

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**

**Advanced GCE**

**BIOLOGY**

**2805/05**

**Mammalian Physiology and Behaviour**

Thursday **19 JUNE 2003** Afternoon 1 hour 30 minutes

Candidates answer on the question paper.

Additional materials:  
Electronic calculator  
Ruler (cm/mm)

Candidate Name	Centre Number	Candidate Number												
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**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 provided 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 steps in any calculations.

<b>FOR EXAMINER'S USE</b>		
<b>Qu.</b>	<b>Max.</b>	<b>Mark</b>
<b>1</b>	<b>14</b>	
<b>2</b>	<b>14</b>	
<b>3</b>	<b>12</b>	
<b>4</b>	<b>19</b>	
<b>5</b>	<b>15</b>	
<b>6</b>	<b>16</b>	
<b>TOTAL</b>	<b>90</b>	

**This question paper consists of 18 printed pages and 2 blank pages.**

Answer all the questions.

1 (a) Fig. 1.1 is a cross section through part of a liver lobule.

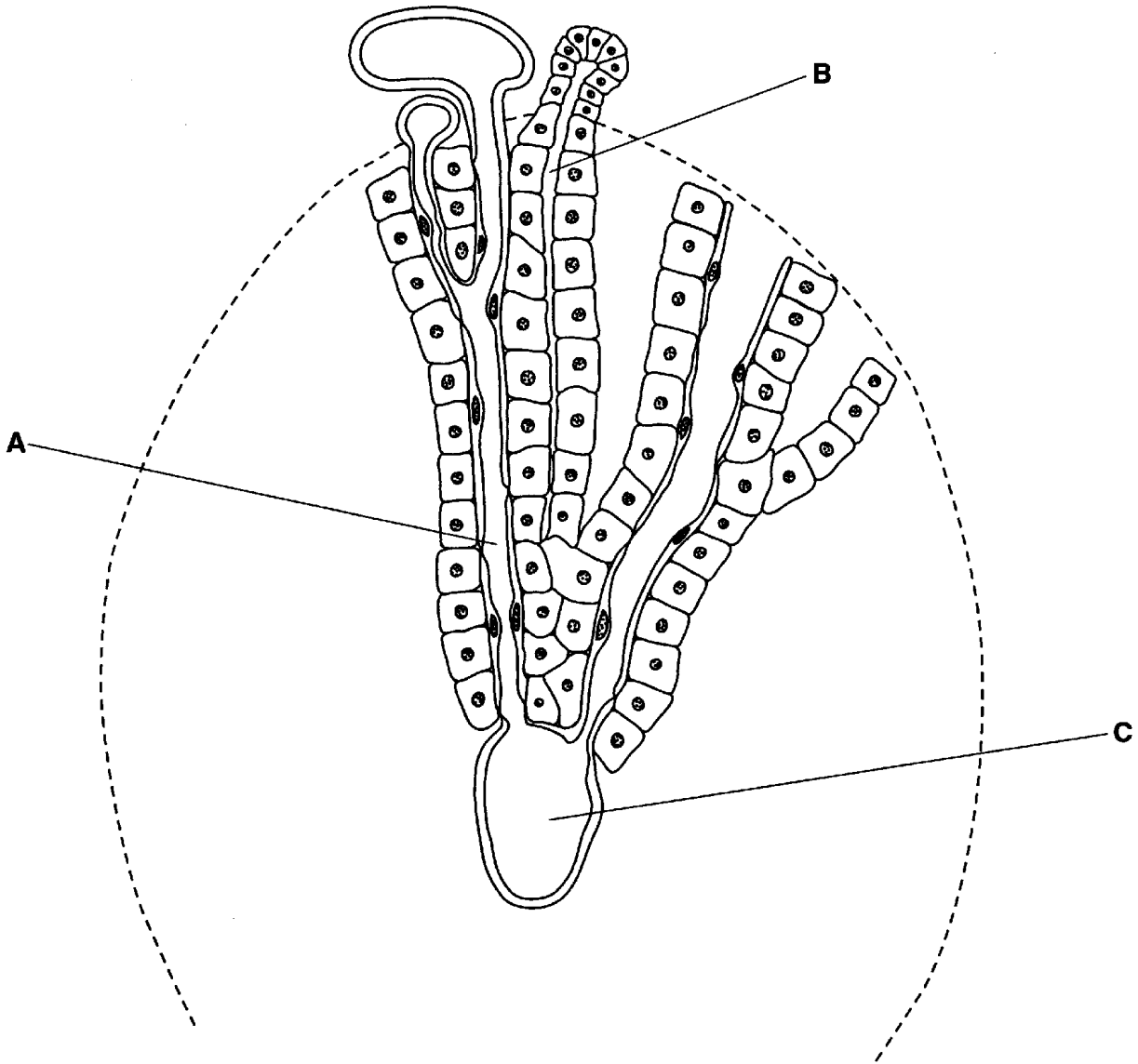


Fig. 1.1

(i) Name A, B and C.

A .....

B .....

C ..... [3]

(ii) On Fig. 1.1, draw an arrow to indicate the direction of flow of the fluid in A. [1]

(iii) Name the fluid that is carried in B.

..... [1]

