

OXFORD CAMBRIDGE AND RSA EXAMINATIONS

Advanced GCE

HUMAN BIOLOGY

2866

Energy, Control and Reproduction

Tuesday

24 JANUARY 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 black or blue 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	10	
2	19	
3	13	
4	21	
5	16	
6	11	
TOTAL	90	

This question paper consists of 17 printed pages, 3 blank pages and an insert.

Answer all the questions.

1 Cardiovascular diseases are a major cause of hospital admissions in the developed world. Strokes and coronary heart disease are both cardiovascular diseases. They both involve blood vessels, in different parts of the body.

(a) Describe how strokes differ from coronary heart disease.

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.....[2]

(b) Fig. 1.1 shows the annual number of strokes in different age groups, in three different countries.

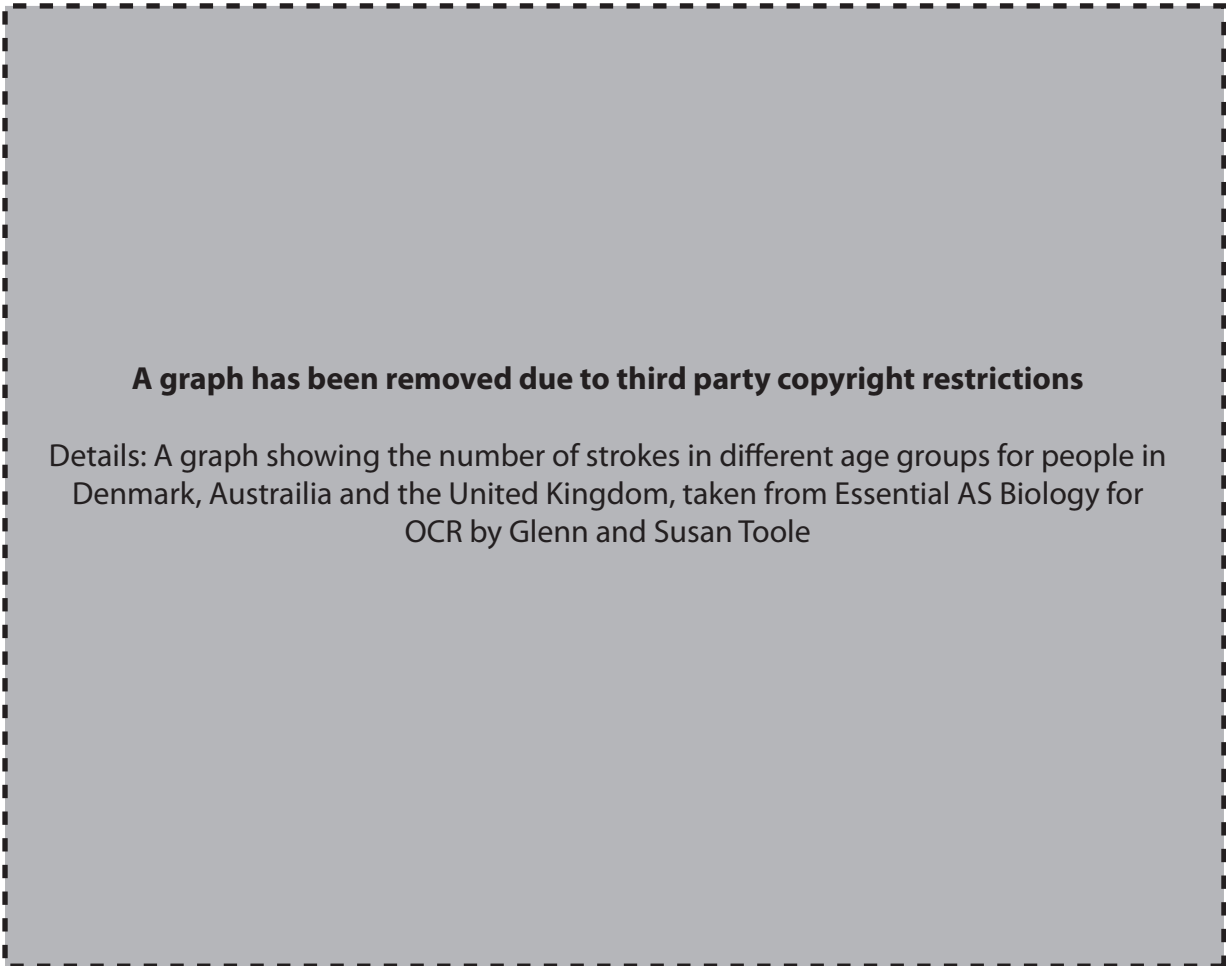


Fig. 1.1

- 2 An understanding of the processes involved in gamete formation has led to advances in the treatment of infertility.

Spermatogenesis and oogenesis are the processes that produce haploid gametes.

(a) State **two** ways in which spermatogenesis **differs** from oogenesis.

