

Candidate Name \_\_\_\_\_

Centre Number

Candidate

Number

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**CAMBRIDGE INTERNATIONAL EXAMINATIONS**  
**General Certificate of Education Advanced Level**

**BIOLOGY**

PAPER 4 Structured Questions A2 Core

**9700/4**

**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	
<b>TOTAL</b>	

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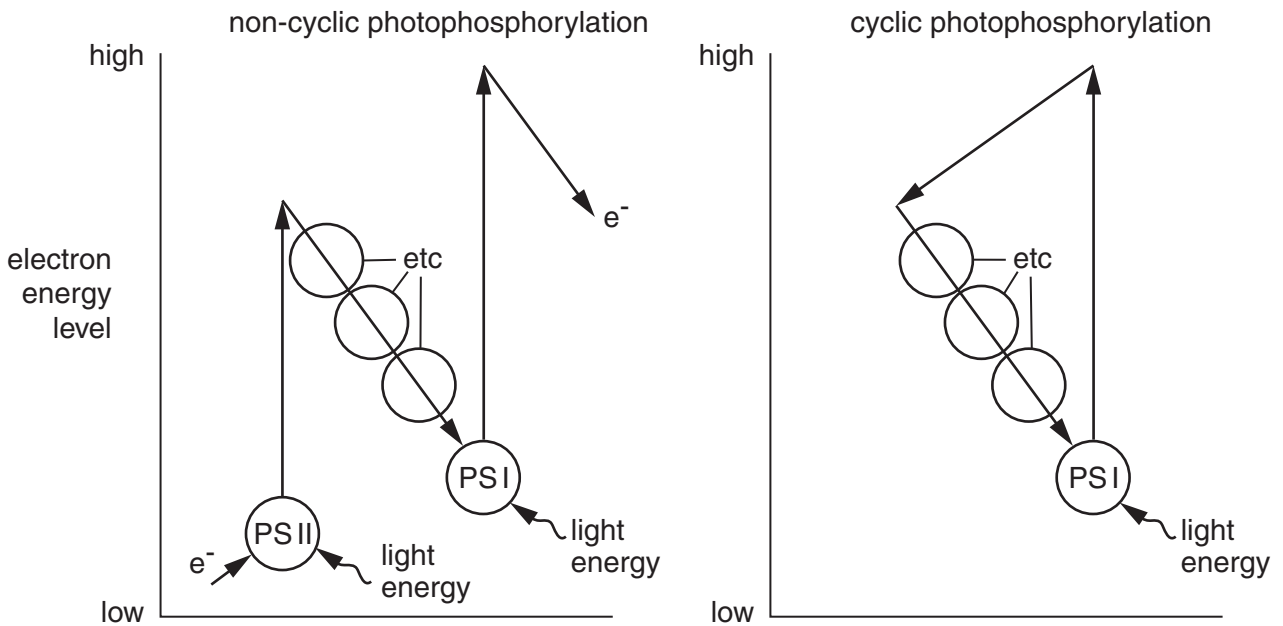
**This question paper consists of 11 printed pages and 1 blank page.**



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.



key

PS I - photosystem I

PS II - photosystem II

etc - electron transport  
chain

e<sup>-</sup> - electron

**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]

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.

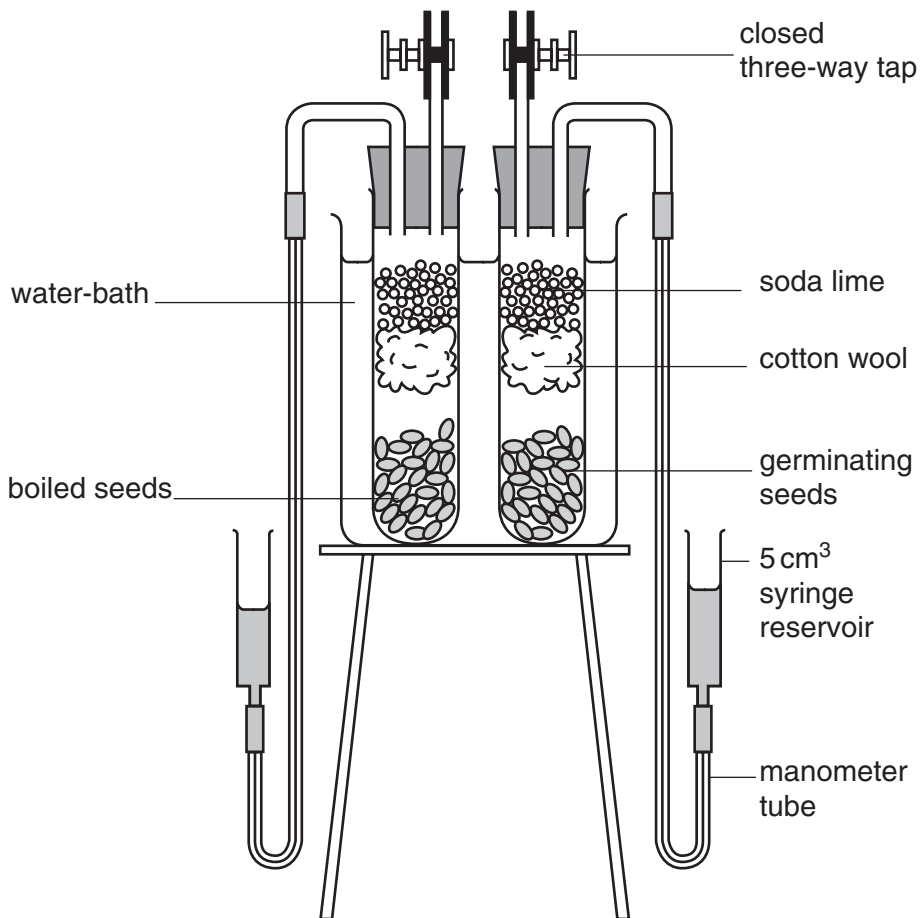


Fig. 2.1

(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.

