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Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Level

BIOLOGY **9700/04**

Paper 4 Structured Question A2 Core

October/November 2004

1 hour 15 minutes

Candidates answer on the question paper.
Additional Materials: Answer Paper should be available on request.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name in the spaces provided at the top of this page.
Write in dark blue or black pen in the spaces provided on the Question Paper.
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 in Section A and **one** question from Section B.
Circle the number of the Section B question you have answered in the grid below.
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.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

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1	
2	
3	
4	
5	
Section A	
6 or 7	
Total	

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For Examiner's Use

Section A

Answer **all** questions.

Write your answers in the spaces provided.

1 Fig. 1.1 shows the arrangement of photosystems, protein complexes containing chlorophyll molecules, on the thylakoid membrane of a plant chloroplast.

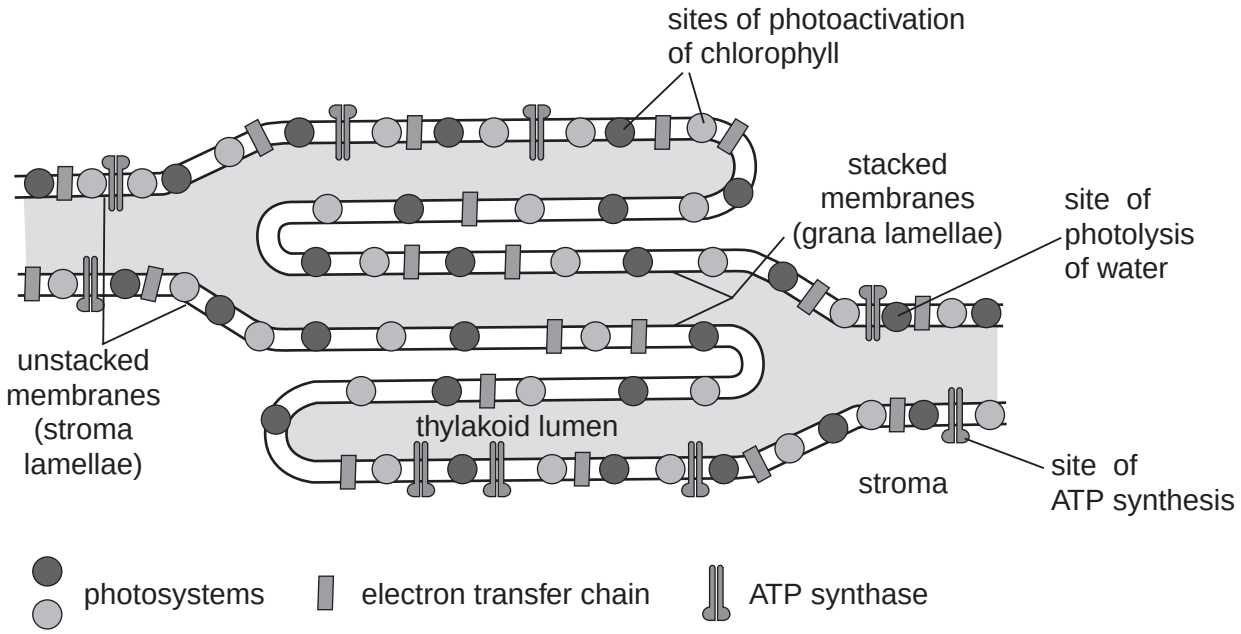


Fig. 1.1

(a) Describe the photoactivation of chlorophyll.

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.....[3]

(b) Explain how the photolysis of water occurs.

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.....[3]

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(c) Outline how ATP is formed in the chloroplast.

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.....[3]

(d) Suggest an advantage of having photosystems, the electron transport chain and ATP synthase as part of the thylakoid membrane.

.....[1]

[Total : 10]

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[Turn over

2 Fig. 2.1 shows the changes in membrane potential in an axon during the passage of a single impulse.

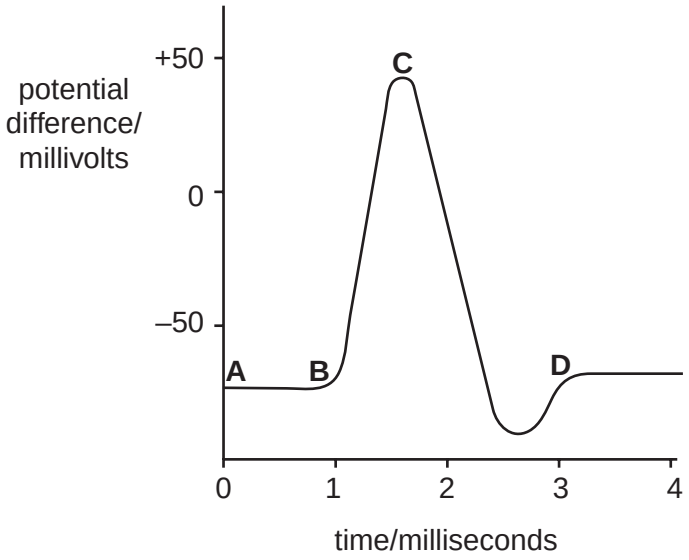


Fig. 2.1

(a) Outline how the resting potential from **A** to **B** is maintained.

