OCR
RECOGNISING ACHIEVEMENT

OXFORD CAMBRIDGE AND RSA EXAMINATIONS
Advanced GCE

BIOLOGY 2805/05

Mammalian Physiology and Behaviour

Thursday **30 JANUARY 2003** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.
Additional materials:
Electronic calculator
Ruler (mm/cm)

Candidate Name	Centre Number	Candidate Number

TIME 1 hour 30 minutes

INSTRUCTIONS TO CANDIDATES

- Write your name in the space above.
- Write your Centre number and Candidate number in the boxes above.
- Answer **all** the questions.
- Write your answers, in blue or black ink, in the spaces on the question paper.
- Read each question carefully before starting your answer.

INFORMATION FOR CANDIDATES

- The number of marks is given in brackets [ ] at the end of each question or part question.
- You will be awarded marks for the quality of written communication where this is indicated in the question.
- You may use an electronic calculator.
- You are advised to show all the stages in any calculations.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	15	
2	17	
3	15	
4	14	
5	16	
6	13	
TOTAL	90	

This question paper consists of 19 printed pages and 1 blank page.

Registered Charity Number: 1066969
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For Examiner's Use

Answer **all** the questions.

1 Fig. 1.1 shows a section through the stomach wall.

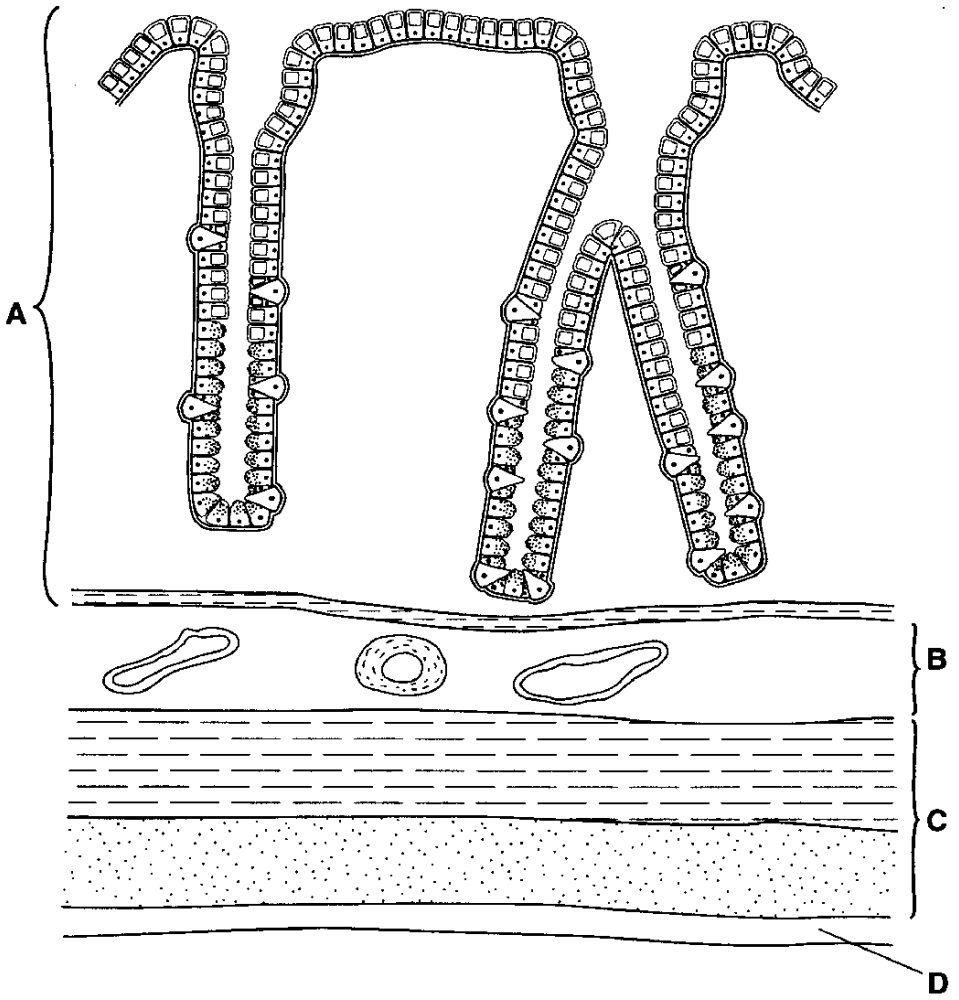

Fig. 1.1

(a) Name the layers **A** to **D**.

