

Centre No.						Paper Reference					Surname	Initial(s)	
Candidate No.						6	1	0	4	/	0	3	Signature

Paper Reference(s)

6104/03

Edexcel GCE

Biology

Biology (Human)

Advanced

Unit 4C Core and Option

Human Health and Fitness

Tuesday 20 June 2006 – Morning

Time: 1 hour 30 minutes

Examiner's use only

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Team Leader's use only

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Question Number	Leave Blank
1	
2	
3	
4	
5	
Paper 31 Total	
6	
7	
8	
9	
Paper 32 Total	
Total	

Materials required for examination

Ruler

Items included with question papers

Nil

Instructions to Candidates

In the boxes above, write your centre number, candidate number, your surname, initial(s) and signature.

The paper reference is shown above. Check that you have the correct question paper.

Answer ALL questions in the spaces provided in this booklet.

Show all the steps in any calculations and state the units. Calculators may be used.

Include diagrams in your answers where these are helpful.

Information for Candidates

The marks for the individual questions and parts of questions are shown in round brackets: e.g. (2).

The total mark for this question paper is 70.

Advice to Candidates

You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, taking into account your use of grammar, punctuation and spelling.

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Answer ALL questions in the spaces provided.

1. Phytochromes are pigments found in plants. One form of phytochrome is known as P_{FR} (or P₇₃₀).

(a) Name **one** place in a plant where P_{FR} is found.

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(1)

(b) State the effect that the following conditions have on P_{FR}.

Darkness

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Exposure to far red light

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(2)

(c) Describe how the effects of exposure of P_{FR} to darkness could be reversed.

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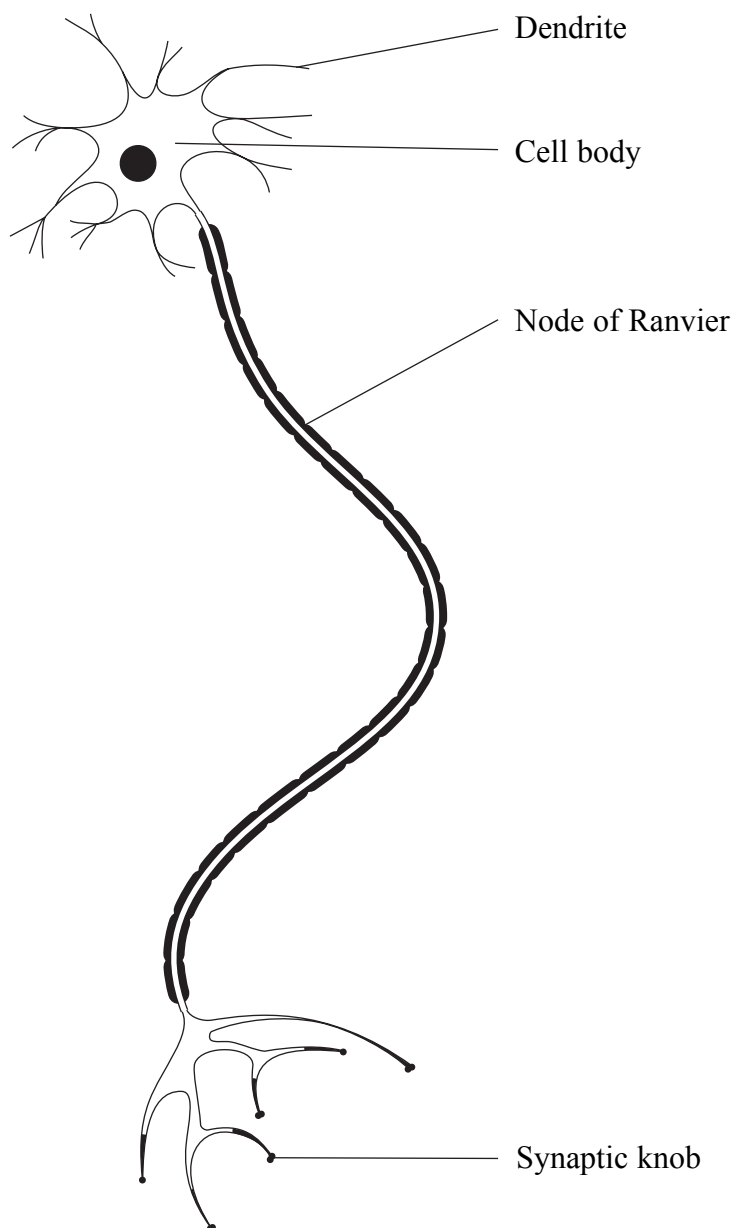
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(Total 4 marks)

Q1



2. The diagram below shows one type of mammalian neurone.



(a) (i) Name the type and state the role of the neurone shown in the diagram.

