Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
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BIOLOGY **0610/41**

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 an HB 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.

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1 All living organisms are placed into groups according to their features.
Myriapods are one of the main groups of arthropods.

(a) State **two** features of myriapods that can be used to distinguish them from other arthropods.

1 .....

2 .....
[2]

View solution

Fig. 1.1 shows that there are four main groups of arthropods.

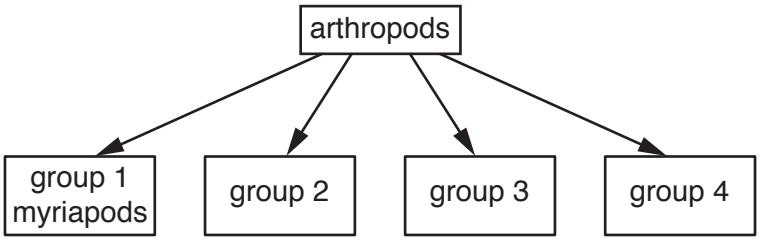

Fig. 1.1

View solution

(b) State the names of **two** of the other groups of arthropods in Fig. 1.1.

1 .....

2 .....
[2]

View solution

(c) Myriapods can be classified into four classes, **1**, **2**, **3** and **4**.

Fig. 1.2 is a dichotomous key that can be used to distinguish the four classes of myriapods.

