



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education



CANDIDATE
NAME

CENTRE
NUMBER

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BIOLOGY

0610/32

Paper 3 Extended

October/November 2011

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, highlighters, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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1	
2	
3	
4	
5	
6	
Total	

This document consists of **19** printed pages and **1** blank page.



- 1 Heart surgeons may stop the heart beating during operations. While this happens blood is pumped through a heart-lung machine that oxygenates the blood.

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Fig. 1.1 is a diagram showing a heart-lung machine in use.

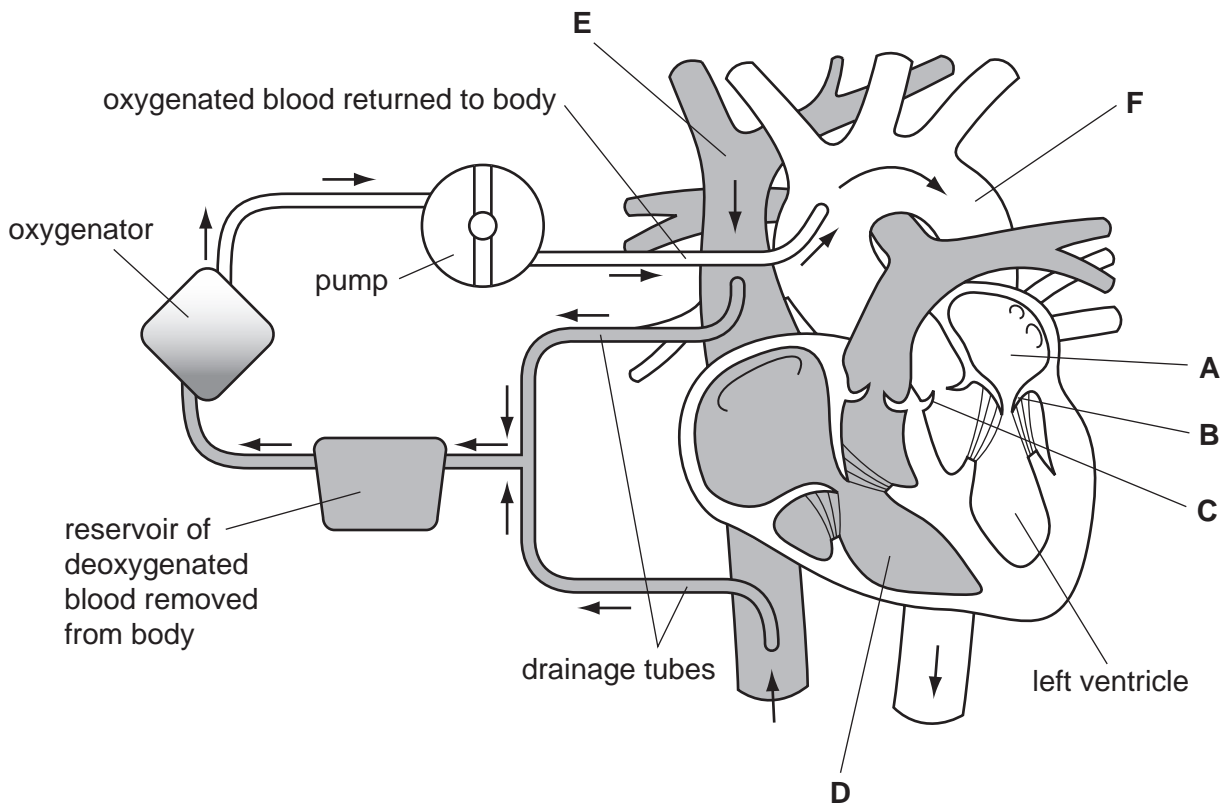


Fig. 1.1

- (a) Name the structures labelled A to D.

A
B
C
D [4]

- (b) Name the blood vessels E and F.

E
F [2]

(c) The heart-lung machine is used so that surgeons can operate on the arteries supplying heart muscle. These arteries may be diseased.

Name these arteries and explain how they may become diseased.

name of arteries

explanation

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..... [3]

(d) Suggest why a patient is put on a heart-lung machine during such an operation.

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..... [2]

Humans have a double circulation system. There is a low pressure circulation and a high pressure circulation.

