

**OXFORD CAMBRIDGE AND RSA EXAMINATIONS**  
**Advanced GCE**

**BIOLOGY**  
 Mammalian Physiology and Behaviour

**2805/05**

Tuesday      **31 JANUARY 2006**      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.

FOR EXAMINER'S USE		
Qu.	Max.	Mark
1	19	
2	11	
3	13	
4	14	
5	13	
6	20	
<b>TOTAL</b>	<b>90</b>	

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

Answer **all** the questions.

- 1 The mammalian liver is made up of lobules that consist of liver cells (hepatocytes) arranged in plates.

Fig. 1.1 shows a section of a liver lobule and its associated blood vessels.

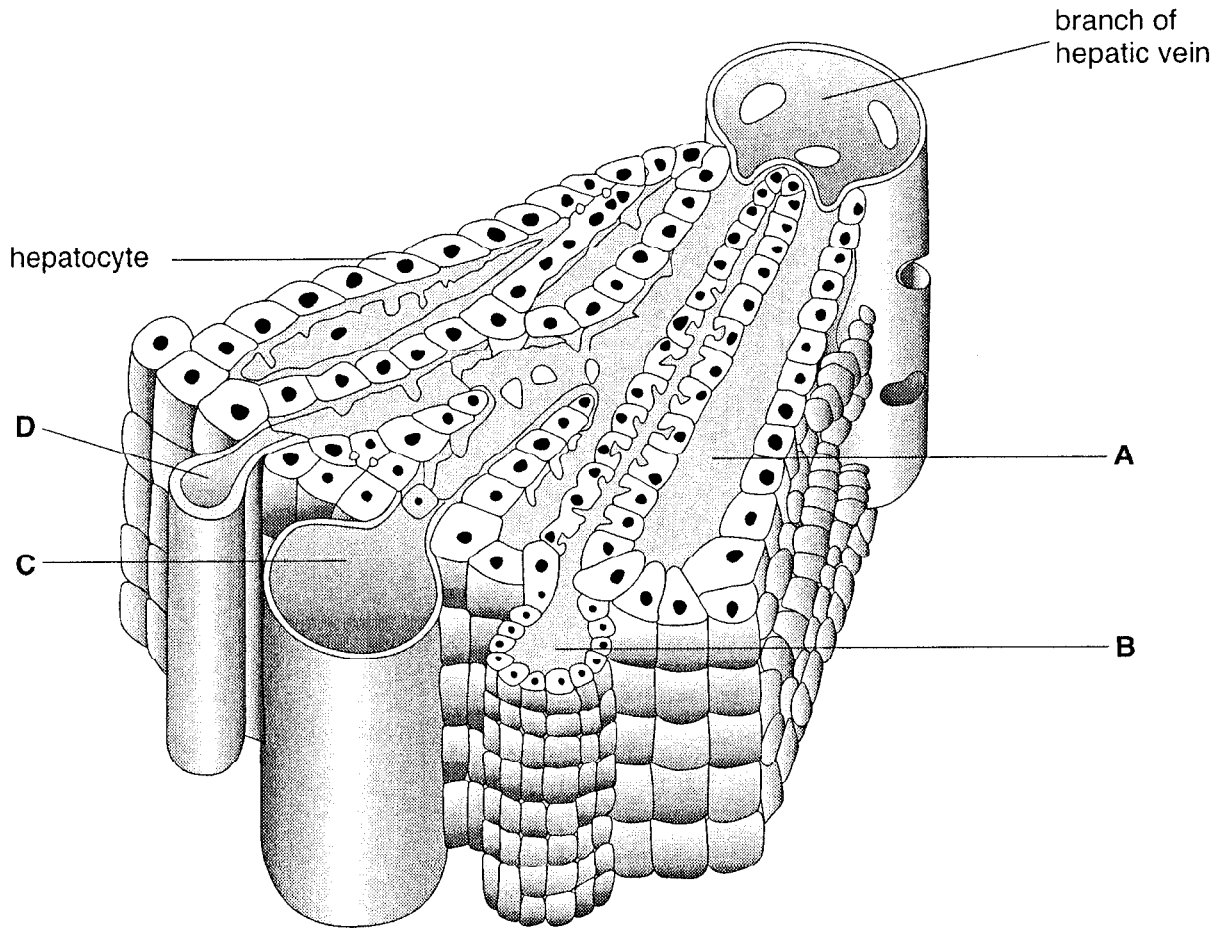


Fig. 1.1

(a) Name structures **A** to **D**.

**A** .....

**B** .....

**C** .....

**D** .....

[4]

(b) In a healthy liver, bile is produced by hepatocytes and secreted into bile canaliculi.

Describe the role of bile in the digestion of lipids (fats and oils).

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.....[3]

(c) Sometimes the liver does not function normally. This may result in a condition known as jaundice. The symptoms of jaundice include yellowing of the sclera at the front of the eyes, yellow skin, orange-coloured urine and white faeces.

Suggest what abnormal events are happening in the liver to produce these symptoms.

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.....[2]

(d) An important function of the liver is the detoxification of potentially dangerous substances such as alcohol (ethanol). Fig. 1.2 outlines how ethanol is detoxified.