spermatogenesis	oogenesis
1.	
2.	

[2]

(b) Fig. 2.1 is a drawing of a human sperm in longitudinal section.

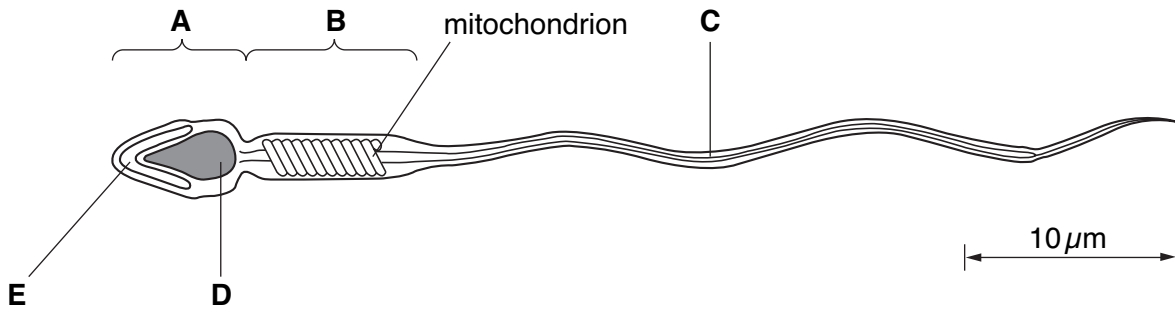


Fig. 2.1

(i) Name A to D.

- A
- B
- C
- D
- [4]

(ii) Name structure E and describe its function.

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-
-
-
-
-
- [3]

(iii) Explain why a sperm cell contains many mitochondria.

-
-
-
-
-
- [2]

3 During exercise, the concentration of carbon dioxide in the blood increases. The increase in carbon dioxide concentration affects the affinity of haemoglobin for oxygen.

(a) (i) State the effect of an increased concentration of carbon dioxide on the affinity of haemoglobin for oxygen.

.....[1]

(ii) Explain how this effect is brought about.

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

(b) The affinity of haemoglobin for oxygen is also affected by other small molecules and ions in the blood.

One of these is a compound called 2,3-diphosphoglycerate (DPG).

DPG is made in red blood cells under certain conditions.

Fig. 3.1 shows the effect of DPG on the oxygen dissociation curve of haemoglobin.