(b) The liver is responsible for the synthesis and secretion of a number of plasma proteins, for example fibrinogen. Fibrinogen is a glycoprotein composed of two identical units, each consisting of three different polypeptide chains.

(i) How many genes are needed to code for the primary structure of the fibrinogen molecule?

.....[1]

(ii) Outline the processes involved during the conversion of the primary structure of fibrinogen to the quaternary structure.

.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....  
.....[4]

(iii) Name **two** plasma proteins that are secreted by the liver, **other than fibrinogen**, and give **one** role for each.

protein 1.....  
role.....

.....  
protein 2.....  
role.....  
.....[4]

[Total: 14]

2 Fig. 2.1 shows a diagram of the middle ear and the cochlea.

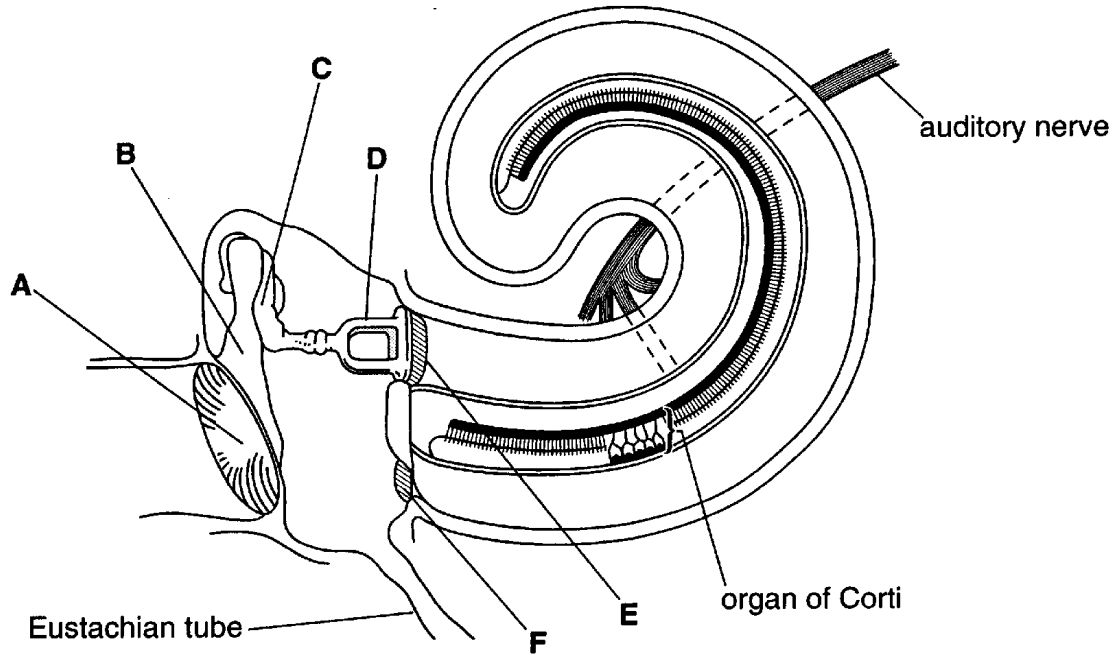


Fig. 2.1

(a) Sound waves cause movement of the eardrum, the bones of the middle ear and the oval window. This amplifies the sound.

Identify, **using the letters from Fig. 2.1**, the following structures involved in the amplification of sound in the ear.

- eardrum                                      .....
- stapes (stirrup)                                      .....
- oval window                                      .....