(e) Explain how the structure of the heart enables it to pump blood into two circulations at different pressures.

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..... [4]

[Total: 15]

- 2 (a) Movement is a characteristic of living organisms.

Define the term *movement*.

.....
 [1]

When the hand is stimulated by a hot object a reflex action occurs in which the fore-arm is raised.

Fig. 2.1 shows the muscles and the neurones involved in the reflex action.

The arrows show where there are nerve impulses during the reflex action.

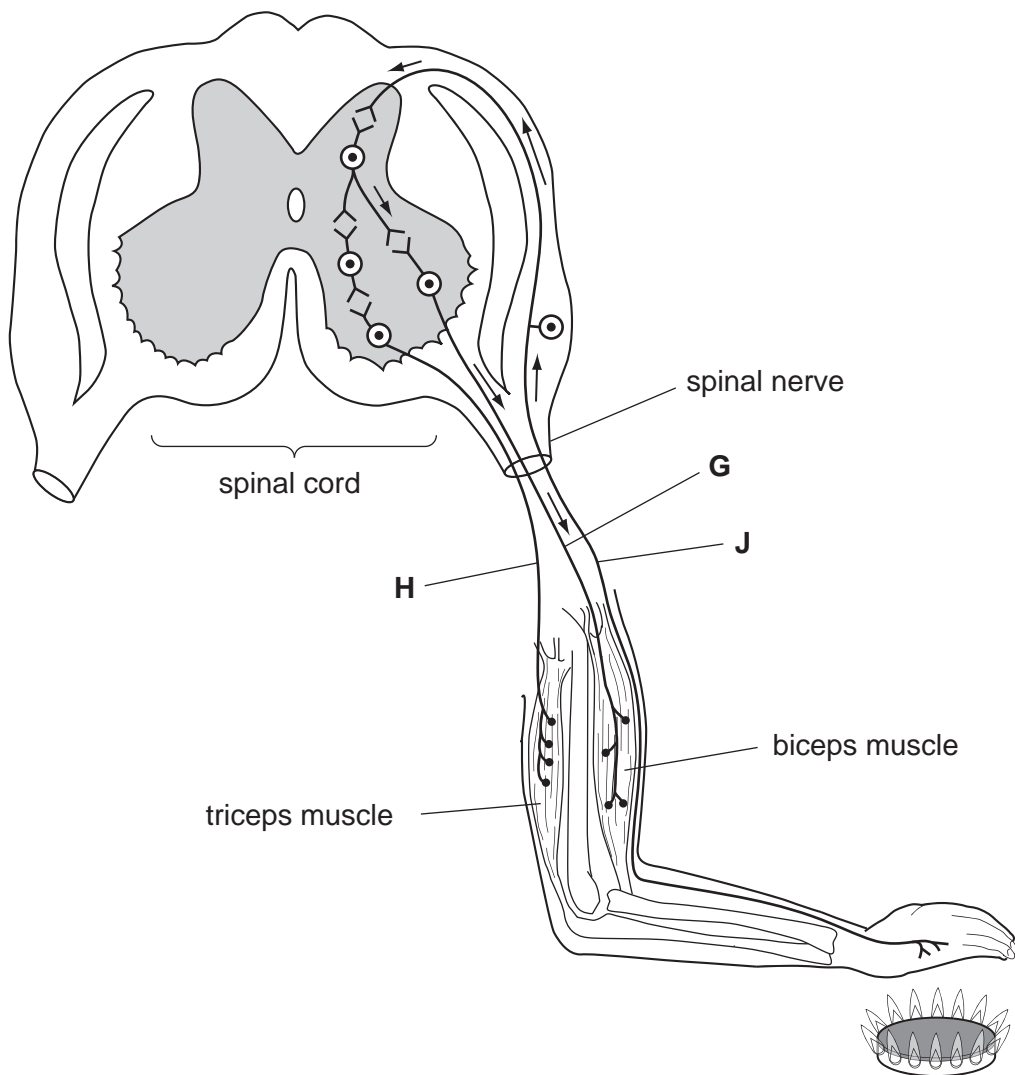


Fig. 2.1

- (b) (i) State the name for the action of two opposing muscles, such as the biceps and the triceps.

