

# ZIMBABWE SCHOOL EXAMINATIONS COUNCIL

## General Certificate of Education Advanced Level

**BIOLOGY**  
PAPER 2

**9190/2**

Friday 4 JUNE 2004

Morning

2 hours 30 minutes

Additional materials:  
Answer paper

**TIME** 2 hours 30 minutes

### INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page and on any separate answer paper used.

#### Section A

Answer **all** questions.

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

#### Section B

Answer **two** questions.

Your answers to Section B must be in continuous prose, where appropriate.

Write your answers on the separate answer paper provided.

At the end of the examination,

1. fasten all separate answer paper used securely to the question paper.
2. enter the number of the Section B questions you answered in the grid below.

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.

You may use a calculator.

The quality of your language will be taken into account in the marking of your answer to Section B.

#### FOR EXAMINER'S USE

Section A	
Section B	
<b>TOTAL</b>	

**This question paper consists of 14 printed pages and 2 blank pages.**

Section A

Answer all questions in this section in the spaces provided.

You are allowed to spend one hour and thirty minutes on this section.

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Use

Fig. 1.1 shows an electron micrograph of a portion of an animal cell.

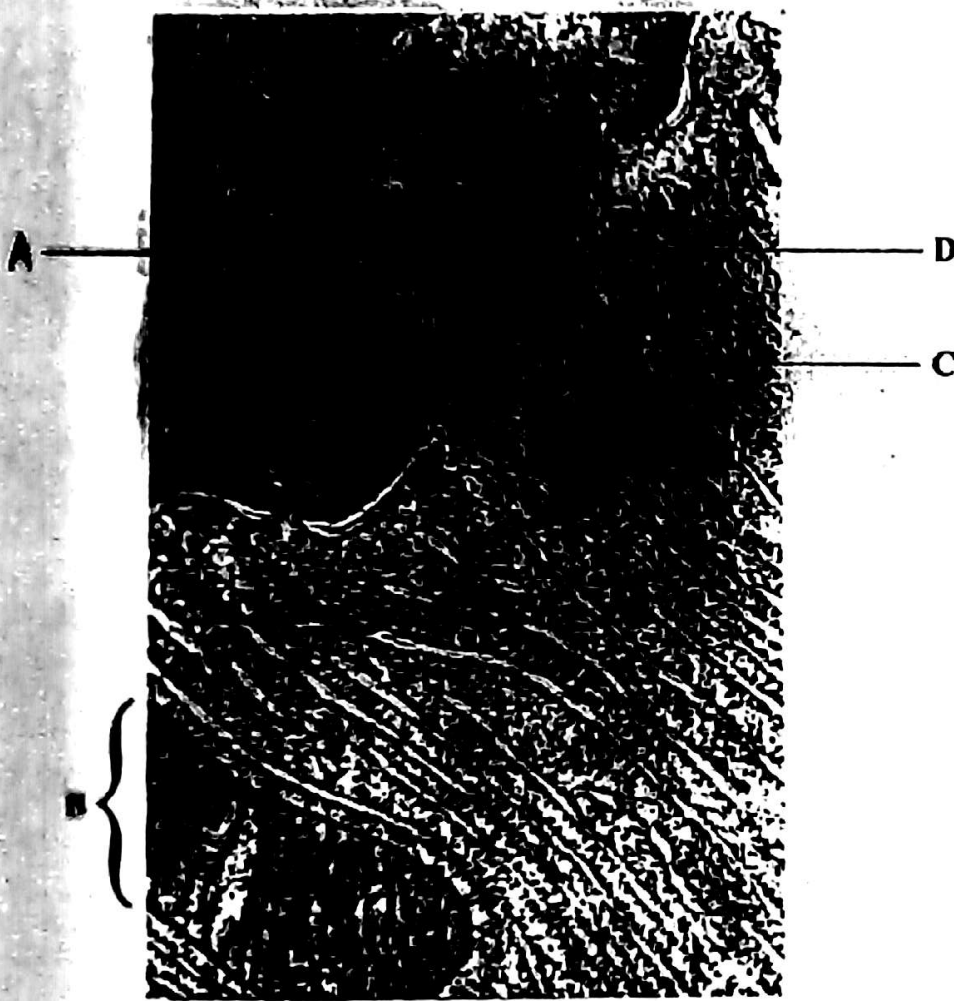


Fig. 1.1

(a) Name the organelles labelled A, B and C.

