

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

HUMAN BIOLOGY

2866

Energy, Control and Reproduction

Tuesday

20 JUNE 2006

Morning

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	11	
2	21	
3	17	
4	12	
5	14	
6	15	
TOTAL	90	

This question paper consists of 16 printed pages.

Answer **all** the questions.

1 Approximately 1% of human births result in twins. 25% of these births produce twins which are identical and 75% are non-identical. Recently the number of twin births has increased.

(a) (i) State **one** method by which the presence of twins in the uterus may be confirmed.

..... [1]

(ii) Not all multiple pregnancies result in multiple births.

Explain the phrase 'vanishing twin syndrome'.

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

(iii) State **two other** reasons why twin births are relatively uncommon in humans.

1.
.....

2.
..... [2]

(iv) Suggest why the number of twin pregnancies is increasing.

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

(b) Epidemiological data were collected to compare the incidence of allergic reactions to the antibiotic penicillin in identical and non-identical twins. The data are shown in Fig. 1.1.

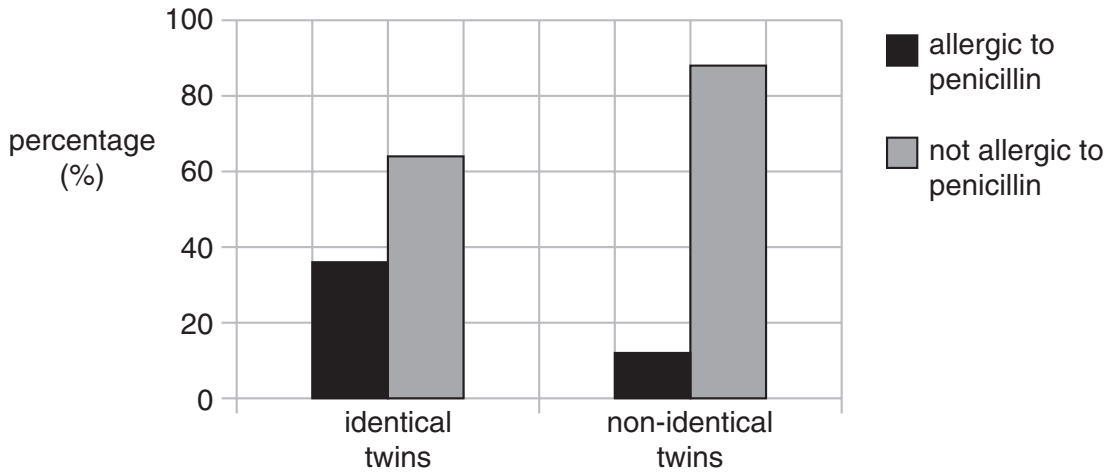


Fig. 1.1

(i) Suggest reasons to account for the differences in the incidence of allergic reactions to penicillin in this study.

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

(ii) Suggest why **epidemiological** data were collected.

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

[Total: 11]

2 The fitness of skeletal muscles in an athlete can be improved by a programme of aerobic training.

These muscles are adapted, by their complex structure, to perform well during exercise.

Most skeletal muscles contain fast-twitch white fibres and slow-twitch red fibres.

Aerobic training improves the efficiency of respiration in slow-twitch red fibres.

(a) (i) Outline the changes that may occur in **slow-twitch** red fibres during a programme of aerobic training.

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

(ii) Explain how **fast-twitch** white muscle fibres of an athlete respire during a short burst of strenuous exercise, such as sprinting.

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

(b) Fig. 2.1 is a diagram of a sarcomere from a skeletal muscle fibre.

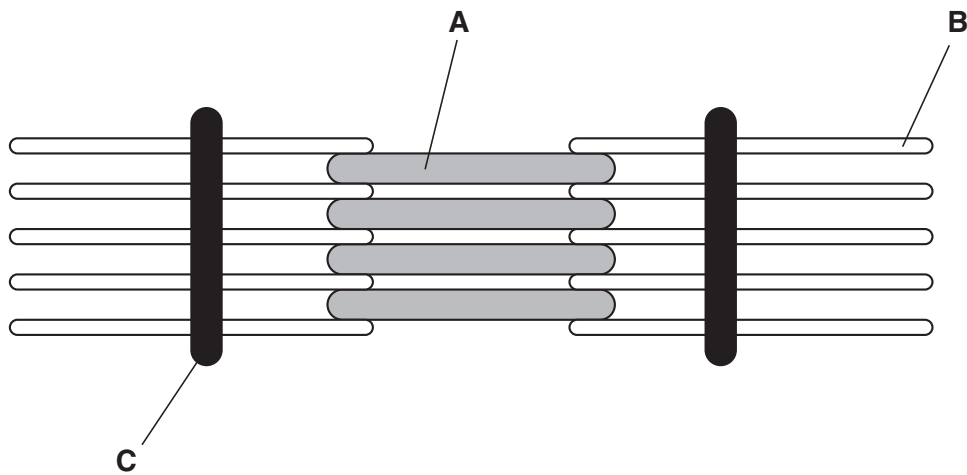


Fig. 2.1

Name **A** to **C**.