A.....

B.....

C.....

D.....[4]

For Examiner's Use

Cells in the lining of the stomach secrete pepsinogen, an inactive form of the enzyme pepsin. Pepsinogen is a longer molecule than pepsin.

(b) Indicate on Fig. 1.1, **using a label line marked with the letter P**, a cell that secretes pepsinogen. [1]

(c) **(i)** Explain why cells in the stomach secrete pepsinogen rather than pepsin.

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.....[2]

(ii) Suggest how pepsinogen is converted into pepsin.

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.....[2]

For Examiner's Use

(d) An investigation was carried out to determine the rate at which the contents of the stomach are emptied into the duodenum in response to two types of food:

- a sucrose solution
- pieces of meat.

Fig. 1.2 shows the results of this investigation.

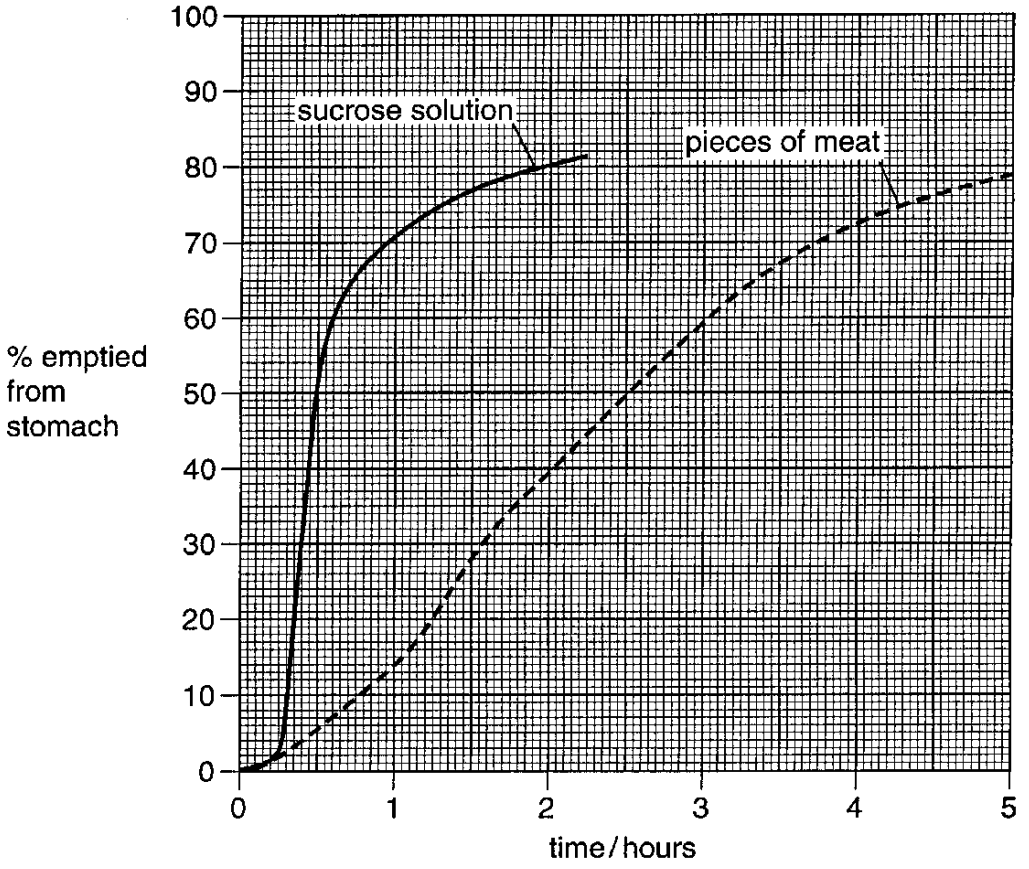

Fig. 1.2

(i) How long does it take for 50% of each food to be emptied from the stomach?

sucrose solution .....

pieces of meat .....[2]

(ii) Explain the advantages of pieces of meat remaining longer in the stomach than sucrose solution.

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.....[4]

[Total: 15]

For Examiner's Use

2 **(a)** Fig. 2.1 is a diagram of a section through a human retina.