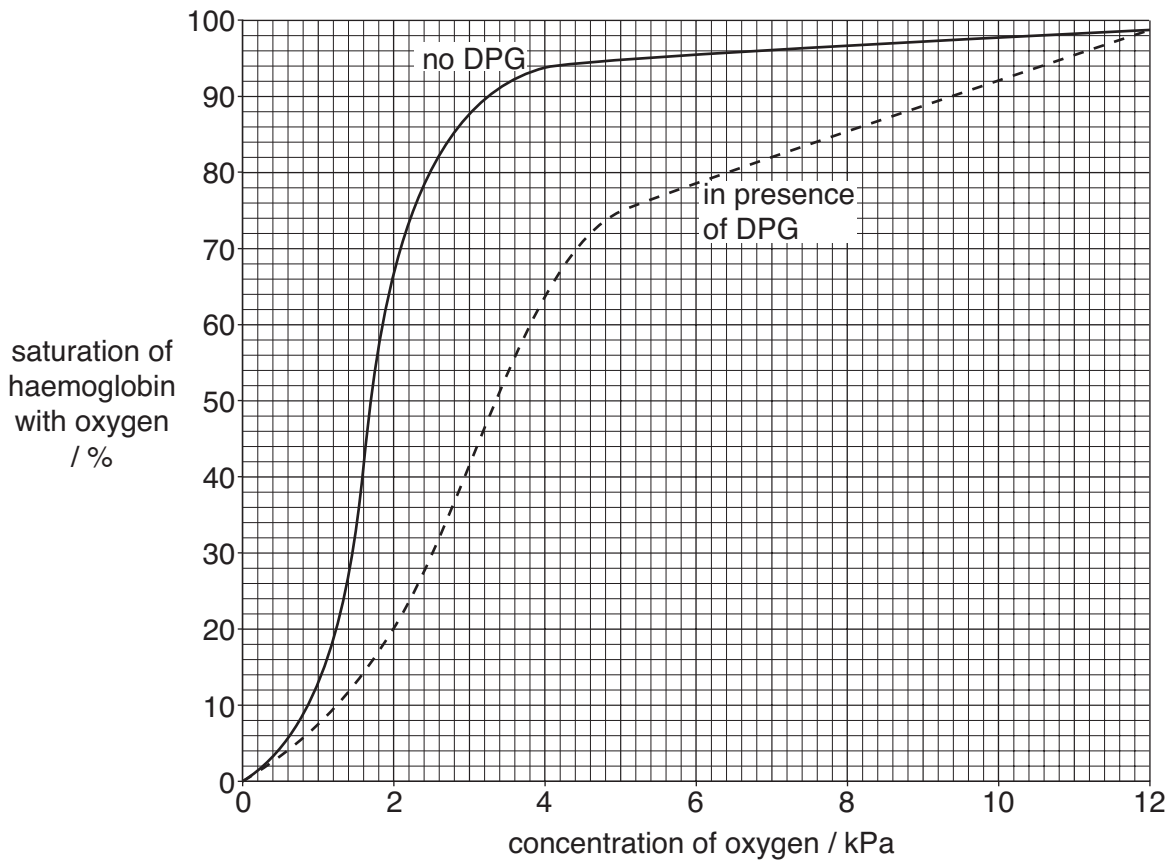


Fig. 3.1
2866 Jan06

Using the information in Fig. 3.1,

- (i) calculate the difference in % saturation of haemoglobin with oxygen between the two curves at a partial pressure of oxygen of 5 kPa;
Show your working.

Answer [2]

- (ii) describe the effect of DPG on the affinity of haemoglobin for oxygen.

.....

 [2]

- (c) Athletes will often live and train at altitude to improve their performance.

Explain why the performance of an athlete at altitude could improve as a result of such training.

.....

 [5]

[Total: 13]

4 Diseases of the nervous system, such as Parkinson's disease, are often caused by damage to neurones which affects their ability to transmit impulses.

(a) Fig. 4.1 is a diagram of a neurone.

