

Centre Number	Candidate Number	Name
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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education Ordinary Level

**SCIENCE** **5125/04, 5126/04**

Paper 4 Biology October/November 2006

Additional Materials: Answer Booklet/Paper **1 hour 15 minutes**

**READ THESE INSTRUCTIONS FIRST**

If you have been given an Answer Booklet, follow the instructions on the front cover of the Booklet. 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 soft pencil for any diagrams, graphs or rough working. Do not use staples, paper clips, highlighters, glue or correction fluid.

**Section A**  
Answer **all** questions.  
Write your answers in the spaces provided on the question paper.

**Section B**  
Answer any **two** questions.  
Write your answers on the separate answer paper provided.

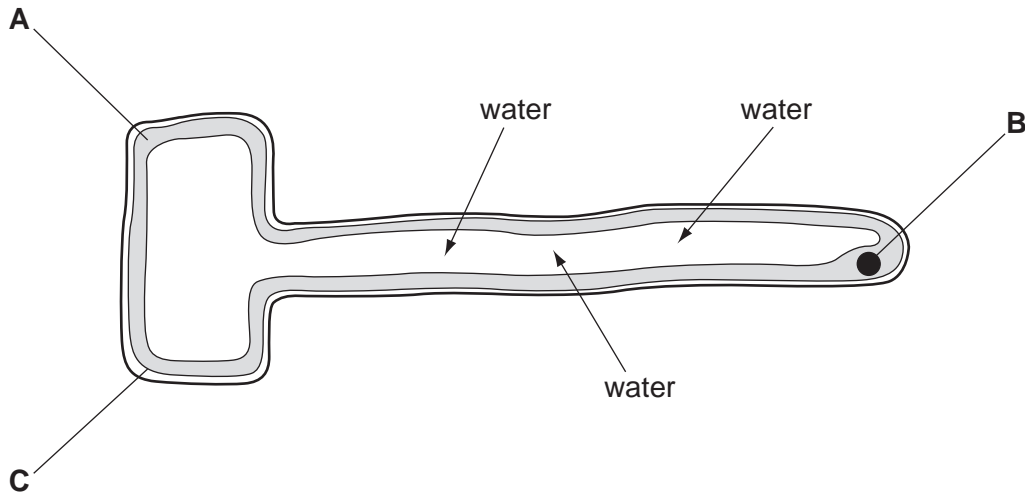
At the end of the examination, fasten all your work securely together.  
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
<b>Section A</b>	
<b>Section B</b>	/
<b>Total</b>	

**Section A**

Answer **all** the questions in the spaces provided.

1 Fig. 1.1 shows a root hair cell.



**Fig. 1.1**

(a) (i) Name parts **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

[3]

(ii) What is the function of part **C**?

.....

..... [1]

(b) Movement of water from the surrounding soil into the root hair cell is shown by arrows on the diagram. This water enters the root hair cell by osmosis.

(i) Describe and explain the process of osmosis.

.....

.....

.....

..... [3]

(ii) How is the root hair cell adapted to take in water as rapidly as possible?

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

2 When food is eaten, a liquid called gastric juice is released into the stomach. The volume of gastric juice released is controlled in three ways.

A – by nerve impulses sent to the stomach when food is tasted in the mouth

B – by the stretching of the stomach when it fills with food

C – by a hormone produced when food reaches the stomach

The release of gastric juice controlled in these three ways is shown in Fig. 2.1.