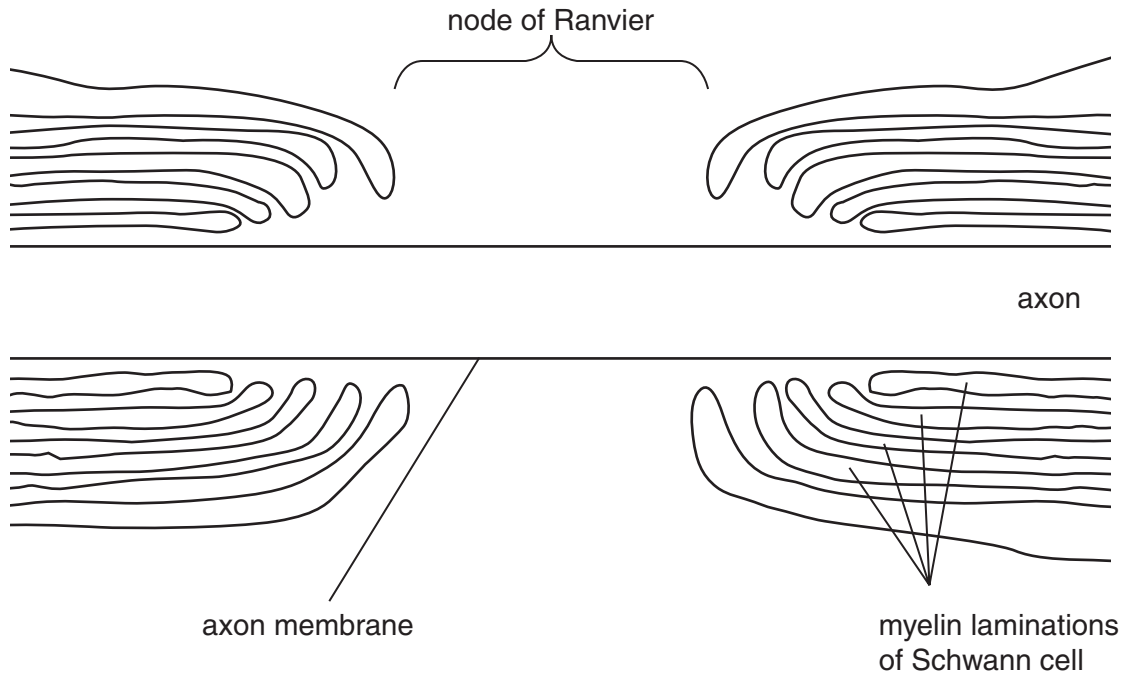


Fig. 3.1

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

.....

.....

.....[2]

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

(i) Na<sup>+</sup>;

.....

.....

.....[2]

(ii) K<sup>+</sup>.

.....

.....

.....[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]

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

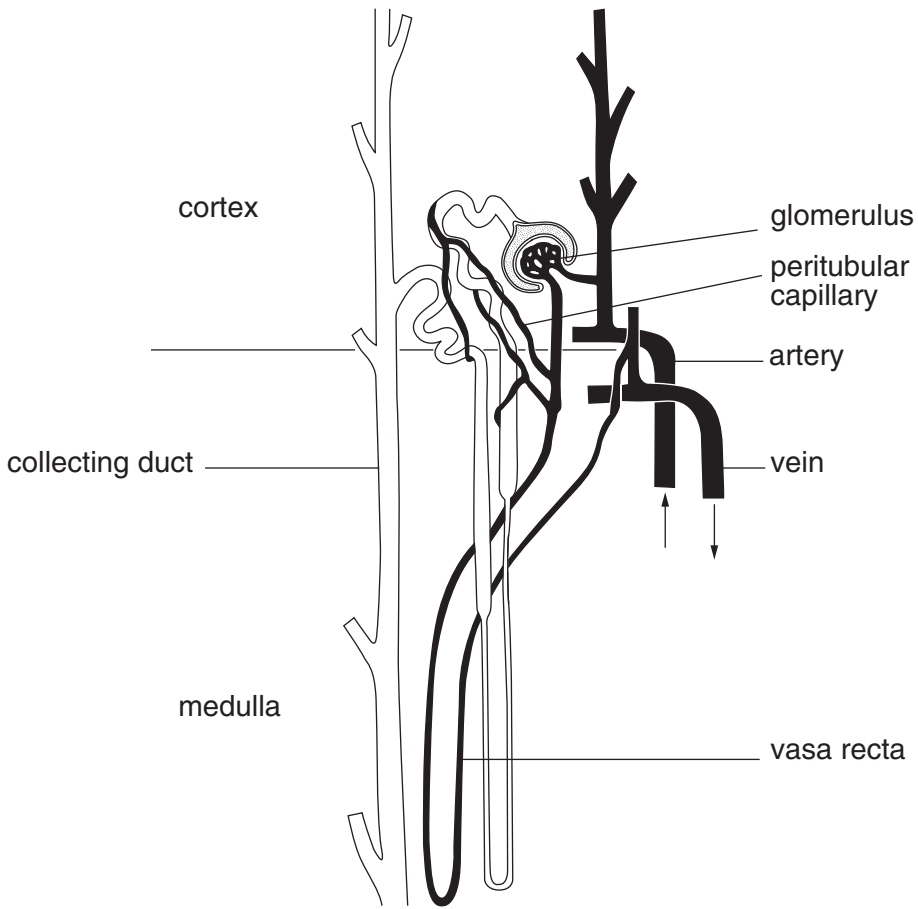


Fig. 4.1

(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]

