

Surname						Other Names					
Centre Number						Candidate Number					
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General Certificate of Education
 June 2004
 Advanced Level Examination



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

BYA7

Tuesday 22 June 2004 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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4			
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6			
7			
8			
9			
Total (Column 1)		→	
Total (Column 2)		→	
TOTAL			
Examiner's Initials			

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

1 Lactose is a disaccharide found in milk. In the small intestine, it is digested into glucose and galactose by the enzyme lactase. Molecules of lactase are located in the plasma membranes of cells lining the small intestine.

(a) What evidence in the paragraph suggests that galactose is a monosaccharide?

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(1 mark)

(b) (i) Name **one** other digestive enzyme that is located in the plasma membranes of cells lining the small intestine.

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(1 mark)

(ii) Give an advantage of lactase and other digestive enzymes being located in the plasma membranes of cells lining the small intestine, rather than being secreted into the lumen of the small intestine.

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(1 mark)

(c) The absorption of galactose from the small intestine is reduced if the absorbing cells are treated with a respiratory inhibitor, such as cyanide. Suggest an explanation for this.

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(2 marks)



- 2 (a) The table gives the amounts of some substances found in bananas.

Substance	Mass/g per 100 g
Protein	1.1
Lipid	0.0
Carbohydrate	19.2
Non-digestible waste	40.0

- (i) 100 g of edible banana tissue was found, by calorimetry, to release 326 kJ of energy. Suggest why a person eating 100 g of banana would not be able to make 326 kJ available from the banana for metabolic reactions.

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 (1 mark)

- S (ii) An animal was fed solely on bananas for several days and its respiratory quotient determined. Suggest the likely value for the respiratory quotient. Give a reason for your answer.

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 (2 marks)

- S (b) The banana plants in some plantations are being attacked by a fungus. Because banana plants are sterile and reproduce asexually, all the banana plants in these plantations may be killed. Explain why it would be less likely that all the banana plants would be killed if they reproduced sexually.

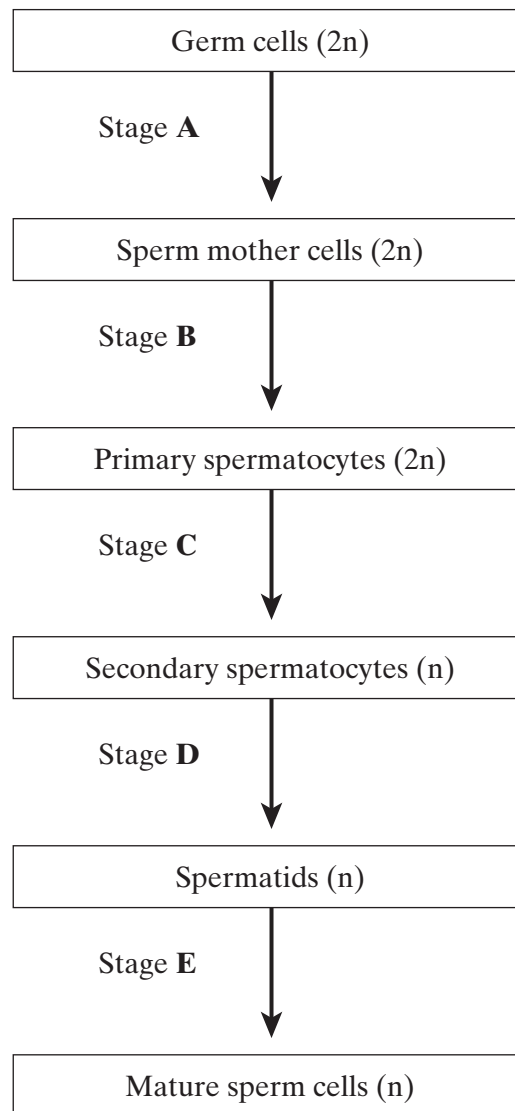
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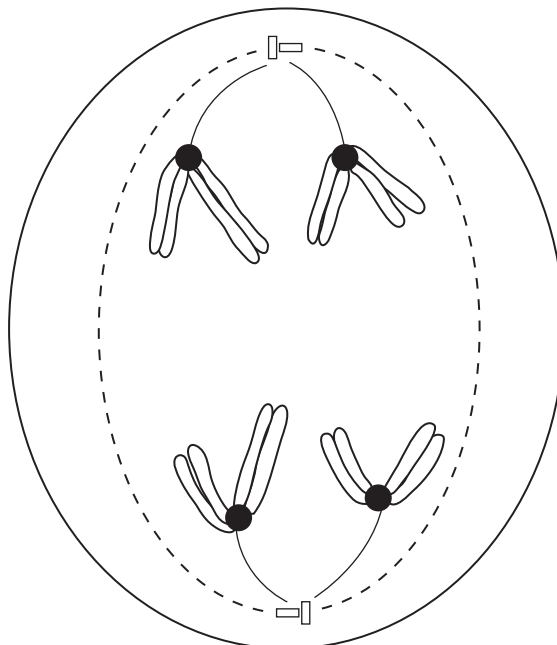
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Turn over ►

- 3 (a) The flowchart shows the main stages in the formation of sperm cells in the testes.



