Centre Number	Candidate Number

Candidate Name _____

CAMBRIDGE INTERNATIONAL EXAMINATIONS

General Certificate of Education Advanced Level

BIOLOGY 9700/4

PAPER 4 Structured Questions A2 Core

MAY/JUNE SESSION 2002

1 hour

Candidates answer on the question paper.
No additional materials are required.

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided on the question paper.

All working for numerical answers must be shown.

INFORMATION FOR CANDIDATES

The intended number of marks is given in brackets [ ] at the end of each question or part question.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
TOTAL	

This question paper consists of 11 printed pages and 1 blank page.

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

[Turn over

Answer **all** the questions.

Write your answers in the spaces provided.

1 Fig. 1.1 shows the flow of electrons in non-cyclic and cyclic photophosphorylation.

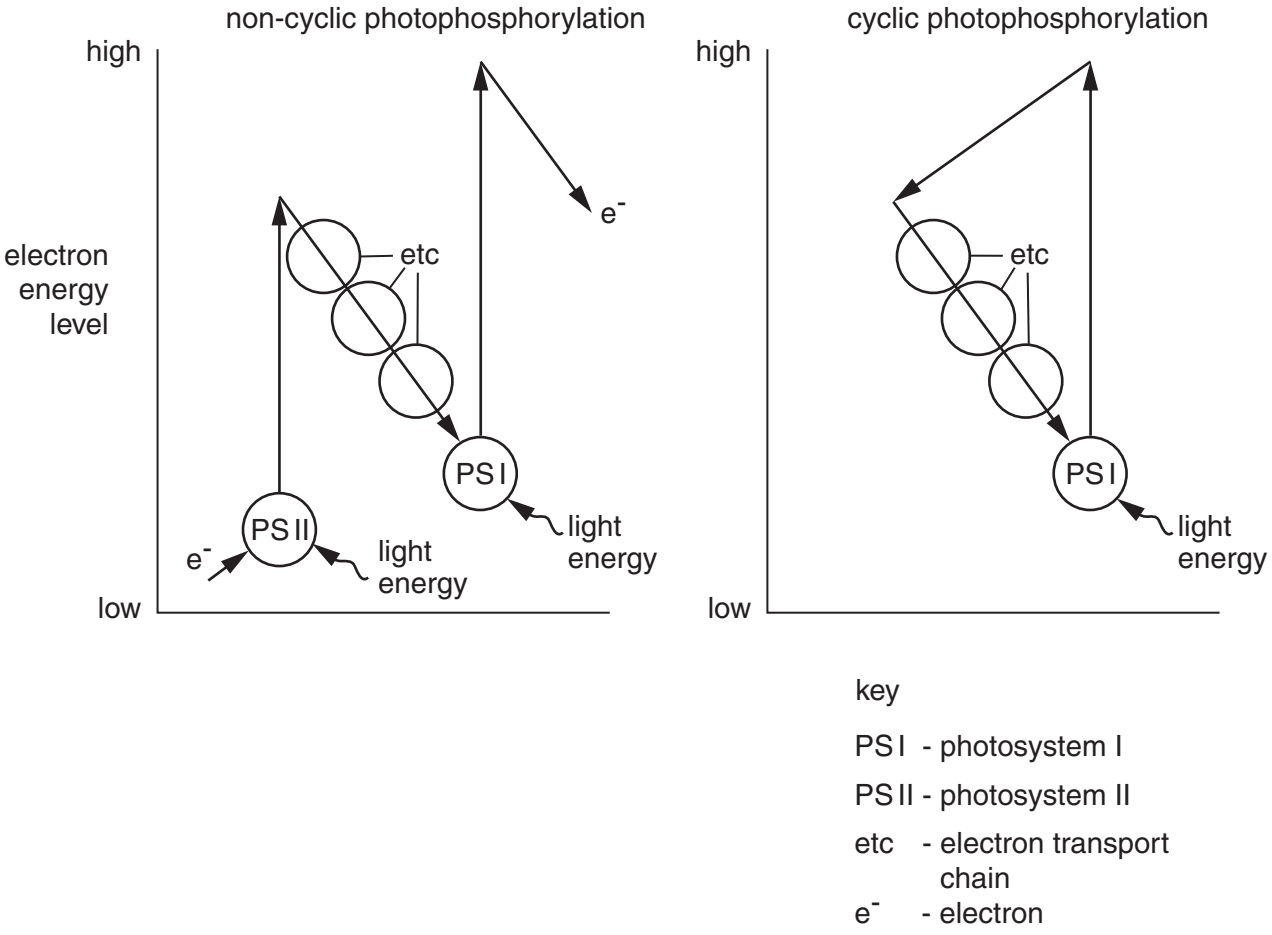

Fig. 1.1

