Centre No.						Paper Reference (complete below)							Surname	Initial(s)
Candidate No.										/			Signature	

1

Examiner's use only

Team Leader's use only

Paper Reference(s)

6104/03

Edexcel GCE

Biology

Biology (Human)

Advanced

Unit Test 4C Core and Option
Human Health and Fitness

Thursday 22 January 2004 – Morning

Time: 1 hour 30 minutes

Materials required for examination
Ruler

Items included with question papers
Nil

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

Instructions to Candidates

In the boxes above, write your centre number, candidate number, the paper reference, your signature, surname and initials. The paper reference is shown above.
Check that you have the booklet for the correct unit and option.
Answer ALL NINE questions in the spaces provided in this booklet.
Your answer to Question 5 should be written on the lined pages. If you need to use additional answer sheets, attach them loosely but securely inside 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 account of your use of grammar, punctuation and spelling.

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Edexcel
Success through qualifications

Answer ALL questions in the spaces provided

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1. In mammals, periods of starvation or physical exercise result in a decrease in the blood glucose concentration.

(a) Name the organ which detects a fall in the blood glucose concentration.

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(1)

(b) Name the hormone that is secreted in response to a fall in the blood glucose concentration.

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(1)

(c) Describe how the secretion of this hormone results in an increase in the blood glucose concentration.

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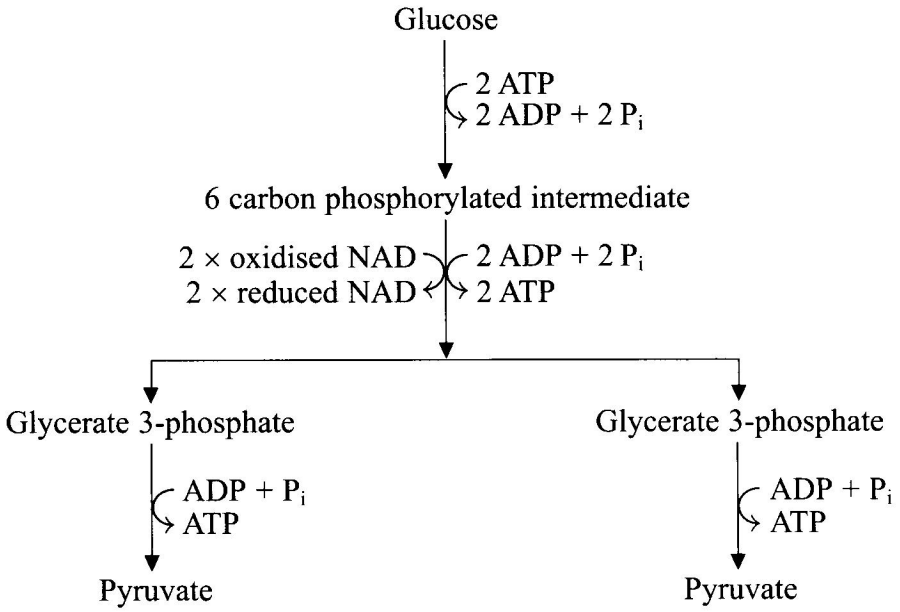
(3)

Q1

(Total 5 marks)

2. The flow chart below illustrates some of the stages that occur in glycolysis.

Leave blank



(a) State the net gain in ATP from one molecule of glucose in glycolysis.

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(1)

(b) Explain why the yield of ATP from the respiration of one molecule of glucose when oxygen is present is more than the yield of ATP from the respiration of one molecule of glucose under anaerobic conditions.