Type:

Role:

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(2)

(ii) Draw an arrow on the diagram to show the direction in which an impulse would travel.

(1)



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(b) State precisely where in the central nervous system the cell body of this type of neurone is found and explain the importance of the dendrites.

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(2)

(c) Describe the node of Ranvier and explain its importance in the neurone.

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(3)

Q2

(Total 8 marks)



3. In non-diabetic individuals, the pancreas secretes hormones which maintain the blood glucose concentration within narrow limits.

The table below shows the changes in blood glucose concentrations of non-diabetic and diabetic men over a sixty-minute period, after eating a glucose-rich meal.

Time after meal / min	Mean blood glucose concentration / mmol dm ⁻³	
	Non-diabetic men	Diabetic men
0	5.5	11.9
30	7.3	16.4
60	4.9	17.7

- (a) Compare the changes in mean blood glucose concentrations of the non-diabetic and the diabetic men over the sixty-minute period.

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(3)

- (b) (i) One possible cause of diabetes is insufficient insulin production. What evidence is there in the table to support this idea?

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(2)



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(ii) Suggest why it is important for the blood glucose concentration to be maintained within narrow limits.

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(2)

(c) After a further sixty minutes, without any additional glucose intake, the mean blood glucose concentration of the non-diabetic men was 5.5 mmol dm^{-3} .

Explain how this change in concentration occurred.

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(3)

Q3

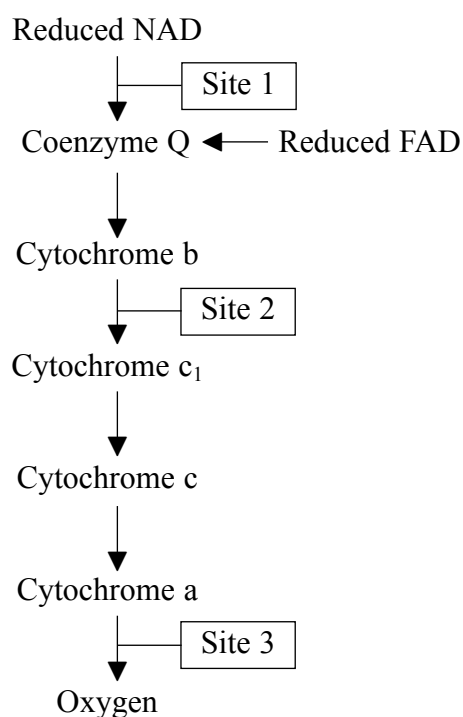
(Total 10 marks)

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4. In oxidative phosphorylation, ATP is formed when electrons pass down the electron transport chain from one component to the next. ATP is synthesised at three sites.

The order of some components in the electron transport chain and the three sites of ATP synthesis are shown in the diagram below.



- (a) The oxidation of one molecule of reduced NAD ($\text{NADH} + \text{H}^+$) yields three molecules of ATP.

Using the information given in the diagram above and your knowledge of mitochondria and oxidative phosphorylation, explain how the three molecules of ATP are made.

