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| Surname             |  |  |  |  | Other Names      |  |  |  |  |
| Centre Number       |  |  |  |  | Candidate Number |  |  |  |  |
| Candidate Signature |  |  |  |  |                  |  |  |  |  |

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General Certificate of Education  
June 2004  
Advanced Level Examination



**BIOLOGY (SPECIFICATION B)** **BYB8/A**  
**Unit 8 Section A Behaviour and Populations**

Friday 25 June 2004 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                   |      |        |      |
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| 5                   |      |        |      |
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| 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**

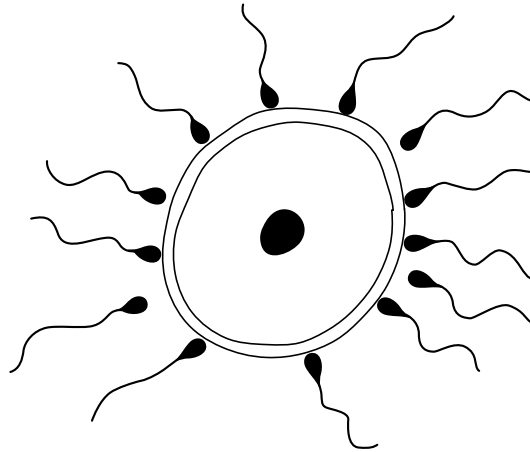
- The maximum mark for **Section A** is 50.
- Mark allocations are shown in brackets.
- You are reminded of the need for clear presentation in your answers. All answers should be in good English and should use accurate scientific terminology.
- You are advised to spend 1 hour on **Section A**.
- You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

**NO QUESTIONS APPEAR ON THIS PAGE**

**SECTION A**

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

**1** The diagram shows an oocyte surrounded by a number of sperm cells.



(a) During fertilisation the nucleus of one sperm cell enters the oocyte.

(i) Describe how the sperm cell penetrates the oocyte.

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(2 marks)

(ii) Describe how the entry of other sperm cells is prevented.

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(2 marks)

**S** (b) The sperm cells produced by one man are genetically different. Give **one** explanation for this.

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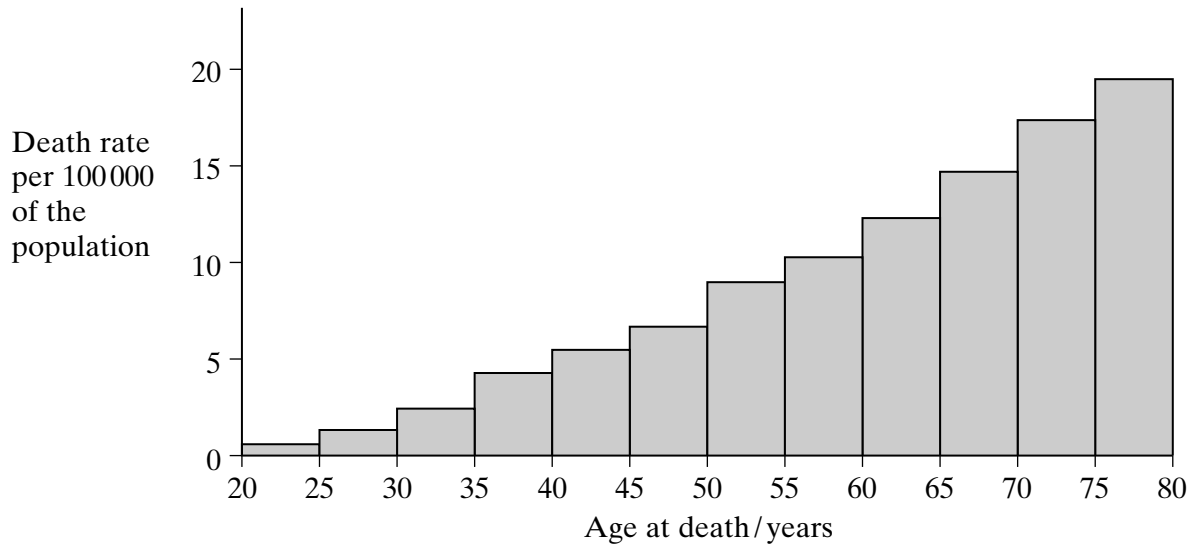
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(2 marks)

**Turn over** ▶

- 2 The death rate from malignant skin tumours was investigated in the USA. The graph shows the results for fair-skinned men in different age groups.



- (a) Describe what is meant by a *malignant tumour*.

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(3 marks)

- (b) Give **one** reason for the change in death rate from malignant skin tumours with increasing age.

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(1 mark)

- (c) The data for fair-skinned and dark-skinned people were collected separately. Explain why skin colour was a factor likely to affect the death rate.

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(2 marks)



**TURN OVER FOR THE NEXT QUESTION**

**Turn over**

3 Contraceptives containing progesterone may be used to control fertility. Progesterone acts as a contraceptive by making the mucus at the entrance to the uterus more dense. At high concentrations it inhibits LH production.