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(5)

Q2

(Total 6 marks)

3. The diagram below represents a section through the human retina.

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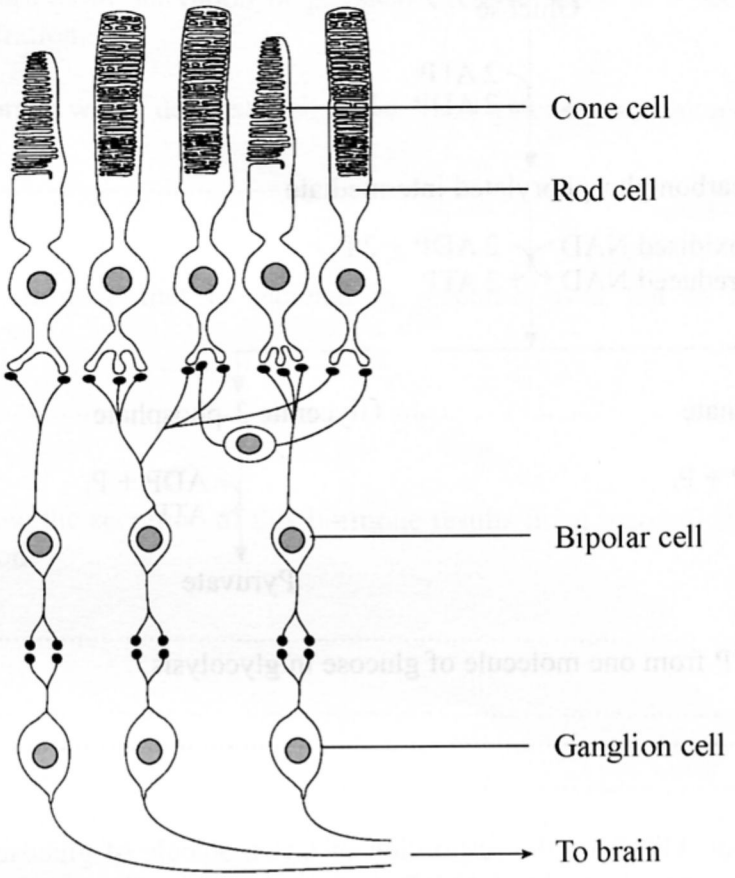

(a) Name the retinal pigment found in a rod cell.

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(1)

(b) Explain how the pigment in rod cells is involved in the conversion of light energy into nerve impulses.

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(4)

(c) Using the information in the diagram, suggest why stimulation of cone cells results in a more detailed image than stimulation of rod cells.

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(3)

(d) The eye of a species of moth contains three different pigments. The table below shows the wavelengths and colours of light which are most strongly absorbed by these pigments.

Pigment	Wavelength most strongly absorbed/nm
A	350 (ultraviolet)
B	440 (violet)
C	525 (green)

Using information in the table, and your knowledge of the retinal pigments in the human eye, compare the sensitivity to colour of the moth's eye with that of the human eye.

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(3)

Q3

(Total 11 marks)

4. The diagram below represents a kidney tubule (nephron).

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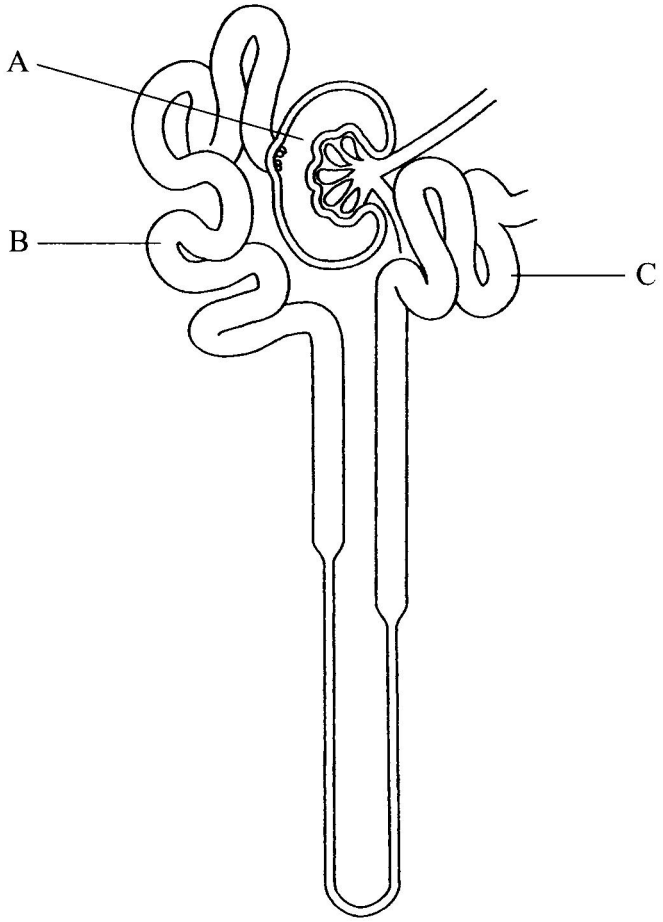


(a) Name the regions labelled A, B and C.

