



22126017

**BIOLOGY**
STANDARD LEVEL
PAPER 2

Thursday 17 May 2012 (afternoon)

1 hour 15 minutes

Candidate session number

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Examination code

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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 questions.
- Section B: answer one question.
- Write your answers in the boxes provided.
- A calculator is required for this paper.
- The maximum mark for this examination paper is *[50 marks]*.



0120

Please **do not** write on this page.

Answers written on this page
will not be marked.



SECTION A

Answer **all** questions. Write your answers in the boxes provided.

1. Several studies have been undertaken to determine whether there is an evolutionary explanation for menopause, the time when reproductive capacity stops in women. Two contemporary hunter-gatherer societies were studied. The graph shows what percentage of women survive to each of the ages given.

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(Question 1 continued)

The graph shows the functional capacity of various physiological systems in women as they get older. The data are calculated as the fraction of youthful capacity still remaining.

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(Question 1 continued)

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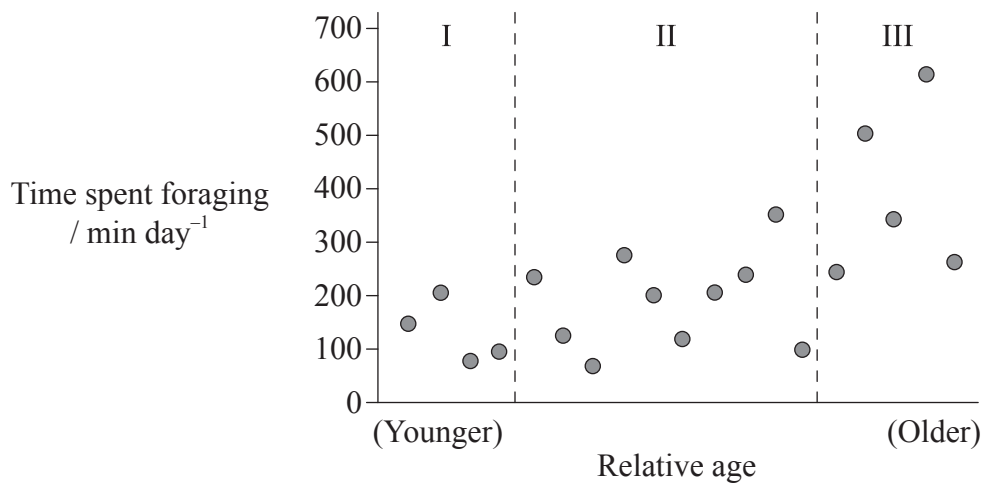
(Question 1 continued)

Foraging (food-getting) requires skill gained with experience and age. The Grandmother Hypothesis suggests that after menopause, women who are skilled at foraging provide greater survivorship success to the offspring of their daughters. The graph shows the foraging patterns of women in three groups.

Group I Have reached puberty, but have not begun child-bearing

Group II Are pregnant and/or have young children

Group III Have passed child-bearing age and have no children younger than 15 years old



[Acknowledgment: Hawkes, K., O’Connell, J. F. and Blurton Jones, N. G. (1989) ‘Hardworking Hadza Grandmothers’. In: V. Standen and R. A. Foley (eds) *Comparative Socioecology*, Oxford: Blackwell Scientific Publications), 341–366. ©British Ecological Society. Used with permission.]

(d) Calculate the difference in the amount of time spent foraging by the **most** skilled women in groups I and III. [1]

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(Question 1 continued)

(e) Evaluate the data in terms of the Grandmother Hypothesis.

[2]

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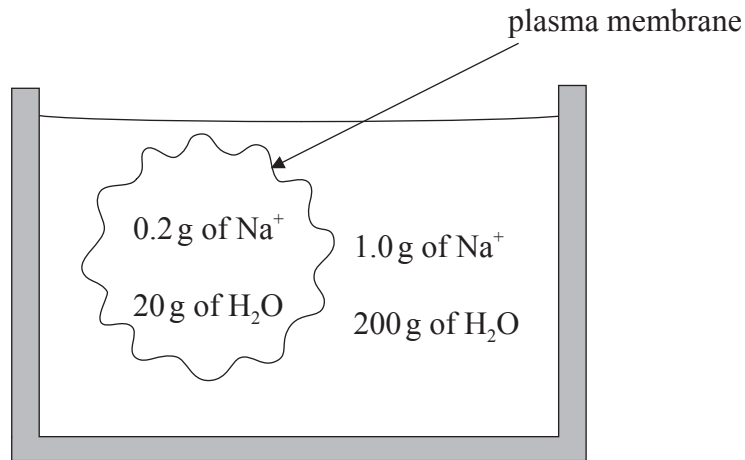
(f) Explain the possible natural selection of menopause among humans during the hunter-gatherer period of their evolution.

[2]

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2. The diagram (not to scale) shows a cell which contains water and sodium ions. This cell is immersed in a salt solution of water and sodium ions.



- (a) State the mode of transport if

(i) water moves into the cell.

[1]

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(ii) sodium ions move into the cell.

[1]

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(Question 2 continued)

(b) Explain facilitated diffusion.

[3]

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(c) State the name of the structures formed within a cell by endocytosis.

[1]

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3. Two foods were measured with a calorimeter to determine the energy in each. Five trials on potato chips and five trials on walnuts were performed. The results are shown in the table below.

Trial	Potato chip / kJ g^{-1}	Walnut / kJ g^{-1}
1	22.4	24.1
2	21.7	23.8
3	21.9	25.2
4	22.0	28.0
5	22.0	27.9
Mean	22.0	missing value
Standard deviation	0.1	2.0

- (a) Calculate the mean energy for the walnut. [1]

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- (b) Explain how this data shows which food had the greatest variation in its energy content. [2]

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- (c) Both potato chips and walnuts contain lipids. State **one** function of lipids. [1]

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4. (a) Blood transports molecules throughout the body. State where the blood absorbs

(i) hormones. [1]

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(ii) carbon dioxide. [1]

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(iii) oxygen. [1]

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(b) Describe **three** features of alveoli that adapt them to gas exchange. [3]

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(Question 4 continued)

(c) Explain how the structure of capillaries relates to their functions.

[3]

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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 in the boxes provided.

5. (a) Draw a labelled diagram to show the structure of membranes. [5]
- (b) Explain the importance of surface area to volume ratio as a factor limiting cell size. [7]
- (c) Outline the digestion, absorption and assimilation of proteins in humans. [6]
6. (a) Draw a labelled diagram of the molecular structure of DNA including **at least four** nucleotides. [5]
- (b) A small DNA sample found at a crime scene can be used in an investigation. Describe the steps taken in the processing of this small sample of DNA. [6]
- (c) Discuss the relationship between **one** gene and **one** polypeptide. [7]
7. (a) Distinguish between bryophyta and coniferophyta. [5]
- (b) Outline the consequences of a global temperature rise on arctic ecosystems. [6]
- (c) Explain why populations that have grown exponentially reach a maximum size, rather than continue to grow. [7]