- A \_\_\_\_\_
- B \_\_\_\_\_
- C \_\_\_\_\_

[3]

(b) Explain the significance of the structure labelled D.

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[3]  
[Total: 6]

2 In Fig. 2.1, A and B show how water molecules are arranged in the same volume of ice and water respectively.

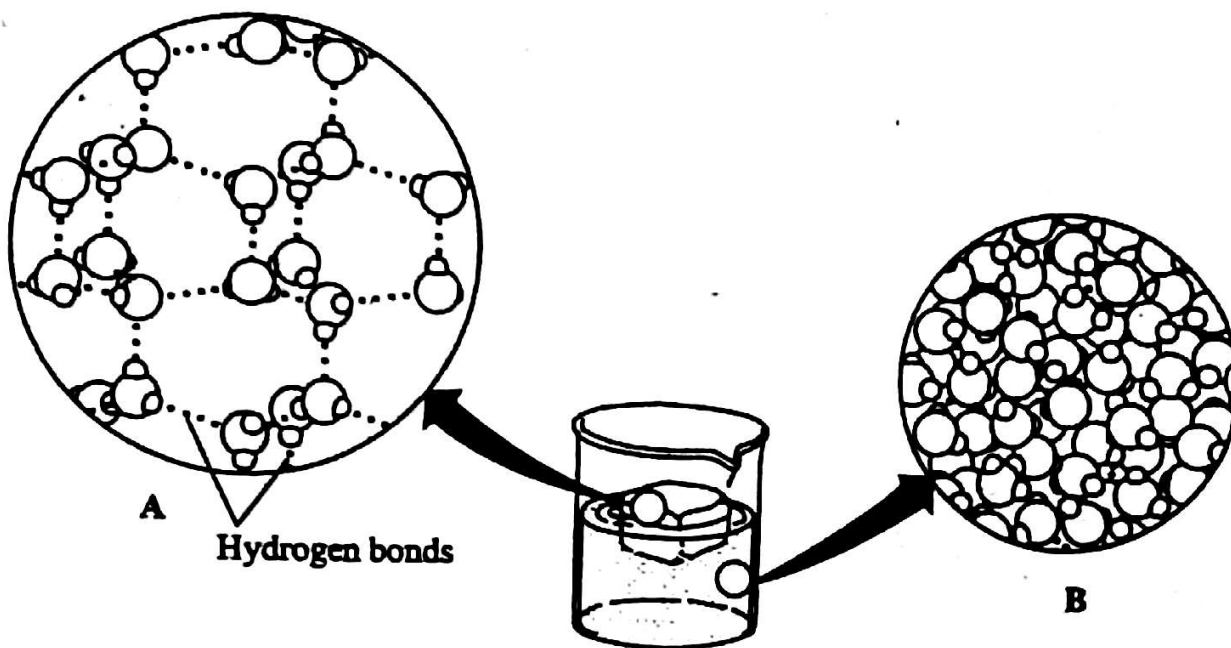


Fig. 2.1

(a) Use Fig. 2.1 to explain why ice floats on water.

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[2]

Explain the significance to living organisms of the fact that ice floats on water.

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[2]

Fig. 2.2 shows the structure of an important biological molecule.