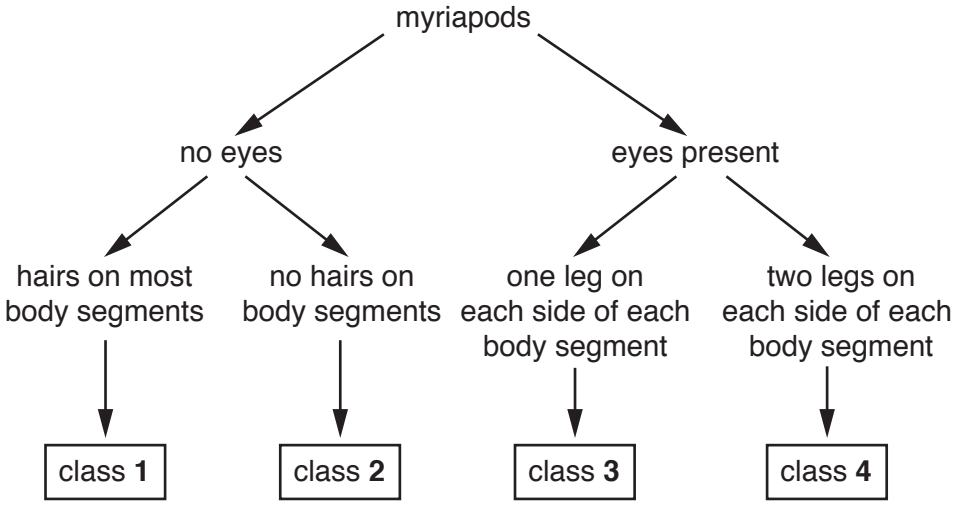

Fig. 1.2

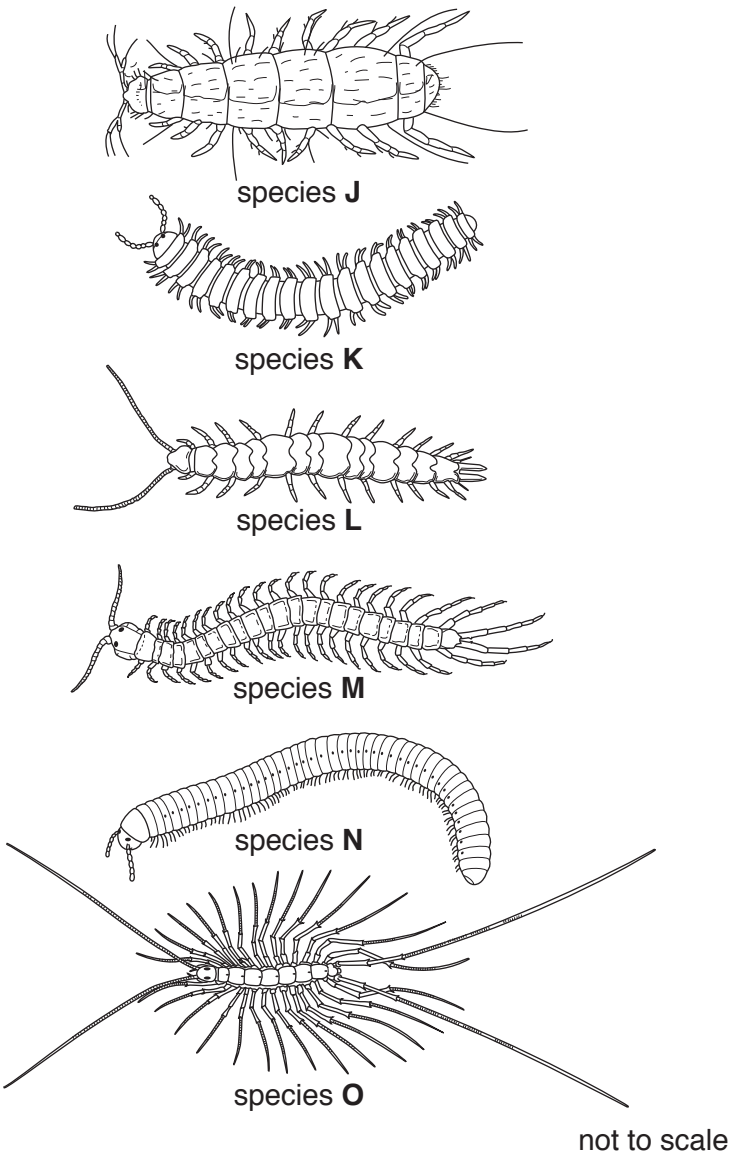

Fig. 1.3

Complete Table 1.1 by using the key in Fig. 1.2 to classify the six myriapods in Fig. 1.3 into the four classes.

Table 1.1

class	letter(s) of species from Fig. 1.3 in each class
1	
2	
3	
4	

[3]

(d) Fig. 1.4 is a photograph of the myriapod, *Apheloria virginiensis*.

View solution

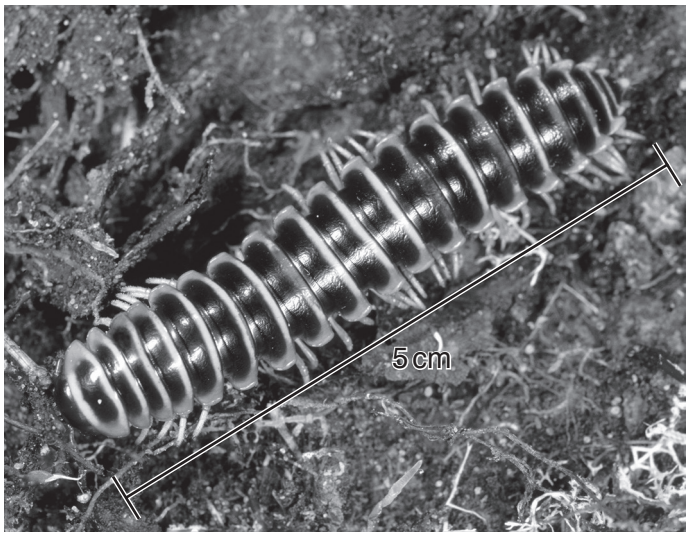

Fig. 1.4

(i) State the genus name and kingdom name for the myriapod shown in Fig. 1.4.

genus .....

kingdom .....

[2]

(ii) *A. virginiensis* releases the poison cyanide when it is attacked by predators. Cyanide stops enzymes in the mitochondria from functioning.

View solution

Suggest why cells die if the mitochondria do not function.

.....

.....

..... [1]

[Total: 10]

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2 Phloem is used to transport sucrose and amino acids in plants. Sucrose is a carbohydrate.

(a) Describe the uses of carbohydrates **and** amino acids in plants.

View solution

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..... [4]

(b) Fig. 2.1 shows a diagram of a plant. The arrows point to circles containing magnified cross-sections of those parts of the plant.

