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

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General Certificate of Education
June 2003
Advanced Level Examination

ASSESSMENT and QUALIFICATIONS ALLIANCE

# HUMAN BIOLOGY (SPECIFICATION A) BYA7
# Unit 7 The Human Life-span

Monday 16 June 2003 Morning Session

**In addition to this paper you will require:**
- a ruler with millimetre measurements.

You may use a calculator.

Time allowed: 1 hour 30 minutes

**Instructions**
- Use blue or black ink or ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided. All working must be shown.
- Do all rough work in this book. Cross through any work you do not want marked.

**Information**
- The maximum mark for this paper is 75.
- Mark allocations are shown in brackets.
- You will be assessed on your ability to use an appropriate form and style of writing, to organise relevant information clearly and coherently, and to use specialist vocabulary, where appropriate.
- The degree of legibility of your handwriting and the level of accuracy of your spelling, punctuation and grammar will also be taken into account.
- You are reminded that this test requires you to use your knowledge of Modules 1, 3, 4 and 5 as well as Module 7 in answering synoptic questions. These questions are indicated by the letter **S**.

| For Examiner's Use | | | |
|---|---|---|---|
| Number | Mark | Number | Mark |
| 1 | | | |
| 2 | | | |
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| Total (Column 1) → | | | |
| Total (Column 2) → | | | |
| TOTAL | | | |
| Examiner's Initials | | | |

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

**1** **Figure 1** shows different stages in the development of a follicle and corpus luteum in a human ovary.

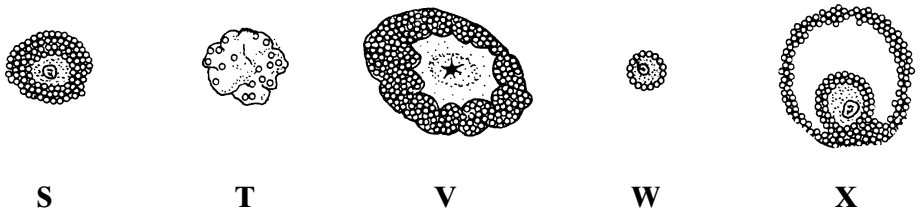


**Figure 1**

(a) (i) Give the letter which shows a mature ovarian follicle.

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*(1 mark)*

(ii) Give the sequence of letters which shows the correct order of these stages.

..... ..... ..... ..... .....

*(1 mark)*

(b) **Figure 2** shows a sperm about to fertilise an oocyte.

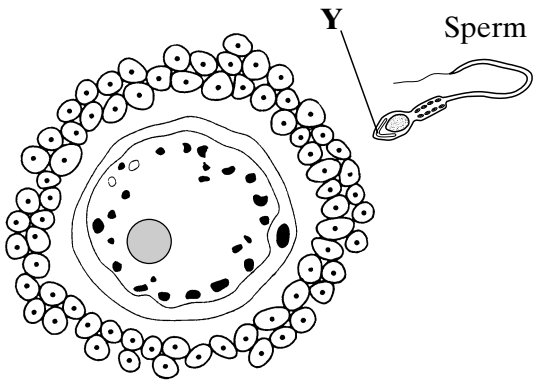


**Figure 2**

(i) Describe the role of structure **Y**.

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*(1 mark)*

**S** (ii) The diameter of the oocyte nucleus is 24 μm. Calculate the magnification of **Figure 2**. Show your working.

Magnification = .....

*(2 marks)*

5

**TURN OVER FOR THE NEXT QUESTION**

**2** A person looks at two spots of blue ink on a piece of white paper in bright light. The two spots are close together. Under these conditions, the person can clearly see two blue, circular spots.

(a) Explain how rays of light from a spot are made to form a distinct circular image on the retina.

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*(2 marks)*

(b) When the same person views the spots in dim light, a single larger spot is seen. It is difficult to see the colour of the ink.

Explain why

(i) two separate spots can no longer be seen;

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*(2 marks)*

(ii) the colour of the ink cannot easily be seen.

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*(1 mark)*

5

**3** The table shows data relating to the storage of glycogen in a human male.

| Tissue | Total mass of tissue / g | Amount of glycogen stored / % of tissue mass |
|---|---|---|
| Liver | 1250 | 8.1 |
| Skeletal muscles | 23500 | 1.7 |

(a) (i) The energy value of one gram of glycogen is 16.8 kJ. Calculate the total energy stored as glycogen in the liver and skeletal muscles. Show your working.

Answer ..... kJ
*(2 marks)*

(ii) This man developed diabetes. Explain what happened to the total energy stored as glycogen in the liver and skeletal muscles before he was treated.