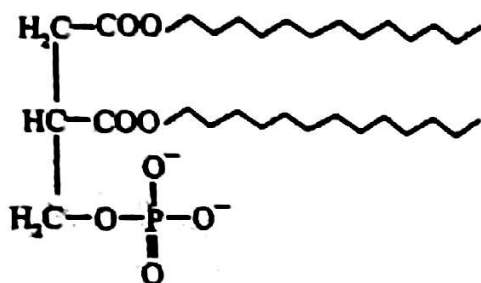


Fig. 2.2

(i) Name the molecule.

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[1]

(ii) Relate the structure of this molecule to its function in cells.

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[2]

[Total: 7]

3

Fig. 3.1 shows some of the stages of meiosis in a cell with four chromosomes.

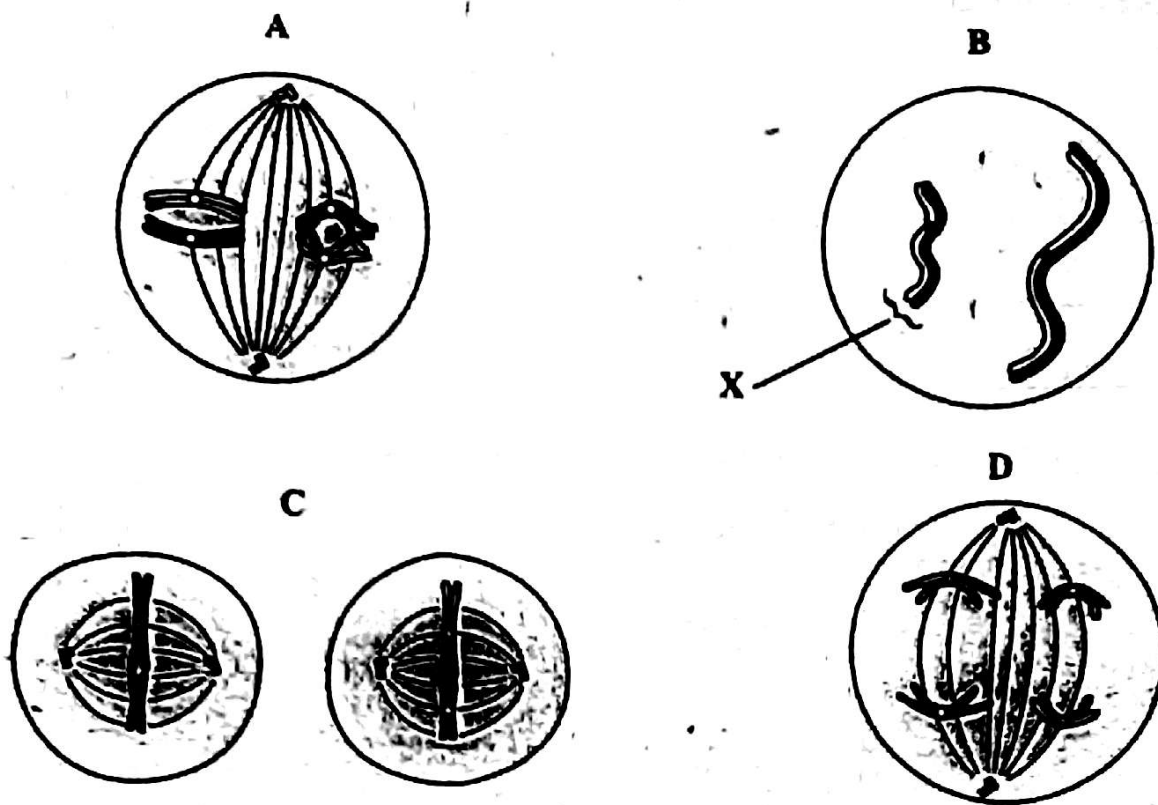


Fig. 3.1

(a) (i) Identify stages A and C.

A \_\_\_\_\_

C \_\_\_\_\_

[2]

(ii) In stage B state the term used to describe structure X.

\_\_\_\_\_

[1]

(b) In the space provided below, draw sketch diagrams to show the distribution of chromosomes in the resultant daughter cells.