View solution

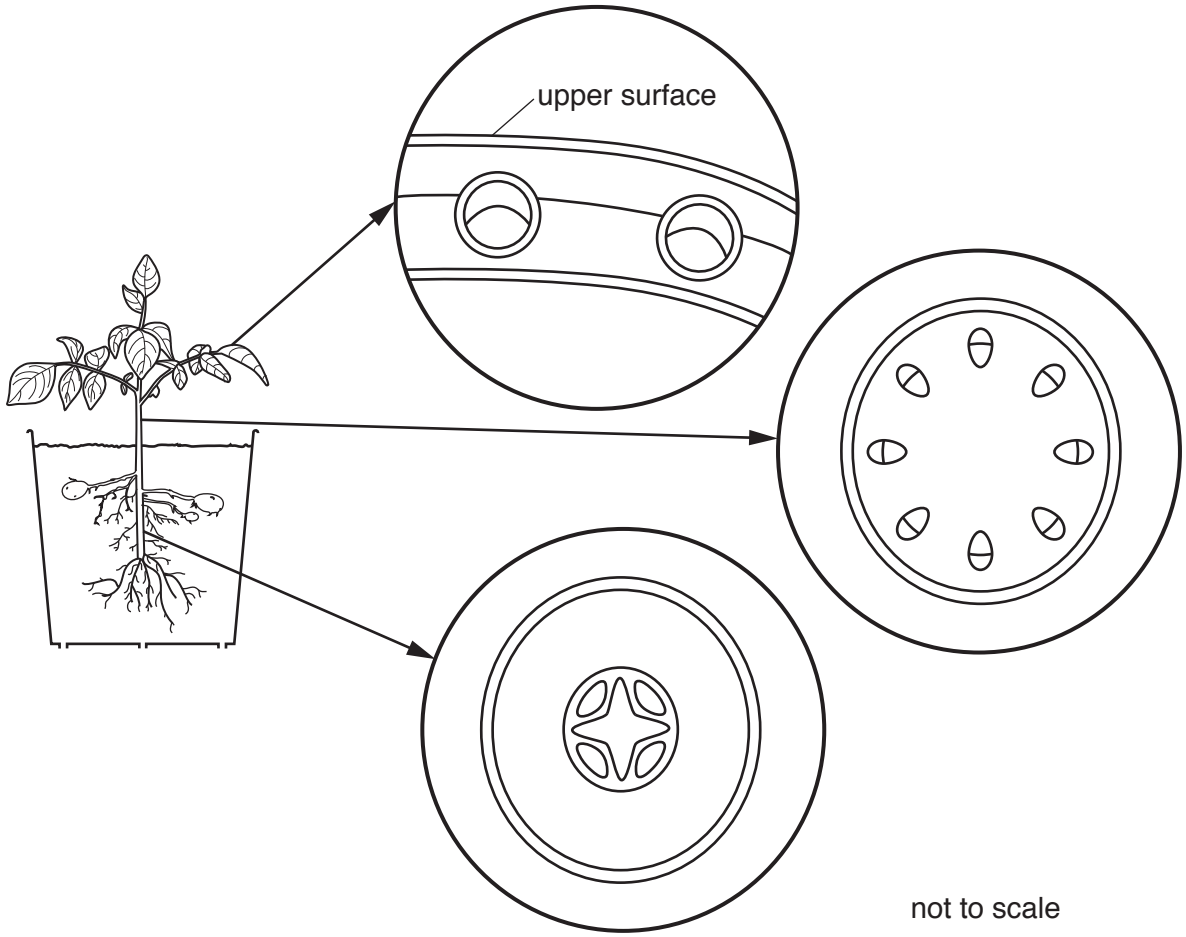

Fig. 2.1

Label the position of the phloem in each of the three magnified sections in Fig. 2.1.

Use a label line and the letter **P** for each section. [3]

(c) Aphids are used by investigators to discover how plants transport sucrose.

Fig. 2.2 shows an aphid with its mouthparts inserted into a plant stem to feed on the liquid in the phloem.



Fig. 2.2

A plant was put in a dark cupboard for several days.
Four aphids, **A**, **B**, **C** and **D**, were then placed on the plant in the dark cupboard as shown in Fig. 2.3.