A

B

C [3]

Question 2 is continued on page 6

(d) Suggest how body builders may modify their diet to increase the **development** of skeletal muscle and enhance their performance.

.....

.....

.....

.....

.....

..... [3]

[Total: 21]

3 A number of drugs and other chemicals affect the action of the nervous system by modifying nerve impulse transmission at synapses.

(a) State **two** functions of synapses.

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

(b) When action potentials arrive at the presynaptic membrane, calcium ions enter the neurones.

(i) Explain how the calcium ions enter the neurones.

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

(ii) Describe the sequence of events which follow the entry of calcium ions until the depolarisation of the postsynaptic membrane.

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

- (c) Contamination from organophosphates in sheep dips, used by farmers to kill ticks on sheep, may cause illness in the farmers and their families.

It is known that organophosphates inhibit acetylcholinesterase.

- (i) Explain the importance of acetylcholinesterase at synapses.

.....

.....

.....

..... [2]

- (ii) Suggest **how** organophosphates may inhibit acetylcholinesterase.

.....

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.....

..... [3]

- (d) It is known that diamorphine activates inhibitory receptors on the presynaptic membrane of sensory neurones in the brain.

- (i) State the **therapeutic** use of diamorphine.

..... [1]

- (ii) Use the information given to explain how diamorphine brings about its therapeutic effect.

.....

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..... [3]

[Total: 17]

4 An understanding of respiration is important when working out a training programme to improve fitness.

(a) When muscles exercise, the concentration of carbon dioxide and hydrogen ions in the blood increases. These products of respiration are rapidly removed by an increase in the rate and depth of breathing.

Fig. 4.1 is a flow diagram that shows how the rate and depth of breathing is controlled.