The diagram shows a dividing cell from a human testis. Only four of the forty six chromosomes are shown.



S During which of stages **A** to **E** in the flowchart would this cell division occur? Give the reason for your answer.

Stage

Reason

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(3 marks)

S (b) During fertilisation, the acrosome of a mature sperm cell releases enzymes. These enzymes digest a path through the glycoprotein in the membrane surrounding the secondary oocyte. Explain how the glycoprotein is broken down by these enzymes.

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(2 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

4 S (a) Fetal haemoglobin has a greater affinity for oxygen at low partial pressures of oxygen than adult haemoglobin. Explain how this allows continuous diffusion of oxygen from mother to fetus in the placenta.

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(3 marks)

(b) Haemoglobin is broken down in the liver. One product of this breakdown is amino acids. Give **two** uses of these amino acids in the body.

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2

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(2 marks)



5 (a) In humans, both sympathetic and parasympathetic divisions of the autonomic nervous system influence the secretion of saliva. When food is in the mouth, increased parasympathetic stimulation of the salivary glands results in increased secretion of saliva. Explain the benefit of increased sympathetic stimulation of the salivary glands once the food has been swallowed.

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(2 marks)

S (b) Describe how increased sympathetic stimulation increases cardiac output.

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(3 marks)

5

TURN OVER FOR THE NEXT QUESTION

Turn over ▶

6 (a) Explain how a Pacinian corpuscle produces a generator potential in response to external pressure.

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(2 marks)

(b) In the eye of an older person, the ciliary muscles do not contract with as much force as in the eye of a younger person. Explain why this might make reading a book difficult for an older person.

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(3 marks)

5

7 (a) **Figure 1** shows part of a myofibril from skeletal muscle.

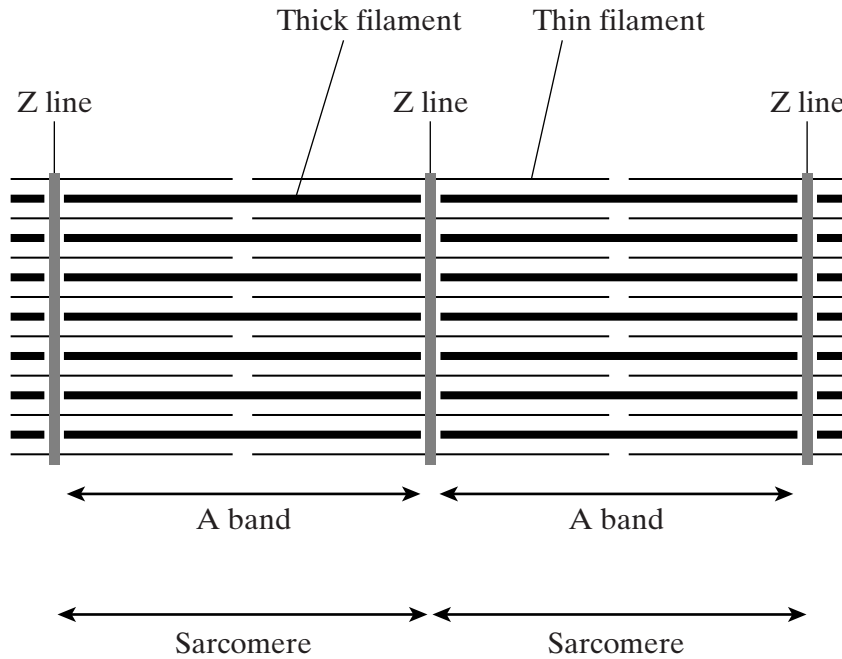


Figure 1

(i) Describe **two** features, visible in the diagram, which show that the myofibril is contracted.

- 1
 -
 - 2
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- (2 marks)*

(ii) Explain the role of calcium ions and ATP in bringing about contraction of a muscle fibre.