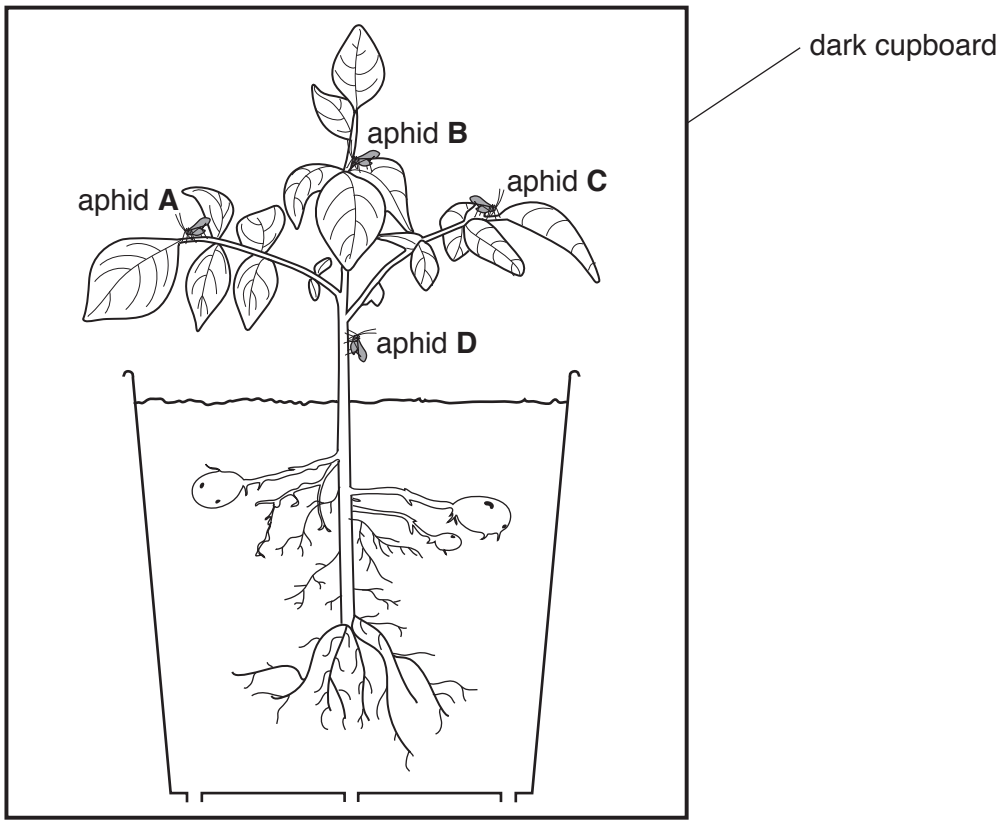

Fig. 2.3

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(i) Immediately after the aphids were placed on the plant it was observed that:

View solution

- all the aphids ingested the same volume of liquid from the phloem
- aphid **D** ingested the highest concentration of sucrose.

Explain why aphid **D** ingested the highest concentration of sucrose.

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..... [3]

(ii) Many crop farmers try to prevent insects such as aphids from damaging their plants.

View solution

Describe how modern technology is used to reduce damage to crop plants by insects.

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..... [3]

(iii) Other insects are useful to crop farmers.

View solution

Give **one** example of how insects are useful to farmers.

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..... [1]

[Total: 14]

3 Kidneys are important for excretion.

(a) Explain the purpose of excretion.

View solution

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..... [2]

(b) Sketch a simple diagram of a human kidney and its ureter.

View solution

Label the cortex, medulla and ureter on your diagram.

[2]

(c) Fig. 3.1 is a photomicrograph of a glomerulus in a kidney.

View solution



Fig. 3.1

(i) Describe the structure of a glomerulus.

You may refer to Fig. 3.1 in your answer.

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..... [2]

(ii) Describe the role of the glomerulus.

View solution

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..... [2]

(d) Table 3.1 shows some comparisons between a human and a mouse.

View solution

Table 3.1

feature	human	mouse
body mass / kg	60.0	0.025
kidney mass / g	320.0	0.310
water intake / dm^3 per day	1.5	0.005
water reabsorption / dm^3 per day	179.0	0.168
salt filtration rate / g per day	580.0	0.556
salt reabsorption / g per day	575.0	0.551

(i) Table 3.1 shows that salts are reabsorbed in the kidneys of both humans and mice.

Describe how salts are reabsorbed **against** a concentration gradient.

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..... [4]

(ii) Scientists stated a hypothesis:

"humans and mice reabsorb salt at almost the same rate in relation to the size of their kidneys"

View solution

Determine whether the data in Table 3.1 supports this hypothesis.

Show your working.

human	mouse

.....

.....

..... [4]

(iii) Table 3.1 also shows that water is reabsorbed in the kidneys of both humans and mice.

State the name of the process that mammals use to reabsorb water. View solution

..... [1]

(iv) Water and salt are reabsorbed in the kidneys.

View solution

State the name of one **other** molecule that is also reabsorbed in kidney tubules.

..... [1]

[Total: 18]

4 **(a)** The body has defence mechanisms to protect it from infection.

