INTERNATIONAL BACCALAUREATE

BIOLOGY

Subsidiary Level

Tuesday 14 May 1996 (afternoon)

Paper 3 — 1 hour 30 minutes

This examination paper consists of 2 sections.

Section A (Core) consists of 4 questions.
Section B (Options) consists of 8 questions.

The maximum mark for each question is 20.

This examination paper consists of 6 pages.

INSTRUCTIONS TO CANDIDATES

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

Answer ONE question from Section A.

Answer ONE question from Section B.

EXAMINATION MATERIALS

Required/Essential:

None

Allowed/Optional:

A simple translating dictionary for candidates not working in their own language

SECTION A *(CORE)*

1. (a) Describe the structure of a cell membrane (plasma membrane). Use one or more diagrams to illustrate your answer. *[7 marks]*

   (b) Many different materials such as ions, water, gases and more complex molecules can be absorbed into cells. Explain the processes involved in the absorption of materials into cells. *[13 marks]*

2. (a) Describe the structure of a typical dicotyledonous leaf as seen in cross-section (cut across). Use a diagram to illustrate your answer. *[12 marks]*

   (b) List the stages in the path taken by water from a vascular bundle in a leaf to the atmosphere outside. *[3 marks]*

   (c) How is water loss through stomata regulated? Use diagrams to illustrate your answer. *[5 marks]*

3. (a) Draw and label a diagram of the human female reproductive system. *[5 marks]*

   (b) Describe the events of the menstrual cycle and the way in which the cycle is controlled by hormones. *[15 marks]*

4. (a) Define the genetic terms 'dominant' and 'recessive'. *[4 marks]*

   (b) Explain what is meant by the terms 'linkage' and 'crossing-over'. *[4 marks]*

   (c) Describe an experiment of the type carried out by Mendel to illustrate the principle of independent assortment (his Second 'Law'). *[12 marks]*

SECTION B *(OPTIONS)*

Human Ecology

5. (a) *Homo sapiens* is classified as a primate. State **six** anatomical features that are characteristic of primates, briefly explaining the advantage of each. *[12 marks]*

(b) A number of features are common to **all** primates. State **four** of them that have developed further in the evolution of *Homo sapiens* and explain the advantage of each change. *[8 marks]*

6. Describe **four** biological solutions that have been used to attempt to increase global food production. For **each** named solution you should:

- state how the method meets a particular need *[4 × 1 mark]*
- give a biological account of the method of food production *[4 × 2 marks]*
- indicate how successful the method has been *[4 × 1 mark]*
- evaluate the future of the method, especially in economic terms. *[4 × 1 mark]*

Environmental Biology

7. (a) Discuss the differences between **renewable** and **non-renewable** energy resources. Give examples to illustrate your answer. *[10 marks]*

(b) Mature natural ecosystems become damaged when people take resources from them. Describe briefly **five** ways in which they can become damaged as the result of such activity. *[5 marks]*

(c) The rate of damage done to ecosystems by people is said to be increasing. Explain why this is so. *[5 marks]*

8. (a) Why are ecologists interested in knowing the distribution and abundance of organisms? *[7 marks]*

(b) Explain, with an example, how you would estimate the **distribution** of a plant population? *[6 marks]*

(c) Explain, with an example, how you would estimate the **density** of a population of mobile animals? *[7 marks]*

Green Plants

9. (a) State the conditions needed for seed germination. *[4 marks]*

(b) Discuss the way in which the shoot of a plant responds to the direction of light and gravity. *[6 marks]*

(c) Explain how plants can control when flowering takes place during the year. *[10 marks]*

10. (a) Describe the life cycle of a fern. Use a diagram to illustrate your answer. *[12 marks]*

(b) Describe the ways in which the life cycle of a flowering plant differs from that of a fern. *[8 marks]*

Molecular Biology

11. (a) Draw diagrams to show the structure of a virus, a prokaryotic cell and a eukaryotic animal cell. *[12 marks]*

(b) State **three** ways in which the structure of a virus is similar to and/or different from plant cells. *[3 marks]*

(c) Explain why viruses are harmful to their hosts. *[5 marks]*

12. (a) State **four** advantages that bacteria such as *Escherichia coli* offer as tools for biotechnology. *[4 marks]*

(b) Describe how genetic material can naturally be transferred from one *E. coli* cell to another by conjugation. Use a diagram to illustrate your answer. *[8 marks]*

(c) Explain ways in which restriction enzymes and ligase are used in genetic engineering. *[8 marks]*