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General Certificate of Education
June 2003
Advanced Level Examination



BIOLOGY (SPECIFICATION B)
Unit 8 Section A Behaviour and Populations

BYB8/A

Thursday 19 June 2003 1.30 pm to 3.45 pm

In addition to this paper you will require:

- Section B provided as an insert (enclosed);
- a ruler with millimetre measurements.

You may use a calculator.

For Examiner's Use			
Number	Mark	Number	Mark
1			
2			
3			
4			
5			
6			
7			
Total (Column 1)	→		
Total (Column 2)	→		
TOTAL			
Examiner's Initials			

Time allowed: The total time for Section A and Section B of this paper is 2 hours 15 minutes.

Instructions

- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** the questions in **Section A** in the spaces provided. All working must be shown.
- **Section A** and **Section B** will be marked by different examiners. You must ensure that any supplementary sheets are fastened to the appropriate question paper answer book.
- Do all rough work in this book. Cross through any work you do not want marked.

Information

- The maximum mark for **Section A** is 50.
- Mark allocations are shown in brackets.
- You are reminded of the need for clear presentation in your answers. All answers should be in good English and should use accurate scientific terminology.
- You are advised to spend 1 hour on **Section A**.
- You are reminded that **Section A** requires you to use your knowledge of Modules 1-5 as well as Module 8 in answering synoptic questions. These questions are indicated by the letter **S**.

SECTION A

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

- 1** The table shows the daily energy and protein requirements of males at different ages.

Age/years	Daily energy requirements/kJ	Daily protein requirements/g
1	3850	20
3	5440	32
5	6690	40
7	8780	52
11	10040	60
13	12550	75
17	14230	85
25	12130	70
45	10880	70
65	9200	70

- S** (a) Explain why the energy requirement of a 7-year-old is much higher than that of a 3-year-old.

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(2 marks)

- S** (b) (i) Explain the change in protein requirement between ages 17 and 25.

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(1 mark)

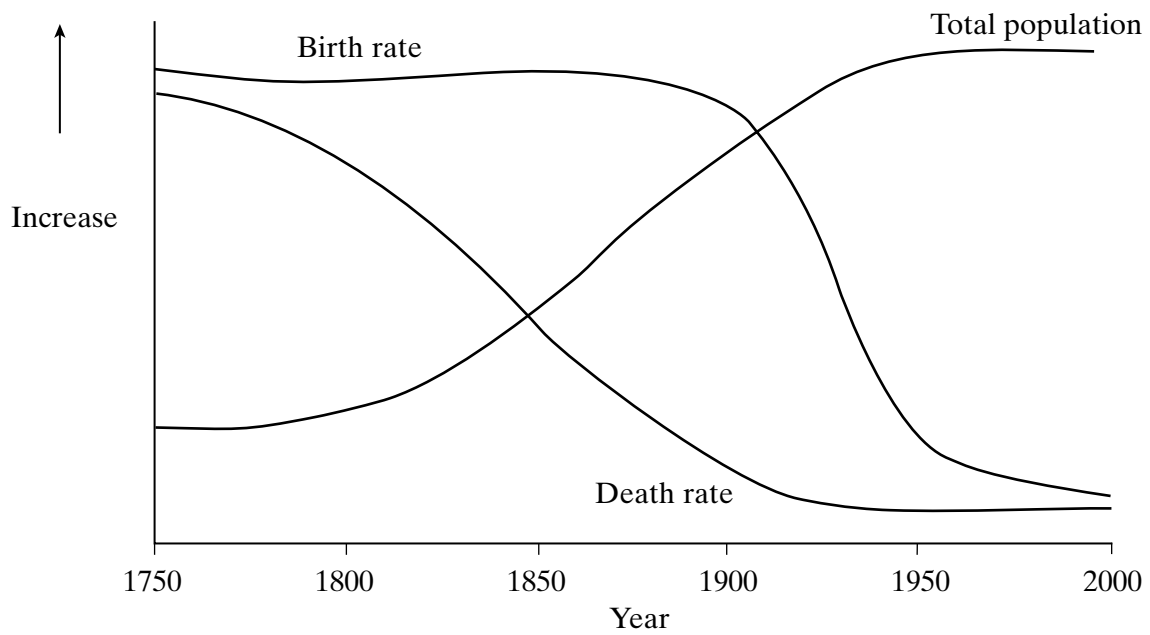
- (ii) Suggest why the protein requirement stays constant after the age of 25 and describe how protein is used.