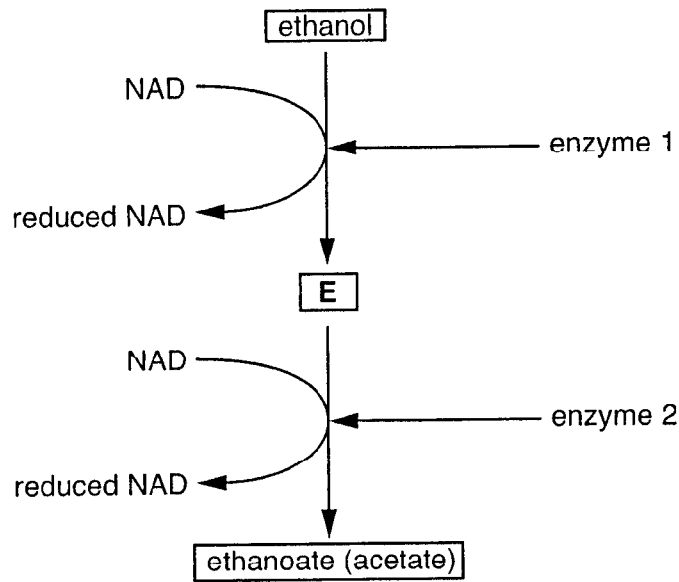


Fig. 1.2

(i) Enzymes 1 and 2 catalyse the same type of reaction.

Name the type of reaction.

.....[1]

(ii) Name substance E in Fig. 1.2.

.....[1]

(iii) Describe how ethanoate (acetate) is metabolised by the hepatocytes.

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2 Ten lambs, all nine months old, were placed in an enclosure. A scientist entered the enclosure carrying an umbrella which was opened and closed repeatedly in front of the lambs. The lambs' reaction was to back away nervously from the umbrella. It was noticed that as the activity continued, the behaviour of the lambs changed until they ignored the umbrella.

(a) (i) State the type of learning behaviour displayed by the lambs by the end of the experiment.

.....[1]

(ii) Suggest **two** advantages to the lambs of this change in their behaviour.

1 .....

.....

2 .....

.....[2]

(b) When a larger group of lambs was put in a field near to a busy road, the lambs tended to react nervously whenever a noisy vehicle drove by. Like the lambs in the previous investigation, they eventually ignored the unpleasant stimulus, in this case the traffic.

Once a day, the farmer drove to the field to fill up food containers with dried feedstuffs for the sheep. After two weeks, the lambs would run to the food containers as soon as the farmer's van approached the field, even though they could not see the vehicle.