View solution

Outline the body's defence mechanisms.

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..... [5]

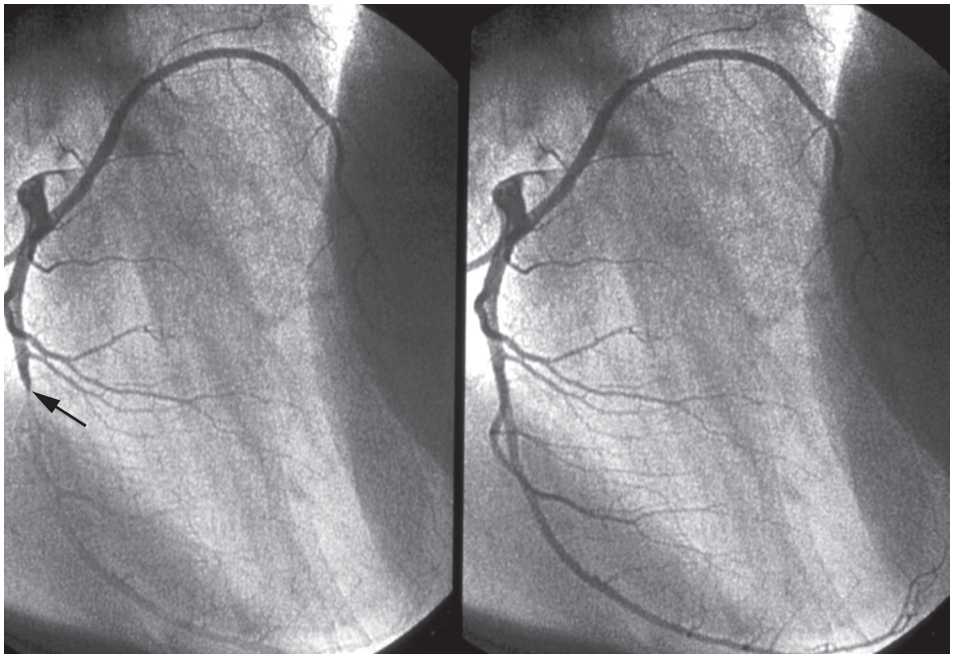
(b) State the name of a type of drug that can be used to treat bacterial infections.

..... [1]

[Total: 6]

View solution

5 Fig. 5.1 shows an angiogram of a heart before and after treatment for coronary heart disease (CHD). An angiogram is an image of the blood flow through the blood vessels of the heart.



before treatment after treatment

Fig. 5.1

(a) The arrow on Fig. 5.1 shows the position of a blockage in a blood vessel.

View solution

(i) State the name of the blocked blood vessel.

..... [1]

(ii) The blockage is caused by a blood clot.

View solution

Describe how a blood clot forms.

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..... [3]

(iii) State the name of a drug that can be used to treat coronary heart disease.

View solution

..... [1]

(b) Many health specialists think that the risk of coronary heart disease can be reduced by doing regular exercise.

A long-term study of a large group of women was used to test this hypothesis.
The women were between 35 and 45 years old at the start of the study.
Every two years the same group of women were asked how much they were exercising.

After 28 years the researchers analysed their data:

- They calculated the average time spent exercising per week by each woman.
- They put the women into categories determined by how much exercise they had done.
- For each category, they calculated the number of women who died from coronary heart disease (CHD).

The results are shown in Fig. 5.2.

