

**ADVANCED GCE****BIOLOGY**

Mammalian Physiology and Behaviour

2805/05

Candidates answer on the question paper

OCR Supplied Materials:

- Insert (inserted)

Other Materials Required:

- Electronic calculator
- Ruler (cm/mm)

Wednesday 17 June 2009**Afternoon****Duration:** 1 hour 30 minutesCandidate
ForenameCandidate
Surname

Centre Number

Candidate Number

INSTRUCTIONS TO CANDIDATES

- Write your name clearly in capital letters, your Centre Number and Candidate Number in the boxes above.
- Use black ink. Pencil may be used for graphs and diagrams only.
- Read each question carefully and make sure that you know what you have to do before starting your answer.
- Answer **all** the questions.
- Do **not** write in the bar codes.
- Write your answer to each question in the space provided, however additional paper may be used if necessary.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [] at the end of each question or part question.
- The total number of marks for this paper is **90**.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You are advised to show all the steps in any calculations.
- This document consists of **24** pages and an Insert. Any blank pages are indicated.

FOR EXAMINER'S USE

Qu.	Max.	Mark
1	12	
2	20	
3	17	
4	14	
5	13	
6	14	
TOTAL	90	



Answer **all** the questions.

- 1 (a) Fig. 1.1 is a diagram of the ear of a human.

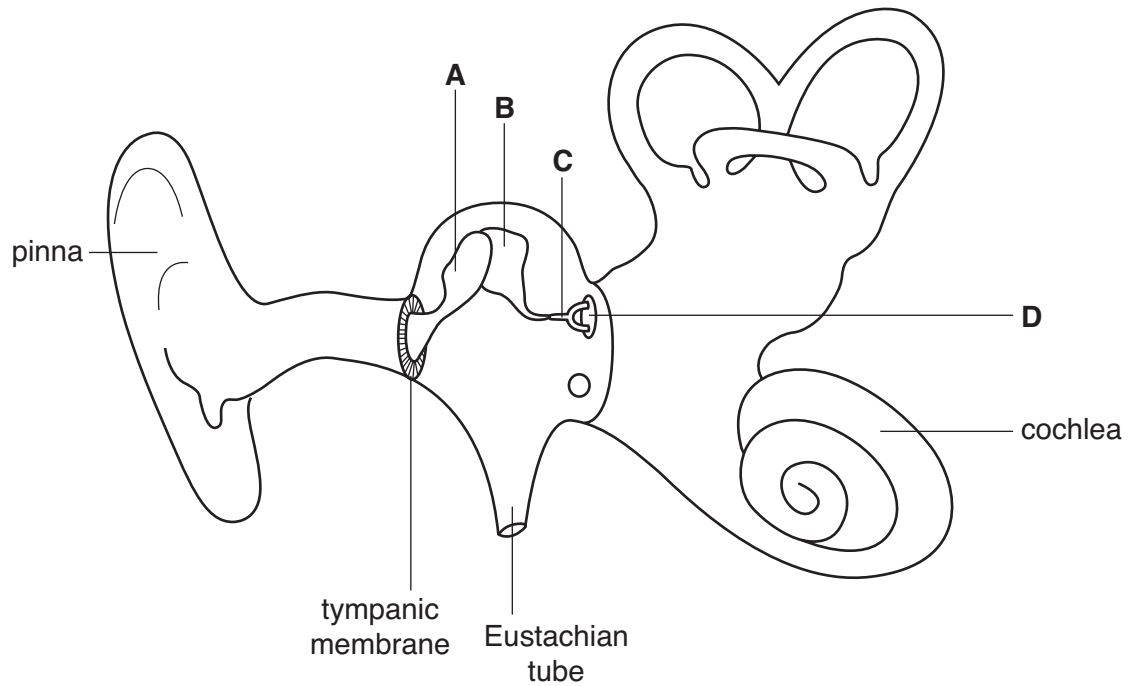


Fig. 1.1

- (i) State the role of structures **A**, **B** and **C**.