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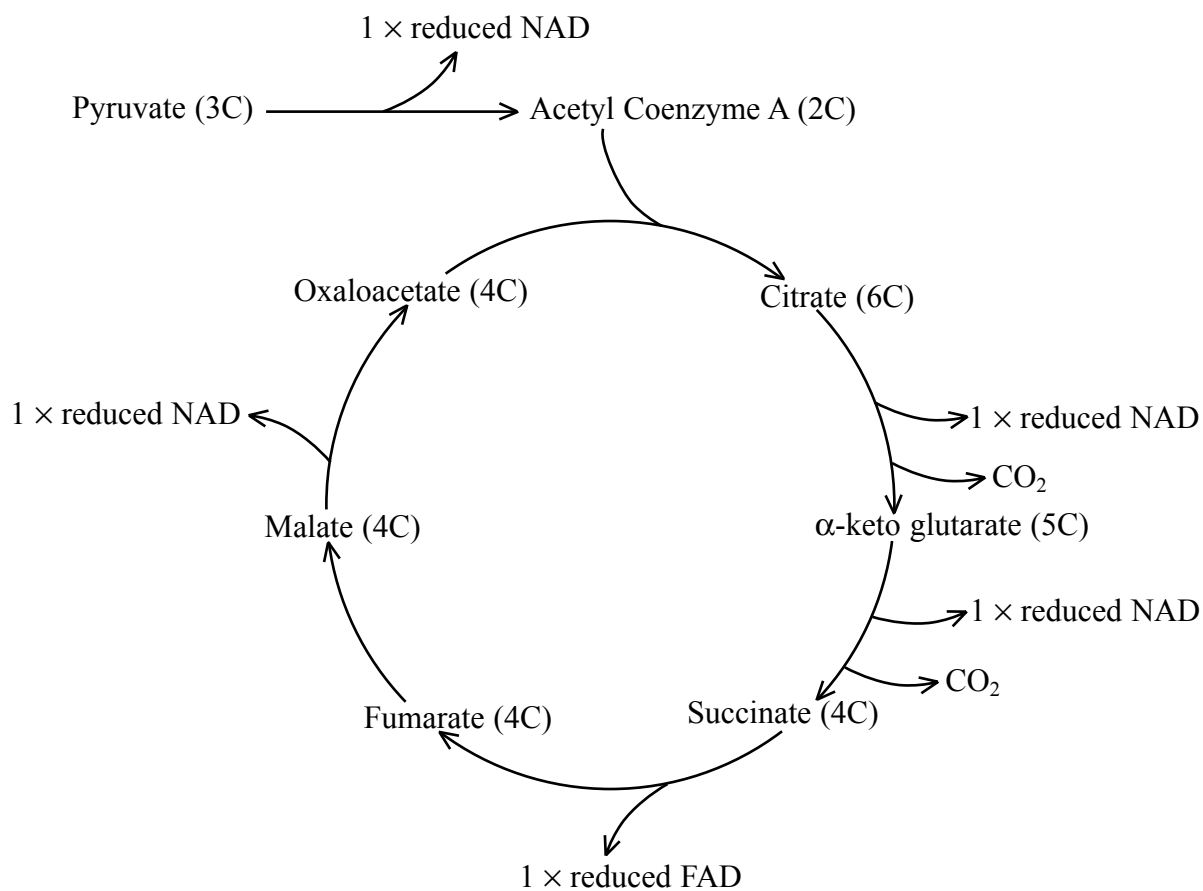
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(4)



(b) The diagram below shows some of the stages that occur in the Krebs cycle.



Using the information given in both diagrams, explain why the oxidation of one molecule of succinate to oxaloacetate yields only five molecules of ATP.

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(3)

(c) State where in the cell the following processes take place.

Glycolysis

Conversion of pyruvate to acetyl coenzyme A

Krebs cycle

(3)

(Total 10 marks)

Q4

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Ruled area for writing, consisting of 24 horizontal dotted lines.

(Total 8 marks)

Q5



N 2 2 1 9 5 A 0 1 1 2 0

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Option C: Human health and fitness

6. Distinguish between each of the following.

(a) Cardiac muscle and striated (skeletal) muscle.

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(3)

(b) Myoglobin and haemoglobin.

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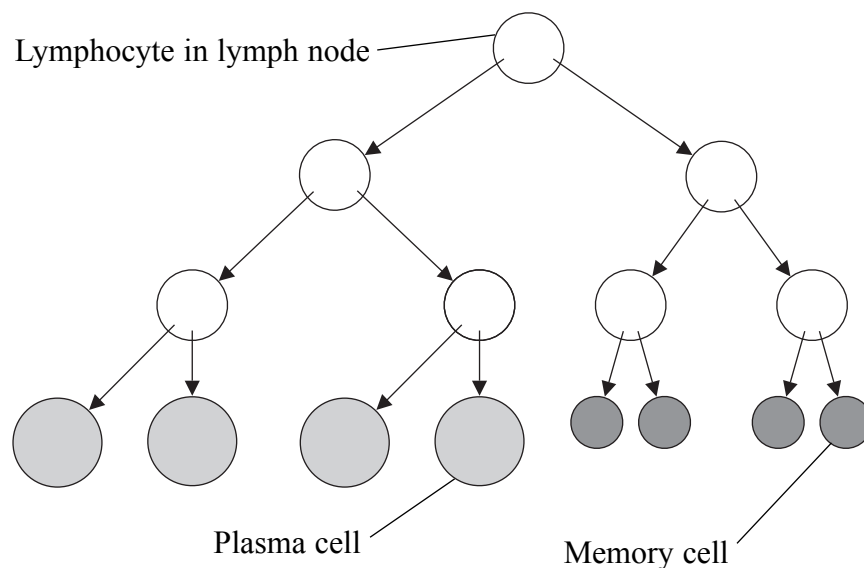
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Q6

(Total 6 marks)



7. The diagram below shows how a lymphocyte in a lymph node divides and differentiates to form plasma cells and memory cells.



(a) (i) Name the type of lymphocyte shown in the diagram.

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(1)

(ii) Name the type of division shown in the diagram.

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(1)

(iii) State the function of each of the following.

Plasma cells

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Memory cells

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(2)



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(b) Some types of white blood cells carry out phagocytosis. Describe the process of phagocytosis.