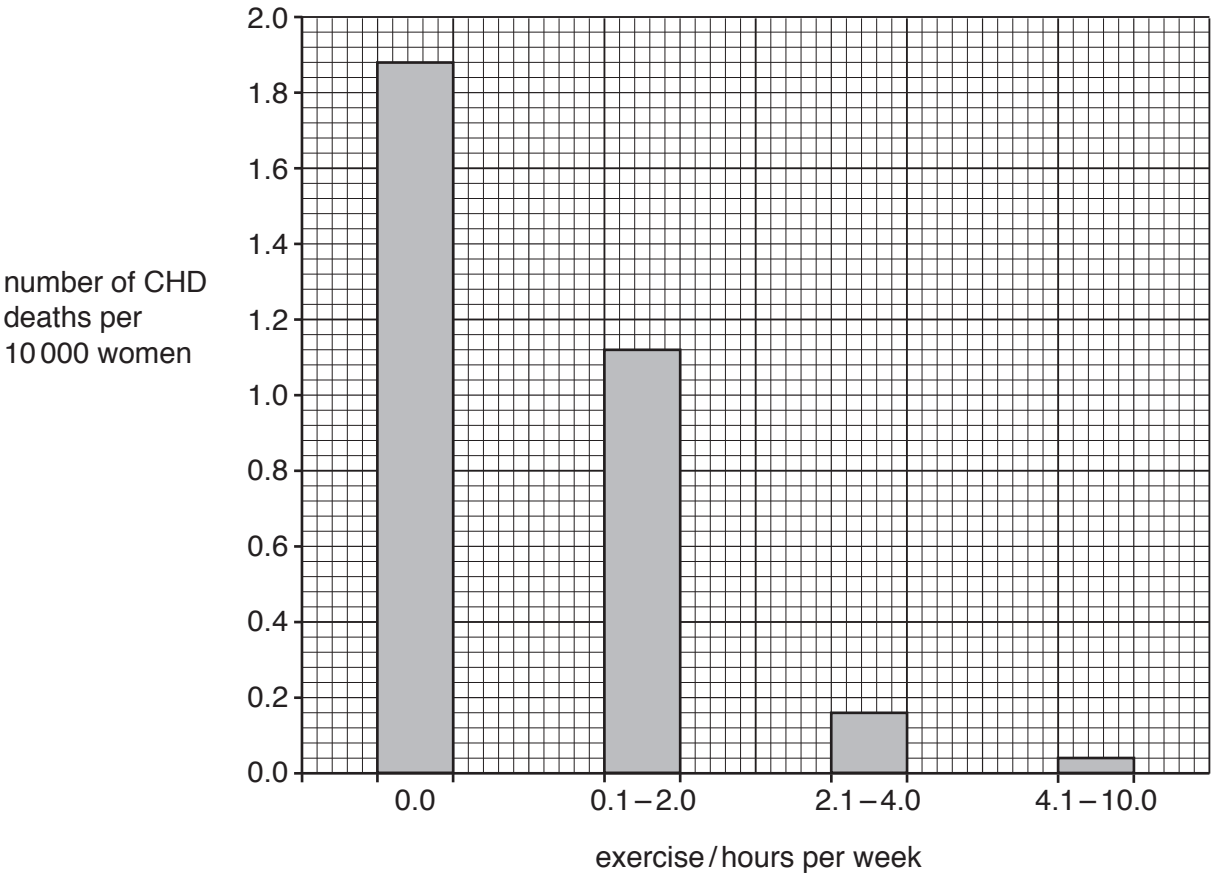

Fig. 5.2

(i) Calculate the percentage **decrease** in the number of CHD deaths per 10 000 women between those who did no exercise and those who exercised for 4.1 to 10.0 hours a week, using the data in Fig. 5.2.

View solution

number of CHD deaths per 10 000 women who did no exercise .....

number of CHD deaths per 10 000 women who did 4.1 to 10.0 hours per week of exercise

.....

Give your answer to the nearest whole number.

Space for working.

..... %
[3]

(ii) Health professionals wanted to use the results of this study to encourage the whole population to take more exercise.

Discuss the arguments for and against health professionals using this study in this way.

Use the information about how the study was designed and the results in Fig. 5.2 in your arguments.

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..... [5]

View solution

(c) Exercise causes heart rate to increase.

View solution

Explain why exercise causes an increase in heart rate.

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..... [3]

[Total: 16]

6 Fish are an important part of a balanced diet for many people.

(a) Fish are a good source of vitamin D.

View solution

State **one** effect of a diet that is deficient in vitamin D.

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..... [1]

(b) Many fish stocks have declined.

Marine ecologists considered the three topics shown in Fig. 6.1 when they discussed the decline of fish stocks.

