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 19 June 2007 – Morning

Time: 1 hour 30 minutes

Examiner's use only

Team Leader's use only

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 NINE 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. The table below refers to three major stages of aerobic respiration and the products of each stage.

Complete the table by inserting the part of the cell in which the stage occurs and two products in the blank spaces.

Stage	Part of cell in which it occurs	Two products
Glycolysis		
Krebs cycle	Matrix of mitochondrion	
Electron transport chain		ATP and water

(Total 4 marks)

Q1

2. (a) The mammalian hormones, glucagon and follicle-stimulating hormone (FSH), both exert their effects on cells by binding to a receptor molecule on the cell surface membrane and stimulating an enzyme called adenyl cyclase.

Glucagon and FSH have different target organs. The cells of the target organs will only respond to the hormones if they have specific receptors on their surface membranes.

(i) Name **one** organ in the body of a mammal in which the cells have glucagon receptors.

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(ii) Name **one** organ in the body of a mammal in which the cells have FSH receptors.

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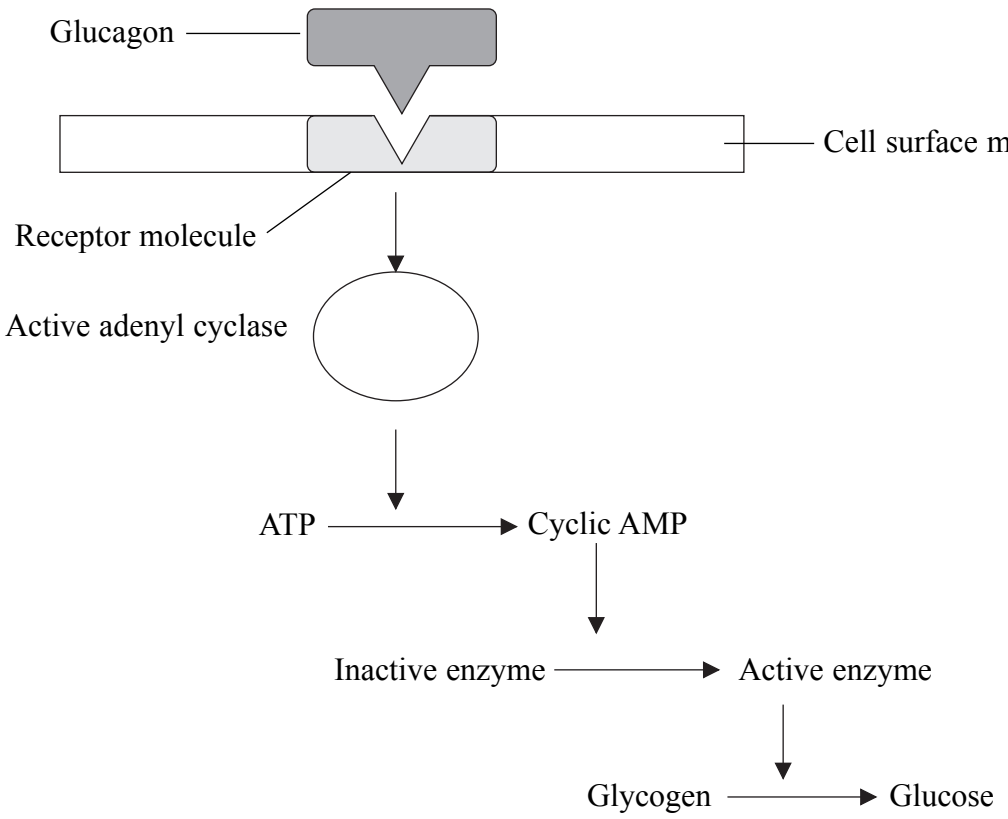
(2)

Leave blank

(b) The diagram below shows the action of glucagon when it combines with its target cell.



Use the diagram to explain how one molecule of glucagon can cause a relatively large increase in the concentration of glucose in the blood plasma.

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(3) **Q2**

(Total 5 marks)

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3. (a) Distinguish between the terms **anabolism** and **catabolism**. Give an example of each.

