After a captive breeding programme, they have been successfully reintroduced to the steppe ecosystem.

The captive breeding programme started with 12 wild horses.

(i) Explain the risks to a species of a captive breeding programme that uses such a small number of individuals.

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..... [3]

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(ii) Suggest ways of maintaining a population of Przewalski's horse in the wild after their reintroduction to the steppe ecosystem.

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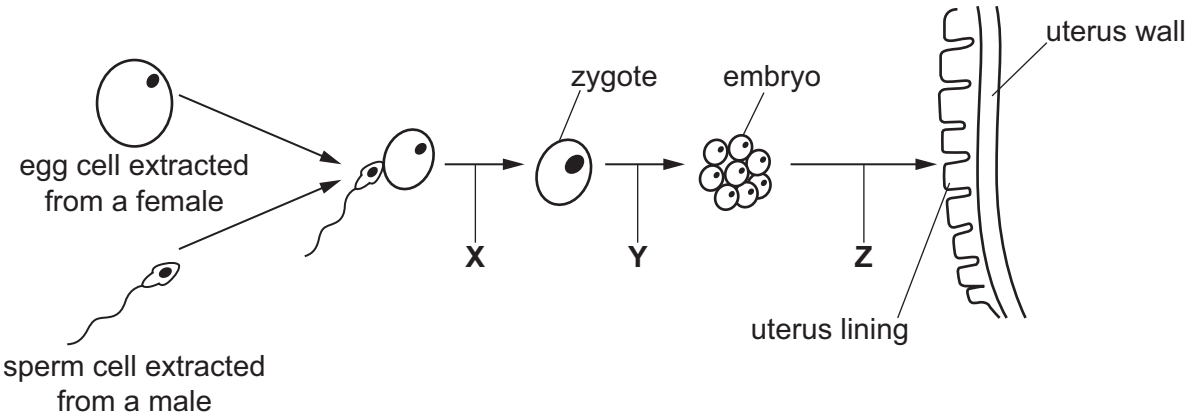
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..... [4]

(c) *In vitro* fertilisation (IVF) can be used in captive breeding programmes.

Fig. 4.3 shows some of the stages involved in IVF.



not to scale

Fig. 4.3

State the names of the processes occurring at **X**, **Y** and **Z** in Fig. 4.3.

X .....

Y .....

Z .....

[3]

[Total: 14]

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5 **(a)** Discuss the advantages of intensive livestock production.

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(b) One disadvantage of intensive livestock production is that antibiotics are often used.

Suggest why antibiotics are needed in intensive livestock production.

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..... [2]

(c) Fig. 5.1 shows the changes in antibiotic use in livestock production in seven countries between 2010 and 2016.

The suggested limit for antibiotic use in livestock is 50 mg per kg of livestock.

