INTERNATIONAL BACCALAUREATE
BACCALAURÉAT INTERNATIONAL
BACHILLERATO INTERNACIONAL

M00/410/S(2)

**BIOLOGY**
**STANDARD LEVEL**
**PAPER 2**

Thursday 11 May 2000 (afternoon)

1 hour

Name

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Number

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INSTRUCTIONS TO CANDIDATES

- Write your candidate name and number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Section A: Answer all of Section A in the spaces provided.
- Section B: Answer one question from Section B. You may use the lined pages at the end of this paper or continue your answers in a continuation answer booklet, and indicate the number of booklets used in the box below. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.
- At the end of the examination, indicate the number of the Section B question answered in the box below.

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| QUESTIONS ANSWERED | | EXAMINER | TEAM LEADER | IBCA |
|---|---|---|---|---|
| SECTION A | ALL | /20 | /20 | /20 |
| SECTION B QUESTION | . . . . . . . . . | /20 | /20 | /20 |
| NUMBER OF CONTINUATION BOOKLETS USED | . . . . . . . . . | TOTAL /40 | TOTAL /40 | TOTAL /40 |

12 pages

## SECTION A

*Candidates must answer **all** questions in the spaces provided.*

**1.** The photomicrograph below shows a transverse section of part of a liver cell.

(a) Identify the organelles labelled X and Y. *[2]*

X . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Y . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

(b) On the photomicrograph, identify the nuclear membrane and show its position with a clear label. *[1]*

(c) The liver cell shown in the photomicrograph was making large amounts of two substances.

Deduce what the **two** substances were, giving reasons for your answer based on the organelles visible in the photomicrograph. *[2]*

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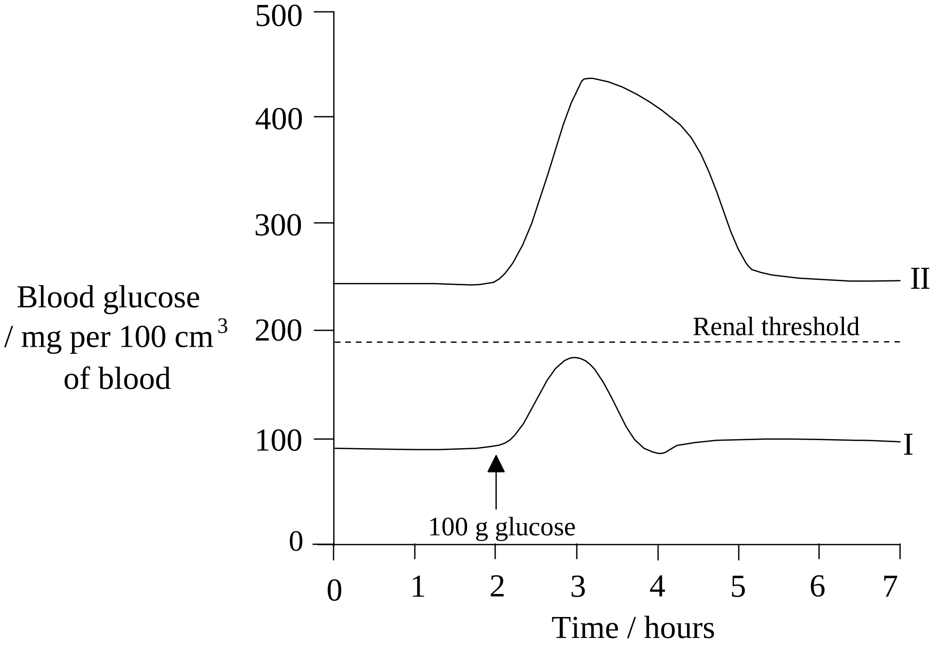
*(This question continues on the following page)*

*(Question 1 continued)*

The graphs below show the levels of blood glucose in two people, I and II, before and after ingesting 100 g of glucose. Glucose is found in the urine if the blood glucose level is above the renal threshold.



(Source: Starling and Lovatt Evans (1962), *Principles of Human Physiology*, Churchill.)

(d) Compare the blood glucose levels of the two people both before and after the ingestion of glucose. *[2]*

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(e) One of the two people had a healthy pancreas and the other had a pancreas which was unable to secrete insulin. Identify with a reason, which person had a healthy pancreas. *[2]*

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(f) The cell in the photomicrograph came from a person who had a healthy pancreas. Identify a substance visible in the cell which gives evidence of this. *[1]*

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**2.** When red and white flowered *Mirabilis jalapa* plants are crossed together, all the offspring have pink flowers. The symbols for the two alleles involved are $C^r$ (red) and $C^w$ (white).

(a) State the genotypes of the red and white-flowered parents and the pink-flowered offspring. *[1]*

Red genotype . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

White genotype . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

Pink genotype . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . .

(b) When Mendel crossed red and white-flowered pea plants together, all of the offspring had red flowers. Suggest a reason for the difference in results between pea plants and *Mirabilis jalapa* plants. *[1]*

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(c) Predict the outcome of a cross between two pink flowered *Mirabilis jalapa* plants, using the Punnett grid given below. *[3]*

| ***Gametes***<br>↓ and → | | |
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**3.** A small rocky ocean island is a site for the breeding and birth of seals. The island is surrounded by a plentiful supply of algae and fish that feed on the algae. Seals are in abundance, some seals occupying precarious positions on the sides of the rocky island.

On a beach on the mainland nearby, abandoned and dead seal pups are to be found. No adults are present on the beach. Following the birth of the pups the adult seals return to the sea to feed on the fish. Vultures are plentiful, attracted to the beach to feed on the pups. This species of seal is particularly nervous in the presence of humans.

(a) Draw a food chain indicating the trophic level of each organism. *[2]*

(b) Based on the information provided, deduce **one** factor that could limit the size of the seal population. *[1]*

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(c) Suggest **two** possible effects on the seal colony of a proposed hotel for tourists on the mainland nearby. *[2]*

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## SECTION B

*Answer* ***one*** *question. Up to two additional marks are available for the construction of your answer. You may use the lined pages at the end of this paper or continue your answers in a continuation answer booklet. Write your name and candidate number on the front cover of the continuation answer booklets, and attach them to this question paper using the tag provided.*

**4.** (a) State what is meant by the term *osmosis.* *[4]*

(b) Outline the functions of the human kidney. *[5]*

(c) Explain the significance of water and its properties to living organisms. *[9]*

**5.** (a) Draw a diagram to show the organs used for gas exchange and ventilation in humans. *[5]*

(b) Outline the process of gas exchange in the human lungs. *[5]*

(c) Explain the reasons for cells not growing to a large size, including the effects of surface area to volume relationships. *[8]*

**6.** (a) List the aims of the Human Genome Project. *[3]*

(b) Explain the meaning of the term *base substitution* and, using a human example, how a single base substitution can have very large effects. *[9]*

(c) Outline **one** example of how gene therapy could be used to help a person with a genetic disease. *[6]*

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