- Calcium ions
 -
 -
 - ATP
 -
 -
- (3 marks)*

QUESTION 7 CONTINUES ON THE NEXT PAGE

Turn over ►

- (b) **Figure 2** shows the structure of a neuromuscular junction. The vesicles contain acetylcholine.

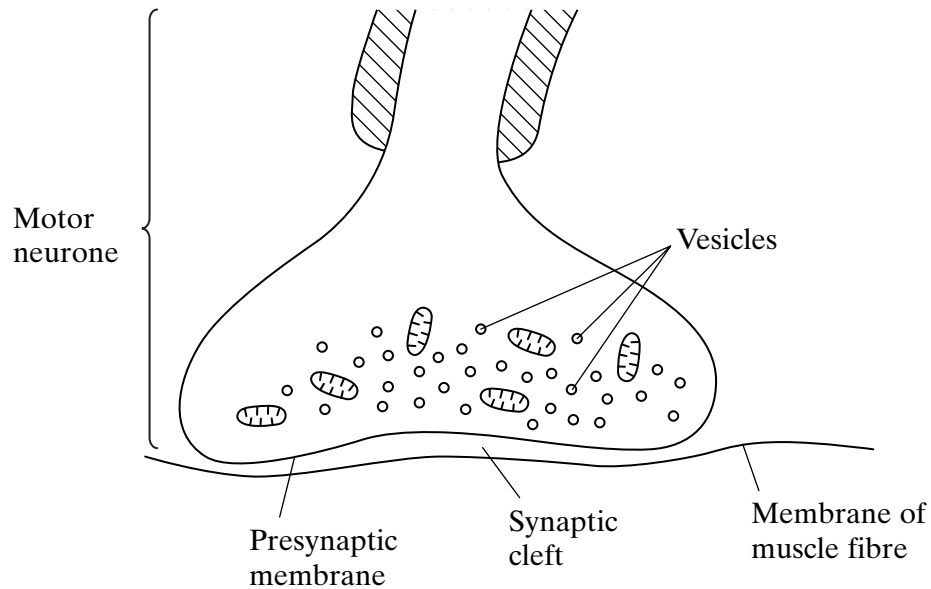


Figure 2

- (i) An action potential is generated at the cell body of the motor neurone. Explain how this action potential passes along the motor neurone to the neuromuscular junction.

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(3 marks)

- (ii) When the action potential arrives at the neuromuscular junction, it results in the secretion of acetylcholine into the synaptic cleft. Explain how.

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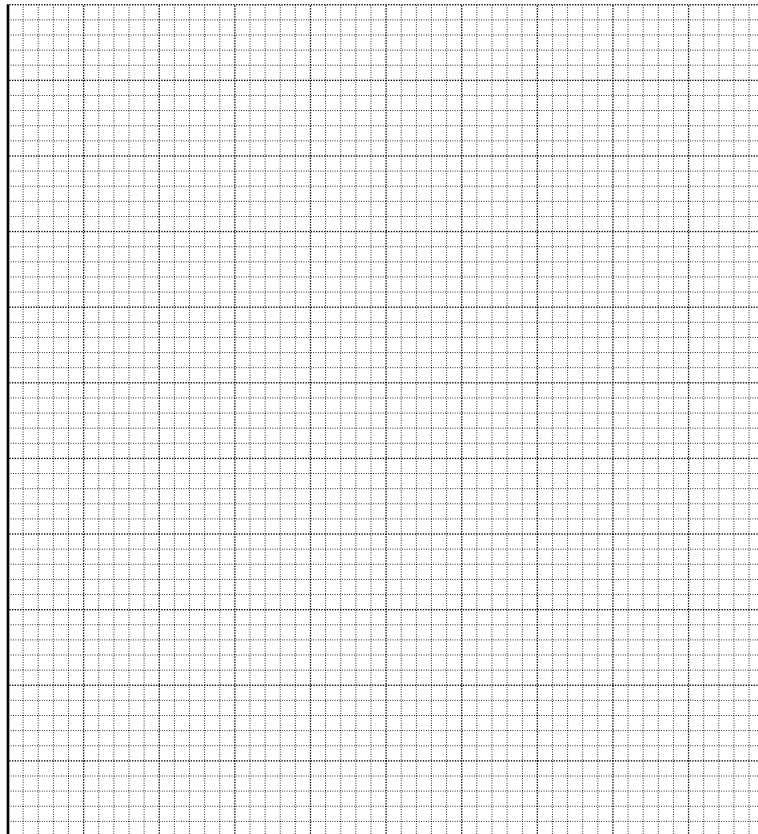
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(3 marks)

(c) Between the ages of 20 and 50, 10% of total muscle mass is lost. Between the ages of 50 and 80, a further 40% of the original total muscle mass is lost. Most of the muscle lost consists of fast fibres.