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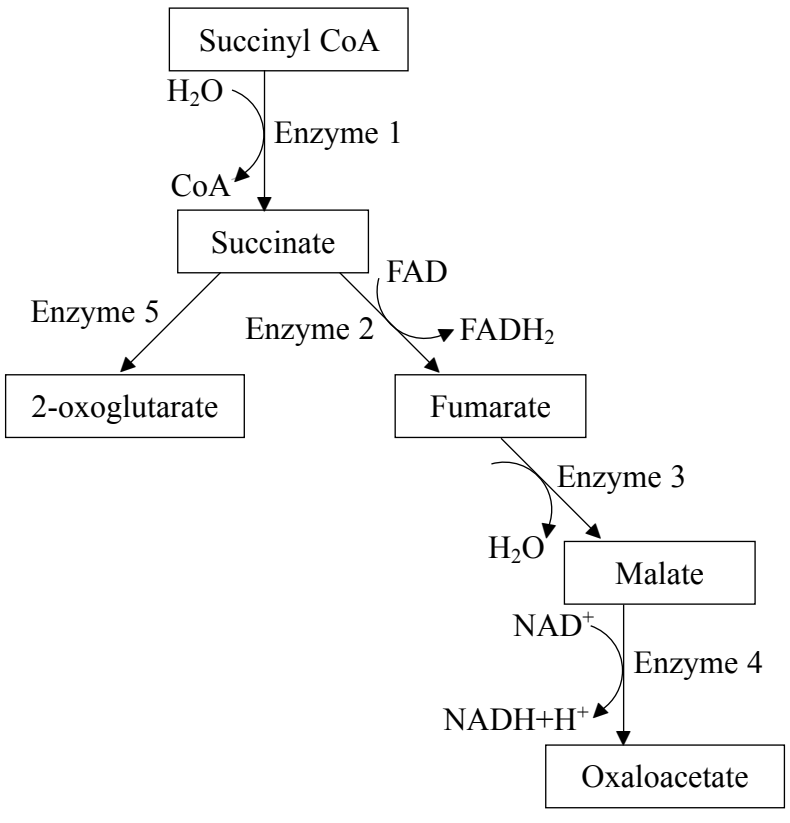
(3)

(b) The diagram below shows part of a metabolic pathway. Each reaction in the pathway is catalysed by a different enzyme. The enzymes have been numbered 1 to 5.



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(i) Enzyme 4 is a type of enzyme called an oxidoreductase. State the evidence shown in the pathway that supports this statement.

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(2)

(ii) Which enzyme in this metabolic pathway is a hydrolase?

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(1)

(iii) A high concentration of oxaloacetate inhibits enzyme 2. This enzyme catalyses the conversion of succinate into fumarate. Describe and explain the effects of a high concentration of oxaloacetate on this metabolic pathway.

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(4)

Q3

(Total 10 marks)

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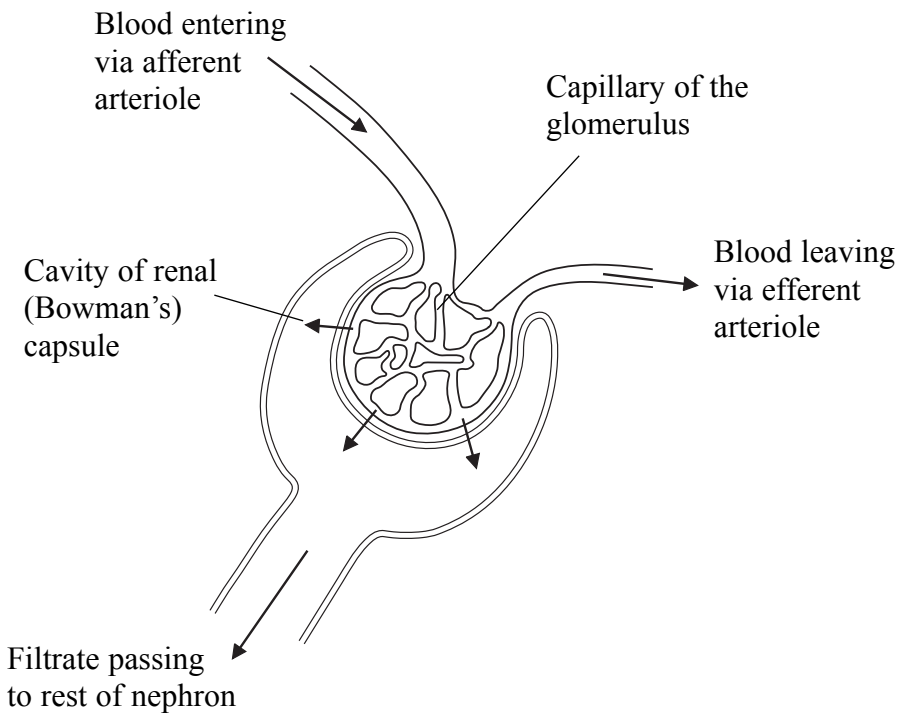
4. The diagram below shows part of a nephron from a mammalian kidney.



Atrial natriuretic factor (ANF) is a hormone that increases the diameter of the afferent arteriole and decreases the diameter of the efferent arteriole.