[3]

(b) Explain how the Eustachian tube is involved in the functioning of the ear.

.....

.....

.....

.....

.....

.....[2]



- 3 Fig. 3.1 shows part of the vertebral column and the spinal cord of a human.

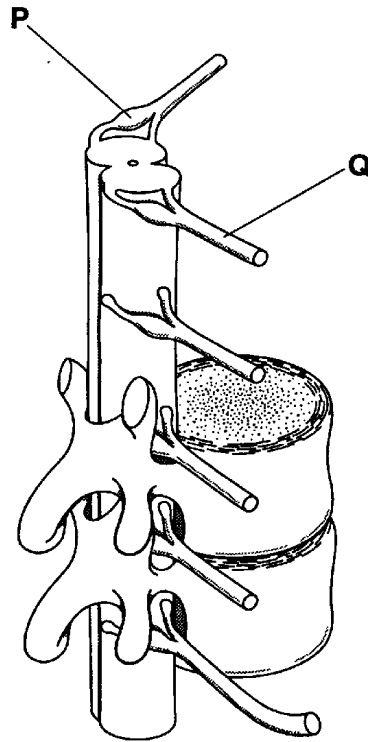


Fig. 3.1

- (a) Name structures **P** and **Q**.

**P** .....

**Q** ..... [2]

- (b) State **two** roles of the spinal cord.

.....

.....

.....

..... [2]

(c) Fig. 3.2 shows a thoracic vertebra and a lumbar vertebra from a human drawn to the same scale.

