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0610/41

May/June 2018

1 hour 15 minutes

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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

The number of marks is given in brackets [] at the end of each question or part question.

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

This document consists of **17** printed pages and **3** blank pages.

- 1 (a) The reactions of chemical digestion are catalysed by enzymes.

Fig. 1.1 shows the stages of an enzyme-catalysed reaction.

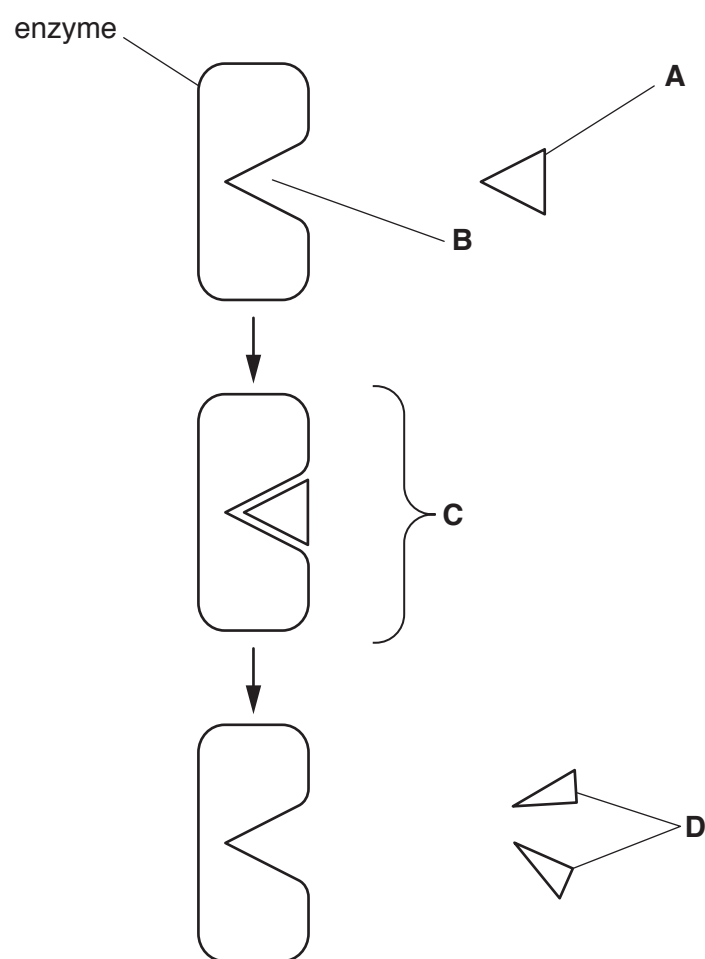


Fig. 1.1

State the names of **A** to **D** in Fig. 1.1.

- A**
- B**
- C**
- D**

[4]

(b) Explain the importance of chemical digestion.

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.....[2]

(c) Fig. 1.2 shows the human alimentary canal and associated organs.

The functions of some of these parts of the body are given in Table 1.1.