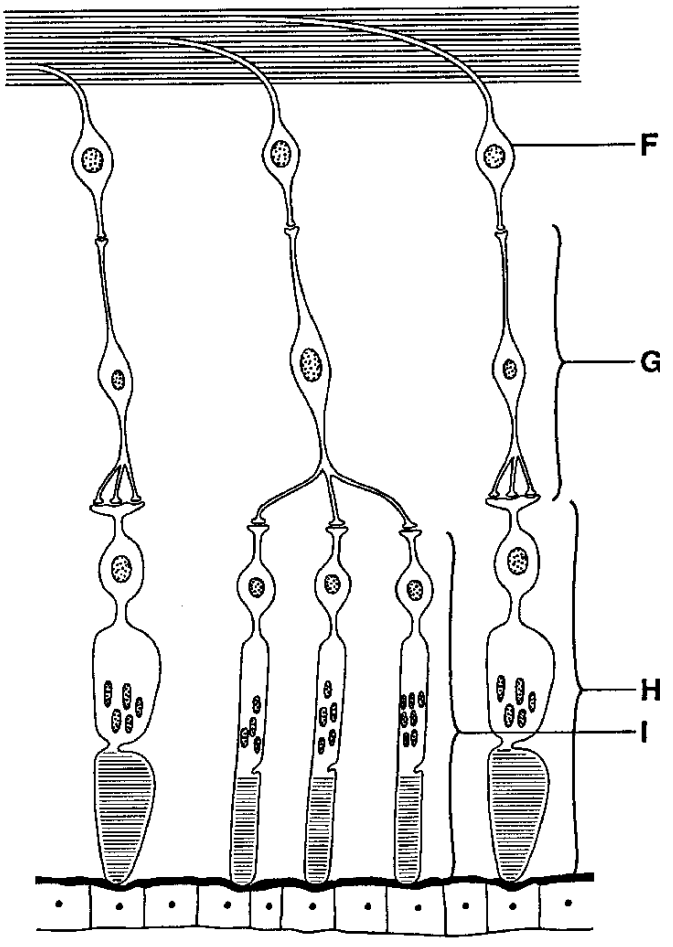

Fig. 2.1

(i) Name the cells **F** to **I**.

F.....

G.....

H.....

I.....[4]

(ii) Indicate on Fig. 2.1, **using a label line marked with the letter V**, where synaptic vesicles are found in cell **H**. [1]

(iii) What is stored in synaptic vesicles?

.....[1]

[Turn over

(b) An investigation was made of the distribution of cells **H** and **I** across a line through regions **R** and **S** in the human retina as shown in Fig. 2.2. The numbers of cell **H** across the line are shown in Fig. 2.3.