(a) State the precise location of photophosphorylation in a chloroplast.

.....[2]

(b) Describe the role of light in photophosphorylation.

.....

.....

.....[2]

(c) Explain how non-cyclic photophosphorylation differs from cyclic photophosphorylation.

.....

.....

.....

.....

.....

.....[4]

(d) Paraquat is a herbicide that prevents the flow of electrons from photosystem I and reduces oxygen to a chemically reactive superoxide radical. This results in severe damage to chloroplasts. It is now possible to make a crop plant resistant to such herbicides.

Suggest a use for such plants.

.....

.....[1]

[Total : 9]

[Turn over

2 **(a)** Define the term *respiratory quotient (RQ)*.

.....

.....[1]

(b) Explain the significance of the different values that may be obtained of RQ.

.....

.....

.....[2]

Two respirometers were set up as shown in Fig. 2.1.

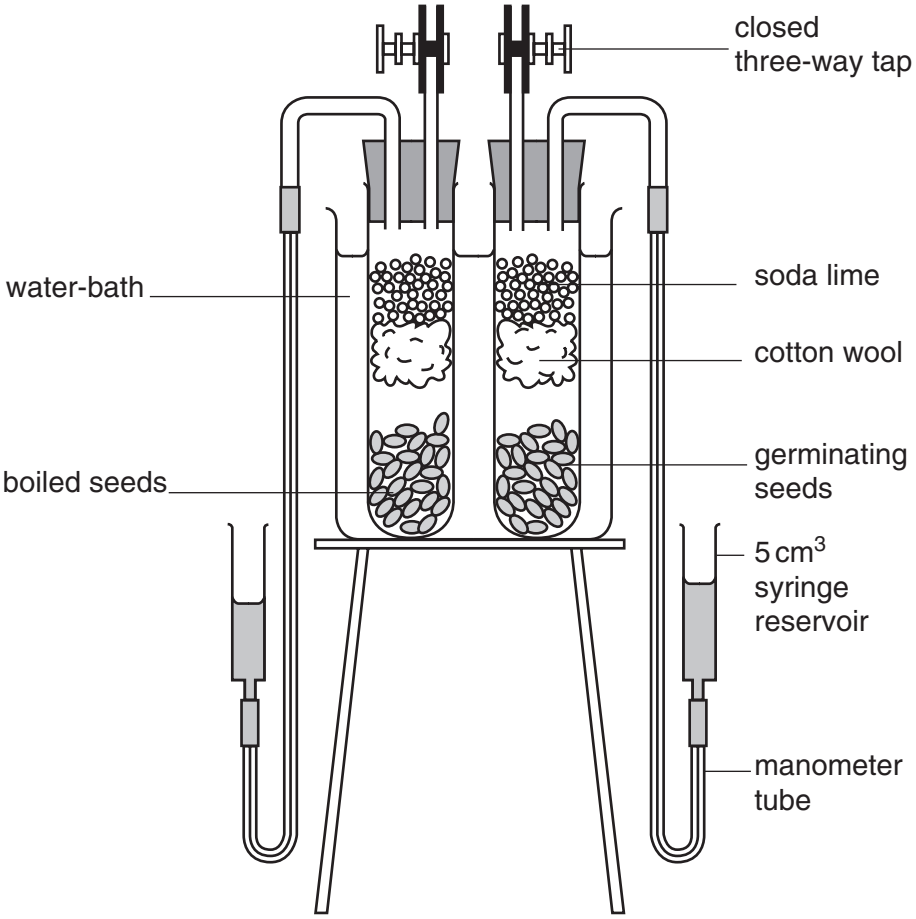

Fig. 2.1

(c) Outline how this apparatus is used to measure the rate of oxygen uptake by a known mass of germinating seeds.