..... [1]

(ii) Explain how two opposing muscles bring about movement at the elbow joint.

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..... [3]

(c) (i) Describe the function of neurone J.

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..... [2]

(ii) Explain why there are impulses in motor neurone G, but not in motor neurone H.

.....

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..... [2]

(d) The action shown in Fig. 2.1 is an involuntary reflex action. The muscles can also be used for voluntary actions.

Explain how muscles are controlled during voluntary actions.

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..... [2]

[Total: 11]

- 3 The sweet potato plant, *Ipomoea batatas*, has fibrous roots and storage roots. Fibrous roots absorb water and ions from the soil. Storage roots store insoluble carbohydrates.

Fig. 3.1 shows the growth of these roots on a sweet potato plant.



Fig. 3.1

- (a) Explain, using the term **water potential**, how fibrous roots absorb water.

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[3]

The membranes of root hair cells contain proteins for the absorption of ions.

(b) Describe how root hair cells are adapted for the absorption of ions.

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..... [3]

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Sweet potato plants produce flowers to reproduce sexually. Sweet potato plants also reproduce asexually when shoots grow from the storage roots to form new plants.

Fig. 3.2 shows the life cycle of sweet potato. The diploid number of this species is 90.

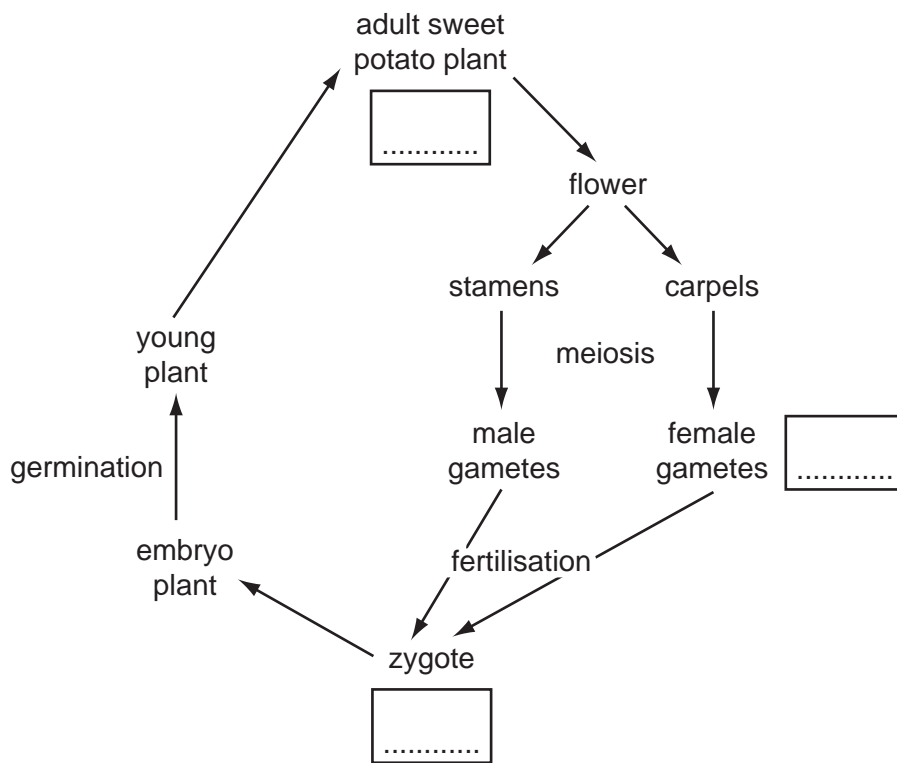


Fig. 3.2

(c) Complete Fig. 3.2 by writing the number of chromosomes in the three boxes.

[2]

(d) State **two** advantages and **one** disadvantage of **asexual** reproduction for plants, such as sweet potato.

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advantage 1

.....

advantage 2

.....

disadvantage

..... [3]

[Total: 11]

4 Proteins in the blood are involved in protection of the body.

Three proteins found in the blood are

- antibodies
- thrombin
- fibrinogen

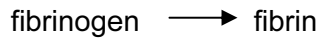
(a) (i) Name the type of white blood cell that produces antibodies.

