IB DIPLOMA PROGRAMME
PROGRAMME DU DIPLÔME DU BI
PROGRAMA DEL DIPLOMA DEL BI

N06/4/BIOLO/SP2/ENG/TZ0/XX

88066005

BIOLOGY
STANDARD LEVEL
PAPER 2

Thursday 16 November 2006 (afternoon)

1 hour 15 minutes

Candidate session number

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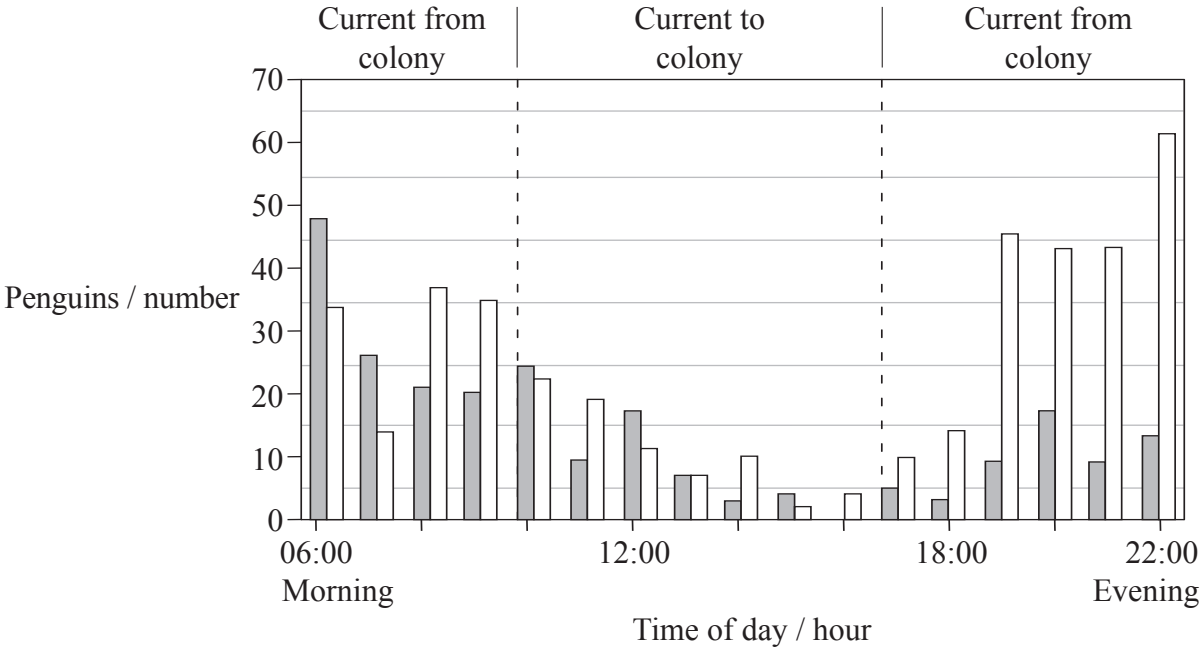
INSTRUCTIONS TO CANDIDATES

- Write your session 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. Write your answers on answer sheets. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.
- At the end of the examination, indicate the numbers of the questions answered in the candidate box on your cover sheet and indicate the number of sheets used in the appropriate box on your cover sheet.

SECTION A

*Answer **all** the questions in the spaces provided.*

1. Magellanic penguins *(Spheniscus magellanicus)* live and breed near the coast of Argentina. However, their colonies are a long way from the open sea where they hunt for fish. They cannot fly so have to swim to the feeding grounds. A study investigated how the water currents due to high and low tides affected their journey to and from their colonies. The results are shown below.



Key: ▩ departing from colony ☐ arriving at colony

[Source: adapted from R P Wilson *et al.,* (2001), *Journal of Avian Biology*, **32**, page 85, **Blackwell Publishing Ltd**]

(a) (i) Identify the number of penguins departing from the colony at 06:00 hours. *[1]*

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(ii) Identify the time of day when most penguins arrive at the colony. *[1]*

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(b) Describe the pattern of movement of penguins departing from the colony between 06:00 hours and 22:00 hours. *[2]*

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(This question continues on the following page)

(Question 1 continued)

(c) Suggest why there is little movement in either direction between 14:00 hours and 16:00 hours. *[2]*