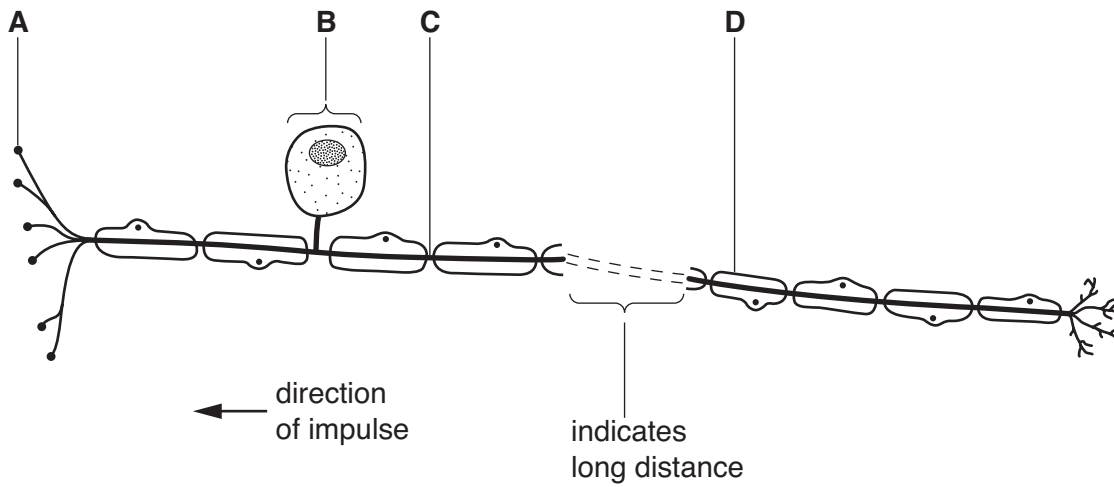


Fig. 4.1

(i) Name the structures labelled A to D.

A

B

C

D

[4]

(ii) Name the type of neurone shown in the diagram.

.....[1]

- (b) Fig. 4.2 shows a recording of an action potential as an impulse is transmitted along the neurone.

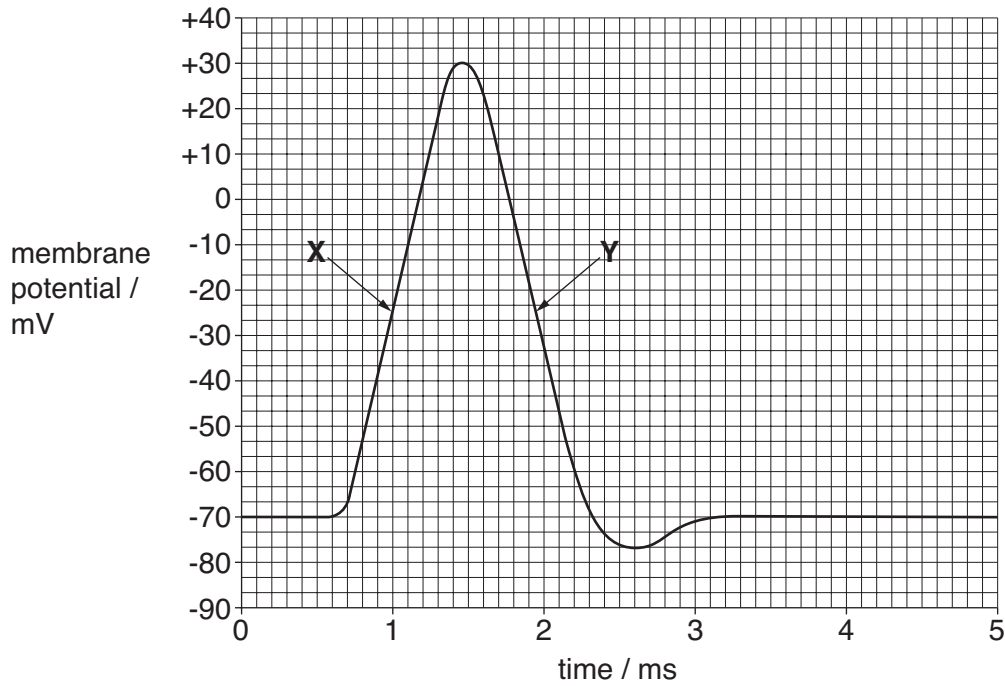


Fig. 4.2

Using Fig. 4.2, state the value

- (i) at the peak of the action potential;

.....