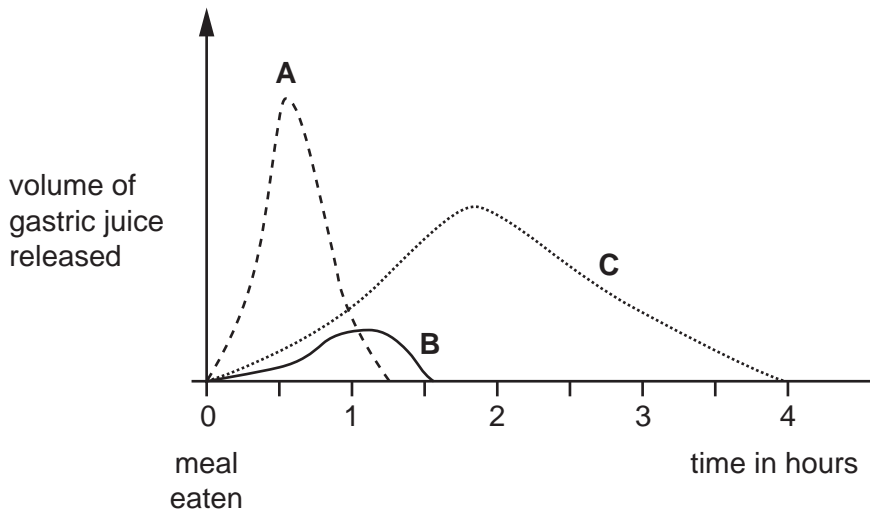


Fig. 2.1

(a) (i) Define the term *hormone*.

.....  
..... [3]

(ii) Use information from Fig. 2.1 to describe the difference between the action of nerves and hormones.

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

- (iii) The release of gastric juice as a result of tasting food in the mouth is a reflex action. Describe how this reflex action takes place. Use words in this list in your answer.

motor neurone

receptor

relay neurone

sensory neurone

spinal cord

stomach

.....

.....

.....

.....

..... [4]

- (b) Gastric juice contains enzymes that help to digest food. Food passes from the stomach into the duodenum, where more enzymes are released.

- (i) Why is food digested?

.....

..... [1]

- (ii) One of the enzymes released into the duodenum is amylase. Describe the action of the enzyme amylase.

.....

..... [2]

- 3 A scientist investigates the breathing of an athlete. While the athlete exercises on a running machine, the number of breaths each minute (frequency of breathing) and the volume of each breath he takes (depth of breathing) are measured. The results of this investigation are shown in Fig. 3.1.

time /minutes	number of breaths per minute	volume of each breath /dm <sup>3</sup>
0	16	0.5
3	18	1.4
6	23	2.8
9	28	3.6
12	30	4.2

**Fig. 3.1**

- (a) What do these results suggest about the effect of exercise on frequency of breathing,

.....

depth of breathing?

..... [2]

- (b) (i) Before the athlete begins exercising, he is breathing in 8.0 dm<sup>3</sup> of air per minute. Calculate his breathing rate after 12 minutes of exercise.

breathing rate = ..... dm<sup>3</sup>/min [2]

- (ii) Explain why the athlete needs to breathe a greater volume of air per minute during exercise.

.....

.....

.....

..... [3]

- 4 Fresh water shrimp require a high concentration of dissolved oxygen in the water in which they live. A scientist investigates the effect of sewage that is piped into a river. He counts the number of fresh water shrimp at different distances downstream (in the direction of water flow) from the sewage outlet pipe.

The scientist's results are shown in Fig. 4.1.

distance from sewage outlet pipe/km	0	1	2	3	4	5
number of fresh water shrimp per m <sup>3</sup>	0	7	23	33	38	37

**Fig. 4.1**

- (a) The results in Fig. 4.1 show that there are no fresh water shrimp near the sewage outlet pipe.

Explain why fresh water shrimp do not live in this part of the river.

.....  
 .....  
 ..... [3]

- (b) The number of fresh water shrimp increases with distance downstream from the sewage outlet pipe.

Suggest why.

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

- (c) The scientist also counts the number of fresh water shrimp 1 km upstream from the sewage outlet pipe. He finds that there are 38 shrimp in 1 m<sup>3</sup> of water.

Suggest why the scientist counts the shrimp at this location.

..... [1]

- (d) Building a sewage treatment works would prevent this pollution of the river, but the water might still be polluted in other ways. Suggest **two** other ways by which the river water might be polluted.

