| 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.**


© CIE 2002

UNIVERSITY of CAMBRIDGE
Local Examinations Syndicate

**[Turn over**

For Examiner's Use

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.

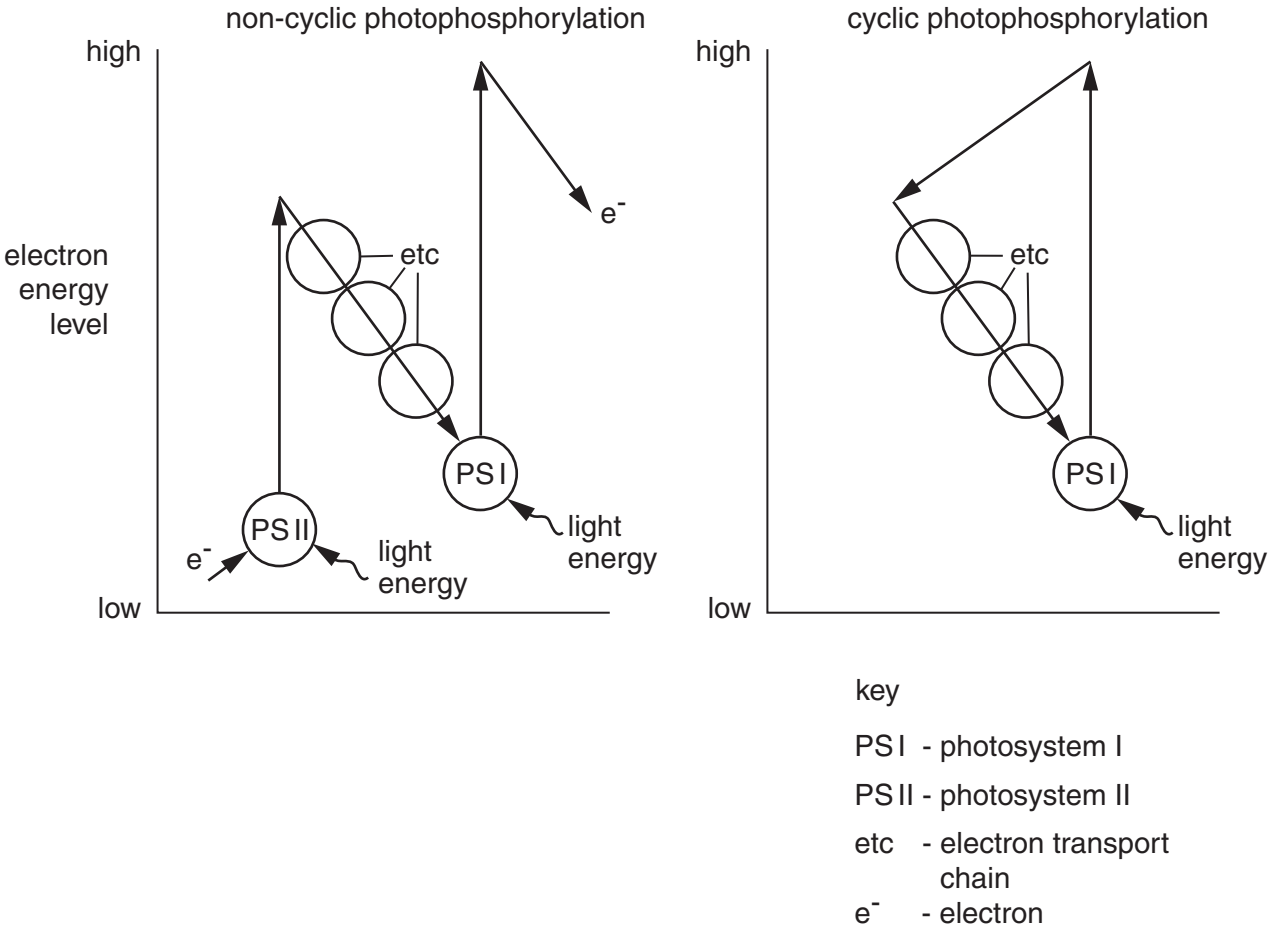