A .....

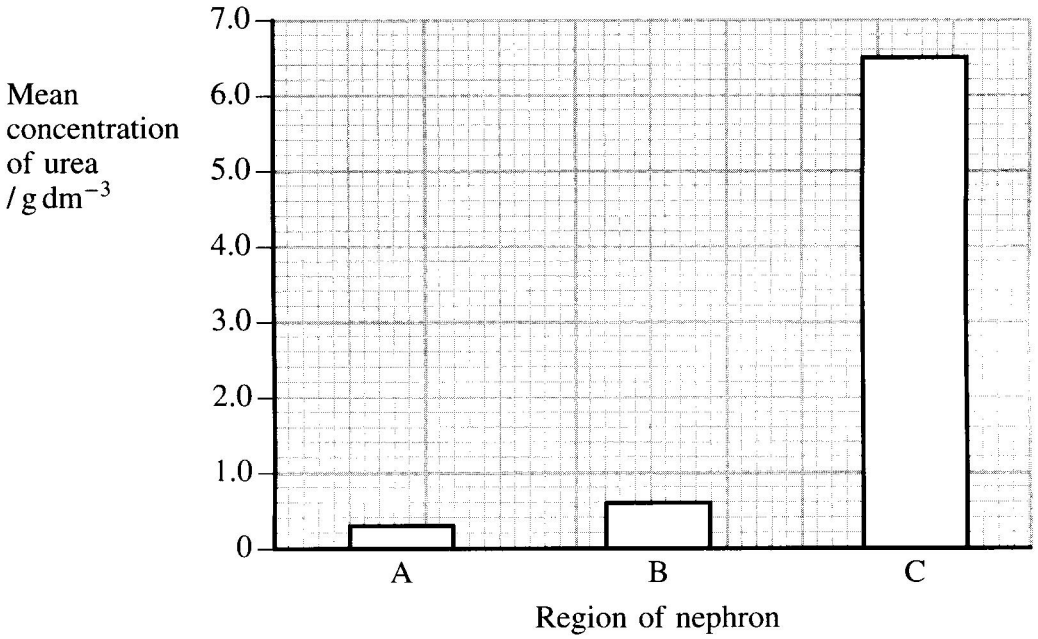
B .....

C .....

(1)

(b) In an investigation on a person eating a balanced diet, the concentration of urea over a 24 hour period was measured in the nephron regions A, B and C. The mean values of the urea concentrations are shown in the graph below.

Leave blank



Explain how the change in urea concentration between parts A and B of the nephron is brought about.

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(2)

(c) Although the urea concentration in regions A and B remained relatively constant throughout the time period, the concentration in region C varied between 6 and 7 g dm^{-3}. Suggest an explanation for this variation.

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(3)

(d) In a similar investigation, the person ate high protein meals during the 24 hour period. The urea concentration in region A of the nephron was found to have increased from 0.30 to 0.38 g dm^{-3}.

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Give an explanation for the increase in urea concentration.

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(4)

Q4

(Total 10 marks)

Leave blank

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Give an account of the sequence of events by which the arrival of an action potential at a synapse results in an action potential in the post-synaptic neurone.

Leave blank

Leave blank

Q5

(Total 8 marks)

Option C: Human health and fitness

Leave blank

6. Explain what is meant by each of the following terms.

(a) Cardiac output

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(2)

(b) Muscle spindle

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(2)

