

Surname						Other Names					
Centre Number						Candidate Number					
Candidate Signature											

For Examiner's Use

General Certificate of Education
June 2007
Advanced Level Examination



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

BYA7

Tuesday 19 June 2007 9.00 am to 10.30 am

For this paper you must have:

- 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.
- Answer the 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 to be marked.

Information

- The maximum mark for this paper is 75.
- The marks for questions are shown in brackets.
- You will be marked on your ability to use good English, to organise information clearly and to use accurate scientific terminology where appropriate.
- 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			
Question	Mark	Question	Mark
1		9	
2			
3			
4			
5			
6			
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8			
Total (Column 1) →			
Total (Column 2) →			
TOTAL			
Examiner's Initials			

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

S 1 (a) Name and describe the process by which salivary amylase digests starch into maltose.

Name

Description

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(3 marks)

(b) Salivary amylase does not digest starch in the acid conditions found in the stomach.
Explain why.

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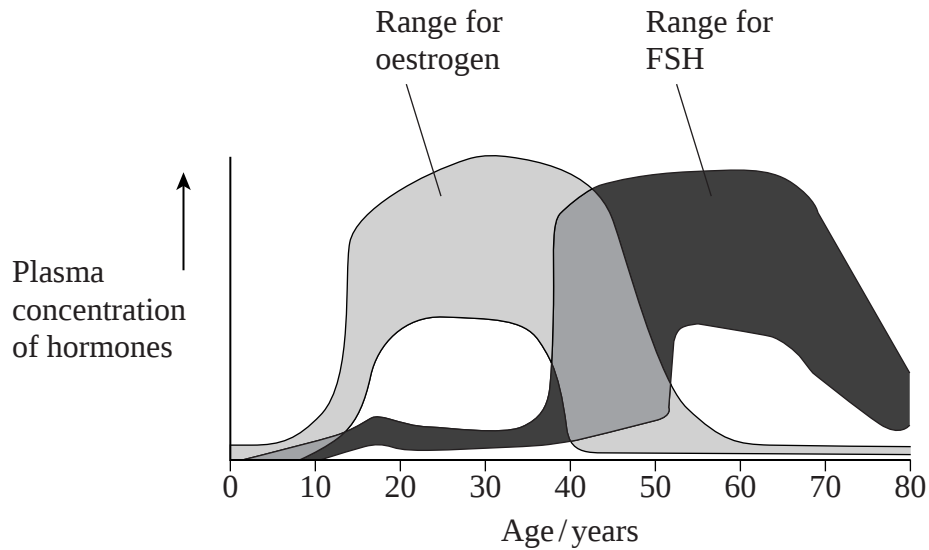
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(2 marks)

Turn over for the next question

- 2 The graph shows the range of plasma concentrations of FSH and oestrogen found in females of different ages.



- (a) Describe **two** changes in the body caused by the initial increase in oestrogen concentration shown on the graph.

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(1 mark)

- S (b) It is more useful to plot the mean plus and minus one standard deviation than to plot the range of concentrations. Explain why.

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(2 marks)

- (c) Use data from the graph to explain the change in FSH concentration between the ages of 37 and 50.

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(2 marks)

Turn over for the next question

3 An investigation of development used a longitudinal study.

(a) (i) What is a longitudinal study?

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 (1 mark)

(ii) Give **one** advantage and **one** disadvantage of a longitudinal study.

Advantage

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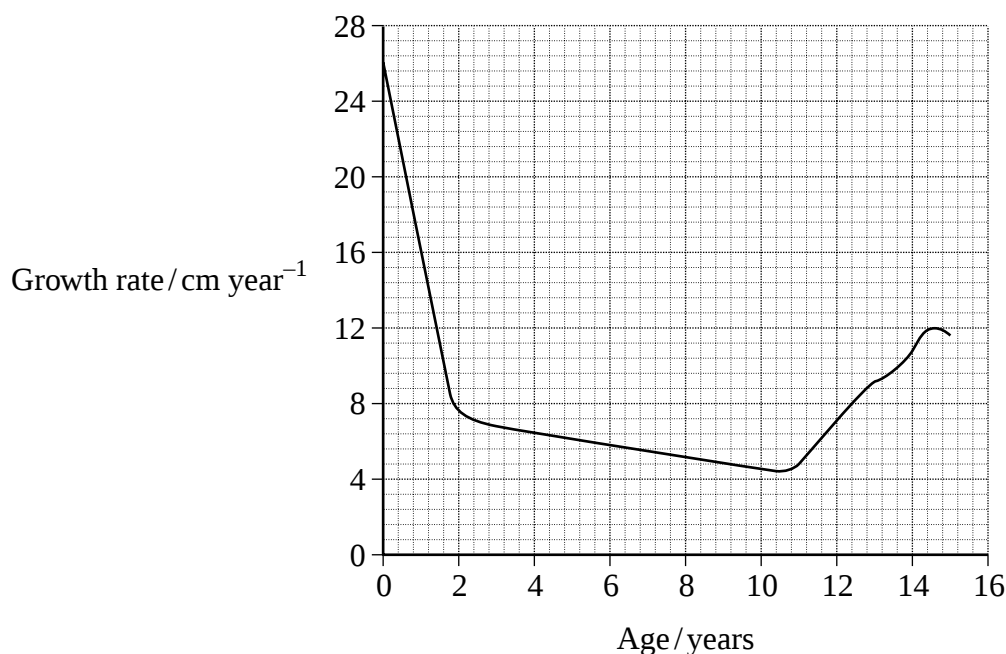
Disadvantage