..... [1]

- (ii) Name structure **D** and explain its function.

name

function

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..... [2]

- (b) The range of frequencies that can be heard by mammals varies between species.

Fig. 1.2 shows the **maximum** frequency of sound detected by several mammal species.

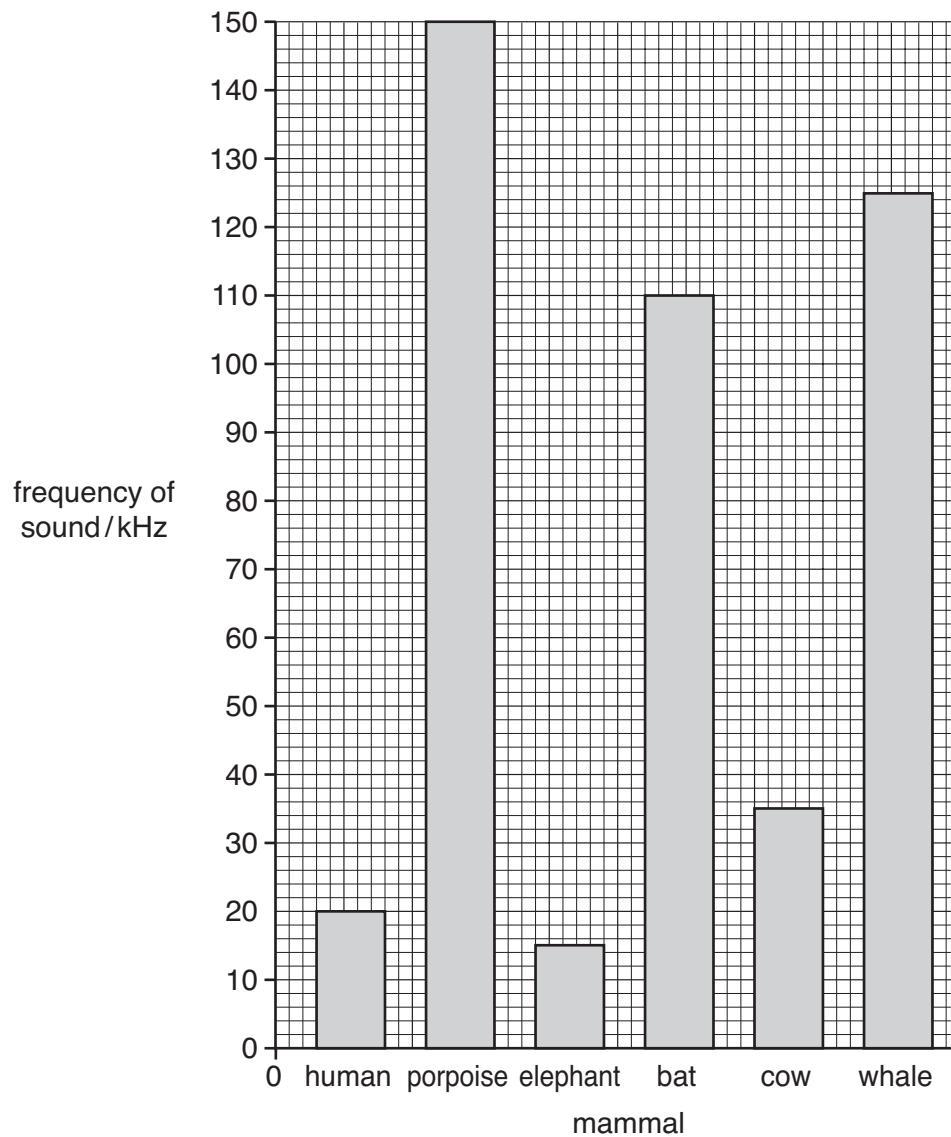


Fig. 1.2

Describe the data in Fig. 1.2 **and** suggest a reason for the differences in the maximum frequencies heard by the different species.