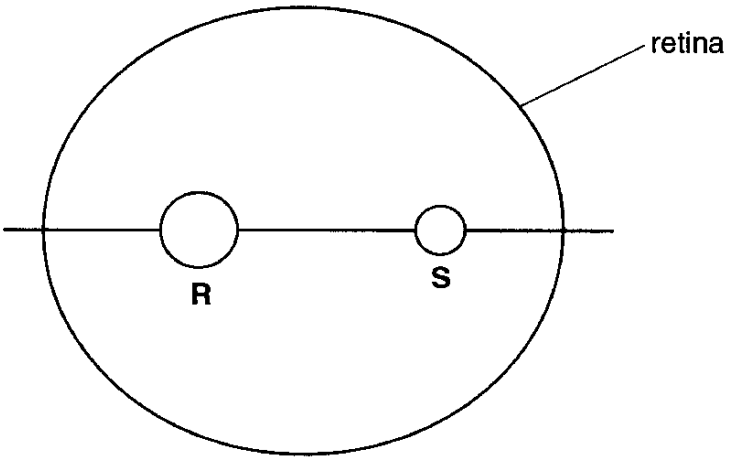

Fig. 2.2

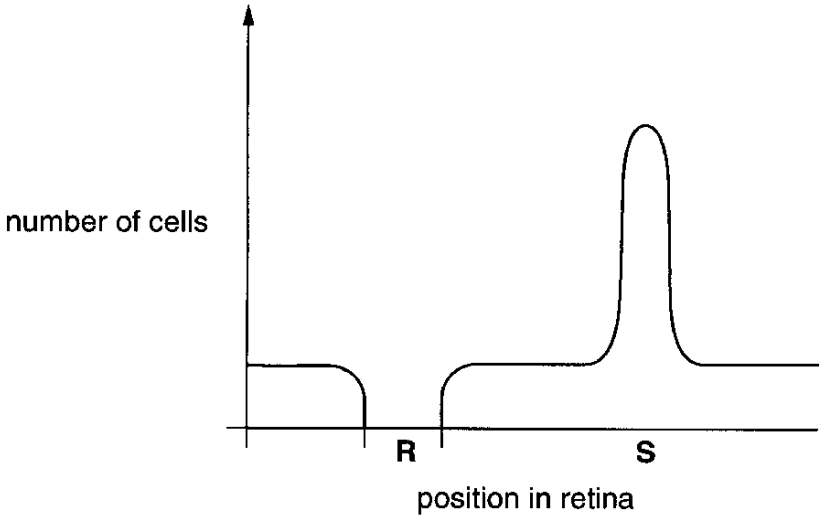

Fig. 2.3

For Examiner's Use

(i) Name the regions of the retina labelled **R** and **S** in Fig. 2.2.

R .....

S .....[2]

(ii) Describe the distribution of cell **I** (from Fig. 2.1) across the retina along the line shown on Fig. 2.2 and Fig. 2.3.

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.....[3]

(iii) Explain why the image perceived by the brain from region **S** has high resolution.

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For Examiner's Use

(c) Fig. 2.4 shows the effect of increasing the intensity of light entering the eye on the diameter of the pupil.