(a) Explain why the probability of conception is reduced when

(i) the mucus at the entrance to the uterus is more dense;

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 (1 mark)

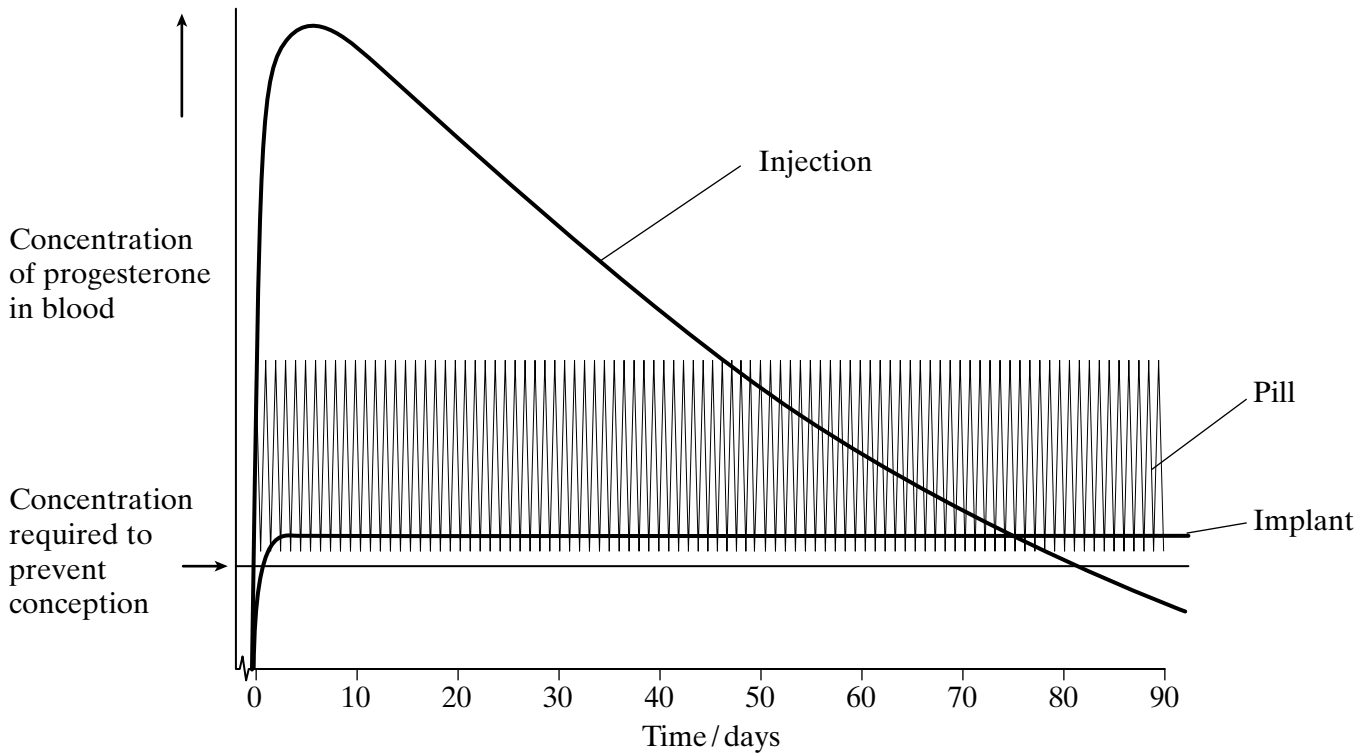
(ii) the production of LH is inhibited.

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 (2 marks)

(b) The contraceptive may be supplied in three different ways. These are shown in the table.

| Method of supplying progesterone | Length of time that contraceptive is effective |
|----------------------------------|--|
| Daily pills                      | 27 - 30 hours                                  |
| Injection                        | 12 weeks                                       |
| Implant                          | 5 years  |

The graph shows the concentration of progesterone in the blood in users of the three types of contraceptive over a period of several weeks.