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(1 mark)

2 The graph shows changes in birth and death rates and the total human population in Britain over the last 250 years.



(a) Between 1750 and 1900 the death rate decreased, but the birth rate remained high. Suggest an explanation for

(i) the decrease in death rate;

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(1 mark)

(ii) the birth rate remaining high.

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(1 mark)

(b) Using information in the graph, explain what is meant by *demographic transition*.

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(2 marks)

Turn over ►

- 3 (a) Describe how the growth of a malignant tumour in one organ can lead to tumours developing elsewhere in the body.

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(1 mark)

The table shows the numbers of deaths of people aged under 65 years due to different cancers, in the UK in 1997.

Men		Women	
Cancer	Number of deaths	Cancer	Number of deaths
Lung	4013	Breast	4118
Colorectum	1691	Lung	2157
Lymphatic tissue	1607	Ovary	1313
Oesophagus	971	Colorectum	1133
Brain	845	Lymphatic tissue	1103
Others	6501	Others	5323
Total	15 628	Total	15 147

- (b) (i) Calculate the percentage of deaths due to lung cancer. Show your working.

Answer
(2 marks)

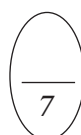
- (ii) Suggest **one** reason for the difference between men and women in the number of deaths due to lung cancer.

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(1 mark)

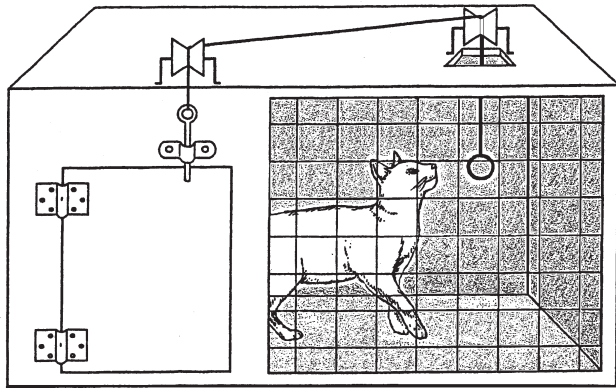
- (c) Explain how excessive sunbathing can lead to malignant skin tumours.

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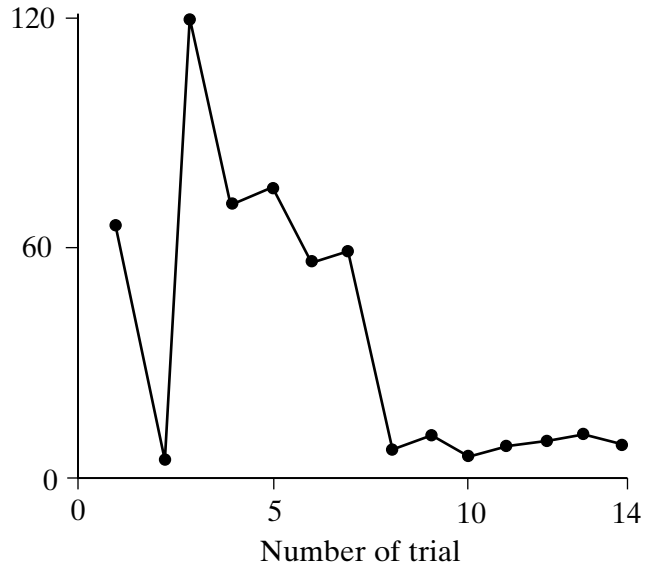
(3 marks)



4 The drawing shows a puzzle box used in studying animal behaviour. In an experiment, a cat was placed inside the box and food visible to the cat was placed outside. The graph shows the time taken for the cat to open the door, by pulling on the ring, during a series of 14 trials.



Time taken / minutes



(a) (i) What type of learning does this experiment demonstrate?

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(1 mark)

(ii) Explain how the results support your answer.

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(2 marks)

(b) Explain the role of reinforcement in this type of learning.

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(2 marks)

Turn over ▶

- 5 In spring, a male stickleback sets up a territory from which he chases away intruders of both sexes. At the same time, he builds a nest and develops a red belly. Once the nest is complete, he courts females whose abdomens are swollen with eggs. The courtship behaviour of the male (♂) and female (♀) is shown in the drawings.