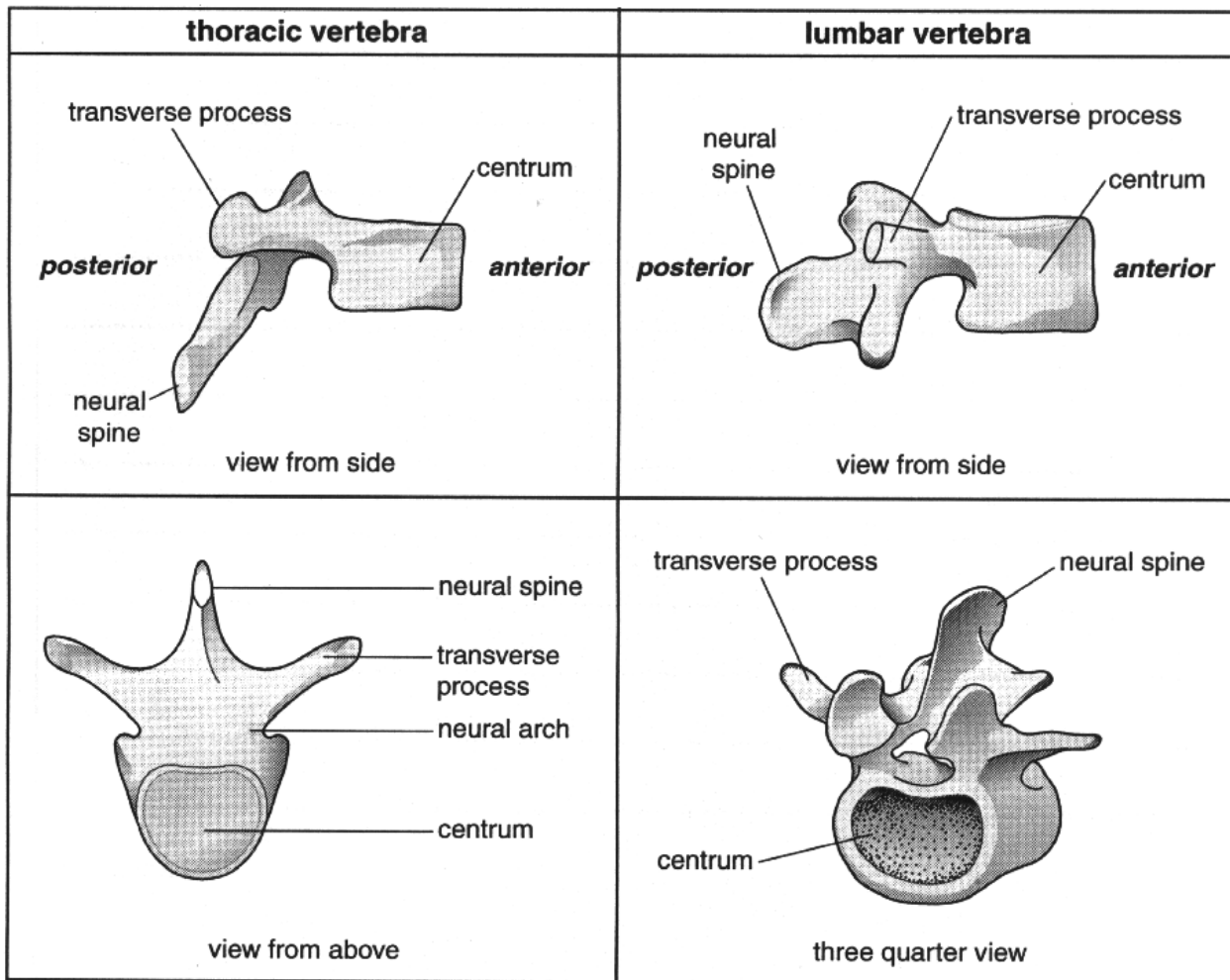


Fig. 3.2

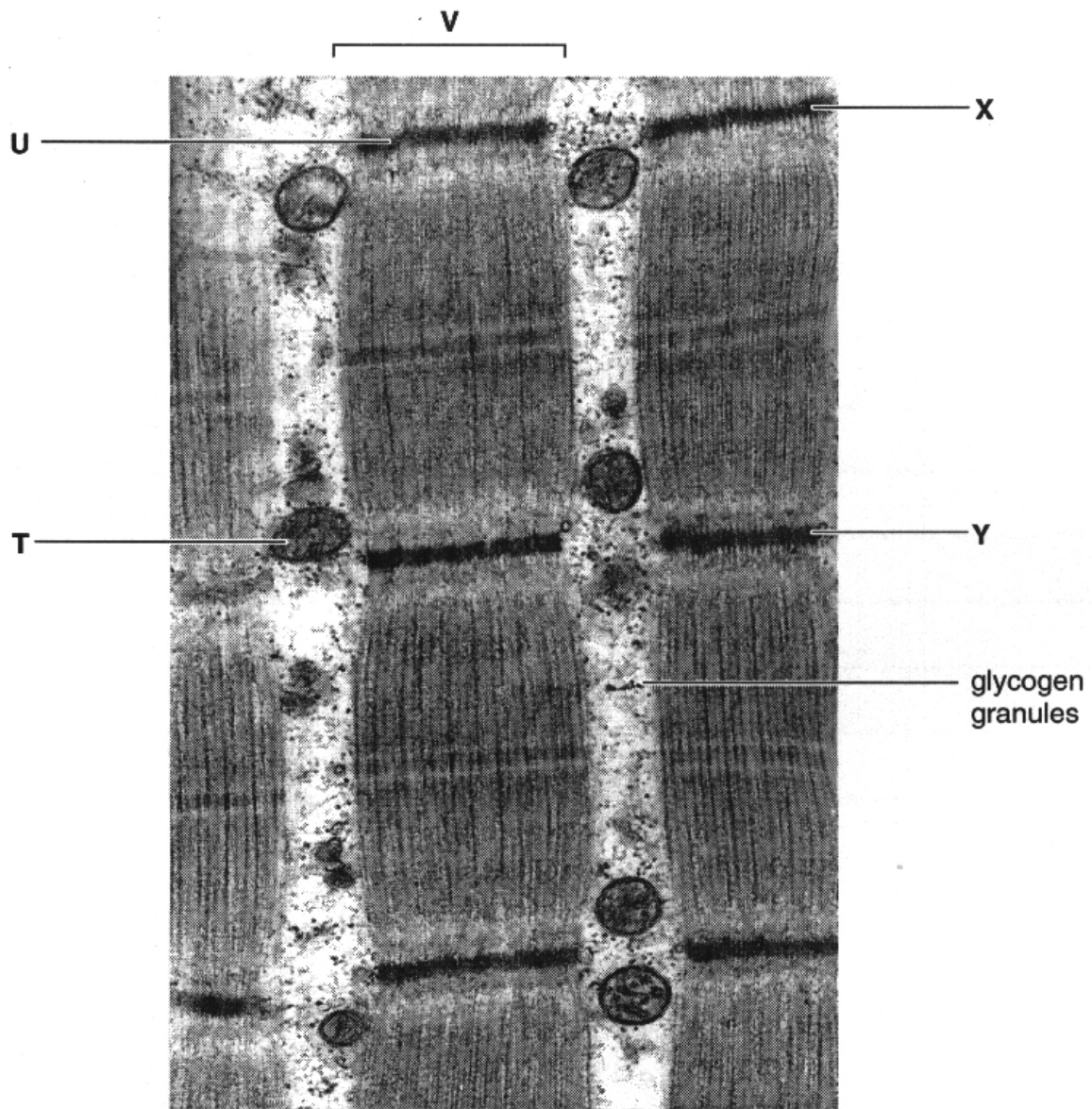
State **two** ways in which the structure of the **thoracic vertebra** differs from that of the lumbar vertebra.