..... [1]

(ii) Outline how antibodies protect the body.

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.....
..... [2]

(b) Thrombin is an enzyme that catalyses the reaction:



(i) State when this reaction occurs.

..... [1]

(ii) Explain how fibrin protects the body.

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..... [3]

An investigation was carried out to determine the effect of different temperatures on the activity of thrombin. The results are shown in Fig. 4.1.

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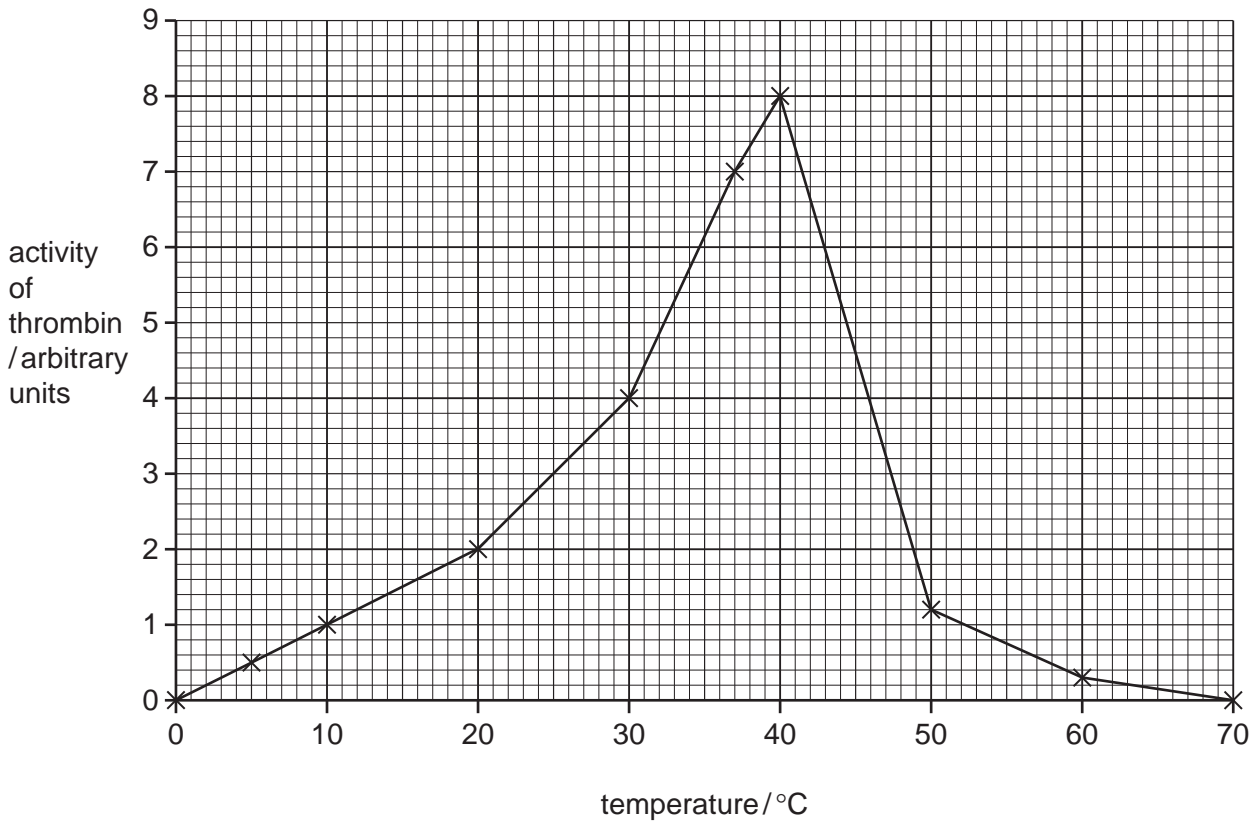


Fig. 4.1

(c) (i) Explain why thrombin functions slowly at 5 °C and does not function at all at 70 °C.

5 °C

.....

.....

70 °C

.....

..... [3]

(ii) Suggest how the activity of thrombin was determined.

.....
..... [1]

(iii) State **two** conditions that would have been kept constant during the investigation.

- 1 [1]
- 2 [2]

[Total: 13]

- 5 Reed warblers are small birds that migrate over long distances between western Africa and northern Europe.