View solution

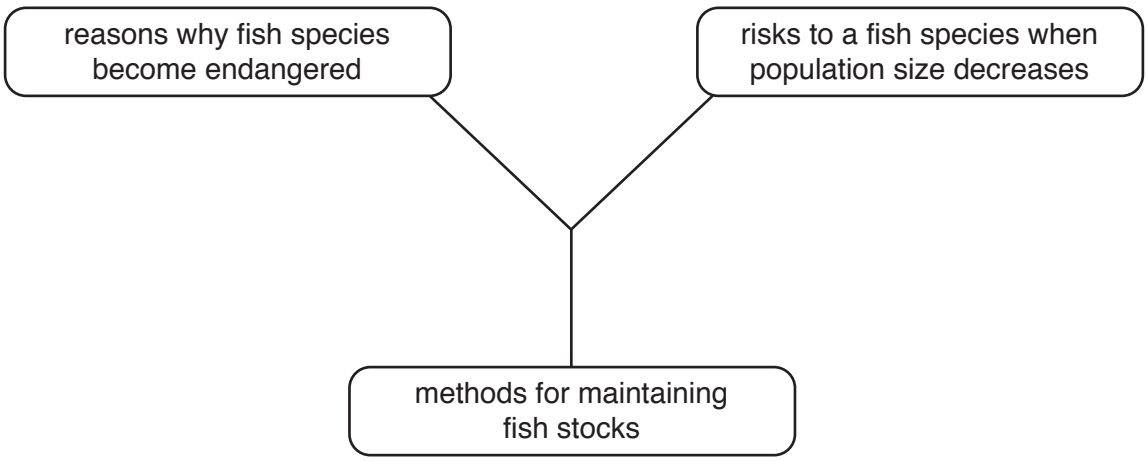

Fig. 6.1

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Describe the key points for each of the three topics shown in Fig. 6.1.

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..... [6]

[Total: 7]

7 Fig. 7.1 shows part of the nitrogen cycle.

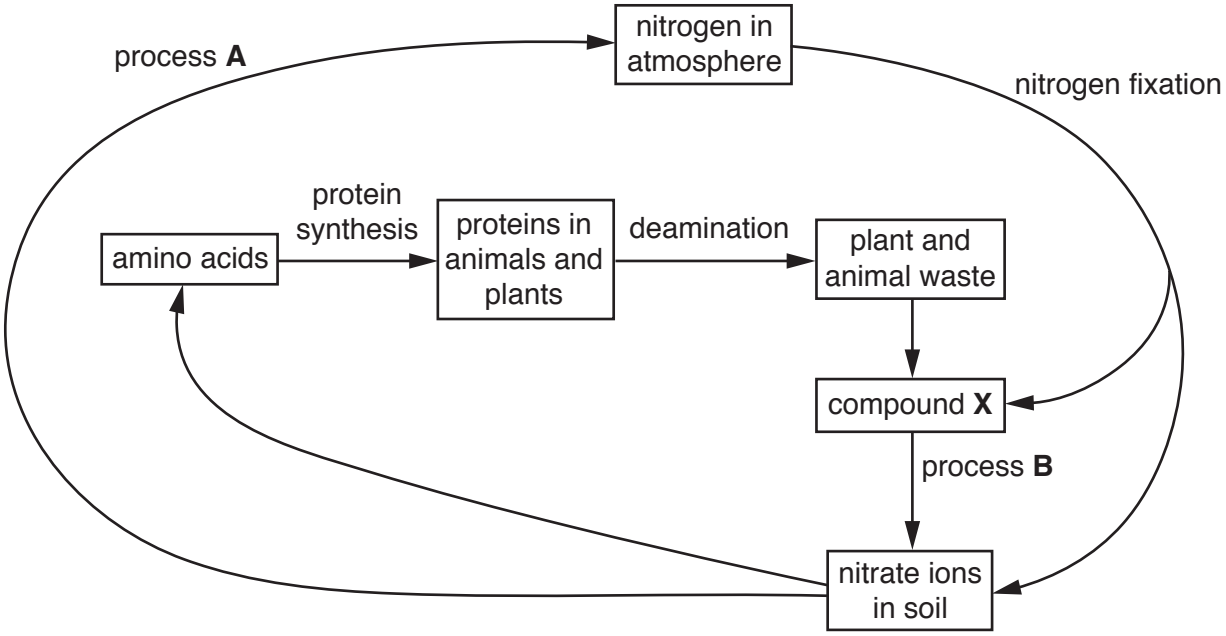

Fig. 7.1

(a) (i) State **two** ways that nitrogen fixation can occur.

View solution

1 .....

2 .....

[2]

(ii) State the names of processes **A** and **B** in Fig. 7.1.

View solution

process **A** .....

process **B** .....

[2]

(iii) State the name of compound **X** in Fig. 7.1.

View solution

..... [1]

(iv) Define the term *deamination*.

View solution

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..... [2]

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(b) State the name of the structure in a cell where protein synthesis occurs. View solution

..... [1]

(c) State the name of an enzyme that digests proteins.

..... [1]

[Total: 9]

View solution

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