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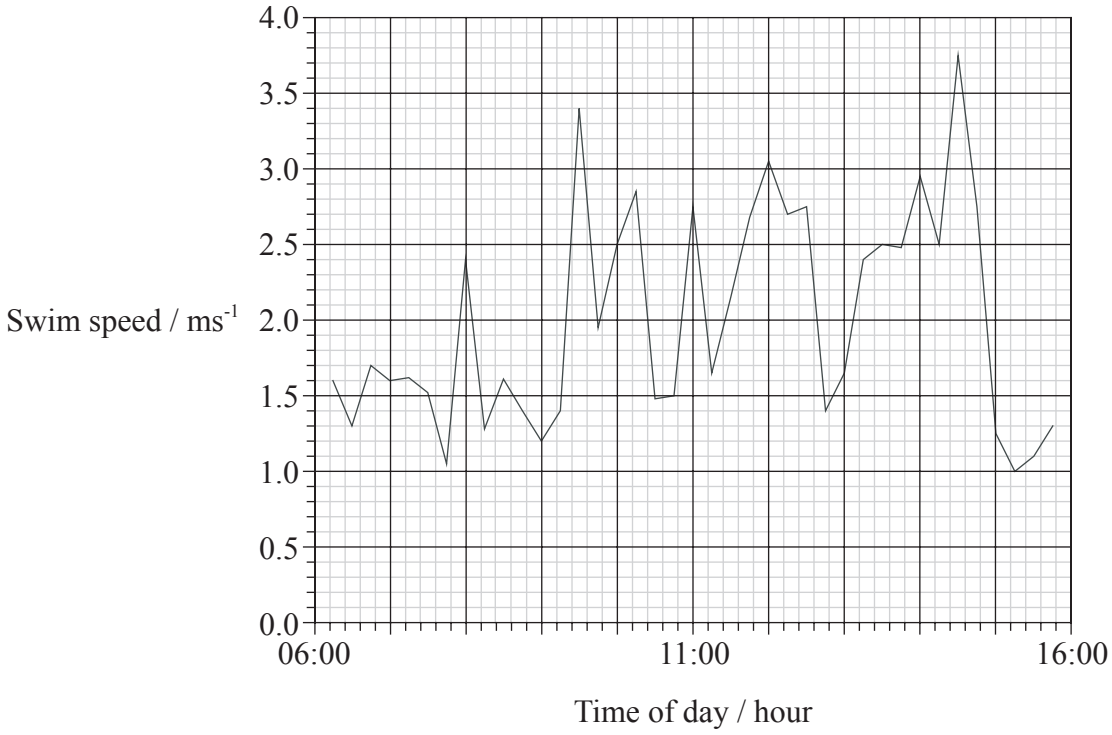
The study also investigated the range of swim speed for one penguin when out hunting in the open sea.



[Source: adapted from R P Wilson *et al.,* (2001), *Journal of Avian Biology*, **32**, page 88, **Blackwell Publishing Ltd**]

(d) Calculate the greatest difference in swim speed during the study. *[1]*

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(e) Suggest **two** reasons for the changes in swim speed of the penguin during the period of time of the study. *[2]*

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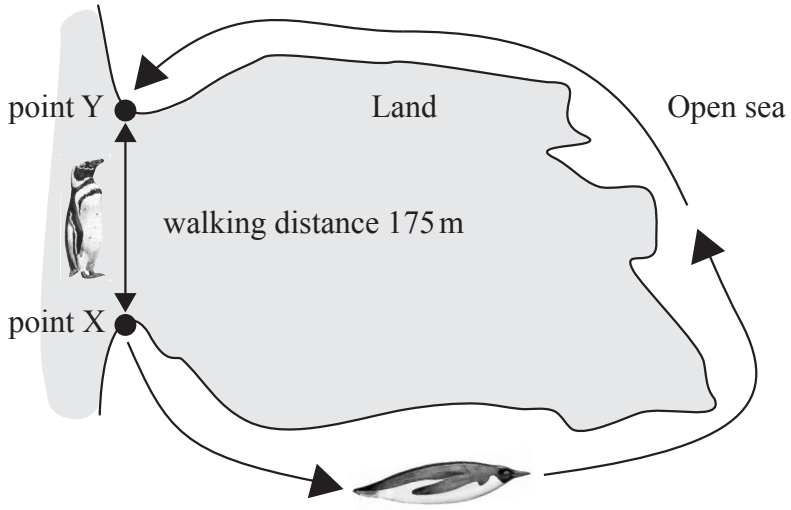
(Question 1 continued)

The diagram below shows part of the coastline.