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[3]

- (c) Macular degeneration (MD) is a progressive disease of the eye caused by the breakdown of the macula, a region of the retina including the fovea.

One form of MD results from the development of new blood vessels underneath the retina, which then leak blood causing blurred vision.

The development of new blood vessels is partly controlled by vascular endothelial growth factor (VEGF).

A drug, Macugen[®], is used to treat patients with this form of MD.

Fig. 1.3 shows the results of a two-year study comparing two groups of patients with this form of MD. One group was treated with Macugen[®] and the other group was given no treatment of any kind.

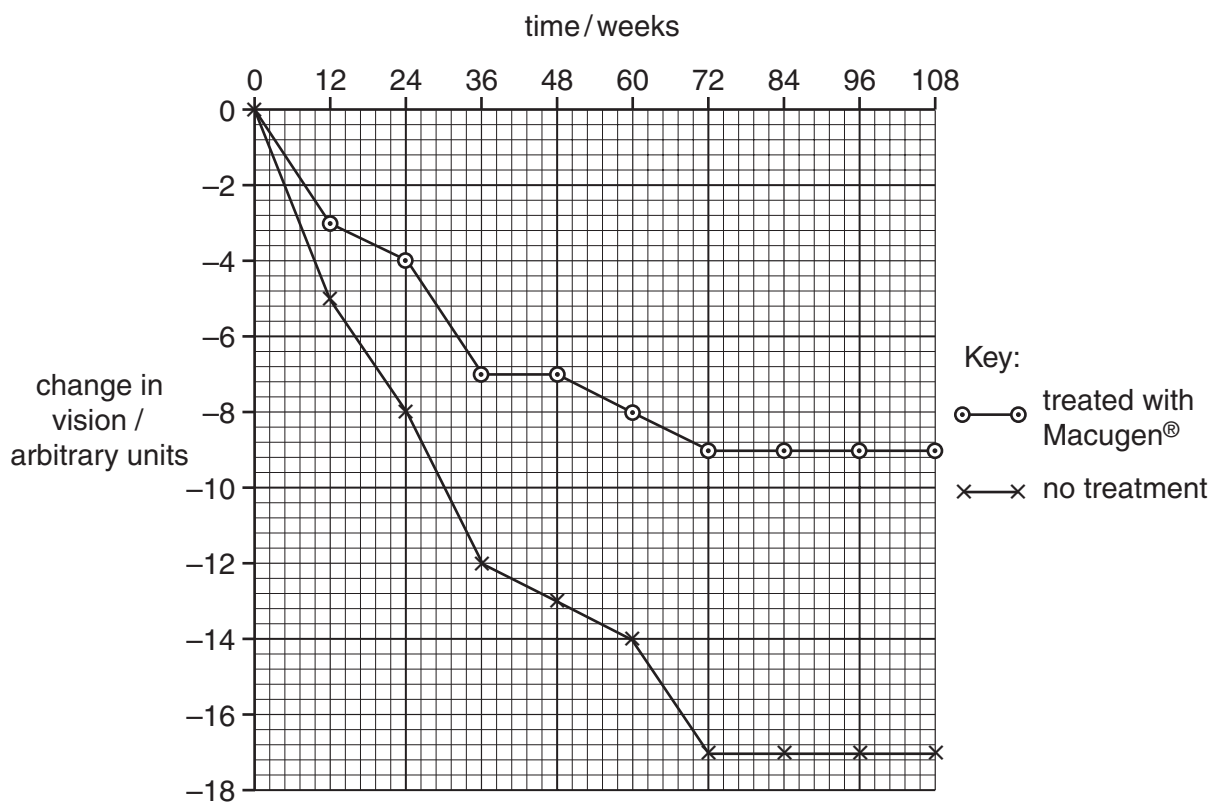


Fig. 1.3

- (i) Describe the results shown in Fig. 1.3.