(c) Anaerobic conditioning

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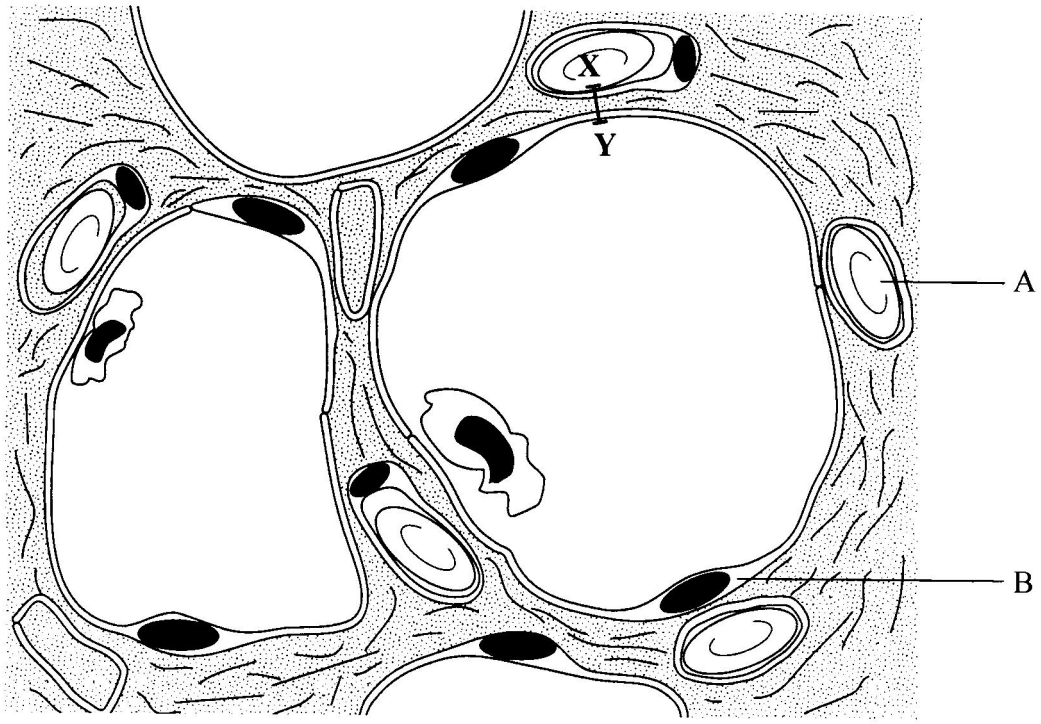
(2)

Q6

(Total 6 marks)

7. The diagram below represents a section through part of a human lung.



(a) Name the cells labelled A and B.

A .....

B .....

(2)

(b) Circle the most appropriate measurement from the three given below to represent the distance between X and Y on the diagram.

0.5 mm 0.5 μm 0.5 nm

(1)

(c) State the cause and explain the effects of pneumoconiosis.

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(3)

(Total 6 marks)

Q7

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8. The trace on the diagram below shows the tidal volume of a man of average fitness at rest.

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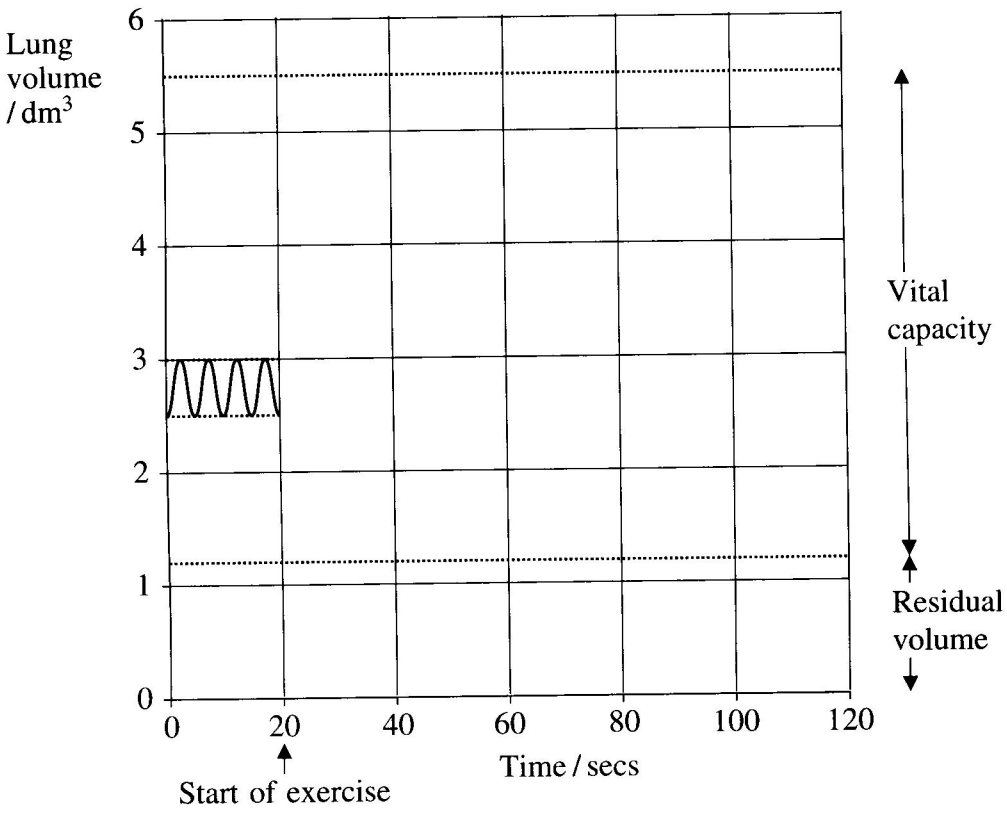