(a) Describe and explain the effects that this hormone will have on the rate of ultrafiltration.

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(2)

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(b) Urea is present in urine. Describe how urea is produced.

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(3)

(c) A student measured the volume of urine that she produced on two different days. The concentration of urea in the urine on each day was determined. The results are shown in the table below.

Day	Volume of urine produced / dm^3	Concentration of urea / g dm^{-3}
1	1.2	15
2	1.8	8

(i) Calculate the percentage change in the concentration of urea between day 1 and day 2. Show your working.

Answer .....%

(3)

Leave blank

(ii) Suggest **two** possible reasons why the concentration of urea in the urine was lower on day 2. For each reason, explain why there would be a decrease in the concentration of urea in the urine.

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(3)

Q4

(Total 11 marks)

Leave blank

5. Give an account of how a nerve impulse is generated in a post-synaptic neurone following the release of a neurotransmitter.

Leave blank

Q5

(Total 10 marks)

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Option C: Human Health and Fitness

6. (a) Describe how the disease **tuberculosis** (TB) is caused.

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(3)

(b) Describe how **atherosclerosis** is caused.

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(3) **Q6**

(Total 6 marks)

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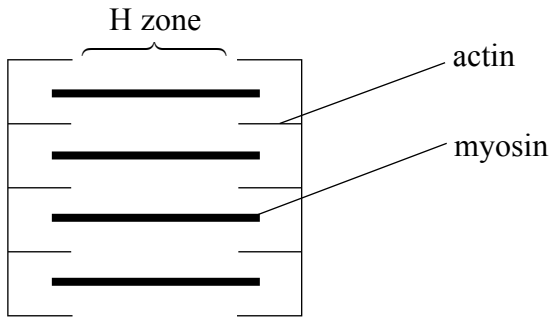
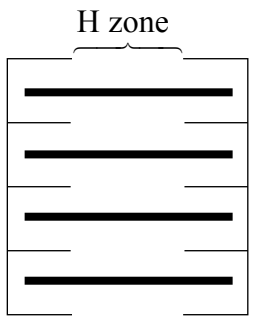
7. The diagrams below show one sarcomere in its fully relaxed state and when it is partially contracted.



Fully relaxed sarcomere



Partially contracted sarcomere

(a) Calculate the percentage change in width of the H zone when the sarcomere is partially contracted. Show your working.

Answer ..... %

(3)

Leave blank

(b) During the contraction of this sarcomere, the myosin filaments pull the actin filaments towards the centre of the sarcomere. Explain how this is brought about.

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(4)

Q7

(Total 7 marks)

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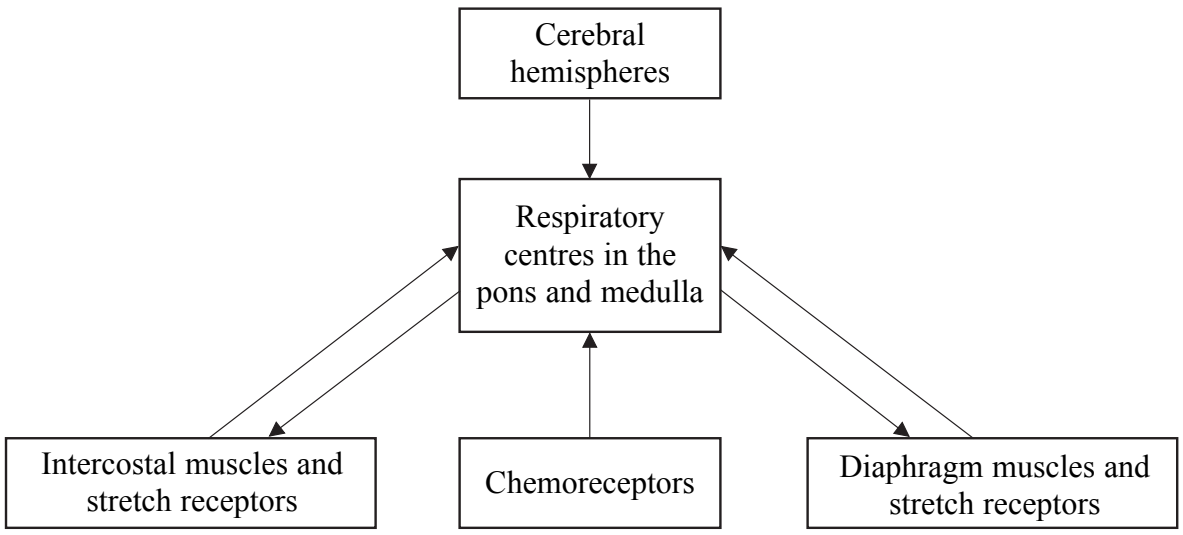
8. The diagram below shows the ways in which the respiratory system and different parts of the brain interact with each other to regulate breathing.