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.....[3]

(b) Describe how the changes in the membrane bring about depolarization from B to C.

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.....[3]

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(c) Explain how the membrane is repolarised from C to D.

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.....[3]

(d) State three differences between nervous and hormonal communication in mammals.

1. .....

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2. .....

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3. .....

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[3]

[Total : 12]

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3 Fig. 3.1 shows the changes in blood lactate concentration with increasing workload in a distance runner and untrained person.

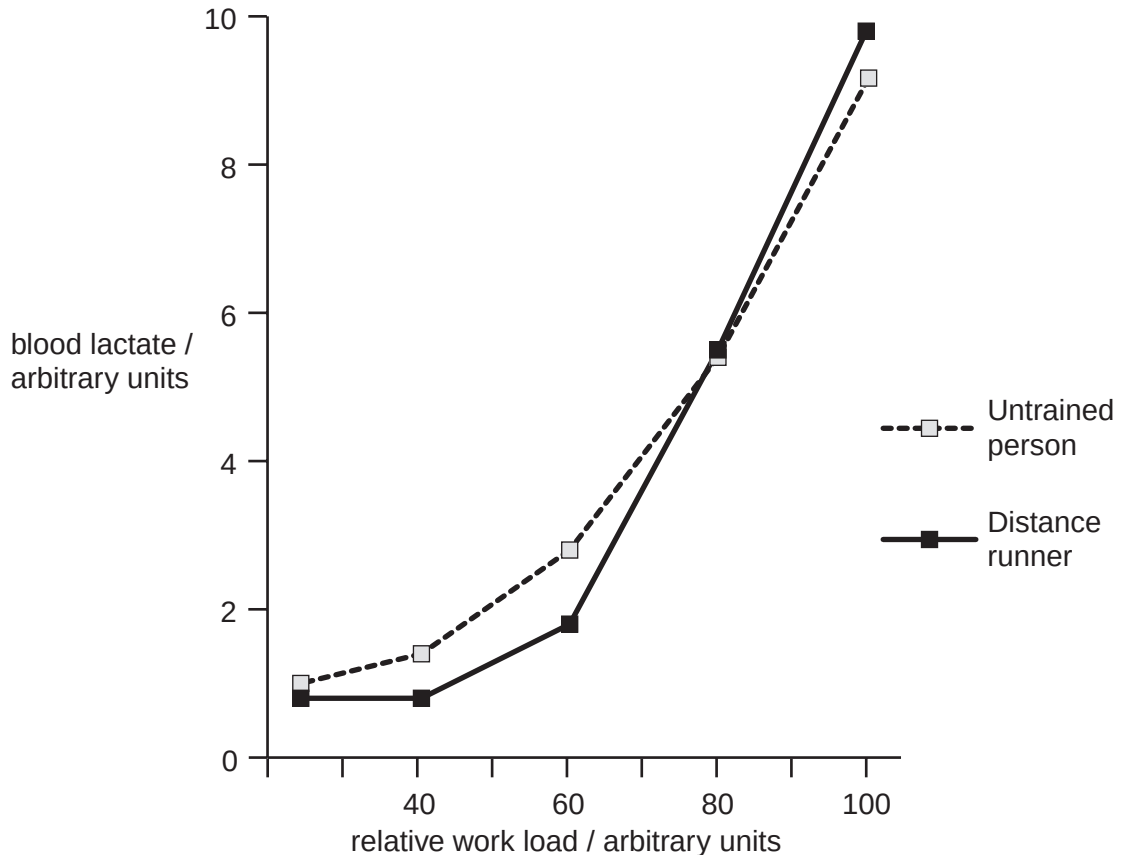


Fig. 3.1

(a) Describe the relationship between blood lactate concentration and relative workload for the distance runner.

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.....[2]

(b) Describe how the lactate that appears in the blood is formed.

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.....[3]

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(c) Outline how blood lactate is linked to oxygen debt.

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.....[3]

(d) Suggest why the build up of lactate occurs at a higher workload in the distance runner.