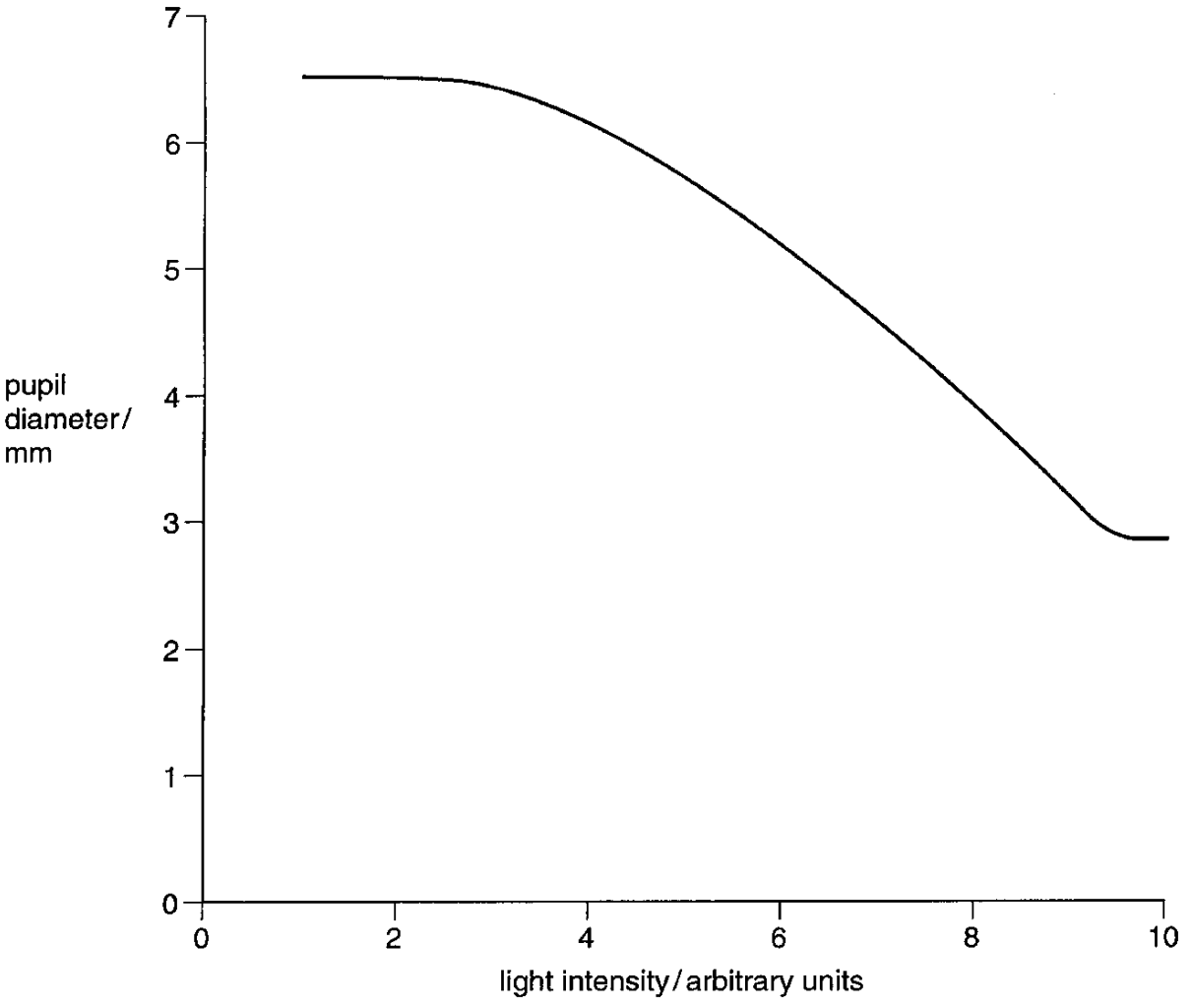

Fig. 2.4

Explain the relationship between light intensity and pupil diameter as shown in Fig. 2.4.

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[Total: 17]

For Examiner's Use

3 Fig. 3.1 shows the left forelimb and scapula of a rabbit and of an armadillo. Both mammals dig holes in the ground. (The drawings are not to the same scale.)

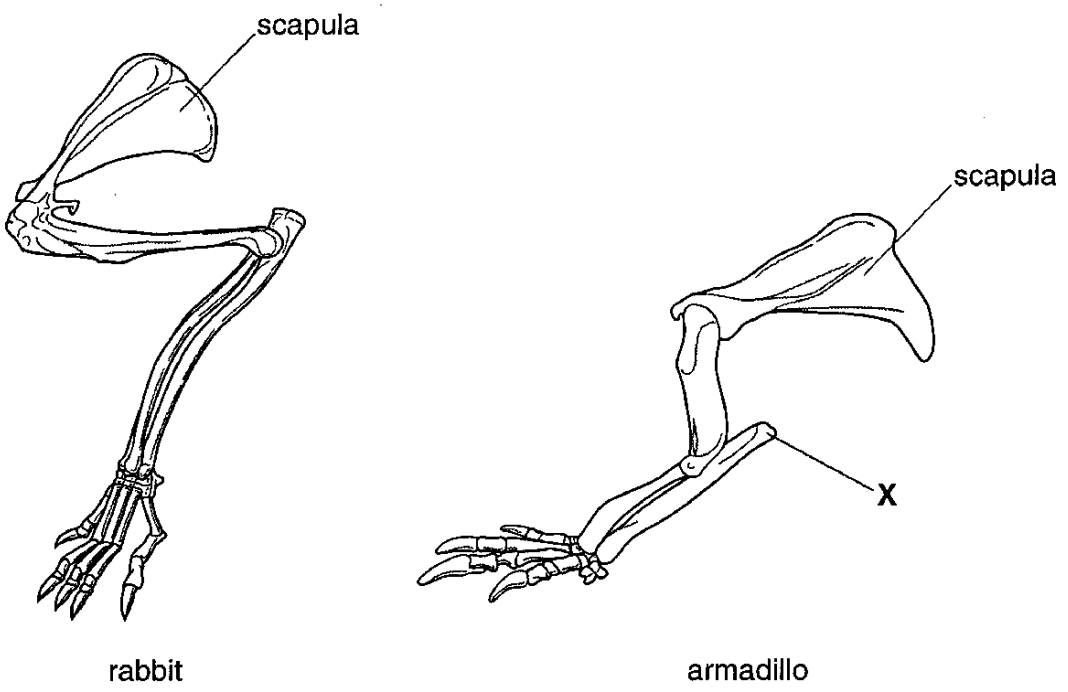

Fig. 3.1

(a) State **one** feature of these forelimbs that shows that they are pentadactyl limbs.

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.....[1]

(b) Describe **three** ways, **visible in Fig. 3.1**, in which the forelimb of the armadillo differs from that of the rabbit.

1 .....

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2 .....

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3 .....

.....[3]

(c) Explain the advantage of the bony process at **X** for the armadillo.

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.....[1]

For Examiner's Use

(d) Name the type of synovial joint found at the shoulder, the elbow and the wrist.

shoulder .....

elbow .....

wrist .....[3]

(e) Describe the lever action of the **human arm** when lifting a weight.
You may use the space below for any drawings that you may wish to include in your answer.