[Source: R P Wilson *et al.,* (2001), *Journal of Avian Biology*, **32**, page 87, **Blackwell Publishing Ltd**]

(f) A penguin uses 88 joules of energy to walk one metre. Calculate the energy used to walk from point X to point Y. *[1]*

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(g) The penguin uses more energy swimming. Suggest **one** reason why most penguins actually swim rather than walk from point X to point Y. *[1]*

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(h) Explain why penguins have many mitochondria in the muscles used for swimming. *[2]*

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2. (a) Explain how photosynthesis can be measured both directly **and** indirectly. *[3]*

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(b) Outline **two** uses of absorbed carbohydrates in humans. *[2]*

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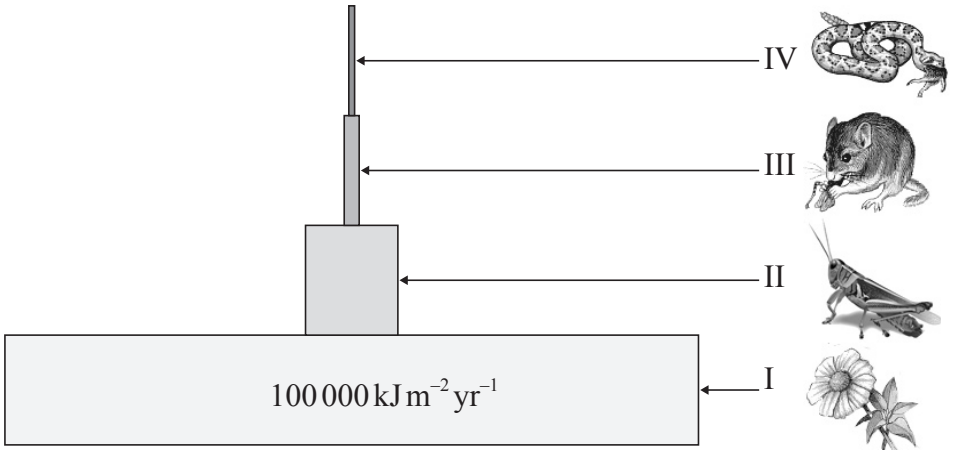
(c) The diagram below represents an energy pyramid and four trophic levels.



[Source: adapted from www.bio.miami.edu/dana/160/pyramid.gif]

(i) Identify the trophic level of the organisms indicated below. *[2]*

I: . . . . . .

IV: . . . . . .

(ii) Calculate the approximate amount of energy in kilojoules transferred in m^{-2} yr^{-1} from trophic level I to trophic level II. *[1]*

. . . . . kJ

3. (a) Draw and label a simplified structure of a nucleotide. *[2]*

A genetic cross was made between pure-breeding snapdragon plants with red flowers and pure-breeding snapdragon plants with white flowers. The cross produced F_1 offspring that had only pink flowers. When the F_1 plants were self-pollinated, the resulting F_2 generation had some red, some white and some pink flowers.

(b) (i) Identify the relationship between the red and white alleles for flower colour. *[1]*

. . . . . .

(ii) Deduce the genotype of the F_1 plants. *[1]*

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(iii) Construct a Punnett grid to show the cross between two F_1 plants. *[2]*

(iv) Deduce the proportion of the different phenotypes of the F_2 offspring. *[1]*

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(c) Discuss **two** advantages of genetic screening. *[2]*

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SECTION B

*Answer **one** question. Up to two additional marks are available for the construction of your answer. Write your answers on the answer sheets provided. Write your session number on each answer sheet, and attach them to this examination paper and your cover sheet using the tag provided.*

4. (a) Draw and label a diagram of the carbon cycle. *[5]*

(b) Outline the mechanism of inhalation in human lungs. *[5]*

(c) Discuss the causes and effects of the greenhouse effect and ways to control it. *[8]*

5. (a) Draw and label a generalized prokaryotic cell as seen under the electron microscope. *[4]*

(b) Outline the process of meiosis. *[6]*

(c) Explain the role of the following hormones in the menstrual cycle: estrogen, progesterone, follicle stimulating hormone (FSH) and luteinizing hormone (LH). *[8]*

6. (a) Draw and label a diagram to illustrate the fluid mosaic model of biological membranes. *[5]*

(b) Using a table, compare aerobic and anaerobic respiration in a eukaryotic cell. *[5]*

(c) Explain the process of translation. *[8]*