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 (2 marks)

(b) Growth rate is defined as the increase in height each year.

Relative growth rate is defined as the increase in height over a year expressed as a fraction of the height at the start of the year.

The graph shows the changes in growth rate in a human male from birth to the age of fifteen.



(i) Identify two ages when the male's growth rate was 8 cm year^{-1} .

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(1 mark)

(ii) The relative growth rate is not the same at these two ages. Explain why.

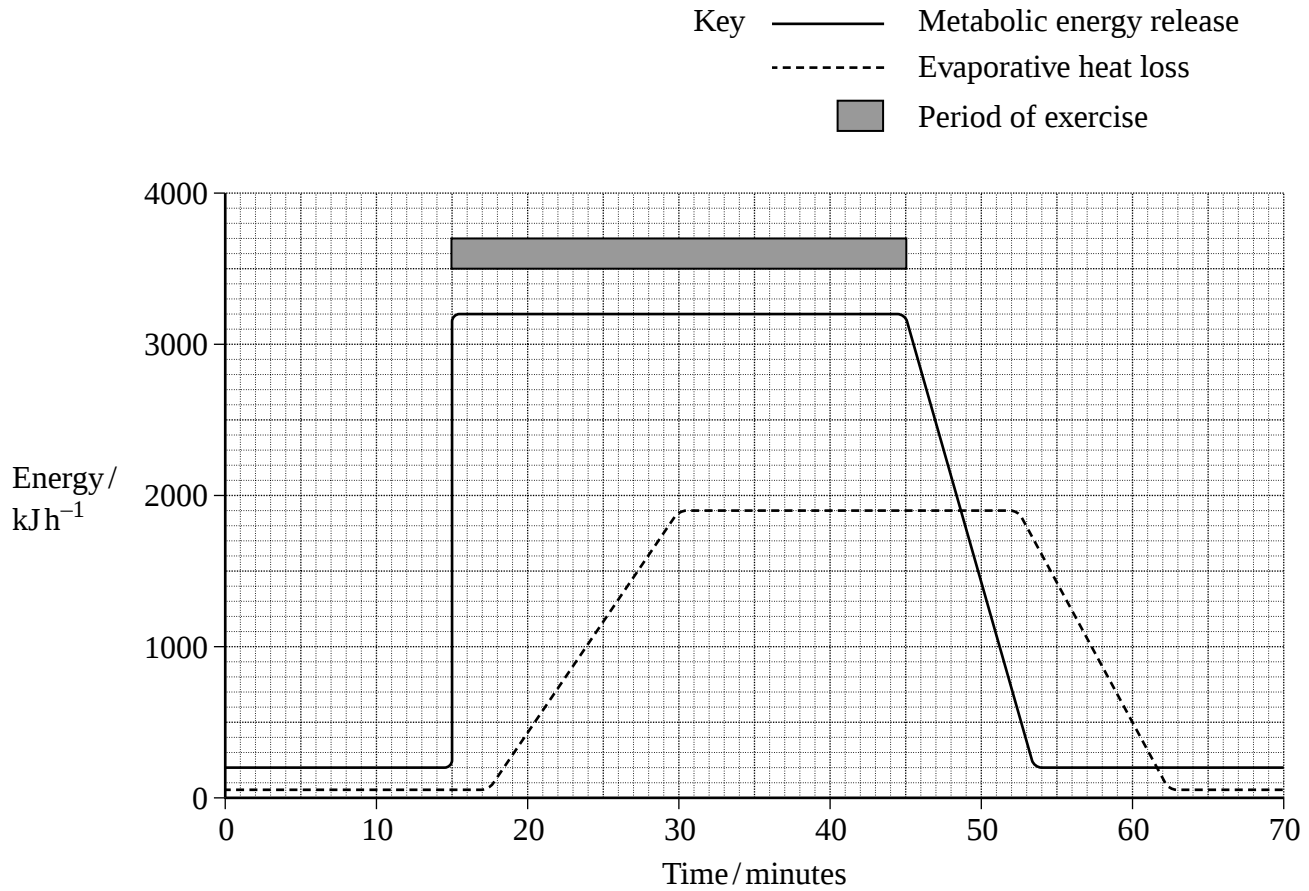
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(1 mark)