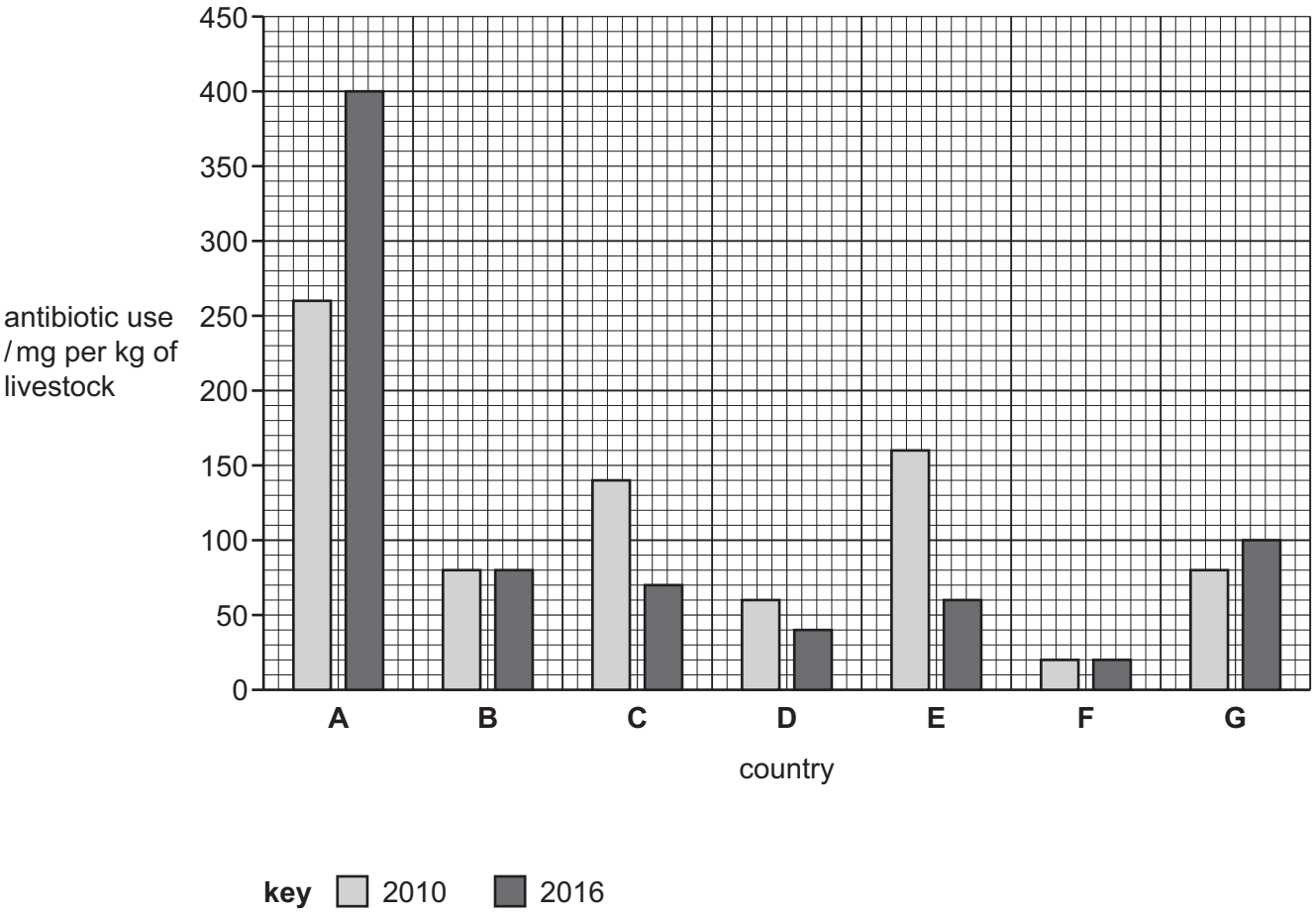


Fig. 5.1

(i) State the letters of the countries in Fig. 5.1 that used less than the suggested limit of 50 mg of antibiotics per kg of livestock in 2016.

..... [1]

(ii) Calculate the percentage increase in antibiotic use in country **A** in Fig. 5.1 between 2010 and 2016.

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

Space for working.

..... [3]

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(iii) Explain the development of antibiotic resistance in bacteria.

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[Total: 13]

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6 **(a)** An athlete monitored their heart rate and breathing rate before, during and after vigorous exercise.

Fig. 6.1 shows the results.