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- (ii) Suggest how Macugen® may bring about the effect shown in Fig. 1.3.

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[Total: 12]

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2 Fig. 2.1, **on the insert**, outlines the control of the secretion of saliva and gastric juice.

(a) Gastric juice contains pepsinogen and hydrochloric acid.

Name the cells that produce these substances.

pepsinogen

hydrochloric acid [2]

(b) Fig. 2.2 shows the tertiary structure of a pepsinogen molecule from the stomach of a mammal.

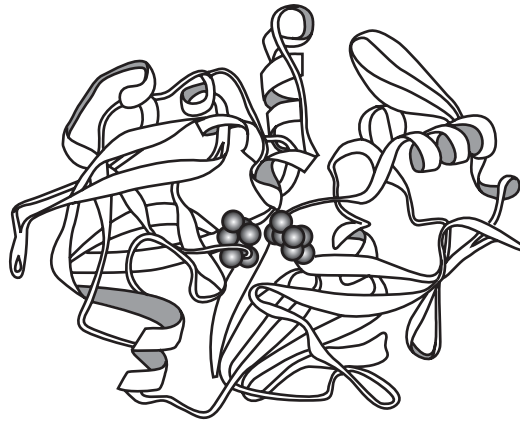


Fig. 2.2

Describe the bonds that maintain the tertiary structure of pepsinogen.

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- (c) Using your knowledge and Fig. 2.1, describe the endocrine control of the secretion of gastric juice **and** state **one** advantage of endocrine control in the stomach.

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- (d) Fatty foods remain in the stomach for longer than other foods because of a delay in gastric emptying. This delay may cause stomach discomfort and indigestion.

Lipases are known to play an important role in the regulation of gastric emptying.

A clinical study was carried out to measure the gastric emptying time of three groups of people of the same age.

- Group **A** was given a meal containing no fats or oils.
- Group **B** was given a meal containing fats.
- Group **C** was given a meal containing fats plus lipase.

The time taken for the stomach to empty was measured for all groups.

The results are shown in Table 2.1.

Table 2.1

group	meal containing	mean gastric emptying time / min
A	no fats or oils	15
B	fats	28
C	fats plus lipase	18

- (i) State the reason for including group **A** in the study.

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- (ii) Describe **and** explain the results shown in Table 2.1.

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..... [4]

- (e) The secretion of saliva is triggered by the sight, smell and chewing of food.

Describe the work carried out by Ivan Pavlov on conditioned learning in dogs **and** outline how he interpreted his observations.

You may use information from Fig. 2.1 in your answer.

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[Total: 20]

- 3 (a)** In this question, one mark is available for the quality of use and organisation of scientific terms.

Fig. 3.1 is a drawing of a section of compact bone.

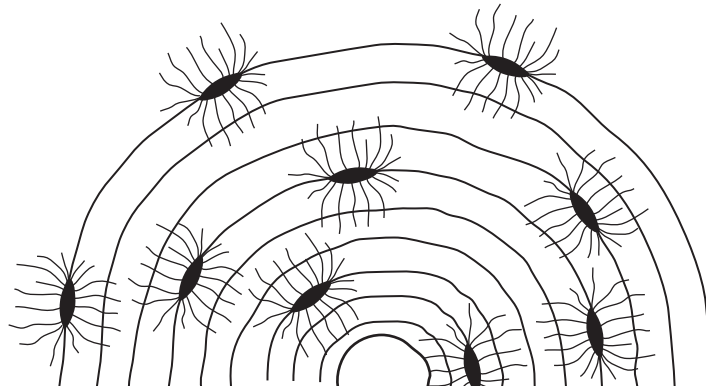


Fig. 3.1

Describe the role played by bone cells in the formation **and** maintenance of compact bone.

This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.

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Quality of Written Communication [1]

(b) Osteoporosis is a disease of the bone.

Name the category of disease to which osteoporosis belongs.