The diagram is not reproduced here due to third-party copyright constraints.
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- (a) Use **one** example from the diagram to explain what is meant by a *sign stimulus*.

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(2 marks)

- (b) Using information in the question, explain **one** advantage to the male stickleback of maintaining a territory.

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(2 marks)

- (c) Experimental studies of all-female groups of sticklebacks have shown that females chase away members of the same sex. Suggest an explanation for this aggression.

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(1 mark)

S (d) After the male has fertilised the eggs, he regularly circulates water over them by fanning them with his fins.

(i) Suggest how this helps the development of the eggs.

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(2 marks)

(ii) Explain how this fanning behaviour could have evolved by natural selection.

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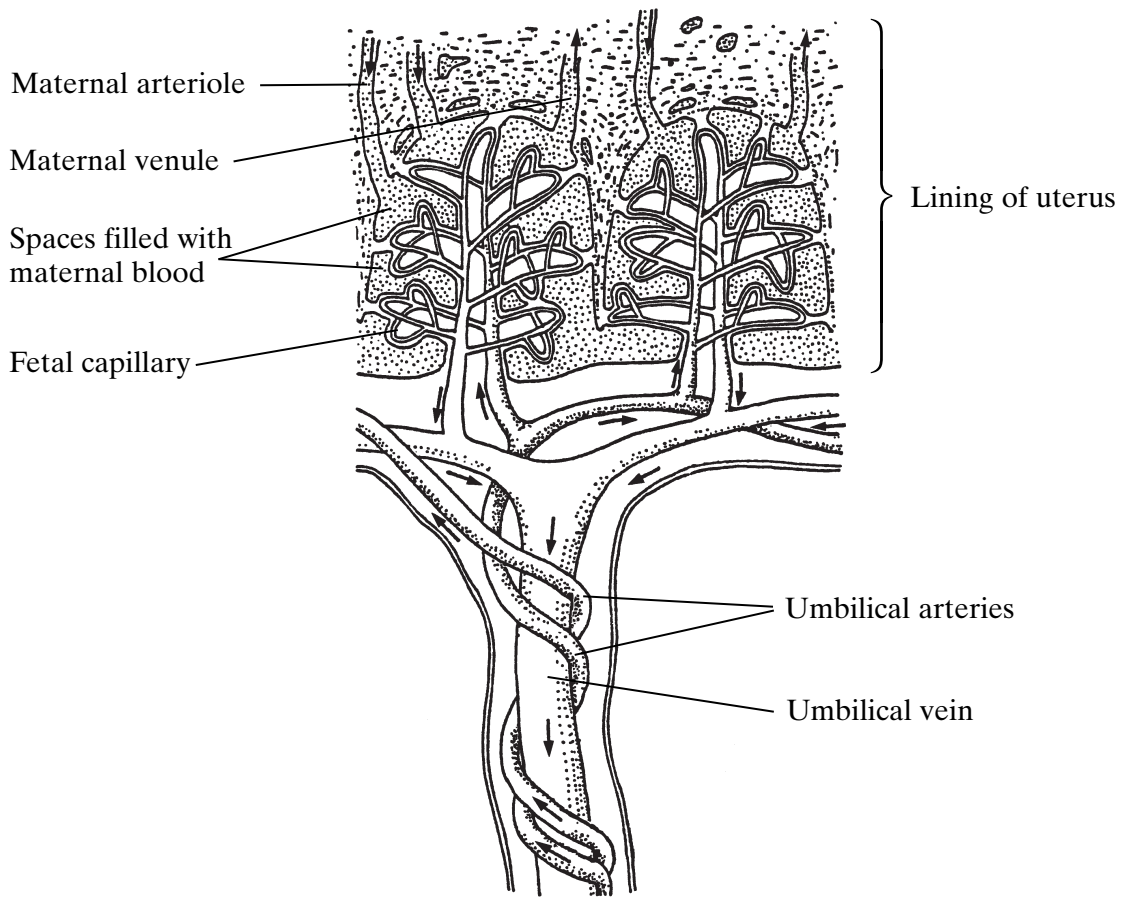
(3 marks)

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10

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

6 The diagram shows the structure of part of a human placenta.



(a) Explain how **two** features of the placenta shown in the diagram increase the rate of exchange between the blood of the mother and that of the fetus.