(a) Breathing can be controlled voluntarily and involuntarily. Name the part of the brain that controls **involuntary** breathing.

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(1)

(b) Suggest **one** occasion when the depth of breathing is increased voluntarily.

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(1)

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(c) Using the information in the diagram, explain the roles of **muscle spindles** and **nerves** in the control of breathing during exercise.

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(3)

(d) The ventilation of the lungs during breathing is essential in maintaining the concentration gradients of the respiratory gases. This ensures that gas exchange is efficient. Explain why the **chemoreceptors** are particularly important during exercise.

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(2)

Q8

(Total 7 marks)

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9. (a) Describe the structure of **compact bone**.

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(4)

(b) The graph opposite shows the effect that regular exercise has on the mean bone mass density of a group of teenagers of similar age. Each group of teenagers performed the same exercise for different lengths of time. There were ten teenagers in each group.

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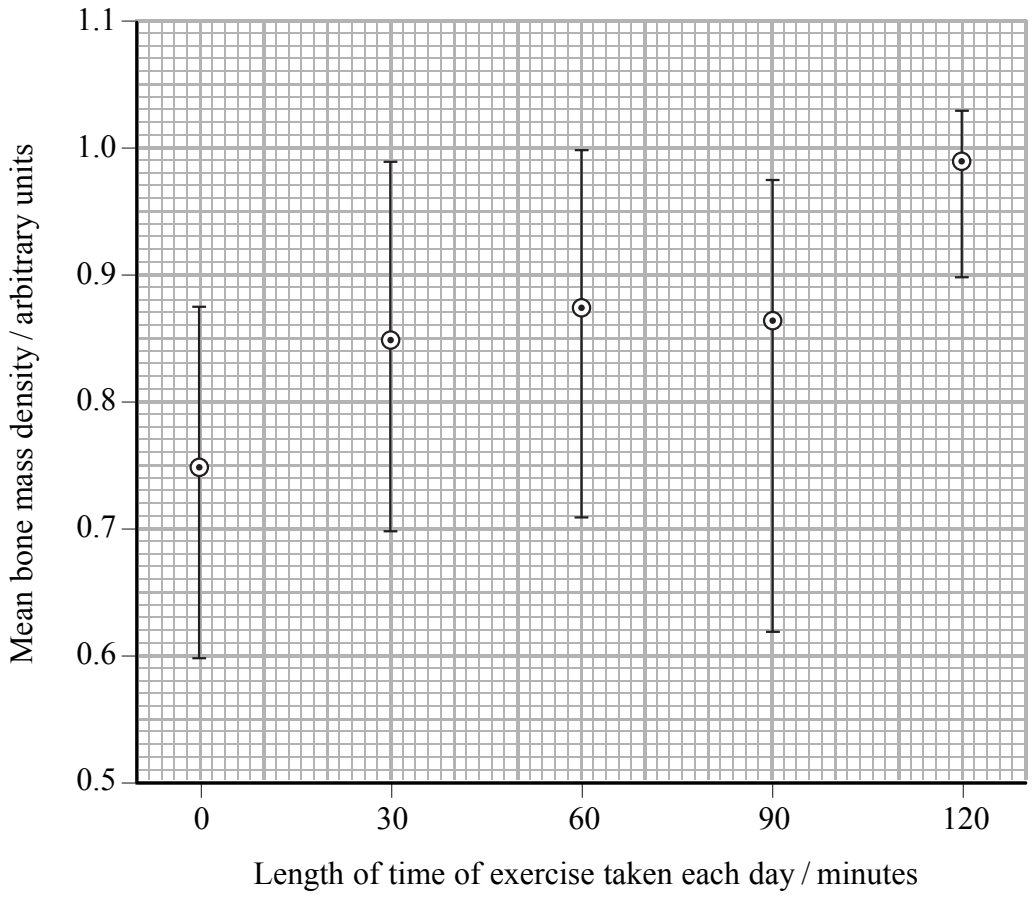

⊙ Mean bone mass density

I Range of individual bone mass densities in each group

(i) Describe the relationship between the length of exercise taken each day and mean bone mass density.

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(3)

QUESTION 9 CONTINUES ON PAGE 21

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(ii) Suggest why there is a variation in the bone mass density of the individuals in each group of teenagers.

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(2)

(iii) Suggest why the range of values for the individuals who exercised for 120 minutes each day was less than the range of values for those individuals who took no exercise each day.

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(1)

Q9

(Total 10 marks)

TOTAL FOR PAPER: 70 MARKS

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