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

# BIOLOGY 9700/4

PAPER 4

**OCTOBER/NOVEMBER 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 12 printed pages.**


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[Turn over

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Answer **all** the questions.

Write your answers in the spaces provided.

**1** Fig. 1.1 shows the changes in concentration of a 3C compound, glycerate phosphate, GP, and a 5C compound, ribulose bisphosphate, RuBP, extracted from samples taken from actively photosynthesising green algae in an experimental chamber when the light source was turned off.

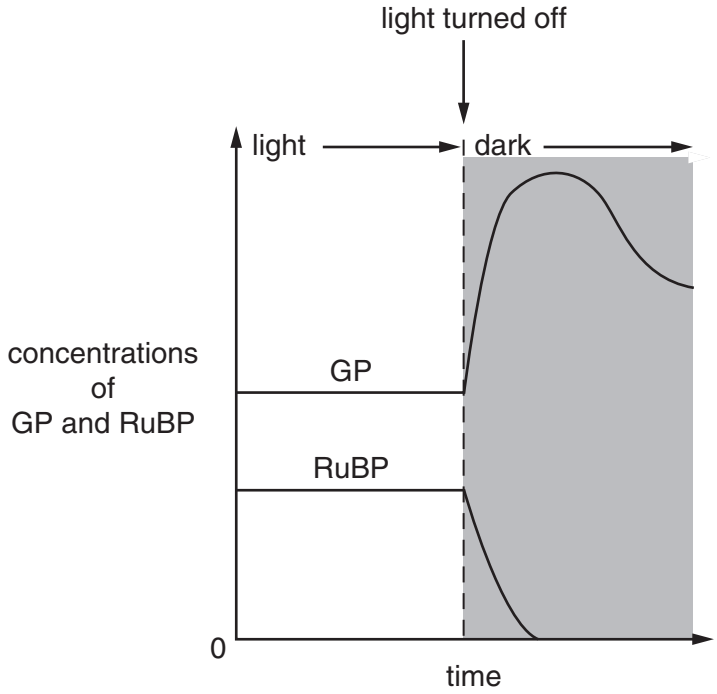



**Fig. 1.1**

**(a)** With reference to Fig. 1.1, describe what happens after the light source was turned off to the concentration of

**(i)** GP;

.....

.....

.....[2]

**(ii)** RuBP.

.....

.....[1]

For Examiner's Use

**(b)** Explain, with reference to the Calvin cycle, the reasons for these observed changes in

**(i)** GP;

.....

.....

.....[2]

**(ii)** RuBP.

.....

.....

.....[2]

**(c)** State the two products of photophosphorylation that drive the Calvin cycle.

1. .....

2. .....[2]

[Total : 9]