- 1
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- 2
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(2 marks)

(b) In the liver of a healthy individual, the enzyme phenylalanine hydroxylase converts the amino acid phenylalanine to another amino acid, tyrosine. The enzyme is coded for by a single gene. Some people are unable to synthesise an active form of this enzyme and, as a result, have a condition called phenylketonuria (PKU). If the condition is untreated, phenylalanine accumulates in the blood with harmful results.

A woman who does not have PKU is pregnant with a fetus who does have the condition. The father is also free of the condition.

(i) Before it is born, the child does not suffer any ill effects from an absence of the enzyme. Suggest why.

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(2 marks)

S (ii) Using information in the passage, explain whether the allele for PKU is likely to be dominant or recessive.

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(3 marks)

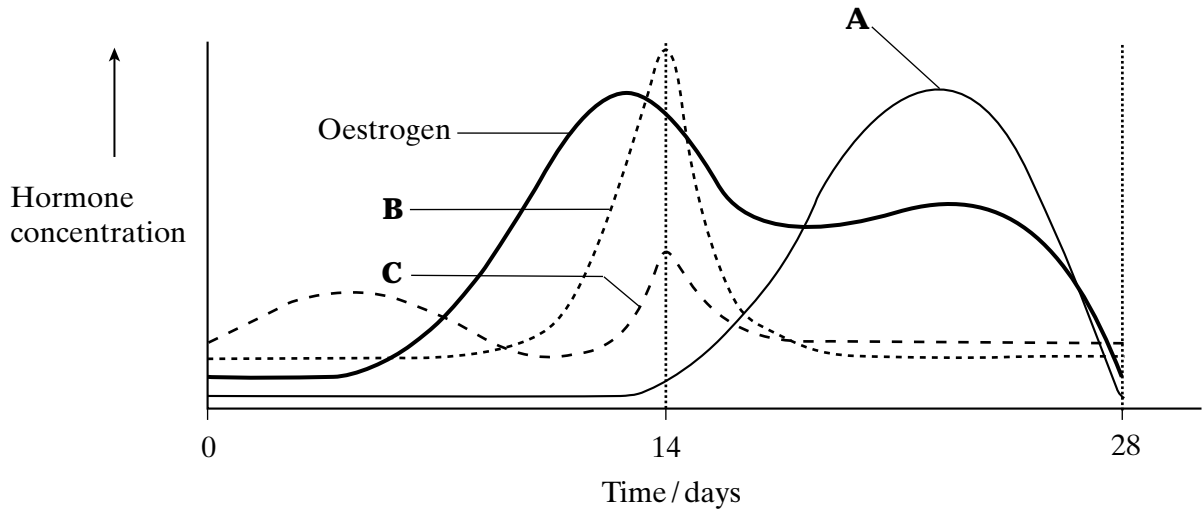
S (iii) Explain how a change in the amino acid sequence in the phenylalanine hydroxylase enzyme might cause it to be inactive.

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(3 marks)

Turn over 

7 The graph shows the changes in concentration of the hormones responsible for controlling the menstrual cycle.



(a) (i) Which curve, **A**, **B** or **C**, shows changes in the concentration of FSH?

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(1 mark)

(ii) Explain how the release of FSH is controlled by negative feedback.

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(2 marks)

(b) The detection of human chorionic gonadotrophic hormone (hCG) in a woman's urine is used as a method for pregnancy testing. Small latex beads are coated with an antibody and added to a sample of urine. If the urine contains hCG the beads clump together.

Explain why only antibodies specific to hCG will cause the beads to clump together.

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(3 marks)

S (c) hCG appears in the mother’s urine because it is able to pass through the membrane of the glomerular capillaries into the kidney tubule but it is not able to be reabsorbed into the blood.

(i) Explain what causes hCG to pass from glomerular capillaries into the kidney tubule.

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(2 marks)

(ii) Suggest why hCG cannot be reabsorbed from the kidney tubule into the blood capillaries.

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(2 marks)

10

END OF SECTION A

SECTION B IS PROVIDED SEPARATELY

ACKNOWLEDGEMENT OF COPYRIGHT-HOLDERS AND PUBLISHERS

Question 3 Source: Stationery Office Department of Health *Health and Personal Social Services Statistics* 1997

Questions 6 and 7 WD Phillips and TJ Chilton *A Level Biology* Oxford University Press 1989

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