Explain the learning process shown by the lambs in their response to the farmer's van.

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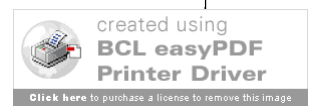
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(c) Reflex actions are unlearned responses to stimuli.

Describe **one** advantage of reflex actions compared to learned responses in a mammal.

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.....[1]

(d) Fig. 2.1 outlines the basic components of a reflex arc in humans.

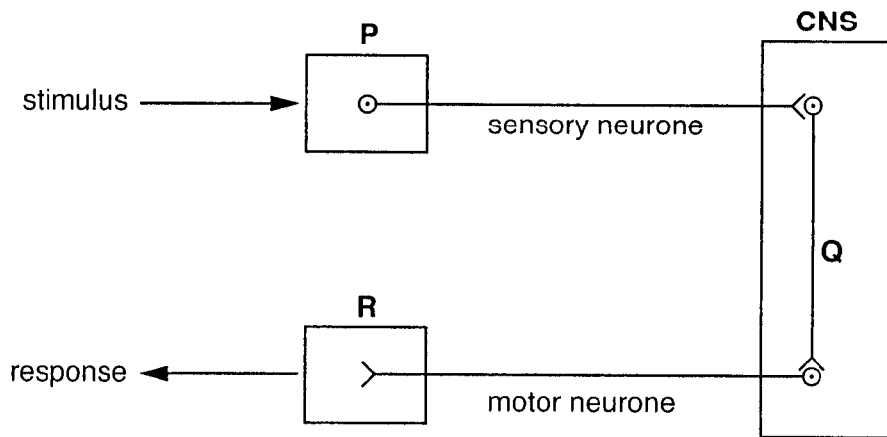


Fig. 2.1

(i) Name the type of neurone labelled Q.

.....[1]

(ii) Name the parts of the reflex arc labelled P and R.

P .....

R .....[2]

[Total: 11]

3 Fig. 3.1 shows a vertical section through the human brain.

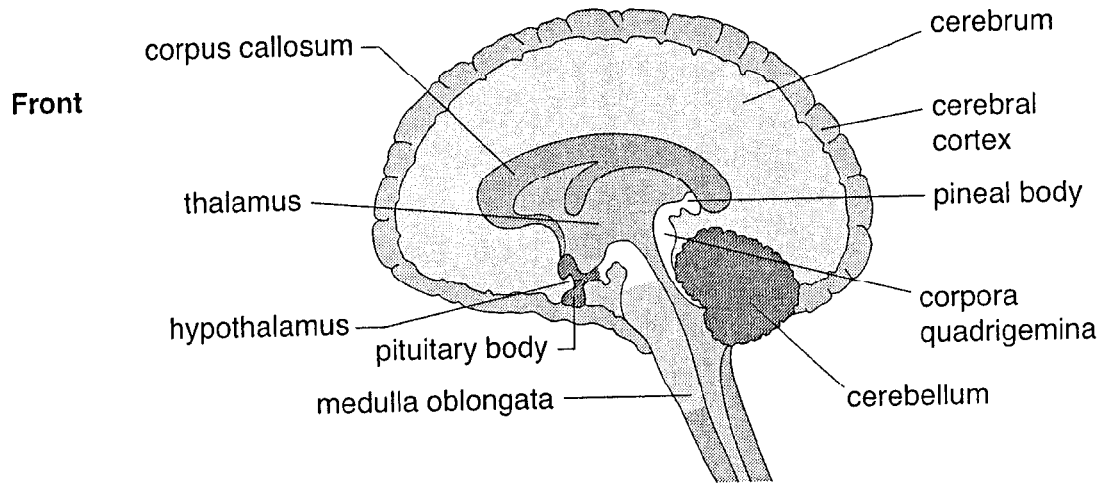


Fig. 3.1

(a) (i) Name the labelled structure shown in Fig. 3.1 that links the two cerebral hemispheres.

