



# INTERNATIONAL BACCALAUREATE

## BIOLOGY

Subsidiary Level

Wednesday 4 May 1994 (afternoon)

Paper 2

45 minutes

This examination paper consists of two questions.  
The maximum mark for each question is 10.  
The maximum mark for this paper is 20.  
This examination paper consists of five pages.

BOX 1

|                  |  |  |  |  |  |  |  |
|------------------|--|--|--|--|--|--|--|
| CANDIDATE NUMBER |  |  |  |  |  |  |  |
| CANDIDATE NAME   |  |  |  |  |  |  |  |

**INSTRUCTIONS TO CANDIDATES**

**DO NOT** open this examination paper until instructed to do so.

**Complete BOX 1** before starting the examination.

**Answer BOTH** questions in the spaces provided in this answer book.

### EXAMINATION MATERIALS

#### Required/Essential

4 figure mathematical tables and/or slide rule or electronic calculator

#### Allowed/Optional

A simple translating dictionary for candidates not working in their own language  
Millimetre square graph paper

| EXAMINER USE ONLY |   |   |   |   |       |
|-------------------|---|---|---|---|-------|
|                   | A | B | C | D | E     |
| Q.1               |   |   |   |   |       |
| Q.2               |   |   |   |   |       |
|                   |   |   |   |   | TOTAL |
|                   |   |   |   |   |       |

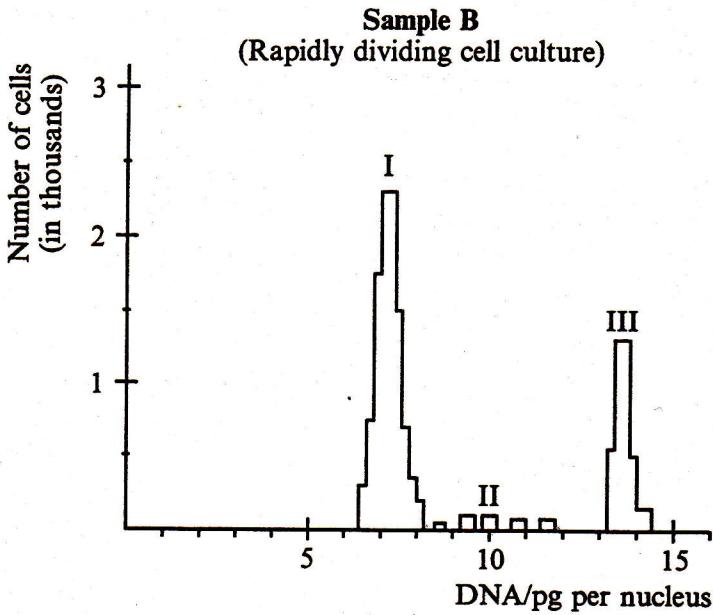
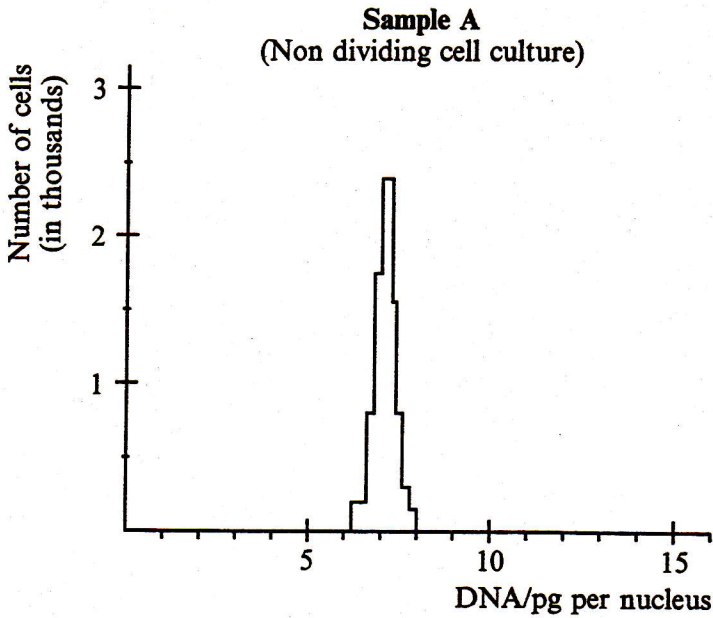
**Question 1**

The amount of DNA present in each cell nucleus was measured in a large number of human cells taken from two different cultures of bone marrow.

Sample A: A non dividing cell culture.

Sample B: A rapidly dividing cell culture.

The results are shown in the graphs below.



(NOTE: pg = picograms)

(a) What are the similarities and differences between the two sets of measurements?

[2 marks]

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(b) How can you explain the observed differences between the two cultures?

[1 mark]

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(c) What can you say about the condition of each of the cells whose DNA contents correspond to points I, II and III in the graph above?

[3 marks]

I. ....  
II. ....  
III. ....

(d) Judging from these data, what would be the approximate amount of DNA per nucleus in the following human cell types/stages?

[4 marks]

Bone marrow cell at prophase .....

Bone marrow cell at telophase .....

Spermatozoa .....

Reproductive cell at prophase I of meiosis .....

**Question 2**

An experiment was performed involving the growth of a specific kind of bacterium in a medium consisting of plain agar to which was added a nutrient supplement as shown in the table below. The amount of growth occurring is also shown in the table.

| Culture number | Nutrient supplement to plain agar             | Number of colonies found |                |
|----------------|---|--------------------------|----------------|
|                |   | After 9 hours            | After 36 hours |
| 1              | Carbohydrates<br>Proteins<br>Vitamins A, B, C | 220                      | 2192           |
| 2              | Proteins                                      | 195                      | 209            |
| 3              | Carbohydrates                                 | 184                      | 200            |
| 4              | Carbohydrates<br>Proteins                     | 190                      | 420            |
| 5              | Carbohydrates<br>Vitamins A, B, C             | 206                      | 2210           |
| 6              | Carbohydrates<br>Vitamin A                    | 180                      | 200            |
| 7              | Carbohydrates<br>Vitamin B                    | 224                      | 2240           |
| 8              | Carbohydrates<br>Vitamin C                    | 207                      | 210            |
| 9              | None  | 0                        | 0              |

(a) Can this micro-organism synthesise proteins? Explain the evidence on which you base your answer.

[2 marks]

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(b) Based on the data, which vitamin appears to enhance reproduction in this species of bacterium? Give one reason for your answer.

[2 marks]

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(c) Are carbohydrates necessary for these bacteria to reproduce? Explain the evidence on which you base your answer.

[2 marks]

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(d) From the experimental results, can it be concluded that these bacteria synthesise their own vitamins? Give reasons for your answers?

[3 marks]

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(e) As a microbiologist, which medium would you choose to perform further experiments on the optimum conditions for growth?

[1 mark]

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