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[7]

[Total: 15]

For Examiner's Use

4 The Russian physiologist, Ivan Pavlov, investigated conditioned learning by measuring the volume of saliva produced by dogs. The experiment, carried out in a controlled environment, consisted of 'puffing' meat powder into the dog's mouth through a tube and then measuring the dog's response.

Fig. 4.1 shows the apparatus he used.

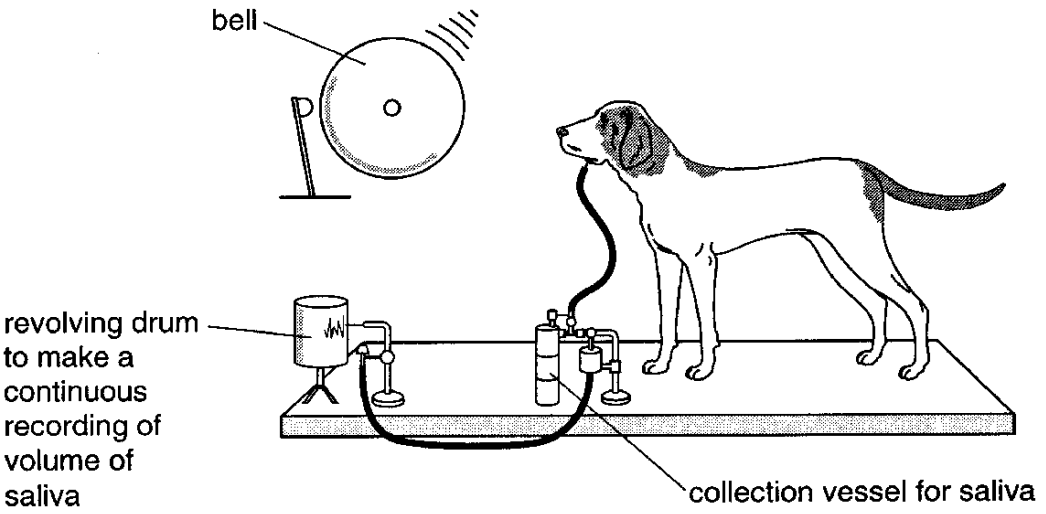

Fig. 4.1

(a) In this question, one mark is available for the quality of written communication.

Describe and explain how the apparatus was used to demonstrate classical conditioning in dogs.

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For Examiner's Use

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Quality of Written Communication [1]

For Examiner's Use

Pavlov also investigated the nervous and hormonal control mechanisms involved in the secretion of gastric juice in dogs.

(b) Describe the nervous and hormonal control mechanisms involved in stimulating the secretion of gastric juice.

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[Total: 14]

For Examiner's Use

5 **(a)** Fatty acids and cholesterol are synthesised in the liver from acetyl coenzyme A (acetyl CoA). One way in which acetyl CoA is generated is from pyruvate, which enters mitochondria during aerobic respiration of glucose. Acetyl CoA can enter the Krebs cycle, if ATP levels within the cell are low, or enter pathways to synthesise fatty acids or cholesterol. Fig. 5.1 illustrates these pathways diagrammatically.