Turn over for the next question

- 4 The graph shows the changes in metabolic energy release and evaporative heat loss by a person during a period of exercise.



- (a) Calculate the total extra metabolic energy released during the period of exercise.
Show your working.

Total extra energy released during exercise kJ (1 mark)

- (b) (i) Explain what caused the change in evaporative heat loss between 17 and 30 minutes.

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(2 marks)

- (ii) Evaporative heat loss decreases only gradually after the period of exercise. Explain why.

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(1 mark)

Turn over for the next question

5 Basal metabolic rate (BMR) is a measure of the rate of energy expenditure under basal conditions.

(a) What is meant by basal conditions?

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 (1 mark)

(b) The table gives the basal metabolic rate of males and females at different ages.

Age / years	Basal metabolic rate	
	Males	Females
15	193.2	180.6
25	165.9	155.4
35	165.9	153.3
45	161.7	151.2
55	157.5	147.0
65	153.3	142.8

(i) The units for basal metabolic rate are not shown. Give suitable units.

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 (1 mark)

(ii) Calculate the percentage change in basal metabolic rate in males between the ages of 25 and 65. Show your working.

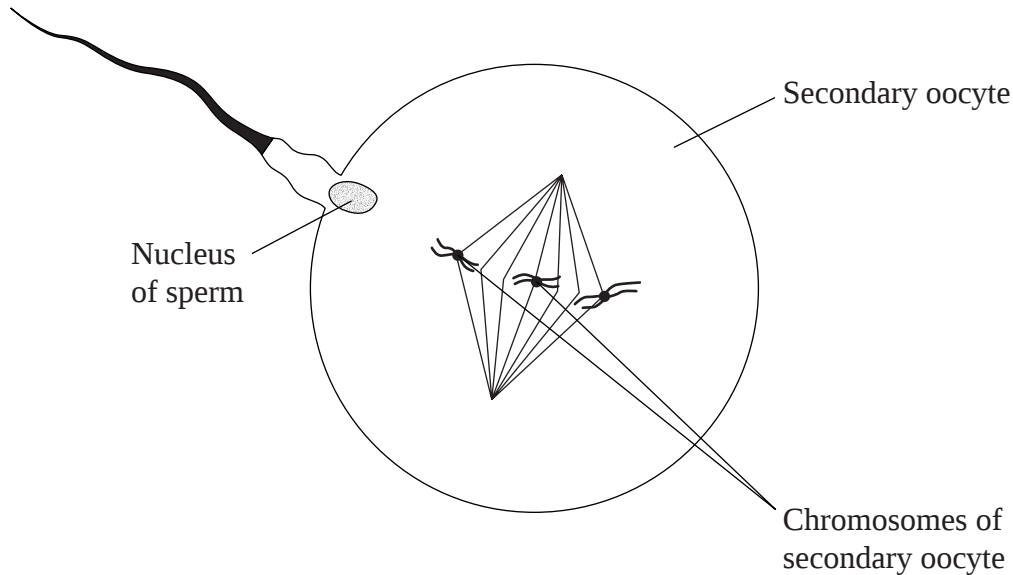
Answer (2 marks)

(iii) Describe **one** consequence of the change in basal metabolic rate calculated in part (ii).

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 (1 mark)

- 6 The diagram shows the nucleus of a sperm entering a human secondary oocyte. Only three of the 23 chromosomes in the oocyte are shown.



- S (a) Which stage or stages of meiosis must still occur to complete the formation of the nucleus of the ovum? Explain your answer.

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 (2 marks)

- (b) The zygote formed develops into a blastocyst. What is a blastocyst?

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 (2 marks)

- (c) In the early stages of pregnancy, hCG is found in the urine of the woman. Explain why this is an indicator of pregnancy.