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Fig. 5.1 shows a reed warbler, *Acrocephalus scirpaceus*.



Fig. 5.1

- (a) State three characteristic features of birds that are visible in Fig. 5.1.

- 1
2
3 [3]

A study was carried out in Sweden into the effects of natural selection on wing length in reed warblers.

The wings of young reed warblers reach their maximum length a few days after leaving the nest.

At this age the wing length in millimetres of each bird was recorded. Each bird was identified by putting a small ring around one of its legs.

When the birds were caught in net traps as adults, the information on the rings was used to identify specific birds and their ages.

The length of time between ringing and trapping was recorded for each bird that was identified before it was released.

The mean age at trapping was calculated for birds with each wing length.

The results are shown in Table 5.1.

Table 5.1

wing length at ringing / mm	number of birds trapped	mean age at trapping / days
63 or less	24	253
64	72	256
65	130	297
66	183	346
67	167	349
68	106	270
69	66	237
70 or more	23	199
	total = 771	

(b) (i) Explain why wing length is an example of continuous variation.

.....

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..... [2]

(ii) Suggest a feature of reed warblers, **other than wing length**, that shows continuous variation.

..... [1]

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(c) The researchers concluded that reed warblers with a wing length of 66-67 mm had the best chance of survival.

(i) Describe the evidence from Table 5.1 that supports this conclusion.

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..... [4]

(ii) The researchers also suggested that more evidence was needed to make this conclusion.

Suggest what other evidence would show that birds with wings 66-67 mm in length have the best chance of survival.

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..... [3]

(d) Scientists have discovered that genes are responsible for wing length in reed warblers. The most common length of wing has been 66-67 mm for many generations of these birds.

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Explain how natural selection may be responsible for maintaining the mean wing length of reed warblers at 66-67 mm.

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[4]

[Total: 17]

- 6 Sewage disposal involves the removal of human waste in pipes from houses to sewage treatment works.

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Fig. 6.1 is a diagram that shows how sewage is treated.