(i) Plot a graph on the grid below to show the percentage of muscle mass remaining between the ages of 20 and 80. Assume that the rate of muscle loss in each age range is constant.



(3 marks)

(ii) Explain why explosive exercises, such as sprinting and weightlifting, will be more affected by this muscle loss than aerobic exercises, such as jogging.

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(1 mark)

8 (a) Prolactin and oxytocin both play a part in stimulating lactation.

(i) Describe the part played by each hormone in stimulating lactation.

Prolactin

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Oxytocin

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(4 marks)

S (ii) Prolactin is a protein. Explain how the specific shape of a prolactin molecule is produced.

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(4 marks)

(b) A cross-sectional study produced the following data concerning growth in girls.

Age/years	Mean body mass/kg
0	4
2	12
4	16
6	21
8	26
10	32
12	40
14	48
16	53
18	54
20	54

(i) Explain what is meant by a *cross-sectional* study.

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(2 marks)

(ii) By what percentage is the mean growth rate between ages 10 and 14 greater than the mean growth rate between ages 0 and 6? Show your working.

Answer

(2 marks)

(iii) Explain the increase in growth rate between ages 10 and 14.

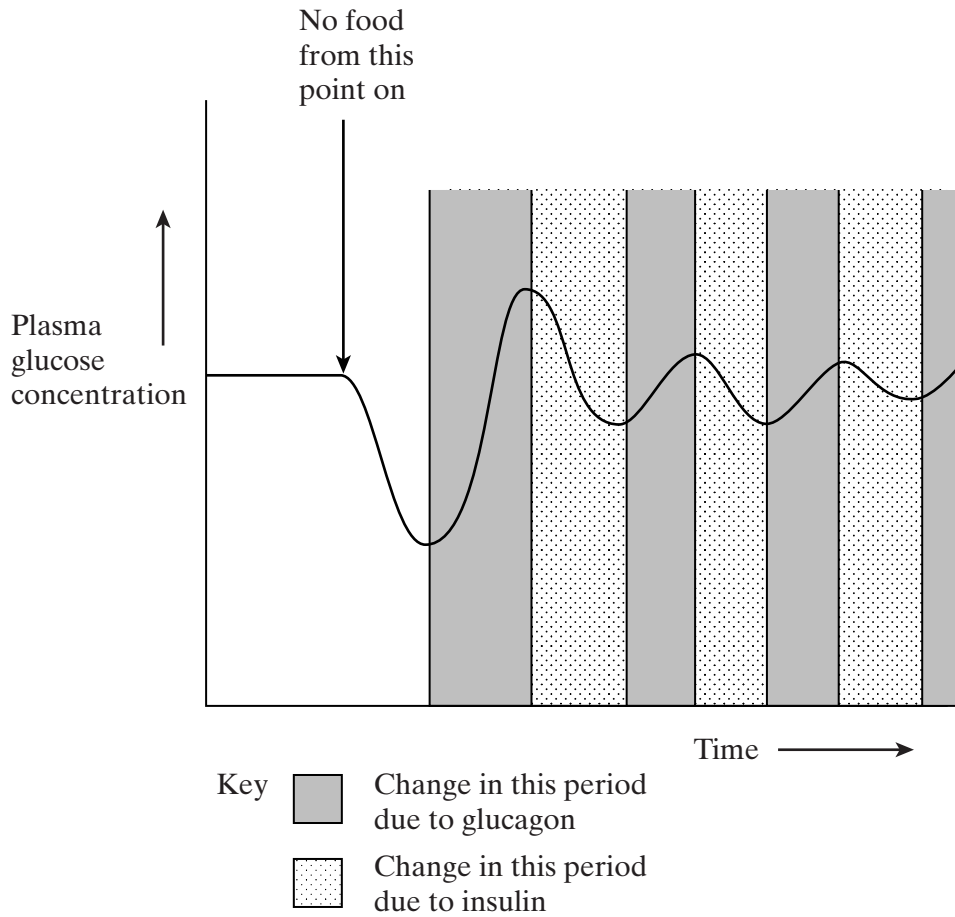
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(3 marks)

Turn over 

9 Homeostatic mechanisms maintain a constant environment in the body.

- (a) The graph shows changes in plasma glucose concentration that occurred in a person who went without food for some time.



Use evidence from the graph to explain the role of negative feedback in the control of plasma glucose concentration.

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(5 marks)

THERE ARE NO QUESTIONS PRINTED ON THIS PAGE