**Fig. 1.1**

**(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.

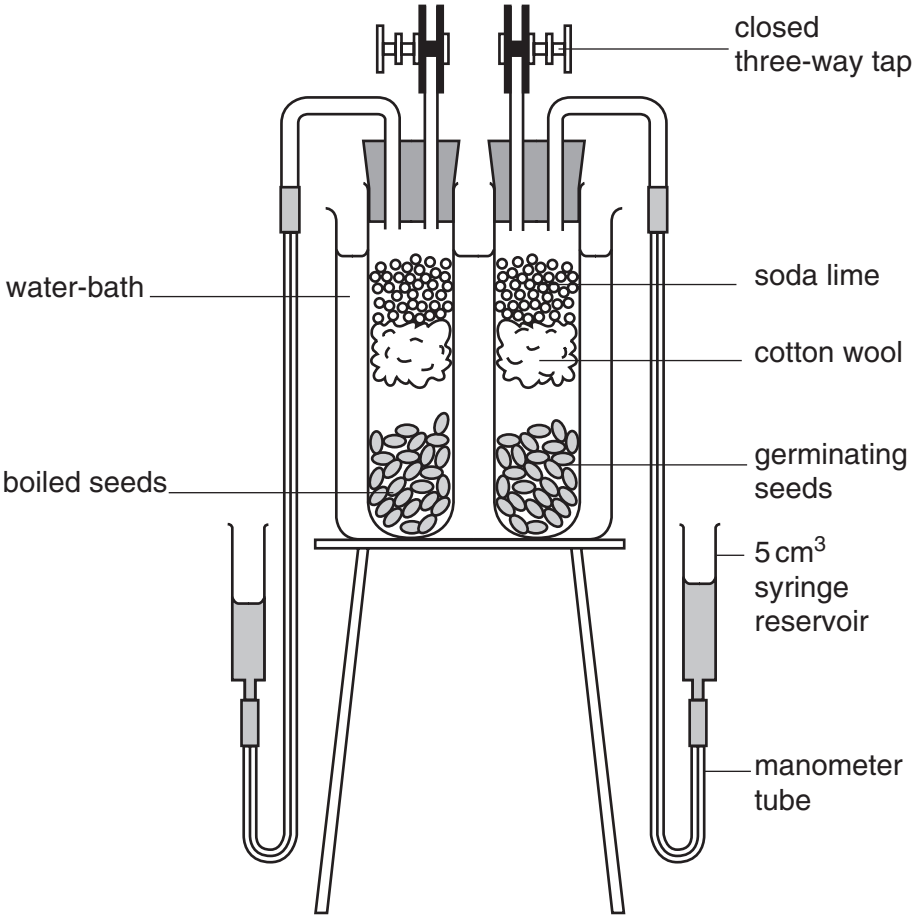



**Fig. 2.1**

**(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]

For Examiner's Use

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