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.....[1]

[Total: 9]

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4 Fig. 4.1 shows four generations of a family in which some members of the family suffer from sickle cell anaemia.

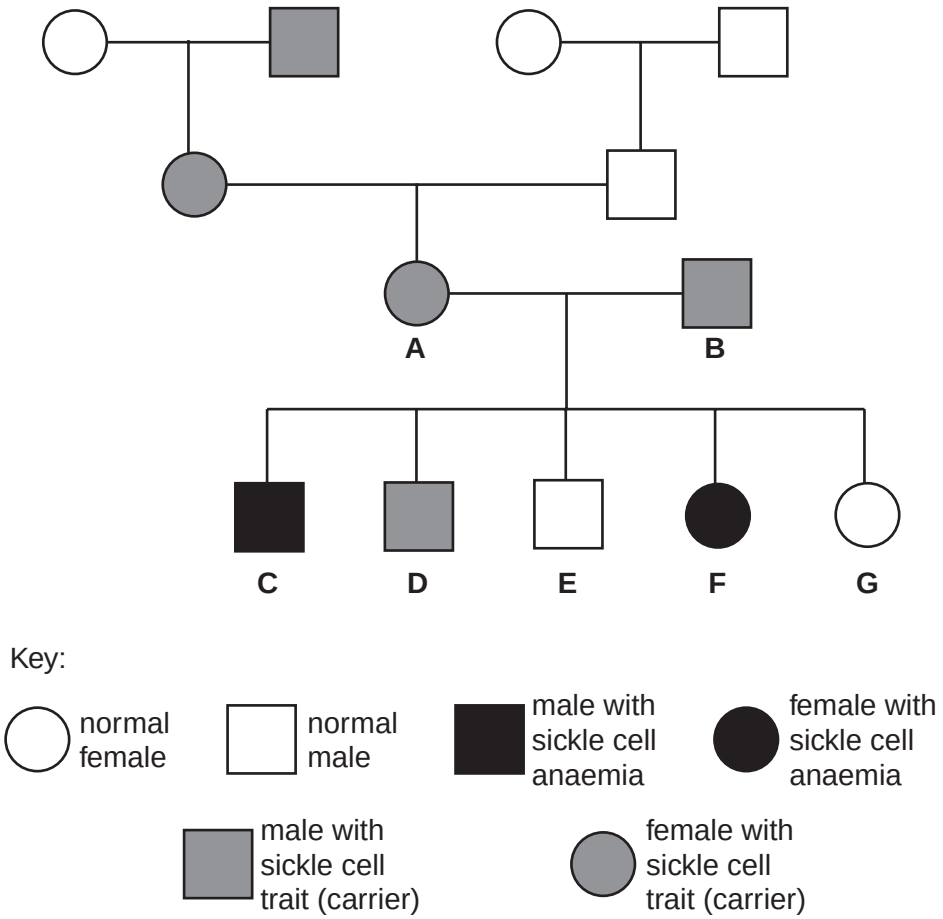


Fig. 4.1

(a) Using the symbols $\mathbf{H^N}$ for the allele for normal haemoglobin and $\mathbf{H^S}$ for the allele for sickle cell haemoglobin, state the genotypes of the following individuals.

A .....

C .....

[1]

(b) Draw a genetic diagram to show the probability of the parents **A** and **B** producing another child with sickle cell anaemia.

[4]

[Total : 5]

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[Turn over

5 Four species of desert pupfish have evolved in the Death Valley region of Nevada since the extensive lakes that existed there were reduced to isolated pools 20 000–30 000 years ago.

(a) Explain how the drying up of an extensive lake system to just a few isolated pools could have resulted in the evolution of four new species of desert pupfish.

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.....[4]

(b) Indicate how environmental factors can act as stabilising forces of natural selection in an isolated pool after the initial evolution of a new species.

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.....[3]

(c) Suggest what may happen if water levels rose and the isolated pools once more formed an extensive lake system.

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.....[2]

[Total : 9]

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Section B

Answer only **one** question from this section, either question 6 or question 7.
Your answer to Section B must be in continuous prose, where appropriate.
Answers may be illustrated by large, clearly labelled diagrams.
Your answer must be set out in sections (a) and (b) etc., as indicated in the question.

6 **(a)** Describe the main features of the Krebs Cycle. [9]

(b) Explain the role of NAD in aerobic respiration. [6]

7 **(a)** Describe the use of recombinant DNA technology in the synthesis of human insulin by bacteria. [9]

(b) Explain the advantages of treating diabetics with human insulin produced by genetic engineering. [6]

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