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*(2 marks)*

**S** (b) Explain **one** way in which glycogen is an effective energy storage molecule.

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*(1 mark)*

5

**4** (a) Prolactin is a hormone involved in the control of lactation. Name the gland which produces prolactin.

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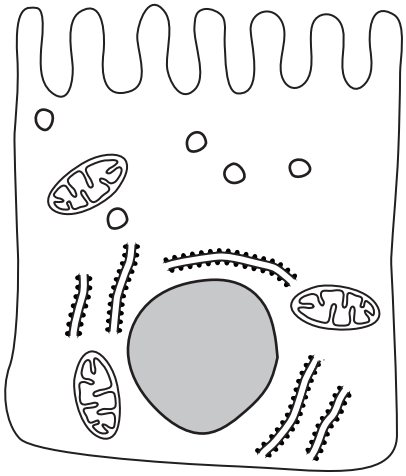
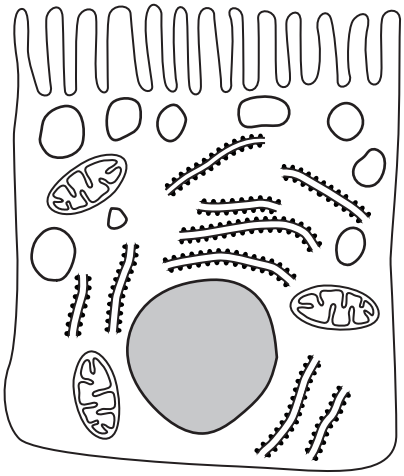
*(1 mark)*

Prolactin was added to human mammary gland cells grown in tissue culture. The diagrams show a mammary gland cell before and after prolactin was added.



Before adding prolactin



48 hours after adding prolactin

**S** (b) Describe **two** changes in the mammary gland cell after prolactin was added and explain how each is associated with lactation.

Change

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Explanation

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Change

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Explanation

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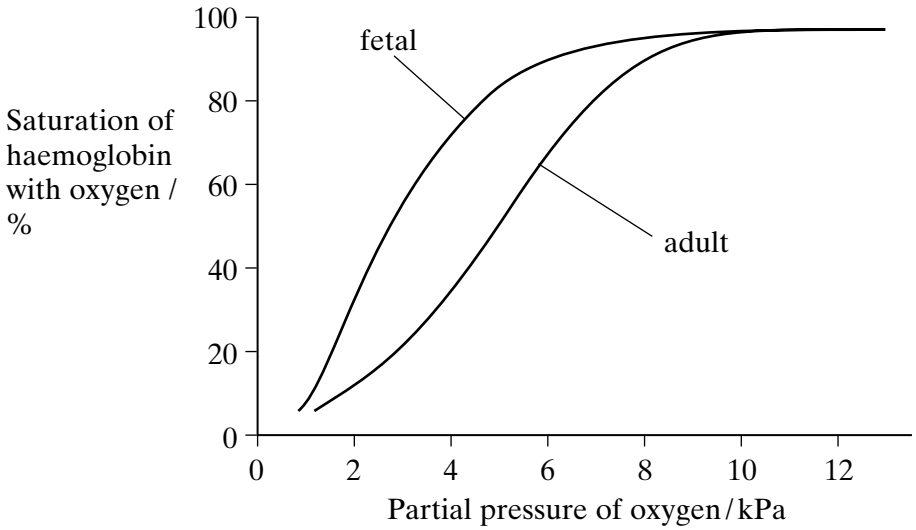
*(4 marks)*

**5** The graph shows dissociation curves for fetal haemoglobin and adult haemoglobin.




(a) Explain the advantage to the fetus of the shape and position of the fetal haemoglobin curve.

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*(2 marks)*

**S** (b) In some children the amount of fetal haemoglobin is abnormally high. Use the graph to explain why these children tire easily during periods of exercise.

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*(3 marks)*

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**Turn over ▶**

**6** (a) Name the transmitter released from the postganglionic motor neurones of the sympathetic division of the autonomic nervous system.