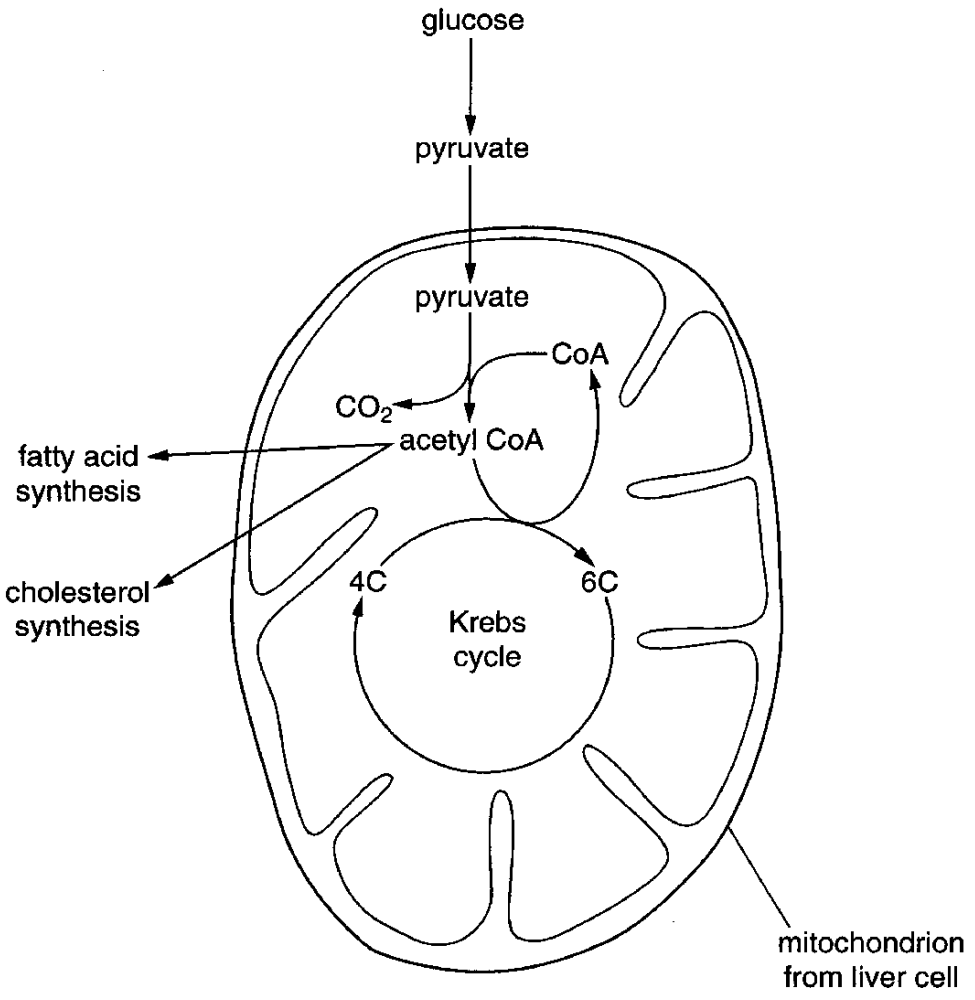

Fig. 5.1

(i) State the process taking place in the cytoplasm of the cell which produces pyruvate from glucose.

.....[1]

(ii) Describe how triglycerides are formed in the liver from fatty acids.

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.....[2]

(iii) Name the organelle where triglycerides are formed.

.....[1]

For Examiner's Use

(b) Lipids, such as triglycerides and cholesterol, are not generally stored in the liver but pass into the circulation for transport to other parts of the body for storage. They are transported in the form of lipoproteins.

Explain why lipids are transported in the blood in the form of lipoproteins.

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.....[3]

(c) In this question, one mark is available for the quality of written communication.

Fats are an important respiratory substrate for mammals. Describe how stored fat may be used to generate ATP when a mammal is starving.

You may use information from Fig. 5.1 in your answer.

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Quality of Written Communication [1]

[Total: 16]

For Examiner's Use

6 Read the passage below, then answer the questions which follow.

β amyloid is a peptide formed when a protein called amyloid precursor protein (APP) is broken down. Normally, β amyloid is removed quickly from the body. In Alzheimer's disease, an insoluble form of β amyloid, containing two extra amino acids, forms plaques in the spaces between the brain cells. These plaques are thought to cause the symptoms of Alzheimer's disease.

Genetically engineered mice have been produced with an inherited form of Alzheimer's and they develop β amyloid plaques just like people with the disease. The immune system does not normally respond to β amyloid.

A vaccine has been developed that may prevent the plaques forming by enhancing the immune system of the genetically engineered mice. Young mice that were given the vaccine either did not develop plaques at all or had only a few plaques. Another group of these mice, which received saline instead of the vaccine, had many plaques of insoluble β amyloid.

Adult mice that had extensive plaques in their brains also received the vaccine. These plaques decreased in size, disappearing almost completely.

(a) Name a region of the brain where the plaques described above develop.

.....[1]

(b) State **two** changes, **other than the formation of plaques**, that may be visible in the brain tissue of people with Alzheimer's disease.

1 .....

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2 .....

.....[2]

(c) State **three** effects of Alzheimer's disease on behaviour.

1 .....

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2 .....

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3 .....

.....[3]

For Examiner's Use

(d) Suggest how the vaccine might work in the genetically engineered mice to protect against Alzheimer's disease.

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(e) Explain why some of the mice received a saline solution instead of the vaccine.

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(f) Very little acetylcholine is released at synapses in some parts of the brain in people with Alzheimer's disease.

Suggest **two** reasons why very little acetylcholine is released at these synapses.

1 .....

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2 .....

.....[2]

[Total: 13]

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