.....

.....

.....

.....

.....

.....[4]

(d) Explain how the apparatus could be modified to measure the RQ of the germinating seeds.

.....

.....

.....[2]

(e) Explain why an increase in temperature from 15 °C to 25 °C will increase the rate of oxygen uptake in germinating seeds.

.....

.....

.....[2]

[Total : 11]

3 Fig. 3.1 shows part of an axon with its associated Schwann cells.

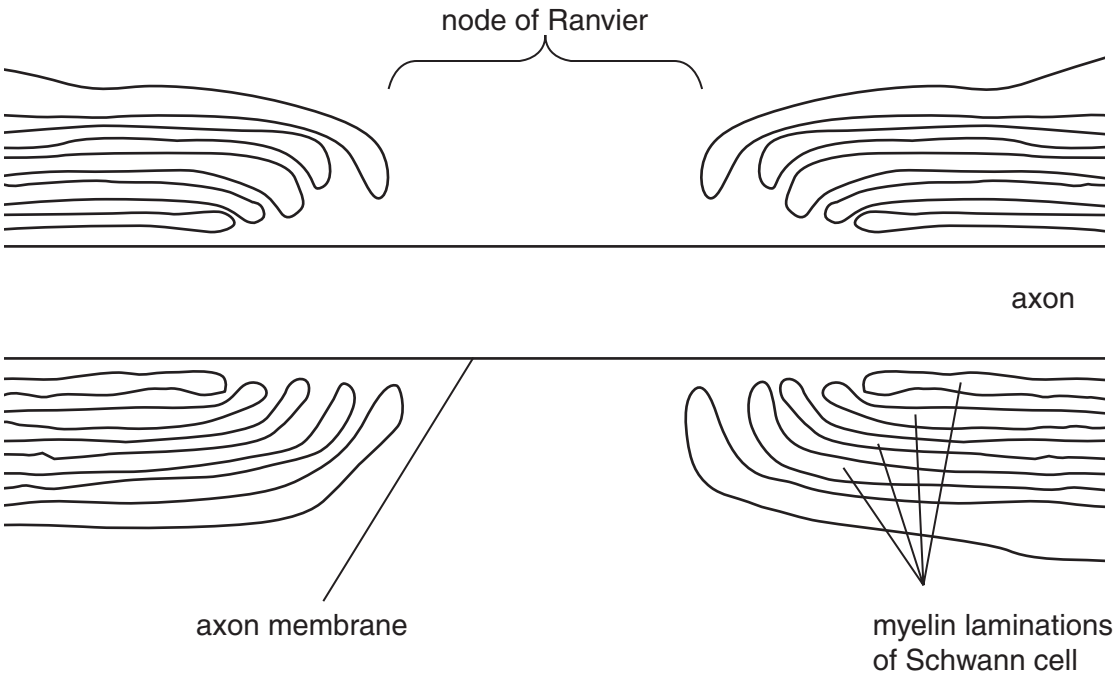

Fig. 3.1

(a) Explain how charged ions, such as Na^+ and K^+, are able to pass across membranes of nerve cells.

.....

.....

.....[2]

(b) Describe the role in impulse transmission along a nerve cell of

(i) Na^+;

.....

.....

.....[2]

(ii) K^+.

.....

.....

.....[2]

(c) Describe the function of the myelin sheath.

.....

.....

.....

.....

.....[3]

(d) Suggest how the intensity of a stimulus can be passed along a single nerve cell.

.....