**[Turn over**

For Examiner's Use

**2** Fig. 2.1 is an electron micrograph of a mitochondrion.

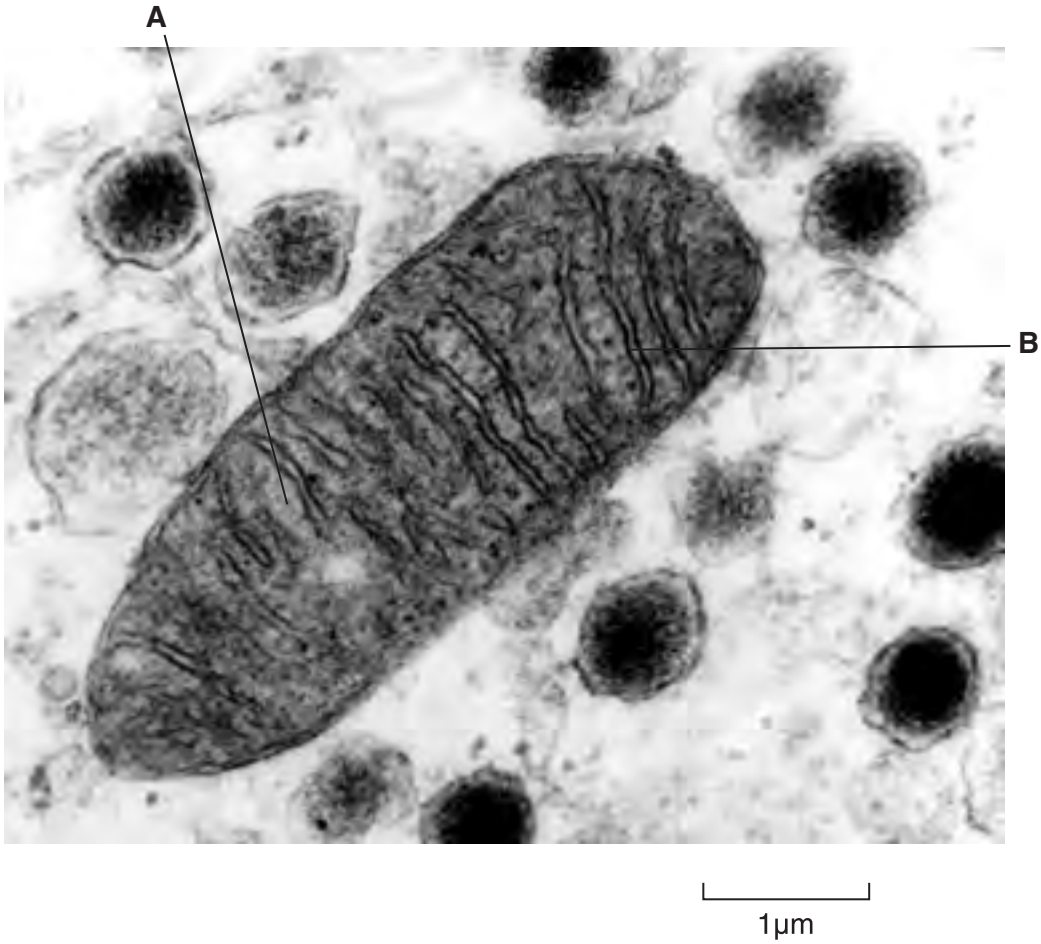



**Fig. 2.1**

Two stages of respiration occur in mitochondria. These are the Krebs cycle and oxidative phosphorylation.

**(a)** Complete the table below by naming the structures labelled **A** and **B** and stating which of the stages of respiration occur in each.

| | name of structure | stage of respiration |
|---|---|---|
| **A** | ..... ..... | ..... ..... |
| **B** | ..... ..... | ..... ..... |

[2]

**(b)** Describe how the structure of a mitochondrion is adapted to carry out these two processes.

.....

.....

.....

.....[3]

**(c)** Describe briefly the role of NAD in respiration.

.....

.....

.....

.....[3]

**(d)** Describe how *photophosphorylation* differs from *oxidative phosphorylation*.

.....

.....

.....

.....[3]

[Total : 11]

**3** The mammalian liver is made up of lobules that consist of liver cells (hepatocytes) arranged in plates.
Between these plates of cells are enlarged leaky capillaries called sinusoids.
Blood from both the hepatic portal vein and the hepatic artery flows through these sinusoids to the central vein and eventually into the hepatic vein.
Inside the sinusoids are Kupffer cells.
Fig. 3.1 shows a section of a liver lobule and its associated blood vessels.