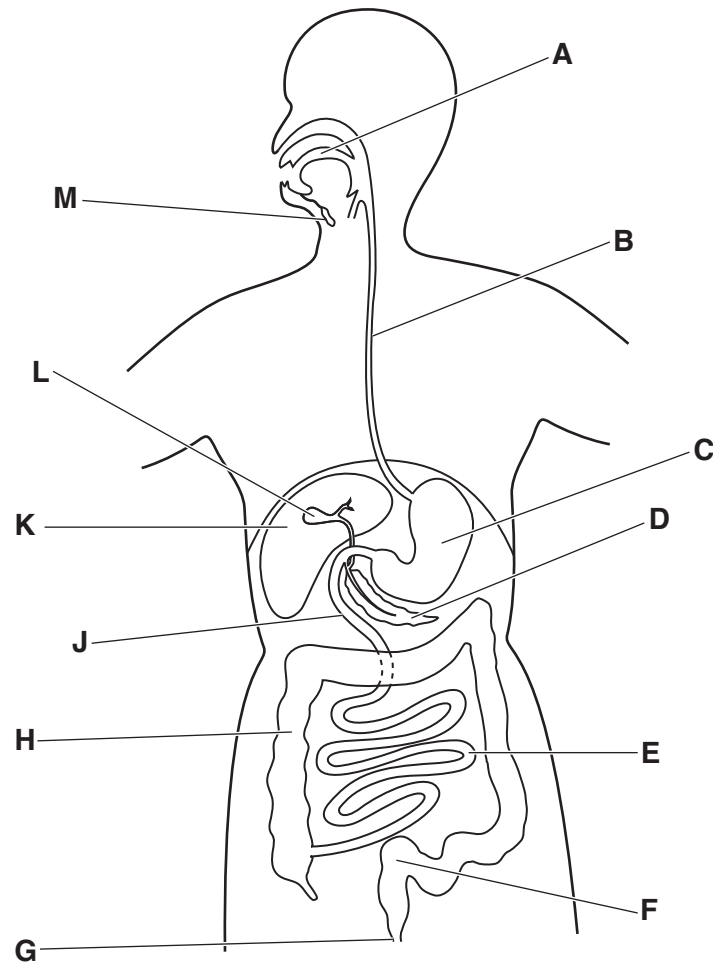


Fig. 1.2

Complete Table 1.1. One row has been done for you.

Table 1.1

function	letter from Fig. 1.2	name of structure
site of starch digestion		
reabsorption of water		
secretion of pepsin		
site of maltose digestion		
secretion of bile		
storage of faeces	F	rectum
secretion of lipase and trypsin		

[6]

[Total: 12]

- 2 (a) Adaptive features are defined as the inherited features of an organism that increase its fitness.

State what is meant by *fitness* in this context.

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.....

.....[1]

- (b) Rodents are the most common mammals in many hot deserts.

Fig. 2.1 shows the lesser Egyptian jerboa, *Jaculus jaculus*, which lives in North Africa and the Middle East in areas that have high daytime temperatures and very little rainfall.



Fig. 2.1

Like many desert-living mammals, jerboas are active at night.

Suggest **two** features of *J. jaculus* that adapt it to each of the following challenges of living in desert ecosystems:

- (i) very high daytime temperatures

1

2 [2]

- (ii) very little or no light at night

1

2 [2]

- (c) A scientist studied communities in different parts of a desert and estimated the biomass of the organisms in each area.

He divided the organisms into four groups according to their roles in the food web as shown in Table 2.1.

Detritivores are animals that eat dead organisms or parts of organisms.

Table 2.1

groups of organisms in the food web	biomass / g per m ²
producers	480
herbivores	220
detritivores	120
carnivores	40

Some of these results are shown as a pyramid of biomass in Fig. 2.2.