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- (d) Osteoarthritis is a degenerative disease of the cartilage in joints. Fig. 3.3 shows the replacement of an arthritic elbow joint with metal and plastic.

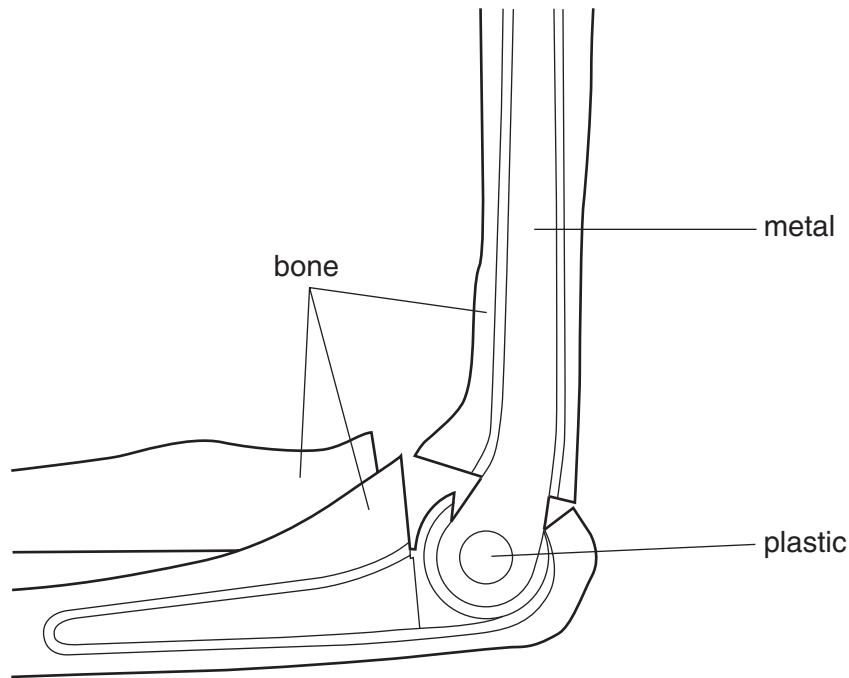


Fig. 3.3

- (i) Describe **two** forms of treatment for osteoarthritis, **other than joint replacement**.

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- (ii) Suggest advantages of a replacement joint, such as that shown in Fig. 3.3.

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[Total: 17]

14
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..... [6

Turn over

- (b) With improvements in nutrition and veterinary medicine the life expectancy of domestic cats is increasing. Accompanying this growing population of elderly cats is an increasing number with signs of apparent dementia called Cognitive Dysfunction Syndrome (CDS).

Some of the symptoms of CDS are:

- increased attention seeking
- aimless wandering
- altered interest in food
- decreased grooming
- loss of bowel control.

A study of 135 cats between the ages of 11 and 21 years was carried out to assess the prevalence of CDS.

The results are summarised in Table 4.1.

Table 4.1

age range / years	number of cats	number of cats with CDS	percentage of cats with CDS
11 – 14	89	25	28
15 – 21	46	23	50
11 – 21	135	48

- (i) Calculate the percentage of cats with CDS for the age range 11 – 21 **to the nearest whole number**.

Show your working and **write your answer in Table 4.1**.

[2]

- (ii) The brains of cats with CDS showed the development of plaques between neurones. This also occurs in the brains of humans with Alzheimer's disease.

Outline the formation of **plaques** in the brains of humans with Alzheimer's disease.

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[Total: 14]

- 5 (a) Fig. 5.1 shows a diagram of part of a mammalian cell membrane.

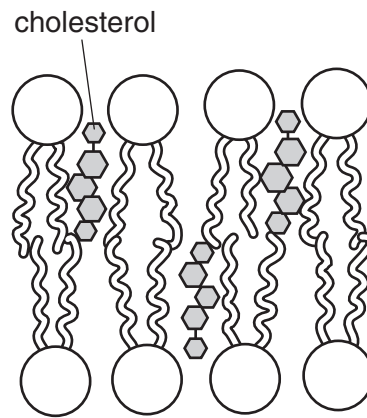


Fig. 5.1

Describe the position of cholesterol molecules within the cell membrane **and** explain the importance of cholesterol in a membrane.