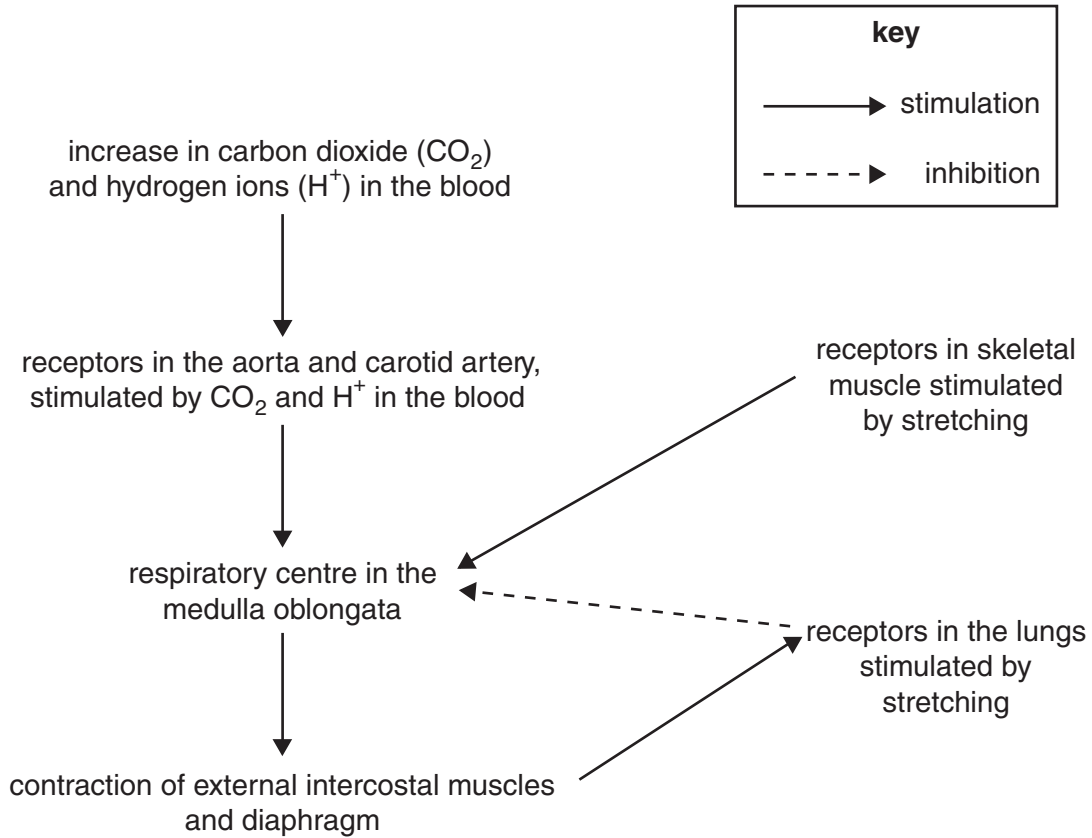


Fig. 4.1

(i) Describe how carbon dioxide and hydrogen ions enter red blood cells from exercising muscle.

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[3]

(ii) Explain the meaning of the term *receptor*.

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

(iii) Suggest the role of the stretch receptors in the lungs.

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

(b) Explain why it is so important to control the concentration of hydrogen ions in the blood.

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

(c) Muscle cells contain large numbers of mitochondria that supply the ATP for muscle contraction. The ATP is produced by oxidative phosphorylation.

Use the most appropriate word or words to complete the paragraph below on oxidative phosphorylation.

Hydrogen atoms from the Krebs cycle are brought to the electron transport chain carried as NAD or FAD. Here the hydrogen atoms are split into protons and electrons. The electrons flow through carriers and during this process is transferred. The protons are pumped across the inner membrane, producing a proton As the protons flood back through the stalked particles, the enzyme forms ATP from ADP and inorganic phosphate. [3]

[Total: 12]

- 5 Trends in a human population can be monitored by carrying out a census.

Fig.5.1 shows the age distribution of the populations of the United Kingdom and the Philippines in the year 2000.



Fig. 5.1

- (a) (i) Using the information in Fig.5.1, state the number of children aged 0-9 years in the Philippines.

..... [1]

- (ii) The total population of the Philippines in 2000 was 80 million.

Calculate the percentage of the total population of the Philippines who are aged 0-9 years.

Show your working and express your answer to the nearest whole number.

Answer = [2]

The human population has continued to grow, largely due to the development of intensive methods of food production.

However, there is a conflict between some agriculturalists who support intensive methods, and conservationists, who believe that more food could be produced using extensive methods.

(c) Distinguish between intensive and extensive methods of food production.

.....

.....

.....

.....

..... [2]

(d) Wheat has been a major food crop for thousands of years.
 Selective breeding has led to improvements in wheat varieties.
 In 1984, a trial was carried out in which four varieties of wheat, ranging from a very old variety to a modern one, were grown and harvested in identical conditions.

Table 5.1 shows the results of this trial.

Table 5.1

<p>A table has been removed due to third party copyright restrictions</p> <p>Details:</p> <p>A table showing the results of the above mentioned trial</p>
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Using the information in Table 5.1, state two improvements made in the characteristics of wheat varieties from the 19th century to the 1980s.

1.

.....

2.

..... [2]

[Total: 14]

6 Ovarian cancer is the fourth most common cancer in women. Examination of the structure of the ovary can reveal any abnormality which may be associated with cancer.

(a) Fig. 6.1 is a diagram of a section through an ovary.



Fig. 6.1

(i) With reference to Fig. 6.1, state which of the letters, A to D, indicate the
 Graafian follicle
 germinal epithelium [2]

(ii) State what happens to the Graafian follicle after ovulation, and explain its function.

 [4]

Question 6 is continued on page 16

Cancer of the ovary is one of the most difficult cancers to detect early. It usually occurs in the outer layers of the ovary but may also occur in the gamete producing cells.

(b) (i) Suggest why the ovary has the potential for the development of cancer.

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..... [1]

(ii) Describe how ovarian cancer may be detected **and** treated.

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..... [5]

(c) Cancers may occur in many parts of the body but finding clear evidence that identifies what causes cancer is very difficult.

Explain why it is so difficult to identify the causes of cancer.

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

[Total: 15]

END OF QUESTION PAPER

Copyright Acknowledgments:

Fig. 5.1, adapted from usa bureau of the census database (www.census.gov)

Fig. 6.1, Innerspace Imaging/Science Photo Library

OCR has made every effort to trace the copyright holders of items used in this Question paper, but if we have inadvertently overlooked any, we apologise.