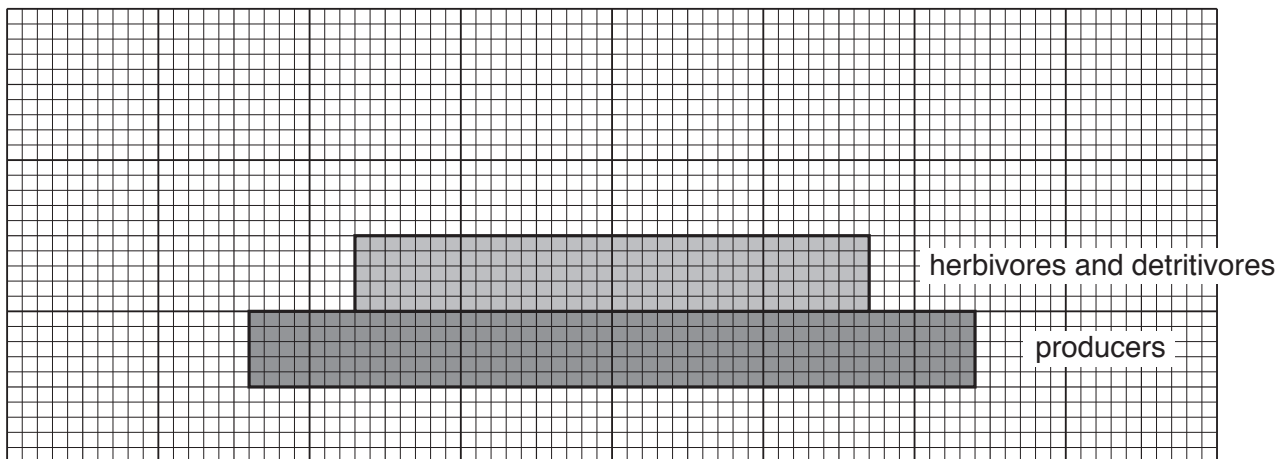


Fig. 2.2

- (i) Use the information in Table 2.1 to complete the pyramid of biomass in Fig. 2.2. [2]
- (ii) The scientist observed the detritivores and decided to include them with herbivores in this pyramid of biomass.

Suggest what the scientist discovered about the detritivores that made him make this decision.

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.....[1]

- (iii) Explain why there are rarely more than four or five trophic levels in ecosystems.

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.....[2]

- (iv) Explain the advantages of presenting information about food webs as a pyramid of biomass and **not** as a pyramid of numbers.

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.....[3]

[Total: 13]

- 3 A student cut a section of a root and made an outline drawing of the distribution of tissues as shown in Fig. 3.1.

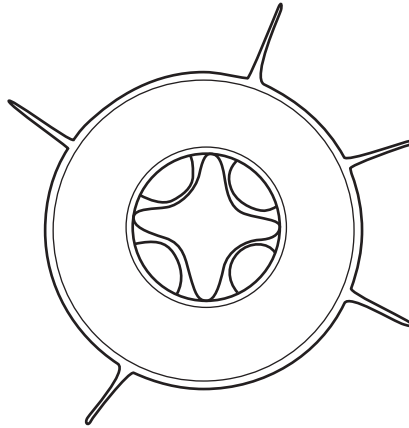


Fig. 3.1

- (a) (i) Identify the position of the xylem tissue by drawing a label line and the letter **X** on Fig. 3.1. [1]

- (ii) State why xylem is a tissue.

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.....[2]

- (b) Water absorbed by the roots moves through the stem and enters the leaves. Most of this water is lost in transpiration.

Explain how the internal structure of leaves results in the loss of large quantities of water in transpiration.

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.....[3]

[Total: 6]

The diagram illustrates a rat tail perfusion setup. A flow-meter is connected to a cannula that is inserted into the tail. The cannula is secured by a ring of muscle. The tail is divided into three sections: the skin (labeled 'skin'), the muscle (labeled 'muscle'), and the bone (labeled 'bone'). The skin section contains a network of blood vessels, including a large artery (labeled 'A') and a large vein (labeled 'V'). The muscle section contains a network of blood vessels, including a large artery (labeled 'B') and a large vein (labeled 'C'). The bone section contains a network of blood vessels, including a large artery (labeled 'D') and a large vein (labeled 'E'). The diagram is labeled with letters A through R. A note at the bottom right states 'Not drawn to scale'.

Fig. 4.1

- (a) (i) State the name of cell P.

.....[1]

- (ii) State the types of blood vessel labelled **Q**, **S** and **T**.

Q

S

T

[3]

- (iii)** State the name of the tissue at **R** that provides insulation.

.....[1]

- (ii) Explain the mechanism that increases blood flow through the skin.

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.....

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.....[3]

- (iii) State the difference between the average blood flow for the treatments (with and without capsaicin) at 35°C.

Space for working.

..... % [1]

- (iv) The researchers thought that capsaicin stimulated receptors in the skin.

Explain the process by which capsaicin could reach these receptors.

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.....[3]

(c) Explain the importance of regulating body temperature in humans.

[4]

(d) Body temperature is controlled by both hormones and nerves.

Explain how co-ordination by hormones differs from co-ordination by nerves.

[3]

[Total: 22]

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- 5 (a) State the balanced chemical equation for aerobic respiration.