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 (2 marks)

- 7 (a) Describe how an action potential is produced in a neurone.

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(4 marks)

- (b) Describe how an impulse is transmitted across an excitatory synapse.

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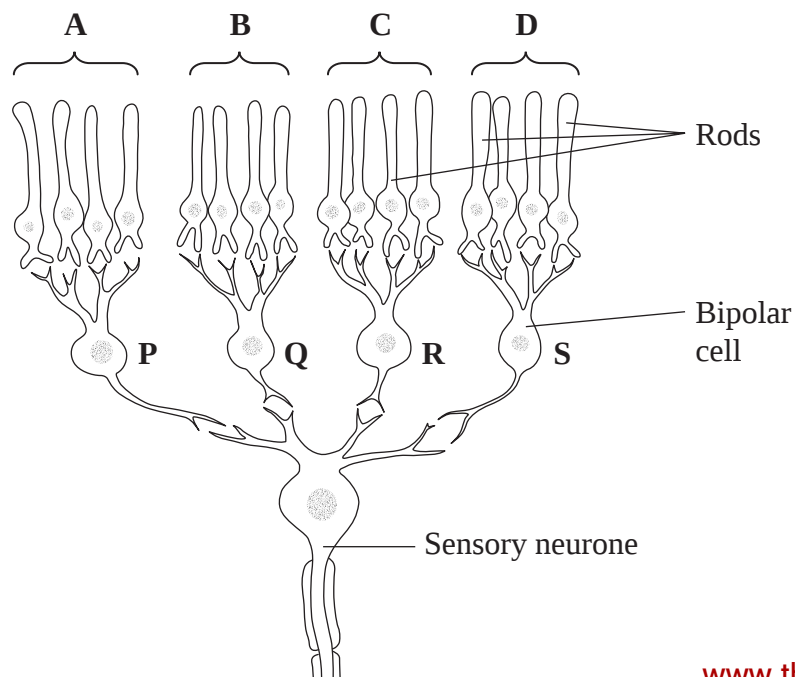
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(3 marks)

The diagram shows connections between cells in the retina.



(c) Explain how the connection of several rods to a single bipolar cell influences

(i) visual acuity,

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(ii) sensitivity.

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(4 marks)

(d) Different groups of rods were illuminated. The impulses produced in the bipolar cells and in the sensory neurone were recorded. The results are shown in the table.

	Experiment 1	Experiment 2	Experiment 3	Experiment 4
Group of rods illuminated	None	A and D	B and C	A, B, C and D
Bipolar cells in which impulses were generated	None	P and S	Q and R	P, Q, R and S
Frequency of impulses in sensory neurone	None	None	Frequent	Infrequent

Use your knowledge of inhibitory and excitatory synapses to explain the results obtained in **Experiment 4**.

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- 8 (a) **Table 1** shows the values of some plant-based foods as sources of several important components of a diet.

Key: ✓✓ good
 ✓ adequate
 ✗ poor

Table 1

Food	Energy	Protein	Dietary fibre	Vitamin A	Vitamin B _{complex}	Vitamin C	Iron	Calcium
Cereals	✓✓	✓✓	✓✓	✗	✓✓	✗	✓	✓✓
Legumes	✓✓	✓✓	✓✓	✗	✓✓	✗	✓	✓✓
Roots	✓✓	✓✓	✓	✗	✗	✗	✗	✗
Fruit & vegetables	✗	✗	✓✓	✓✓	✓✓	✓✓	✓✓	✓✓

- (i) Using examples from **Table 1**, explain why vegetarians should eat a range of different foods.

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(3 marks)

- (ii) Dietary fibre binds with mineral ions and may make the ions unavailable for absorption. Using information in the table, explain why female vegetarians may be at risk of becoming anaemic.