.....[1]

[Total : 10]

[Turn over

4 Fig. 4.1 shows a kidney tubule, collecting duct and associated blood vessels.

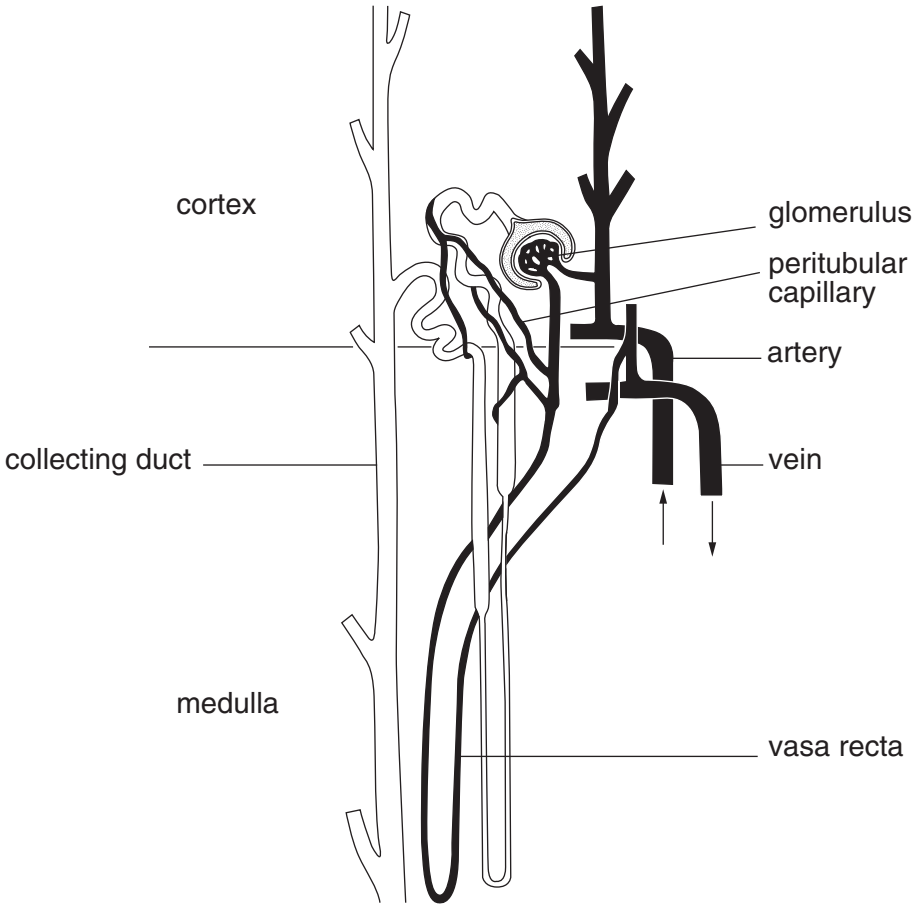

Fig. 4.1

(a) Describe the function of the

(i) glomerulus;

.....

.....

.....[2]

(ii) peritubular capillaries;

.....

.....

.....[2]

(iii) vasa recta.

.....

.....

.....[2]

(b) Explain the role of the collecting duct in controlling the water content of body fluids.

.....

.....

.....

.....[3]

(c) Suggest **two** disadvantages of the use of dialysis machines in treating kidney failure.

.....

.....

.....[2]

[Total : 11]

5 Pure-breeding pea plants with round, yellow seeds were crossed with pure-breeding pea plants with wrinkled, green seeds. The offspring all had round, yellow seeds. These seeds were grown and the resultant plants allowed to self-pollinate.

This produced 1112 offspring with the following characteristics.

630 round, yellow seeds
202 round, green seeds
216 wrinkled, yellow seeds
64 wrinkled, green seeds

(a) Using the symbols **R** for round, **r** for wrinkled, **B** for yellow and **b** for green, draw a genetic diagram to explain these results.

[4]

(b) Explain why the wrinkled, green seeds produced pure-breeding offspring, while the round, yellow seeds did not.

.....

.....

.....

.....[3]

(c) A ratio of 9:3:3:1 was expected.

A chi-squared test was carried out to test the significance of the differences between the observed and expected results. This gave a value of 0.47.

probability	0.99	0.98	0.95	0.90	0.50	0.10	0.05	0.02	0.01
at 3 degrees of freedom	0.12	0.19	0.35	0.58	2.4	6.3	7.8	9.8	11.3

With reference to the table of probabilities, explain how the value for the chi-squared test supports the hypothesis that these are two pairs of segregating alleles at two loci.

.....

.....

.....

.....[2]

[Total : 9]

BLANK PAGE