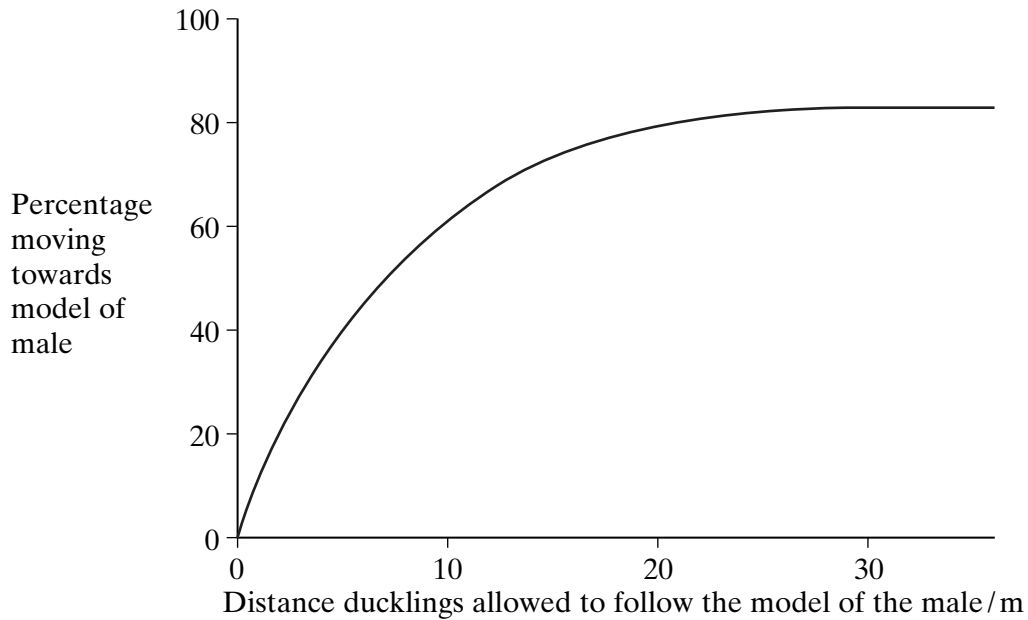
- (i) Fewer pregnancies occur in women using the injection than in women using daily pills. Use the information given to suggest an explanation for this.

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(1 mark)

- (ii) Suggest and explain the advantages and disadvantages of using implants rather than injections as a method of contraception.

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(3 marks)

- 4 The mallard is a species of duck in which the sexes differ in appearance. In a laboratory investigation on imprinting, groups of mallard ducklings were allowed to follow a model of a male mallard for different distances. To determine the strength of imprinting, the ducklings were then placed at equal distances from a model of a male and a model of a female mallard. The percentage of ducklings that moved towards the male model was found for each group. The graph shows the results of the investigation.



- (a) Give **one** factor which should have been kept the same for each trial during the investigation. Explain why this factor needs to be kept the same.

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(1 mark)

- (b) Describe what the results of this investigation show about imprinting.

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(2 marks)

- (c) In nature ducklings usually imprint on a parent. Suggest how imprinting increases the chance of survival of the ducklings.

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(2 marks)

**5** In a new-born baby, bladder emptying is a reflex.

**S** (a) Complete the table to give the receptor and effector in this reflex.

|             |                        |
|-------------|------------------------|
| Stimulus    | Full bladder           |
| Receptor    |                        |
| Coordinator | Central nervous system |
| Effector    |                        |
| Response    | Bladder empties        |

(2 marks)

(b) Explain how the above reflex is modified by learning.

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(2 marks)

**S** (c) The control of pupil diameter also involves a reflex. This reflex cannot be modified by learning. Suggest the advantage of the reflex not being modifiable.

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(2 marks)



**Turn over** ▶

- 6 The table shows the birth rate, death rate and life expectancy in England and Wales in four different years. You may assume there was no migration.

| Year                                  | 1851 | 1901 | 1931 | 1961 |
|---------------------------------------|------|------|------|------|
| Birth rate per 1000 population        | 34.3 | 28.5 | 15.8 | 17.6 |
| Death rate per 1000 population        | 22.0 | 16.9 | 12.3 | 11.9 |
| Female life expectancy at birth/years | 41.9 | 52.4 | 62.9 | 74.0 |
| Male life expectancy at birth/years   | 39.9 | 48.5 | 58.7 | 68.1 |

- (a) (i) Give the year when the population was growing at the slowest rate. Explain your answer.

Year .....

Explanation .....

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(2 marks)

- (ii) The population of England and Wales in 1851 was 18 million. Calculate the size of the population in 1852. Show your working.

Answer .....

(2 marks)

(b) One reason for the decrease in the death rate between 1851 and 1931 was the introduction of mass vaccination. Explain how vaccinating a large proportion of the population reduces the death rate.

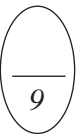
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(2 marks)

S (c) Suggest a genetic explanation for the difference in life expectancy of females and males.

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(3 marks)



**TURN OVER FOR THE NEXT QUESTION**

**Turn over**

7 Mitochondria contain the genes needed for the synthesis of the enzymes involved in the electron transport chain. One of these enzymes is cytochrome oxidase. If a mutation occurs during replication of the mitochondrial genes, functional cytochrome oxidase may not be produced.

S (a) Explain why mutation of a mitochondrial gene might result in no functional cytochrome oxidase being produced.

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(5 marks)

**S** (b) As people get older, mutant genes tend to accumulate. Some cells of an old person have many mitochondria with a mutant gene for cytochrome oxidase. Explain why less ATP will be made in these cells.

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(2 marks)

**S** (c) Suggest and explain **two** ways in which a shortage of ATP might affect physiological function in older people.

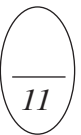
1 .....

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2 .....

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(4 marks)



**END OF SECTION A**  
**SECTION B IS PROVIDED AS AN INSERT**

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