.....[2]

- (b) Researchers in the Czech Republic investigated oxygen consumption in horses. They measured the oxygen consumption of the horses while they were exercising at four different paces: walking, trotting, cantering and galloping.

The results are shown in Fig. 5.1.

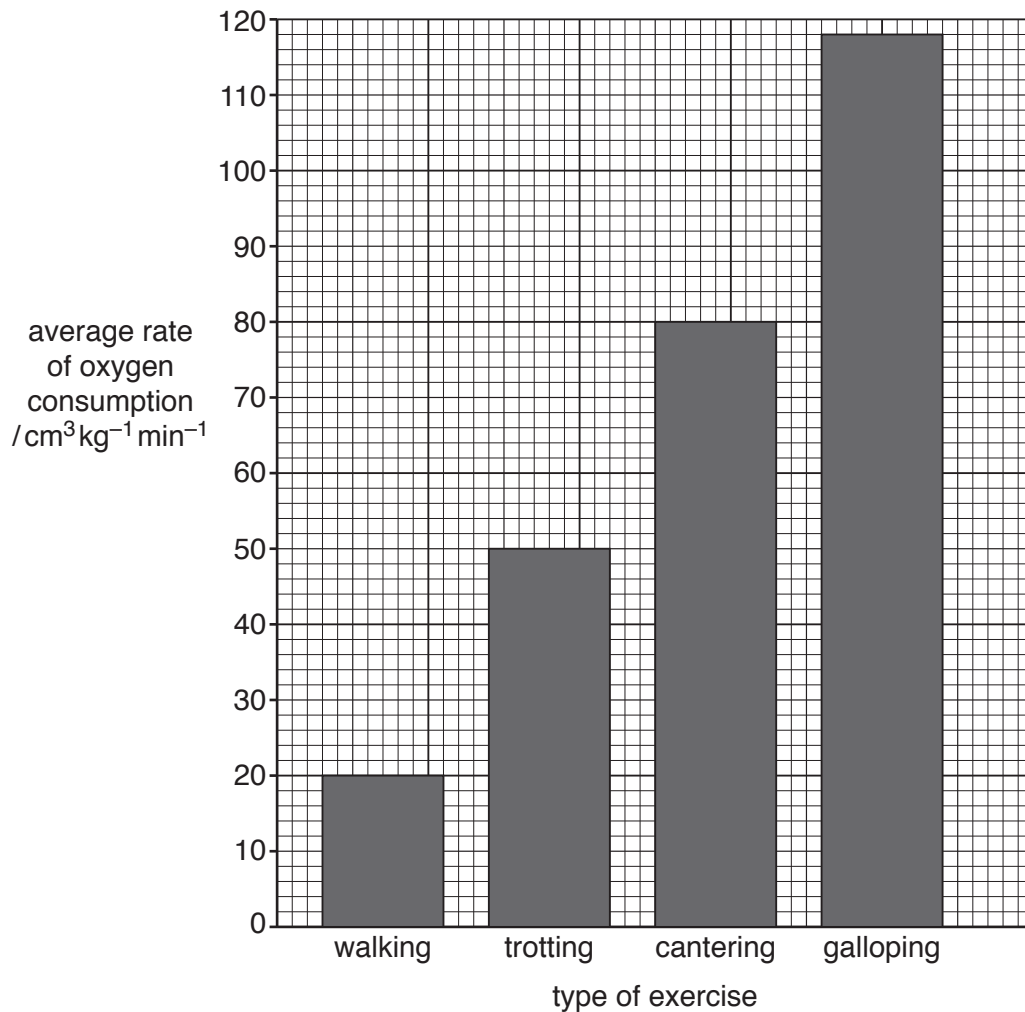


Fig. 5.1

Calculate the percentage increase in the average rate of oxygen consumption as the horses change from walking to trotting.

Show your working.

..... %
[2]

- (c)** The researchers also calculated the oxygen debt for each type of exercise.

They found that the horses developed a larger oxygen debt when they exercised by galloping and cantering rather than when they walked.