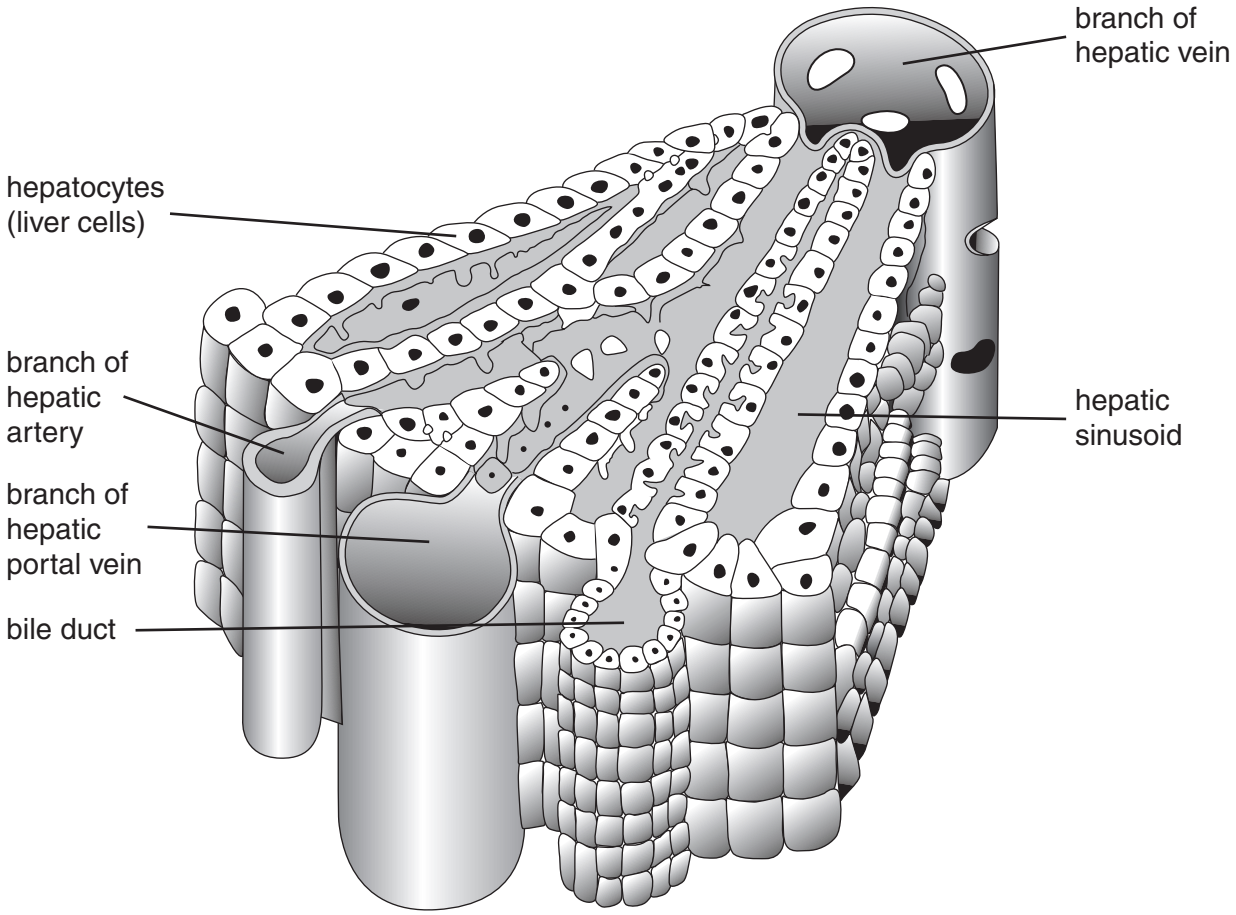



**Fig. 3.1**

**(a)** Describe the role of the Kupffer cells in the homeostatic function of the liver.

.....

.....

.....

.....

.....[4]

**(b)** State how liver cells are involved in fat metabolism.

.....

.....

.....

.....[3]

**(c)** Explain how urea produced by liver cells from the deamination of excess amino acids is transported to the kidney for excretion.

.....

.....

.....[2]

**(d)** State how blood in the hepatic vein will differ after a heavy meal from blood in

**(i)** the hepatic portal vein;

.....

.....[1]

**(ii)** the hepatic artery.

.....

.....[1]

[Total : 11]