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

- 5 Night blindness is a genetic disorder controlled by a dominant allele. The allele **N** that causes night blindness is dominant to the allele **n** for normal vision. Those who have this disorder cannot see well in dim light.

Fig. 5.1 shows a family tree. Some members of this family have night blindness, whilst others do not.

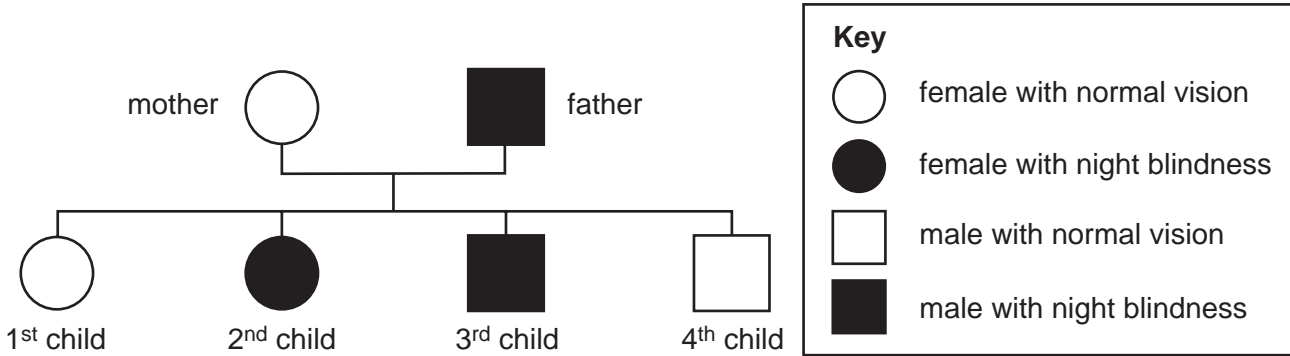


Fig. 5.1

- (a) (i) In this family the father has the genotype **Nn**.  
What is the genotype of the mother?

..... [1]

- (ii) Some of the children do not have night blindness.  
Explain why.

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

- (b) The 2nd child marries a man who also has night blindness. Both have the genotype **Nn**.  
Draw a suitable diagram to work out the chance that a child born to this couple will have night blindness.  
In your diagram use **N** to represent the dominant allele and **n** to represent the recessive allele.

chance of night blindness = ..... [4]

- (c) The family shown in Fig. 5.1 includes both male and female children.  
Explain how the sex of each child is genetically determined.

.....

.....

.....

.....

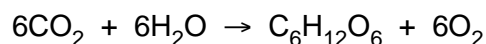
..... [3]



**Section B**

Answer **two** questions from this section.  
Write your answers on the separate answer paper provided.

- 6** During 2003, 5 million people became infected with the human immunodeficiency virus (HIV), which causes acquired immune deficiency syndrome (AIDS). About half of the people who acquire HIV become infected before the age of 25 and die of the life-threatening illnesses called AIDS before their 35th birthday. The majority of people with HIV, 95% of the global total, live in the developing world.
- (a) Explain the differences between HIV and AIDS. How is the abuse of drugs such as heroin and alcohol associated with the spread of the condition? [5]
- (b) Suggest how the spread of HIV worldwide may be controlled. Explain why control and treatment of HIV in developing countries presents particular problems. [5]
- 7** (a) Describe the carbon cycle in terms of photosynthesis, animal nutrition, respiration and combustion. You may draw a diagram to help your answer. [5]
- (b) The carbon cycle maintained a constant proportion of carbon dioxide in the air for thousands of years. In the last century, however, the proportion of carbon dioxide in the air increased. Suggest reasons for this increase and describe the consequences that this may have across the world. [5]
- 8** The process of photosynthesis takes place in the leaves of green plants.



- (a) Explain how plant leaves obtain carbon dioxide, water and energy needed for the process, and state what happens to the glucose and oxygen produced in the leaves. [5]
- (b) Suggest how you would investigate the effect of varying light intensity on the rate of photosynthesis. [5]





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