Explain why the horses developed an oxygen debt when they exercised.

.....[3]

- (d)** Describe how the horses would recover from an oxygen debt when they stop exercising.

[4]

- 6 (a) Fig. 6.1 is a diagram of the human female reproductive system.

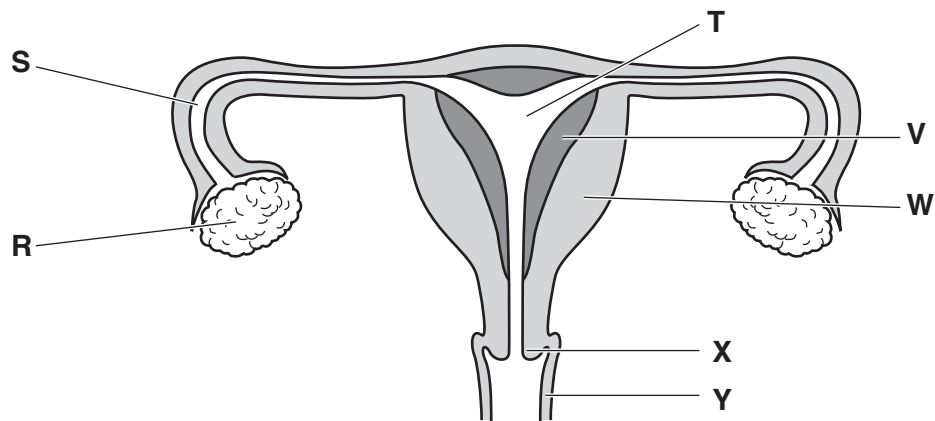


Fig. 6.1

- (i) Complete Table 6.1 by stating the letter from Fig. 6.1 that identifies the structure where each process occurs.

Table 6.1

process	letter from Fig. 6.1
meiosis	
fertilisation	
implantation	

[3]

- (ii) State the name of the part of the female reproductive system labelled **S** in Fig. 6.1.

..... [1]

(b) Fig. 6.2 is a diagram of a human sperm cell.

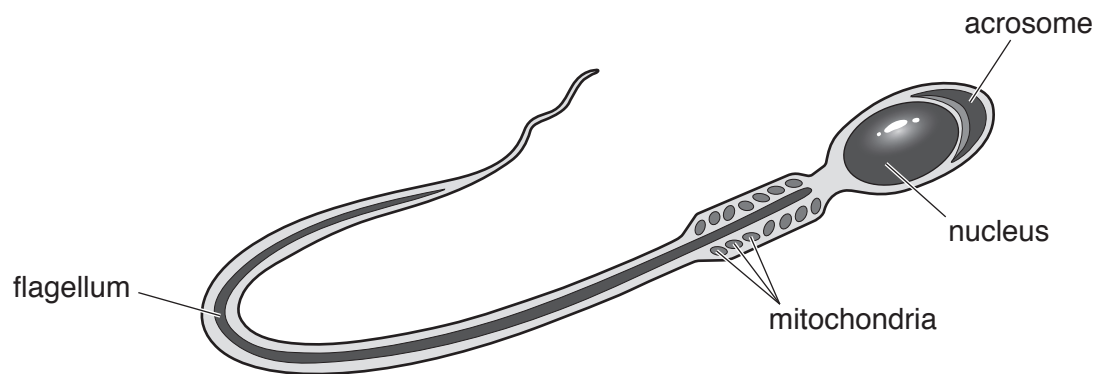


Fig. 6.2

(i) Write the formula that would be used to calculate the magnification of the diagram.

[1]

(ii) The actual length of the sperm cell in Fig. 6.2 is 0.055 mm.

Convert this value to micrometres (μm).

Space for working.

..... μm [1]

(c) Explain why the nuclei of sperm cells differ from those of other cells in the male.

.....

 [2]

(d) Explain the roles of the flagellum, the mitochondria and the acrosome in sperm cells.

..... [6]

(e) Explain why the sex of a child is determined by its father.

.....[2]

[Total: 16]