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..... [3]

- (b) State **two other** functions of cholesterol in a mammal's body.

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- (c) High concentrations of cholesterol in the blood can increase the risk of developing coronary heart disease (CHD).

Describe how a raised concentration of cholesterol in the blood may lead to CHD.

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..... [4]

- (d) Substances called plant sterols have a molecular structure similar to that of cholesterol. They are added to some types of margarine.

A clinical trial tested the effects of plant sterols on the concentration of cholesterol in the blood. The trial lasted 14 months and was carried out on two groups of people, **P** and **Q**, with high blood cholesterol concentrations.

- Group **P** had a diet containing no added plant sterols.
- Group **Q** had a diet that included 2.6 g plant sterols each day for the first 12 months of the trial.

Fig. 5.2 shows the results of this trial.

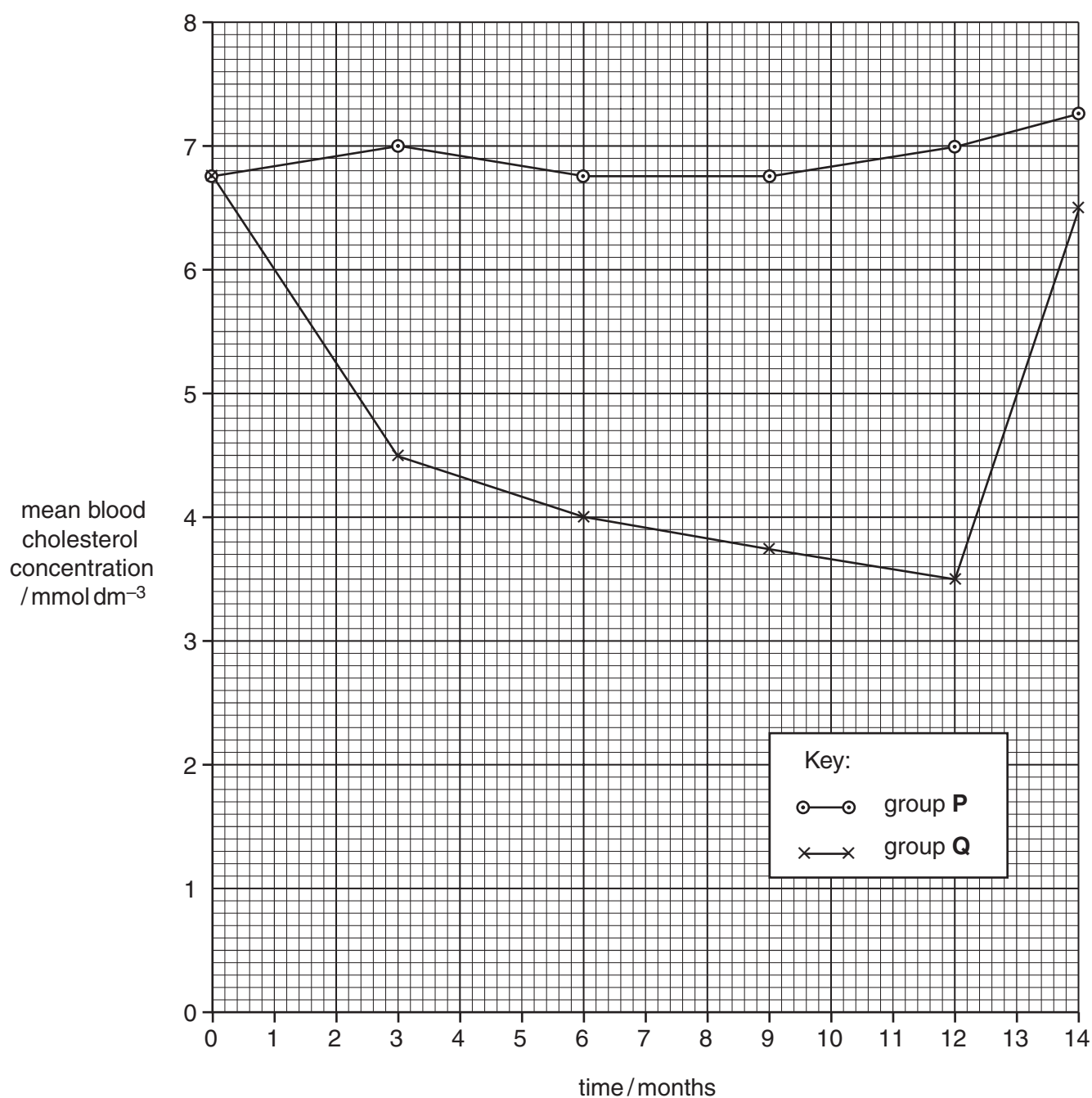


Fig. 5.2

A recommended value for the concentration of cholesterol in the blood is between 2 and 5 mmol dm⁻³.

Discuss the results of the clinical trial shown in Fig. 5.2.

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..... [4]

[Total: 13]

- 6 (a) Kangaroos have a chambered stomach that is functionally similar to those of ruminants such as cattle. They regurgitate the vegetation they have eaten, chew it as 'cud', and then swallow it again for final digestion.

Anaerobic microorganisms in the stomach of kangaroos produce carbon dioxide as a waste gas, whereas those in cattle produce carbon dioxide and a second waste gas.

- (i) Name the second waste gas produced by microorganisms in the stomachs of cattle.

..... [1]