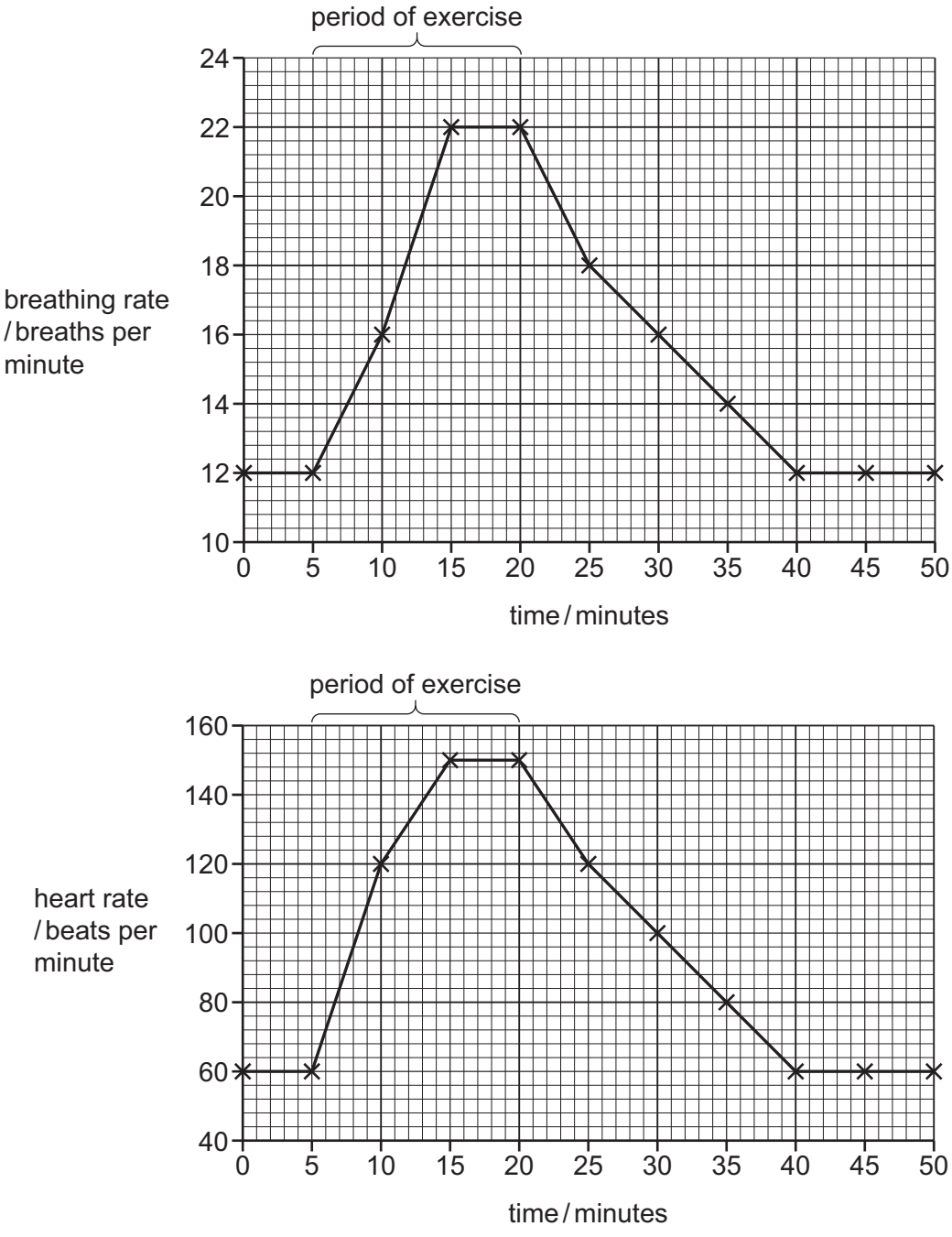


Fig. 6.1

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Complete the sentences to describe **and** explain the results shown in Fig. 6.1.

After exercise, it takes ..... minutes for the athlete's breathing rate to return to its resting rate.

The heart rate decreases by ..... beats per minute between 20 and 40 minutes.

The heart rate and breathing rate do not immediately return to their resting rates because anaerobic respiration has occurred.

Lactic acid has built up in ..... causing an oxygen ..... .

The heart rate remains high to transport lactic acid to the ..... .

The breathing rate remains high to supply ..... for the ..... respiration of lactic acid.

[7]

(b) The carbon dioxide produced during exercise is excreted. Urea is another substance that is excreted.

(i) State the name of the organ that produces urea.

..... [1]

(ii) State the name of the organ that excretes urea.

..... [1]

(c) State the balanced chemical equation for anaerobic respiration in yeast.

..... [2]

(d) State **one** food product that is made using anaerobic respiration in yeast.

..... [1]

[Total: 12]

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