- (ii) of the resting potential.

..... [2]

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

Describe the sequence of events occurring in the neurone membrane at **X** and **Y** on Fig. 4.2. **Details of the resting potential are not required.**

X

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[6]

Quality of Written Communication [1]

- (d) Parkinson's disease is caused by the gradual death of a group of neurones in the brain which secrete a neurotransmitter called dopamine.

The best hope of a cure is to transplant new dopamine-secreting neurones into the brain.

These neurones could be obtained by growing them from human stem cells.

- (i) Describe the features of stem cells which allow them to be used for this purpose.

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.....[3]

- (ii) Explain how these stem cells may be obtained **and** how they may be used to produce dopamine-secreting neurones.

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.....[4]

[Total: 21]

5 The growing concern over the increase in obesity has made adequate exercise an important issue.

(a) Explain the term **aerobic exercise**.

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.....[3]

(b) Describe the effects of a **short** period of strenuous exercise on the cardiovascular system.

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.....[4]

(c) Fig. 5.1 shows a metabolic pathway that occurs in muscle tissue.

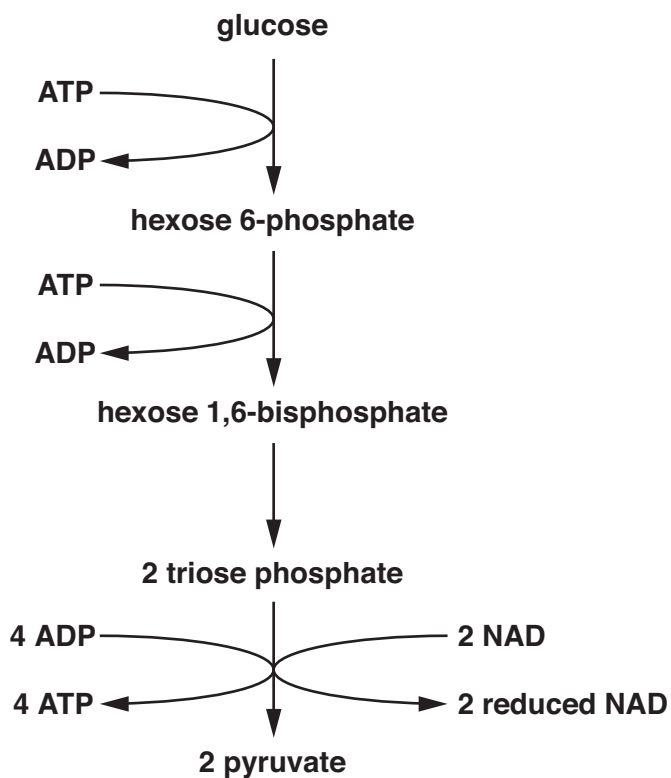


Fig. 5.1

(i) Name the metabolic pathway shown in Fig. 5.1.

.....[1]

(ii) State the net yield of ATP when one molecule of glucose is metabolised by this pathway.

.....[1]

- 6 There is an increasing awareness of the importance of monitoring the effect of human activities on ecosystems. To do this it is necessary to understand the environmental processes that may be affected.

Fig. 6.1, on the insert, shows the carbon cycle.

- (a) Name the processes occurring at **X** and **Y** on Fig. 6.1.

X

Y[2]

- (b) Human demand for timber and other wood products has led to an increase in deforestation.

Explain how deforestation can result in an increase in the carbon dioxide concentration of the atmosphere.

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.....[2]

- (c) The forest floor is normally a mixture of leaf litter and soil.

Explain how leaf litter and soil contribute to the carbon dioxide in the atmosphere.

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.....[3]

- (d) Describe **two** possible ways in which a rise in atmospheric carbon dioxide concentration could affect the human ecosystem.

1

.....

.....

2

.....

.....[4]

[Total: 11]

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