- (ii) It is thought that this second waste gas produced by cattle may have a large environmental impact.

Suggest how this may be so.

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 [2]

- (iii) Suggest how **both** waste gases may leave the cattle.

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 [1]

- (b) The Florida manatee, *Trichechus manatus latirostris*, is an aquatic, herbivorous mammal that lives in both fresh water and sea water in Florida, USA.

Fig. 6.1 is a drawing of a Florida manatee.

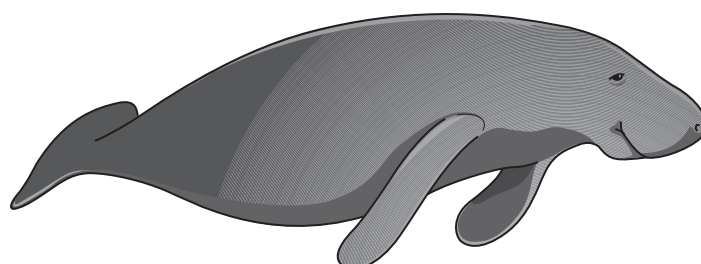


Fig. 6.1

Most of the plant material, especially cell walls, consumed by the manatee is digested by microorganisms in the large intestine. This also happens in mammals such as the horse.

- (i) Name the main component of plant cell walls **and** describe briefly the structure of this component.

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- (ii) Suggest the disadvantages of digestion occurring in the large intestine.

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- (iii) One function of the large intestine in a mammal is to absorb ions by active transport.

Outline the process of active transport.

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..... [2]

- (c) The large structure at the posterior end of the manatee is called a fluke. The manatee propels itself by up and down movements of the fluke, in the same way as a dolphin. During this movement the backbone flexes.

- (i) Name the structures that hold the vertebrae together as the manatee swims.

..... [1]

- (ii) Name the structures that act as shock absorbers as the vertebrae push against each other.

..... [1]

Question 6(d) starts on page 24

(d) Fig. 6.2 shows the skeleton of a flipper of a manatee.



Fig. 6.2

Name the arrangement of bones in the flipper.

..... [1]

[Total: 14]

END OF QUESTION PAPER

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