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(3)

(Total 7 marks)

Q7



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8. (a) The table below shows the relationship between ventilation (minute volume) and oxygen uptake by a person.

Minute volume / $\text{dm}^3 \text{min}^{-1}$	Uptake of oxygen / $\text{dm}^3 \text{min}^{-1}$
10 (Resting)	0.40
20	1.10
30	1.70
40	2.05
50	2.30
60	2.50
70	2.50
80	2.50

- (i) Using information from the table, describe how oxygen uptake changes as the minute volume increases.

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(3)

- (ii) Calculate the percentage increase in oxygen uptake when the minute volume rises from $10 \text{ dm}^3 \text{min}^{-1}$ to $60 \text{ dm}^3 \text{min}^{-1}$. Show your working.

Answer %

(3)



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(b) The uptake of oxygen into the blood is improved as a result of the changes in the cardiovascular system brought about by a training programme.
Describe and explain how these changes increase the oxygen uptake into the blood.

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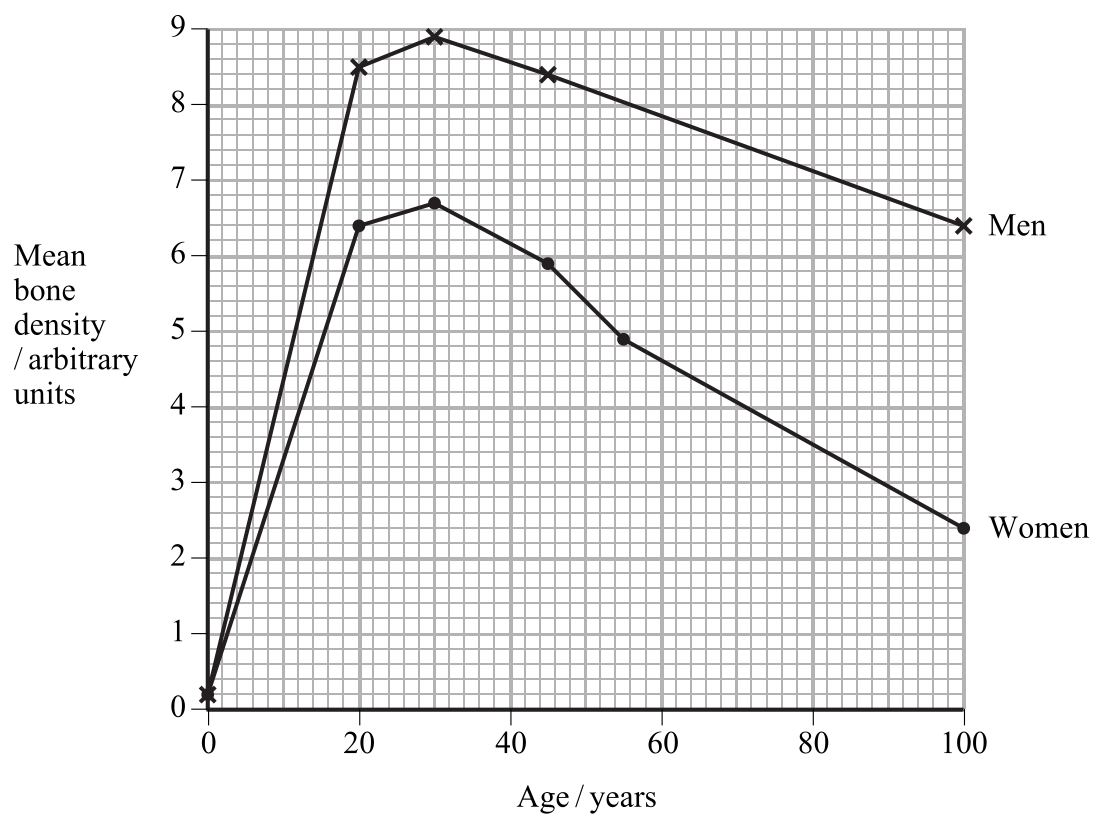
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(Total 9 marks)

Q8



9. The graph below shows the relationship between the mean bone density and age, for men and women.



(a) Compare the changes in the mean bone density of men and women after the age of 20.

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(3)



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(b) If the mean bone density decreases below 4 arbitrary units the risk of fractures increases.

(i) Name the bone disorder in which there is an increased risk of fractures.

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(1)

(ii) Using information from the graph, suggest reasons why this disorder is more common in older women than in older men.

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(3)

(iii) State **one** way in which a person could reduce the risk of developing this disorder.

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(1)

(Total 8 marks)

Q9

TOTAL FOR PAPER: 70 MARKS

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