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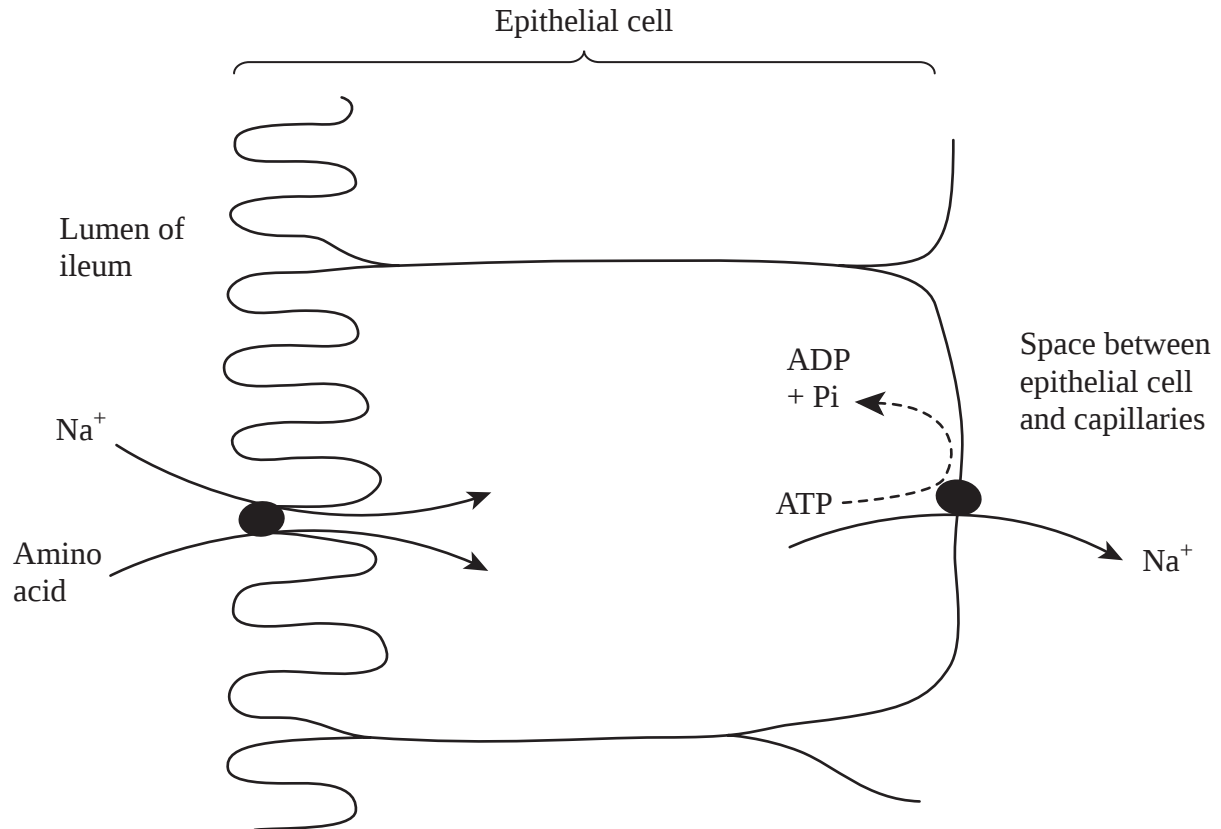
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- (b) In the small intestine, proteins are digested into amino acids, which are absorbed and used in the synthesis of human proteins.

The diagram shows how amino acids are absorbed from the ileum.



- S (i) The active transport of sodium ions out of the epithelial cell is important for the continued absorption of amino acids from the ileum. Explain why this active transport is important.

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(3 marks)

Question 8 continues on the next page

- (ii) Two proteins that are synthesised from absorbed amino acids are actin and myosin. Actin and myosin filaments are arranged differently in resting and contracted muscle.

Describe how actin and myosin are arranged in resting muscle.

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(3 marks)

- (c) **Table 2** shows the proportions of slow twitch and fast twitch fibres in the muscles of four different athletes.

Table 2

Athlete	Percentage of fibres	
	Slow twitch	Fast twitch
A	75	25
B	25	75
C	53	47
D	45	55

Which athlete is likely to be the best long distance runner?
Explain your answer.

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(3 marks)

- 9 S (a) Describe how amino acids are organised to form a molecule of a protein such as haemoglobin. Do **not** give details of protein synthesis in your answer.

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(5 marks)

- (b) Fetal haemoglobin has slightly different properties from adult haemoglobin. Describe how the dissociation curve of fetal oxyhaemoglobin is different from that of adult oxyhaemoglobin. Explain how this difference provides an adaptation to living in the uterus.

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(4 marks)

Question 9 continues on the next page

- S (c) As people exercise, their cardiac output increases. Explain how this is brought about.

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(4 marks)

- S (d) Some South American people live at high altitudes where the partial pressure of oxygen is less than it is at sea level. Many of these people have high concentrations of nitrous oxide in their blood plasma. Nitrous oxide stimulates the dilation of arterioles. Suggest the advantage of the high concentrations of nitrous oxide in the blood.

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(2 marks)

END OF QUESTIONS

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