



INTERNATIONAL BACCALAUREATE

BIOLOGY

Subsidiary Level

Friday 5 May 1995 (morning)

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 this paper is 40.

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) (i) Describe with the aid of diagrams, the process of **mitosis**. [10 marks]
- (ii) State the most important characteristics of the daughter cells produced by mitosis and explain the importance of mitosis for unicellular and multicellular organisms. [4 marks]
- (b) State the main characteristics of the daughter cells produced by **meiosis** and explain the importance of meiosis for the future of the species. [6 marks]
2. (a) Describe an investigation to determine that starch is a product of photosynthesis. In your description include: materials/equipment, procedure, results and conclusions. [10 marks]
- (b) Draw a labelled diagram of a chloroplast. [5 marks]
- (c) Describe the path of a carbon atom in atmospheric carbon dioxide until it becomes part of a glycogen molecule in the liver of an animal. [5 marks]
3. (a) Describe the way in which hormones produced by the ovary and pituitary control the changes in the lining of the uterus in a non-pregnant woman. [10 marks]
- (b) During a woman's pregnancy, a new hormonal balance is established. Name the hormones involved and their origin. [5 marks]
- (c) What factors combine to produce birth (parturition) of a human baby? [5 marks]
4. (a) Define the term homeostasis. [1 mark]
- (b) Describe the way structures in the skin function to maintain a near constant body temperature in people. Include in your answer labelled diagrams to show the relevant structures. [15 marks]
- (c) Humans can survive a broader range of environmental temperatures than other mammals. How are they able to achieve this? [4 marks]

SECTION B (OPTIONS)

Human Ecology

5. (a) Define the terms ‘antigen’ and ‘antibody’. Distinguish between naturally-acquired and artificially-acquired immunity. Describe the ways by which each can be acquired. *[9 marks]*
- (b) Describe the different types of ‘materials’ that are used as vaccines. *[3 marks]*
- (c) Discuss **one** major international vaccination campaign. In your answer include the name of the pathogen, materials used in the vaccine, effectiveness of the vaccine and possible future developments. *[8 marks]*
6. Agricultural practices affect natural ecosystems.
- (a) Discuss the major effects of the removal of natural vegetation on a named natural ecosystem. *[11 marks]*
- (b) Discuss the major effects of the use of fertilisers and pesticides on natural communities. In your answer give **one** example of **each**. *[9 marks]*

Environmental Biology

7. An ecologist needs to be able to identify and sample plant and animal populations in an environment.
- (a) Explain simply, how identification keys are devised and constructed and how they may be used. *[4 marks]*
 - (b) Describe and discuss, for a named terrestrial environment, the following methods of sampling populations in an area:
 - (i) quadrats *[7 marks]*
 - (ii) transects *[4 marks]*
 - (iii) capture–mark–release–recapture. *[5 marks]*
8. (a) Define the term ‘ecosystem’ and give a general description of its components. In your description include detailed explanations of the nature, characteristics and roles of each component. *[10 marks]*
- (b) Compare and contrast the characteristics of a natural climax (mature) ecosystem with an artificial (human made) ecosystem in terms of:
 - (i) species diversity *[4 marks]*
 - (ii) stability. *[6 marks]*

Green Plants

9. Colonisation of terrestrial environments by plants was possible because of the evolution of adaptations for water control and reproduction.

Describe the reproductive adaptations of angiosperms to life on land with respect to:

- (a) their life cycle *[3 marks]*
- (b) flower production and fertilisation *[13 marks]*
- (c) seed and fruit production and their dispersal. *[4 marks]*

10. Seed germination and plant growth are influenced by various specific environmental factors.

- (a) (i) Describe and discuss in general, the environmental and biological conditions necessary for the breaking of seed dormancy. *[8 marks]*
 - (ii) Why is this considered to be a valuable adaptation? *[2 marks]*
- (b) Describe and discuss the classic experiments of F. Went that gave an explanation of the growth orientation bending of seedlings in response to **one** external factor. In your discussion include the role of auxins and similar substances. *[10 marks]*

Molecular Biology

11. Bacteria, which are prokaryotic, are the smallest organisms considered to have a cellular structure.
- (a) (i) With the aid of a diagram, give the general structure of a bacterial cell.
(ii) Describe size, shapes and possible variations in structure. *[9 marks]*
 - (b) Discuss the different mechanisms of bacterial reproduction. Include both asexual and those considered to be sexual. *[7 marks]*
 - (c) Describe briefly, **one** of the two possible types of cycle shown by bacteriophages. *[4 marks]*
12. In the late 50s François Jacob and Jacques Monod of the Pasteur Institute in Paris, carried out research on the genetic control of enzyme synthesis. Their work led to a hypothesis that explained how genes can be regulated.
- (a) Define the term 'operon'. *[4 marks]*
 - (b) Draw a diagram of the lac operon. *[4 marks]*
 - (c) Explain how the lac operon works when the bacteria are growing in the presence and absence of lactose. *[12 marks]*
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