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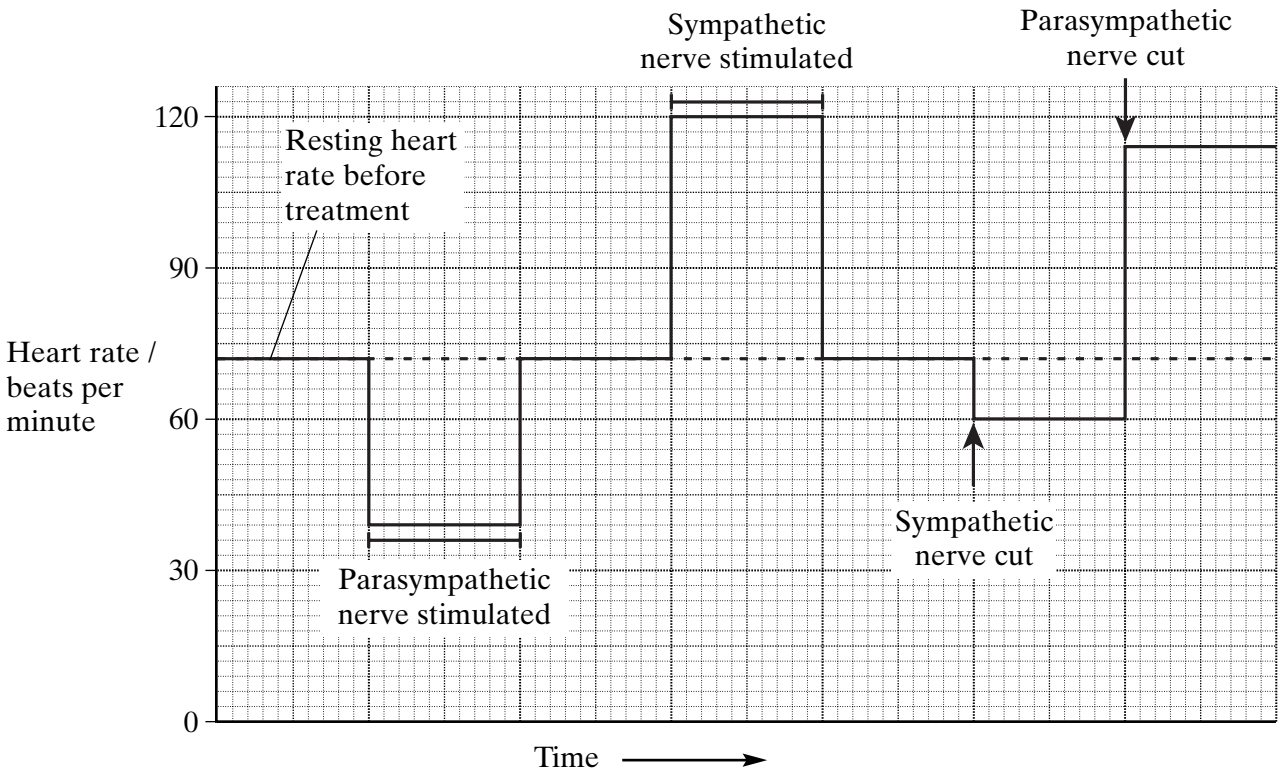
*(1 mark)*

(b) The graph shows the results of a sequence of treatments to investigate the control of heart rate by the autonomic nervous system.




(i) Explain what the results of cutting the sympathetic and parasympathetic nerves demonstrate about the control of resting heart rate.

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*(3 marks)*

(ii) What does the graph suggest about how a change in heart rate occurs when a person exercises?

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*(1 mark)*

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**TURN OVER FOR THE NEXT QUESTION**

**7** (a) Explain what is meant by a *balanced diet.*

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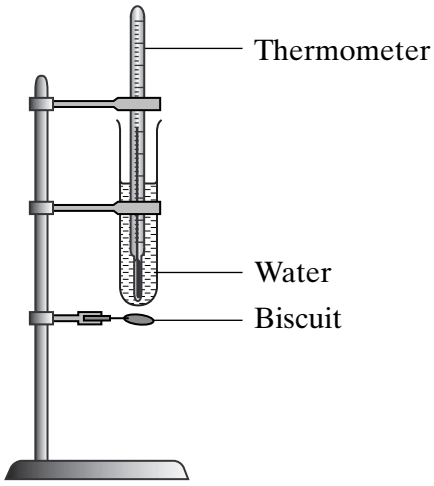
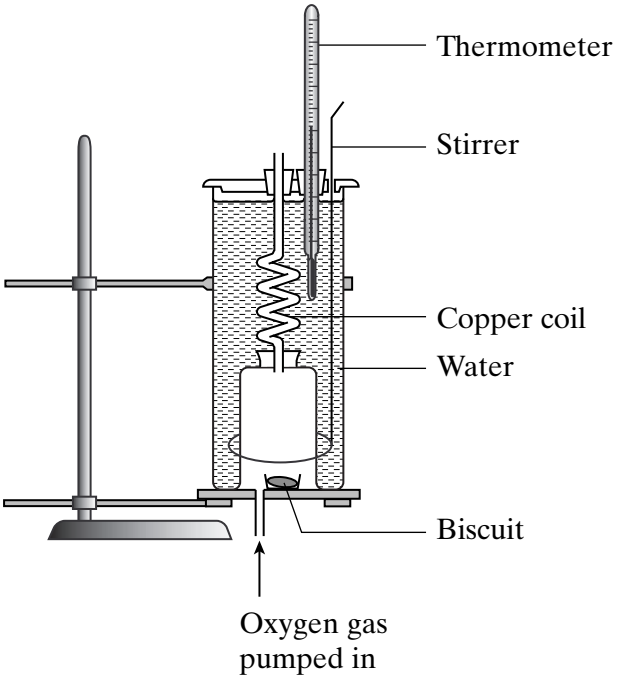
*(2 marks)*