- 1 .....
- .....
- 2 .....
- ..... [2]





- 4 Fig. 4.1 is an electron micrograph showing a longitudinal section of contracted striated muscle.



x 42 000

Fig. 4.1

(a) (i) Name T, U and V.

T .....

U .....

V .....[3]

(ii) Name the structure between positions X and Y on Fig. 4.1.

.....[1]

(iii) Explain the presence of glycogen granules in striated muscle.

.....

.....[1]

(iv) Calculate the actual distance between positions X and Y on Fig. 4.1. Show your working and express your answer to the nearest 0.1 of a micrometre ( $\mu\text{m}$ ).

Answer..... $\mu\text{m}$  [2]

(b) Fig. 4.2 shows the arrangement of thick and thin filaments in striated muscle.

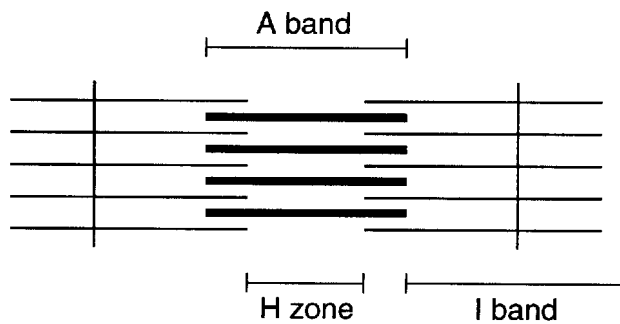


Fig. 4.2

State what happens to the lengths of the following when muscle contracts and shortens.

A band .....

H zone .....

I band .....[3]



5 (a) Suckling in young mammals is an example of innate behaviour.

Explain what is meant by *innate behaviour*.

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

(b) The sympathetic nervous system responds rapidly to danger. Resources are mobilised for strenuous activity. These resources are diverted from the abdominal organs, such as the stomach and intestines, to muscles. This is often known as the 'fight or flight' response. The sympathetic nervous system also stimulates the adrenal glands to release adrenaline. One effect of adrenaline is to stimulate the mobilisation of glucose from the liver.

State the actions of the sympathetic nervous system and adrenaline in the 'fight or flight' response on

the heart .....  
.....  
.....

the digestive system .....  
.....  
.....[4]

- (c) Research was carried out on the physiological effects of cold environmental temperatures on a species of small mammal. The mammals were conditioned to press a lever to increase their environmental temperature. The conditioning lasted for three days. The researchers measured changes in insulin and adrenaline in these mammals for the three days of conditioning and for seven days afterwards. These results are shown in Fig. 5.1.