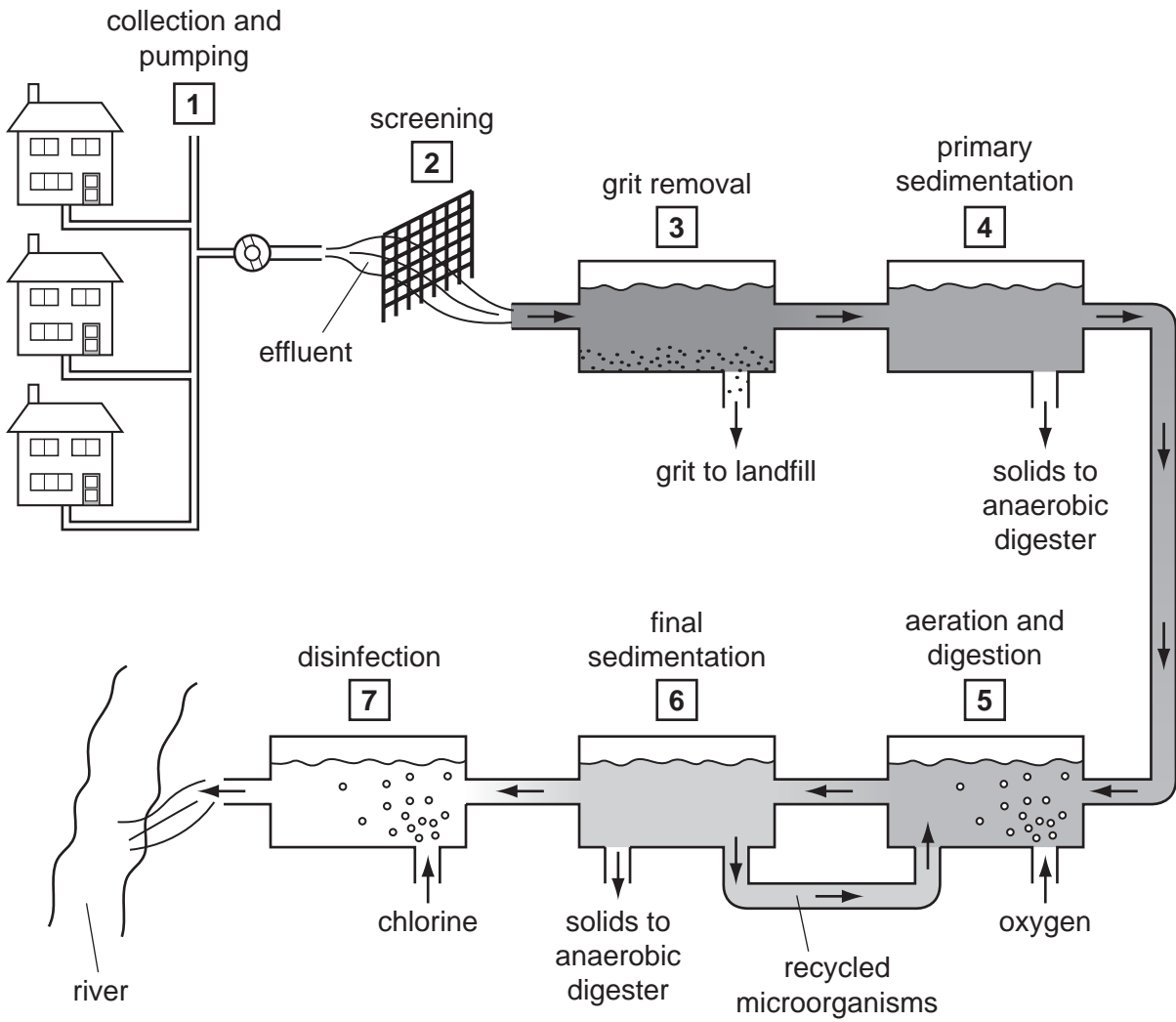


Fig. 6.1

- (a) During stage 5 microorganisms break down organic matter consisting of cellulose, starch, protein and lipid (fat). The microorganisms multiply during this stage and are recycled.

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Complete Fig. 6.2 by writing in the boxes the names of the enzymes used to catalyse the reactions shown. The first box has been completed for you.

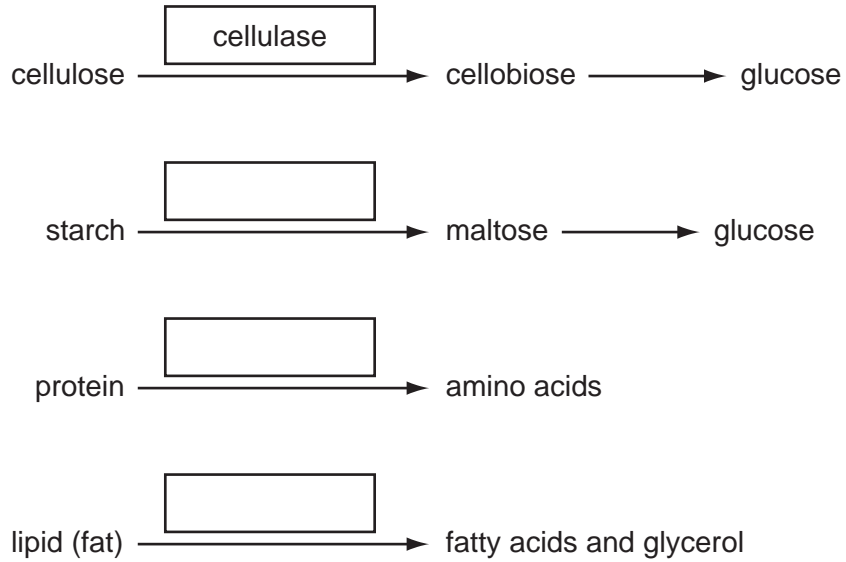


Fig. 6.2

[3]

(b) State why it is important that sewage is treated.

.....
.....
..... [1]

(c) At stage 5 in Fig. 6.1, oxygen and microorganisms are added.

Explain why oxygen is bubbled through the tank at this stage.

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..... [4]

(d) Suggest **and** explain the advantage of recycling microorganisms from stage 6 to stage 5 as shown in Fig. 6.1.

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..... [3]

(e) Explain why chlorine is added at stage 7.

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..... [2]

[Total: 13]

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