(b) A student investigated the energy content of a biscuit using the two different sets of apparatus shown in the diagram.




**Apparatus A**




**Apparatus B**

Identify and explain **two** features of **Apparatus B** which allow the student to obtain a more accurate estimate of the energy content of the biscuit.

Feature

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Explanation

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Feature

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Explanation

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*(4 marks)*

**QUESTION 7 CONTINUES ON THE NEXT PAGE**

(c) The table shows the recommended daily intake of calcium and iron.

| Age range / years | Calcium / mg | Iron / mg |
|---|---|---|
| **Males** | | |
| 0–3 | 408 | 6.4 |
| 4–6 | 450 | 6.1 |
| 7–10 | 550 | 8.7 |
| 11–14 | 1000 | 11.3 |
| 15–18 | 1000 | 11.3 |
| 19–50 | 700 | 8.7 |
| 50+ | 700 | 8.7 |
| **Females** | | |
| 0–3 | 408 | 6.4 |
| 4–6 | 450 | 6.1 |
| 7–10 | 550 | 8.7 |
| 11–14 | 800 | 14.8 |
| 15–18 | 800 | 14.8 |
| 19–50 | 700 | 14.8 |
| 50+ | 700 | 8.7 |

Describe and explain the difference between males and females in the requirement for

(i) calcium;

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*(3 marks)*

(ii) iron.

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*(3 marks)*

**S** (d) Kwashiorkor is a disease in children caused by a lack of protein in the diet. One of the symptoms is swelling of the abdomen caused by the build up of tissue fluid. Explain why, in sufferers of kwashiorkor,

(i) there is a build up of tissue fluid;

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*(2 marks)*

(ii) blood takes longer to clot.

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*(1 mark)*

15

**TURN OVER FOR THE NEXT QUESTION**

LEAVE MARGIN BLANK

**THERE ARE NO QUESTIONS PRINTED ON THIS PAGE**

**8** Wheat flour that is used to bake bread contains a high proportion of starch and a protein called gluten.

(a) Describe how starch is digested to glucose in the small intestine.

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*(3 marks)*

(b) In some people, gluten causes the destruction of villi in the gut. Explain why this will result in a loss of body mass.

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*(3 marks)*

Many babies suffer discomfort of the digestive system, a condition known as colic. Many of the symptoms are due to a temporary inability to produce the enzyme lactase. As a result, lactose, the main sugar in milk, remains undigested in the gut.

(c) Explain how the presence of undigested lactose leads to discomfort.

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*(2 marks)*

**QUESTION 8 CONTINUES ON THE NEXT PAGE**

In an investigation, babies suffering from colic were divided into two groups. Those in group **A** were given a solution of lactase in their bottled milk and those in group **B** were given distilled water in their bottled milk. The results of this investigation were analysed with a statistical test.

**S** (d) Explain why

(i) distilled water was added to the milk of group **B**;

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*(2 marks)*

(ii) a statistical test was used to analyse the results.

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*(2 marks)*

The table shows the results of this investigation.

| | **Mean duration of colic symptoms / minutes** | | |
|---|---|---|---|
| | **Before treatment** | **After treatment** | Statistically significant difference? |
| Group **A** (lactase) | 124.5 | 65.7 | Yes |
| Group **B** (distilled water) | 121.0 | 113.8 | No |
| Statistically significant difference? | No | Yes | |

**S** (e) Give **three** conclusions that can be drawn from these data.

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*(3 marks)*

15

**TURN OVER FOR THE NEXT QUESTION**

**9** (a) Describe the events that take place in a neurone which produce an action potential.

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*(6 marks)*

(b) Describe how transmission occurs across a synapse.

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*(4 marks)*

**S** (c) Explain what is meant by the tertiary structure of a protein and describe the importance of this in transmission across a synapse.

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*(5 marks)*

15

**END OF QUESTIONS**