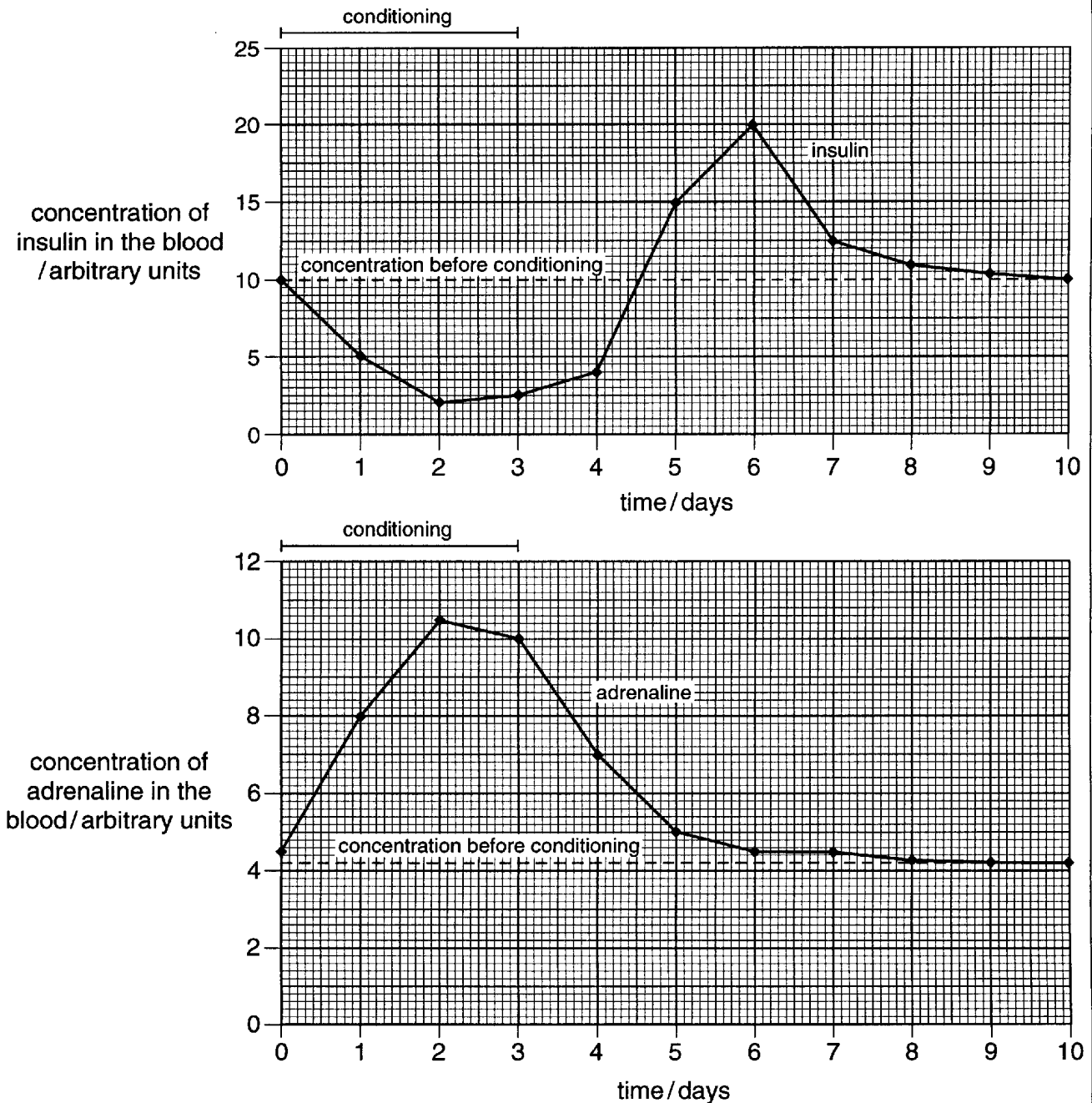


Fig. 5.1

(i) Using the data in Fig. 5.1, describe the effect of the conditioning on the concentrations of insulin and adrenaline over the ten day period.

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.....  
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.....  
.....[5]

(ii) Suggest an explanation for the changes you have described in (i).

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.....[4]

[Total: 15]

- 6 (a) Complete the table to show the site of production, site(s) of action and effects of three of the hormones that control digestion.

hormone	site of production	site(s) of action	effect
gastrin	.....	stomach	stimulates secretion of gastric juice
cholecystokinin (CCK)	duodenum	.....	stimulates secretion of fluid rich in enzymes
		gall bladder	..... ..... .....
secretin	.....	pancreas	..... .....
		.....	stimulates synthesis of bile

[6]

(b) Fig. 6.1 is a diagram that shows some of the processes involved in the chemical digestion of protein and the absorption of amino acids.