.....[1]

(ii) The table below shows functions of some areas of the brain.

Complete the table using the labels in Fig. 3.1.

area of brain	function
.....	co-ordination of posture
.....	control of heart rate
.....	control of temperature regulation
.....	control of speech

[4]



Alzheimer's disease is a complex, degenerative disease that affects the brain. The risk of developing this disease increases with age, particularly over the age of 65. Symptoms include a gradual loss of memory, disorientation, difficulty with learning, loss of language skills and a decline in the ability to perform routine tasks. The areas of the brain that control memory and thinking skills are affected first.

**(b)** State the functions of acetylcholine and acetylcholinesterase in synapses in the brain.

acetylcholine .....

.....

acetylcholinesterase .....

.....[2]

**(c)** One form of treatment in the early stages of Alzheimer's disease is to use acetylcholinesterase inhibitors that may reduce some of the symptoms, but are not thought to halt the disease in the long-term.

**(i)** Suggest and explain how acetylcholinesterase inhibitors may act to reduce the symptoms of Alzheimer's disease.

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**(ii)** Suggest how people may reduce the risk of developing Alzheimer's disease.

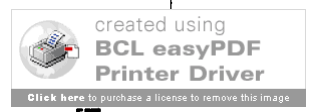
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[Total: 13]



- 4 In an investigation, striated muscle tissue from a mammal was electrically stimulated over a period of 700 milliseconds (ms). The tension generated by the muscle was measured during the investigation and the results are shown in Fig. 4.1.