**4** Fig. 4.1 shows the results of an animal cell that has undergone meiosis I.

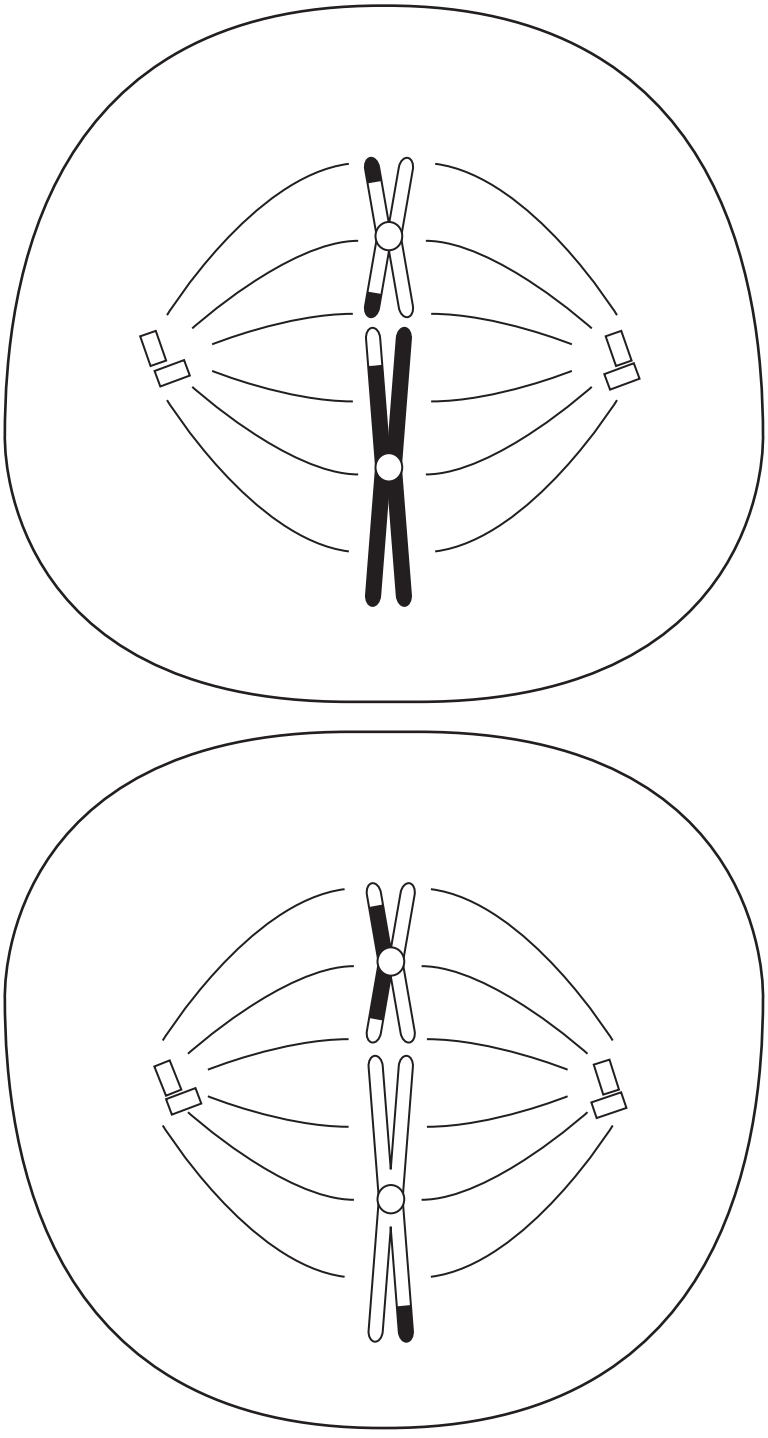


**Fig. 4.1**

**(a)** State which stage of meiosis II is shown.

.....[1]

**(b)** Describe the next stage of meiosis II.

.....

.....

.....

.....[3]

**(c)** Describe what has happened before the start of meiosis to

**(i)** the nuclear membrane;

.....

.....[1]

**(ii)** the centrioles.

.....

.....[2]

**(d)** Name and explain two ways in which meiosis can lead to variation.

1. .....

.....

.....

2. .....

.....

.....[4]

[Total : 11]

**5** Scallops, which are bivalve molluscs, are important commercially throughout the world. The marine bay scallop, *Agropecten irradians*, has three distinct shell colours, yellow, orange and black. The shell colour is controlled by a gene with three alleles, yellow, $S^y$, orange, $S^o$, and black, $S^b$.
Scallops are hermaphrodite and are able to fertilise themselves to produce offspring.
Single mature adult specimens of yellow, orange and black scallops were collected and kept in separate tanks of seawater until they produced young. The young were then scored for shell colour. The results were as follows.

yellow scallop – 25 yellow and 8 black
orange scallop – 31 orange and 9 black
black scallop – 27 black

**(a)** Explain the results from the orange and black scallops, using the symbols given.

.....

.....

.....

[6]

**(b)** Orange scallops are more valued for human consumption.

Describe how a marine biologist could produce a pure-breeding line of orange scallops for commercial exploitation using the offspring from the single orange scallop.

.....

.....

.....

.....[2]

[Total : 8]

*Copyright Acknowledgements:*

Question 3. S. Siddiqui, *Comprehensive Practical Biology for A Level*, Ferez and Sons, 1999.

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