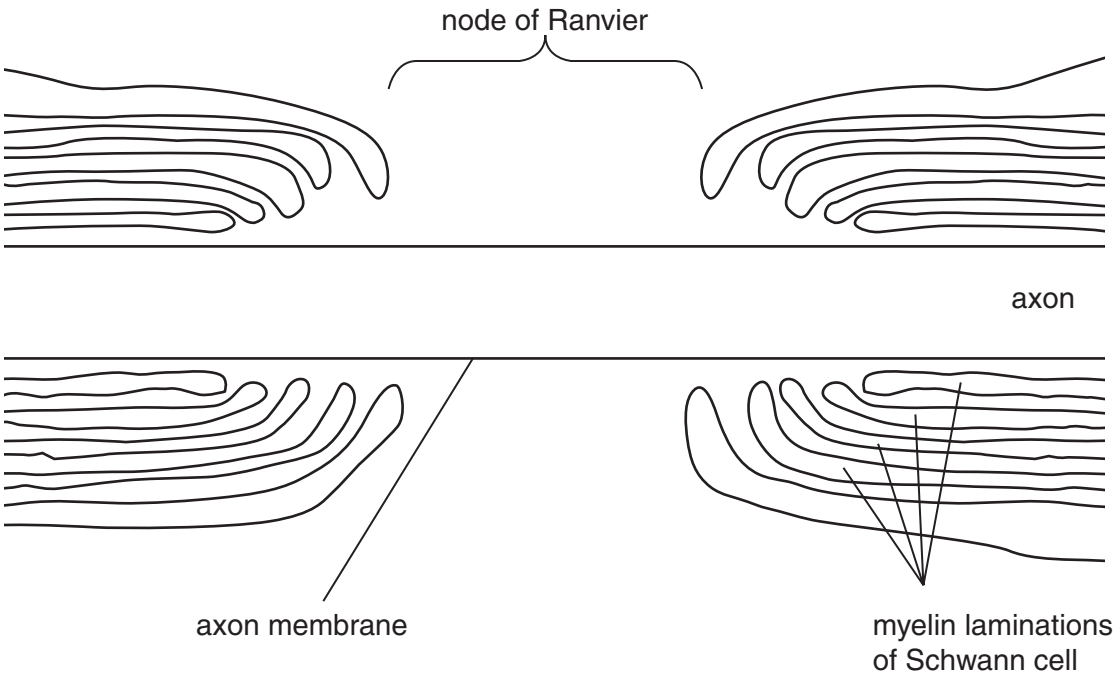



**Fig. 3.1**

**(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]

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

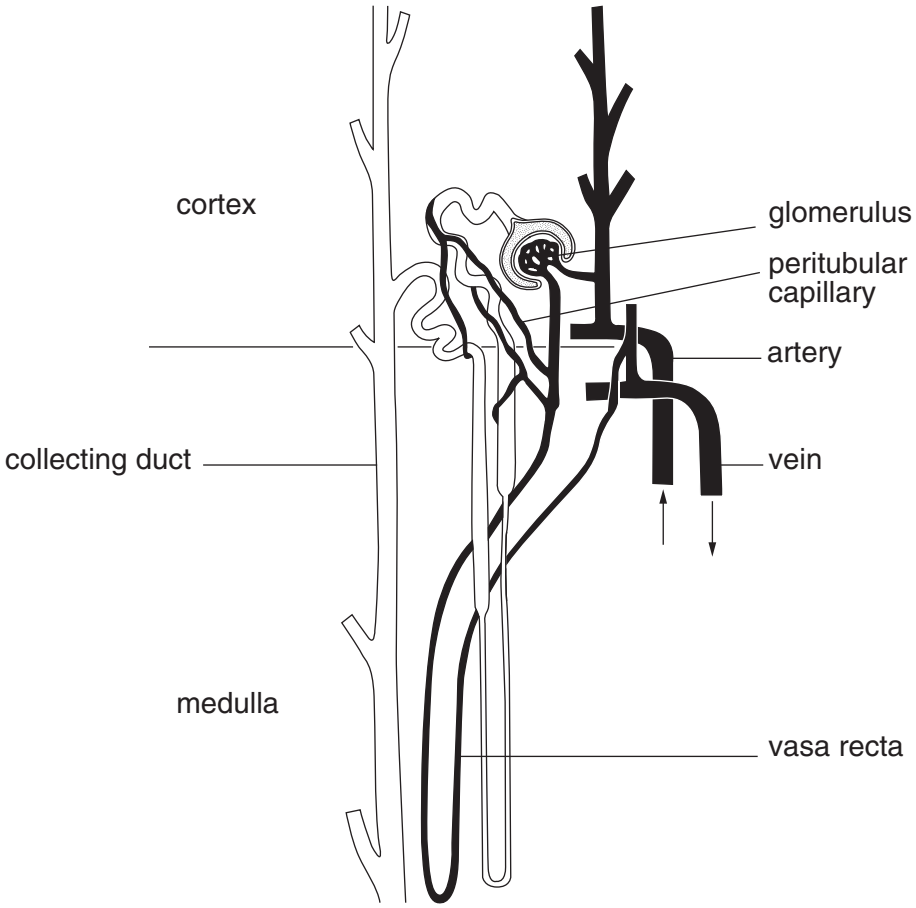



**Fig. 4.1**

**(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**