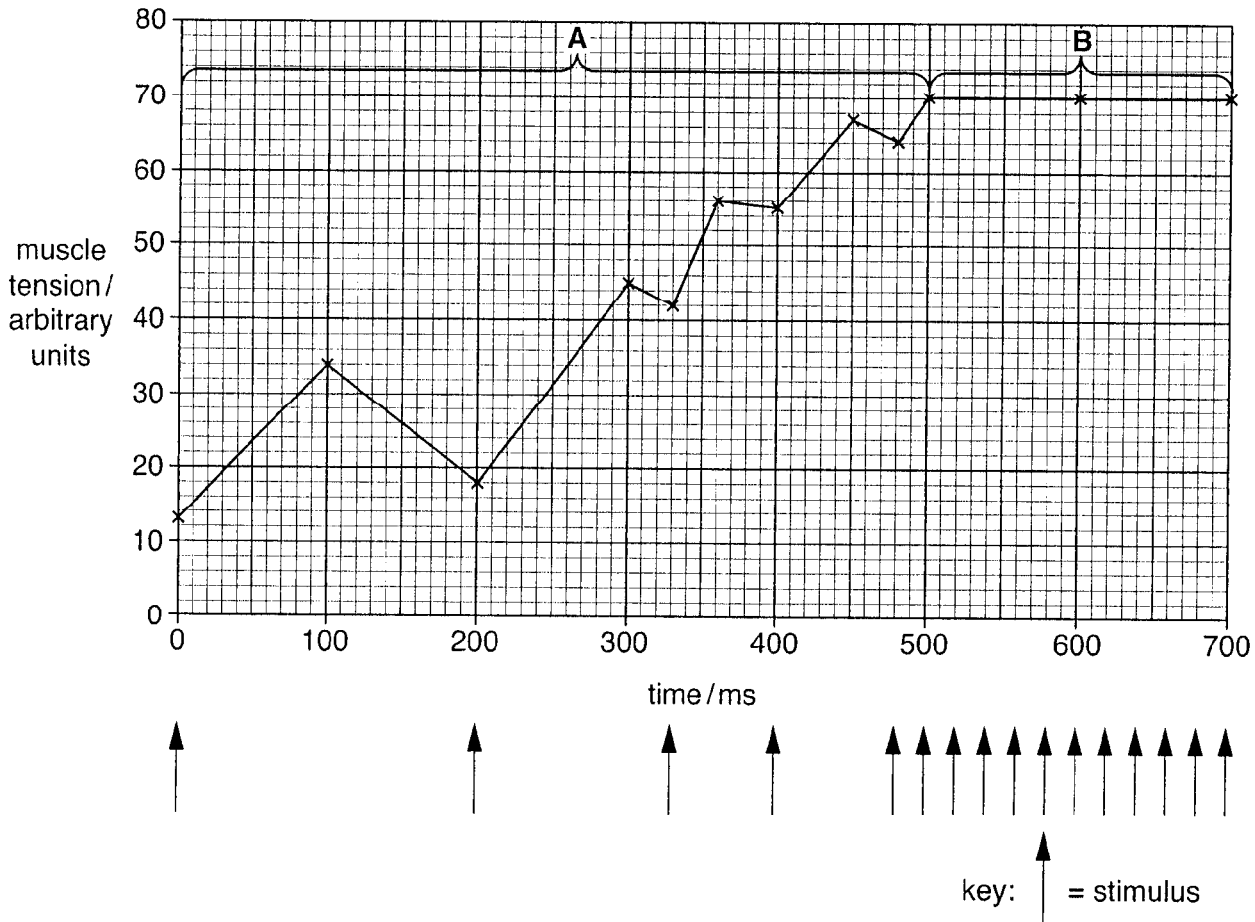


Fig. 4.1

- (a) (i) Describe the relationship between muscle stimulation and muscle tension in region A on Fig. 4.1.

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.....[2]

- (ii) Region **B** on Fig. 4.1 shows the tension of the muscle with repeated stimulation. Some toxins, such as those released by the tetanus bacterium, also cause the effect shown in region **B**.

Suggest why these toxins may be fatal.

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

Fig. 4.2 shows a neuromuscular junction.