[2]



- (4) Explain how the behaviour of chromosomes during meiosis brings about genetic variation.

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[4]  
[Total: 9]

Table 4.1 shows the nucleotide base compositions of DNA from various organisms.

Table 4.1

Organism	Base composition (mole percent)			
	A	T	G	C
<i>Escherichia coli</i> (K12)	26.0	23.9	24.9	25.2
<i>Streptococcus pneumoniae</i>	29.8	31.6	20.5	18.0
<i>Mycobacterium tuberculosis</i>	15.1	14.6	34.9	35.4
Yeast	31.3	32.9	18.7	17.1
Sea urchin	32.8	32.1	17.7	18.4
Human	30.9	29.4	19.9	19.8

- (a) What information about the nucleotide bases in DNA can be deduced from the table?

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[3]

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(b) Suggest the importance to the structure of DNA that adenine always pairs up with thymine while guanine pairs up with cytosine.

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[2]

(c) Fig. 4.1 shows a representative portion of DNA.

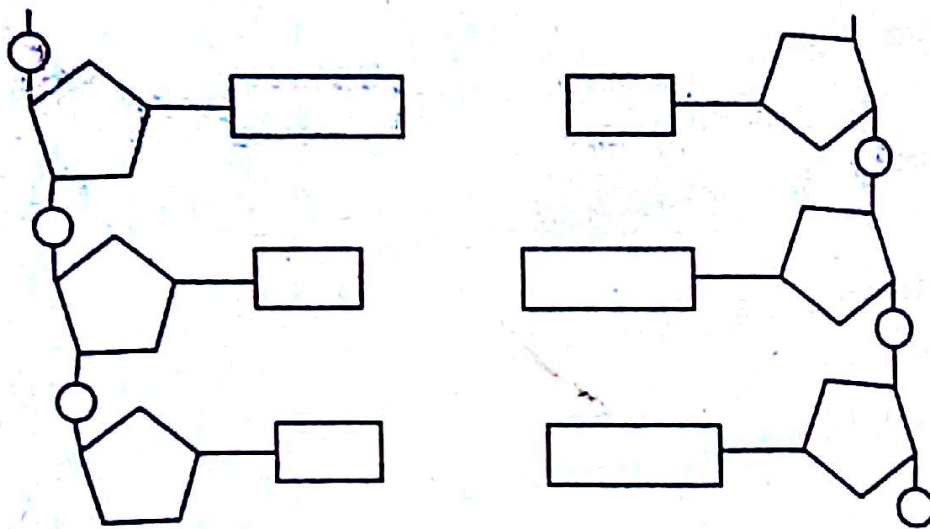


Fig. 4.1

(i) Label the diagram fully to show a nucleotide and how the nucleotides are joined together to produce a double stranded DNA molecule.

[3]

[Total: 8]



## Section B

Answer any two questions. You are advised to spend one hour in this section.

Answers should be illustrated by large, clearly labelled diagrams, where appropriate.

Answers must be in continuous prose, where appropriate.

Additional marks are awarded for quality of language.

Answers must be set out in sections (a), (b) etc, as indicated in the question.

- 0 (a) Describe the role played by microorganisms in the nitrogen cycle. [6]
- (b) Discuss how deforestation may affect the environment. [6]
- 11 (a) Discuss the short term effects of physical exercise on muscles and gaseous exchange. [6]
- (b) Describe how emphysema and chronic bronchitis affect the gaseous exchange system. [6]
- 12 (a) Describe how you would measure the rate of a reaction catalysed by the enzyme catalase. [6]
- (b) Explain the effects of the following on an enzyme-catalysed reaction:
- (i) enzyme concentration, [3]
- (ii) substrate concentration. [3]
- 13 (a) Describe how an action potential is transmitted along a myelinated neurone. [6]
- (b) Explain the mechanism of transmission of a nerve impulse across a cholinergic synapse. [6]