(a) Calculate the minute volume (V_E). Show your working.

Answer .....

(2)

(b) The man began to run on a treadmill at 20 seconds and continued running for the next 100 seconds.

Continue the trace on the diagram to the end of the time scale to show the changes in the tidal volume while the man was exercising.

(2)

(c) Explain the meaning of the term **residual volume**.

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(1)

(d) Describe and explain the effect of training on ventilation efficiency.

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(2)

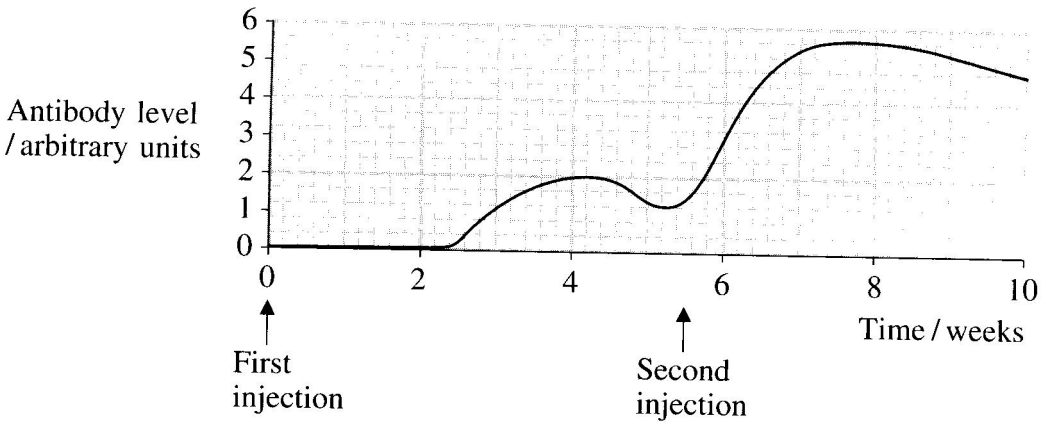
Q8

(Total 7 marks)

9. Children are vaccinated against a number of diseases. A vaccine contains disease-causing organisms which have been made harmless but which act as antigens. In order to achieve full protection, it is often necessary to give two injections of a vaccine.

Leave blank

The graph below shows the change in the level of antibodies in the body following two injections of a vaccine against a disease.



(a) (i) Compare the changes in the level of antibodies in the body following the first and second injections of the vaccine.

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(3)

(ii) Explain how vaccination can bring about an increase in the level of antibodies.

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(3)

(b) Explain how passive immunity differs from active immunity.

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(3)

(c) Antibodies are just one of the many types of protein found in blood plasma. The table below shows the protein content of lymph, tissue fluid and blood plasma.

	Protein content/g dm^{-3}
Lymph	26
Tissue fluid	19
Blood plasma	69

Compare the protein content of lymph with that of tissue fluid and blood plasma and suggest a reason for the differences.

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(2)

Q9

(Total 11 marks)

TOTAL FOR PAPER: 70 MARKS

END