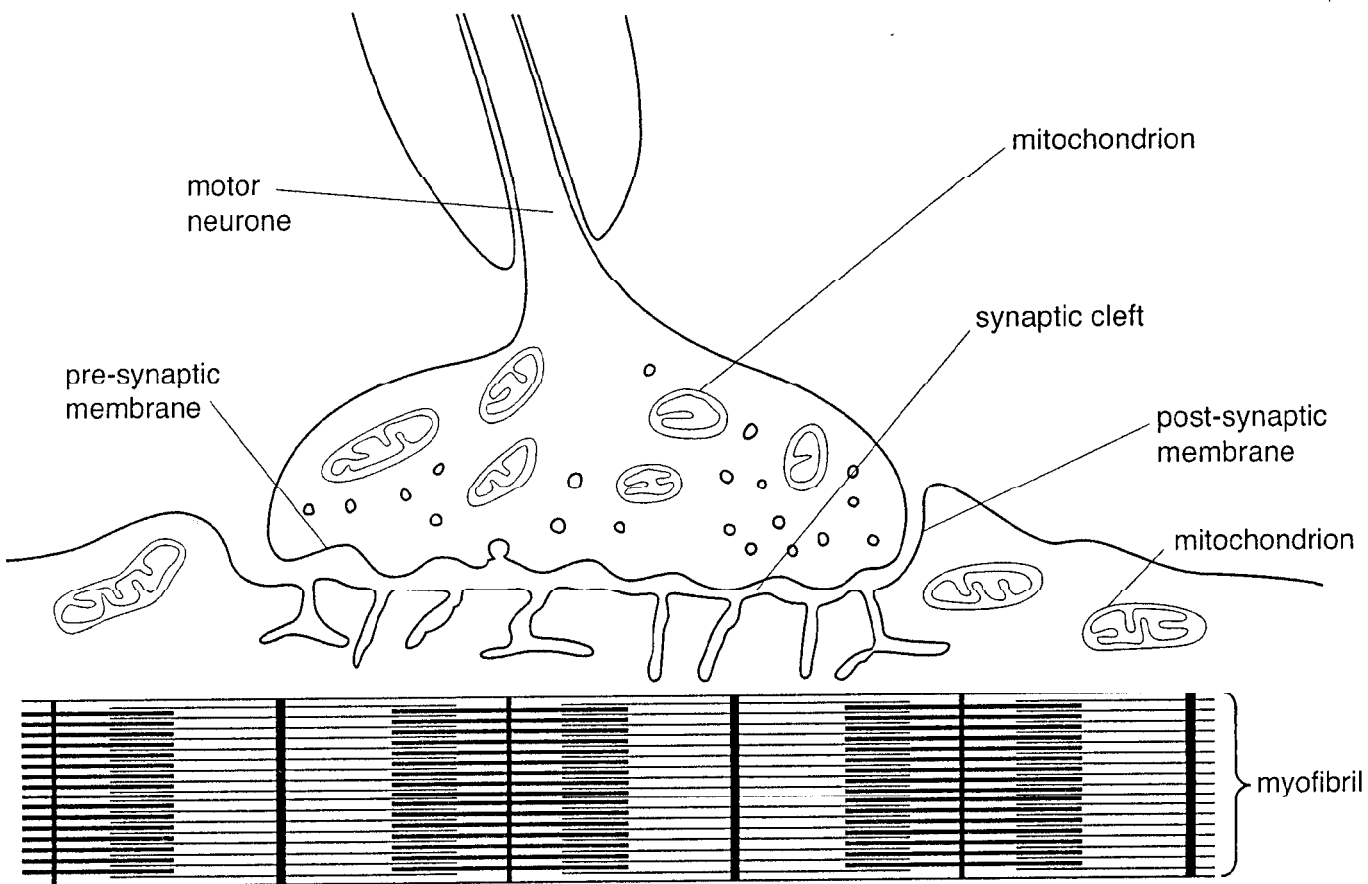


Fig. 4.2

Fig. 4.2 shows that mitochondria are present on **both** sides of the synaptic cleft. Explain why mitochondria are essential for the transmission of impulses across the cleft and for muscular contraction.

*transmission of impulses across the cleft* .....

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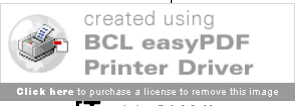
*muscular contraction* .....

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Quality of Written Communication [1]

[Total: 14]



- 5 (a) Harbour Seals, *Phoca vitulina*, are aquatic mammals that have large eyes. Their underwater vision is better than their vision on land.

The eyes of Harbour Seals have:

- many rod cells in the retina
- few cone cells in the retina
- a layer of reflecting plates, the tapetum lucidum, behind the retina that reflects light back through the retina in a similar way to cats' eyes
- pupils that dilate underwater to form a very wide circle.

Suggest the advantages to Harbour Seals of having the following features:

- (i) many rod cells and few cone cells in the retina;

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- (ii) tapetum lucidum;

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- (iii) pupils dilating to form a wide circle.

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[6]









- (c) A project investigating the nutrition of sheep was carried out by scientists in Colombia, South America. The purpose of the investigation was to measure the effect of supplementing the usual diet of dry hay, *Pennisetum clandestinum*, with leaves from a legume, *Enterolobium cyclocarpum*, on the growth of wool. Table 6.1 summarises the results of the project. Three groups of 30 sheep were used and the growth of wool was measured after three months.

**Table 6.1**

diet supplement / g day <sup>-1</sup>	mean wool growth / g cm <sup>2</sup> of fleece
none	0.39
100	0.46
300	0.58

- (i) Calculate the percentage increase in the mean growth of wool when 300 g day<sup>-1</sup> of the diet supplement *E. cyclocarpum* was added compared to the mean wool growth with no diet supplement. Show your working and express your answer to the nearest whole number.

Answer .....% [2]

- (ii) Suggest why the supplement had such a dramatic effect on the growth of wool.

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[Total: 20]

**END OF QUESTION PAPER**