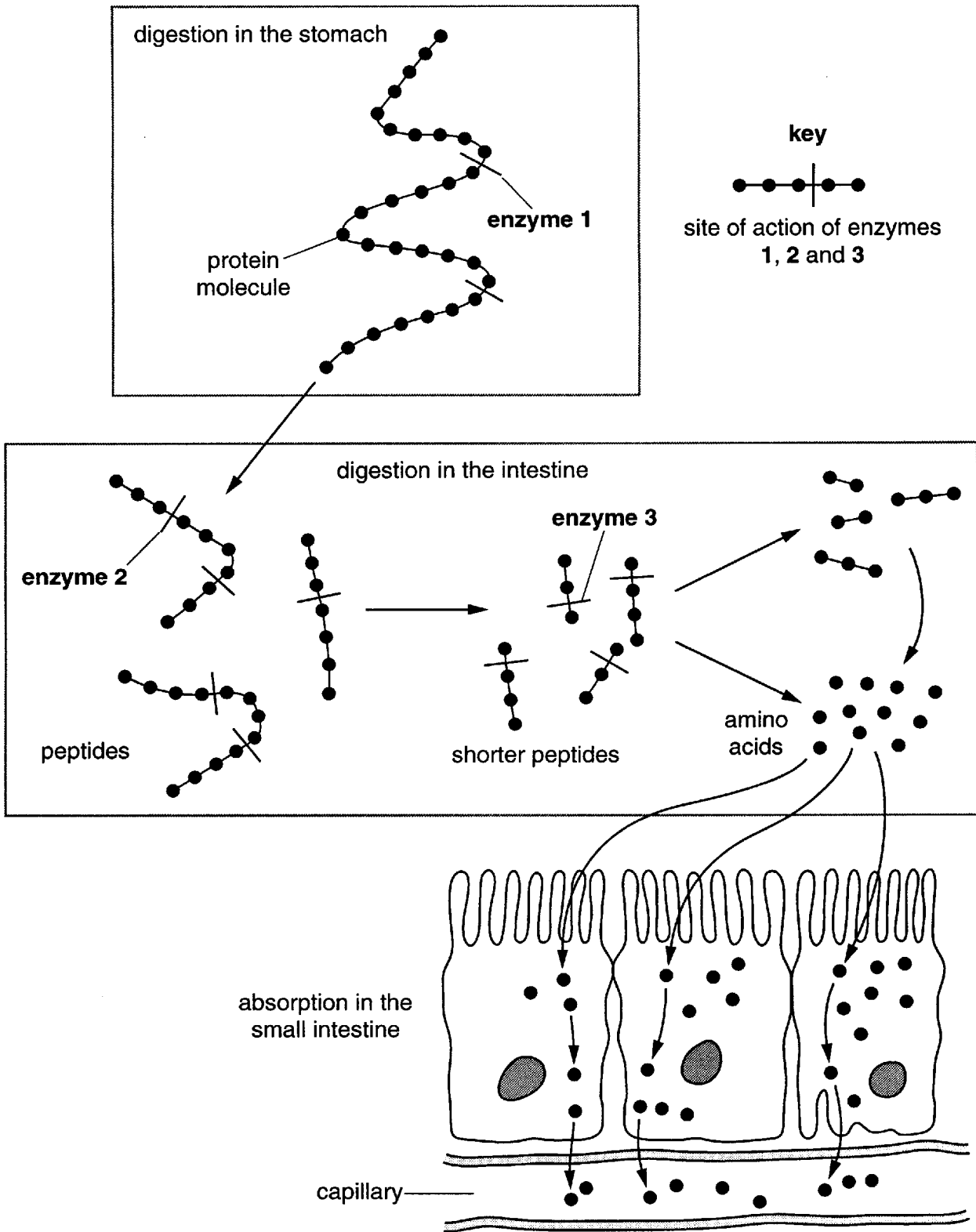


Fig. 6.1



(i) Name the enzymes 1, 2 and 3 shown in Fig. 6.1.

1 .....

2 .....

3 .....[3]

(ii) Describe the action of enzyme 3.

.....

.....

.....

.....

.....

.....[3]

(iii) Explain how amino acids pass from the lumen of the small intestine to the capillary, as shown in Fig. 6.1.

.....

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.....

.....

.....

.....[4]

[Total: 16]

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*Copyright Acknowledgements:*

- Question 3 Fig. 3.1 from 'Biology: a modern introduction', fig. 13.1, p. 154, by B. S. Beckett, 2nd Edition, published by Oxford University Press, (ISBN 0 19 914088 X).
- Question 4 Photo reproduced by permission of the Electron Microscope Unit, Department of Histopathology, Manchester Royal Infirmary.

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