

Answer ALL questions in the spaces provided.

1. The table below refers to some regions of the brain and their functions. Complete the table by inserting the correct word or words.

Region of brain	One function
Medulla	
	Learning and memory
	Control of balance and fine movement
Hypothalamus	

(Total 4 marks)

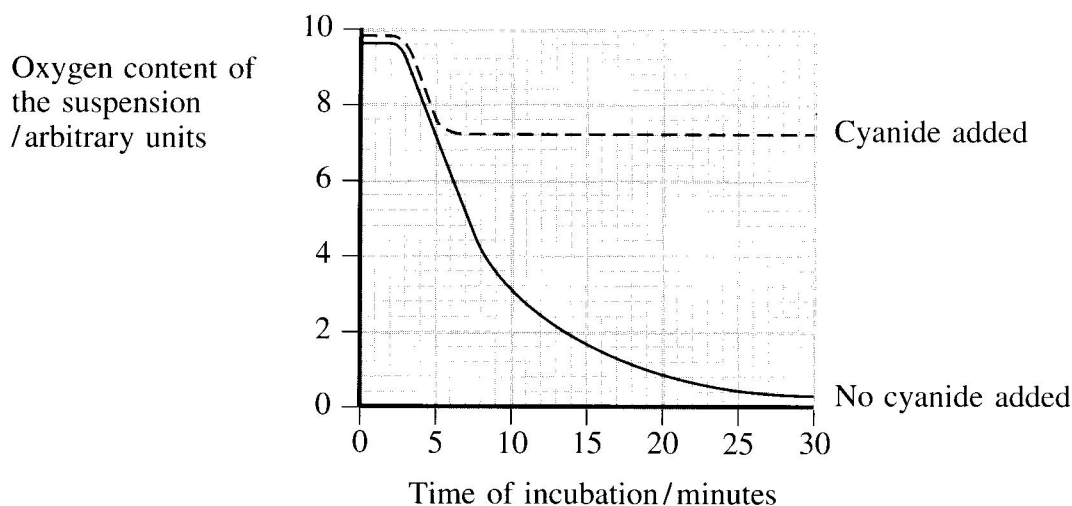
Q1

2. An investigation was carried out into the effect of cyanide on the respiration of yeast cells. Cyanide is an electron transport inhibitor. It binds irreversibly with one of the electron carriers.

The yeast cells were mixed with a buffer solution which had ADP, phosphate ions and glucose dissolved in it. This suspension was incubated for 30 minutes and during this time the oxygen content of the solution was monitored using an oxygen probe.

The experiment was then repeated but cyanide was added to the suspension after 5 minutes of incubation.

The results obtained are shown in the graph below.



- (a) State precisely where the electron transport chain is found.

..... (1)

- (b) Explain why the oxygen content of the suspension did not change after the cyanide was added.

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 (2)

(c) Suggest why the oxygen content of the suspension of cells without cyanide did not reach zero.

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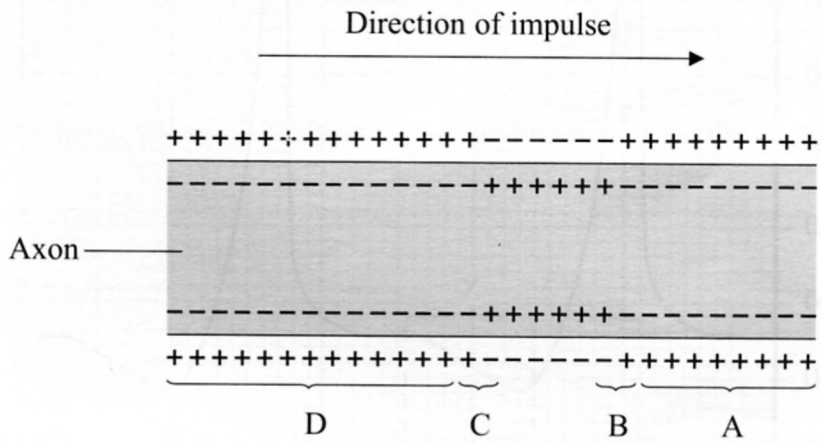
(2)

Q2

(Total 5 marks)

3. Neurones transmit electrical impulses along their cell surface membranes when stimulated to do so. These impulses are called action potentials and involve changes in the electrical potential across the membranes due to movement of positive ions.

The diagram below shows the distribution of charge inside and outside an unmyelinated axon as an impulse passes along.



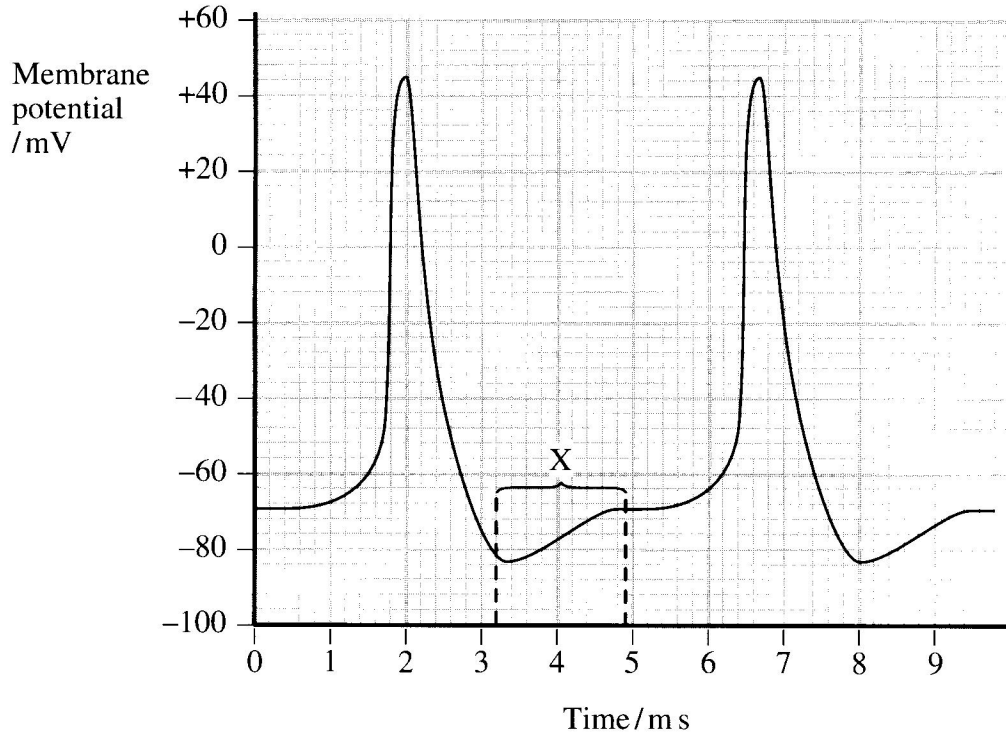
(a) Use the most suitable term from the list below to describe the state of the axon in regions B, C and D. Region A has been done for you.

- Depolarising
- Resting
- Repolarising

- A Resting
- B
- C
- D

(2)

(b) The diagram below shows two action potentials recorded using an oscilloscope.



(i) Explain how the change in membrane potential between 0.5 and 2.0 milliseconds is brought about.

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(4)

(ii) Calculate the number of action potentials occurring per second. Show your working.

Answer per second
(2)

(c) Explain what is taking place during the period marked X on the diagram on page 6.

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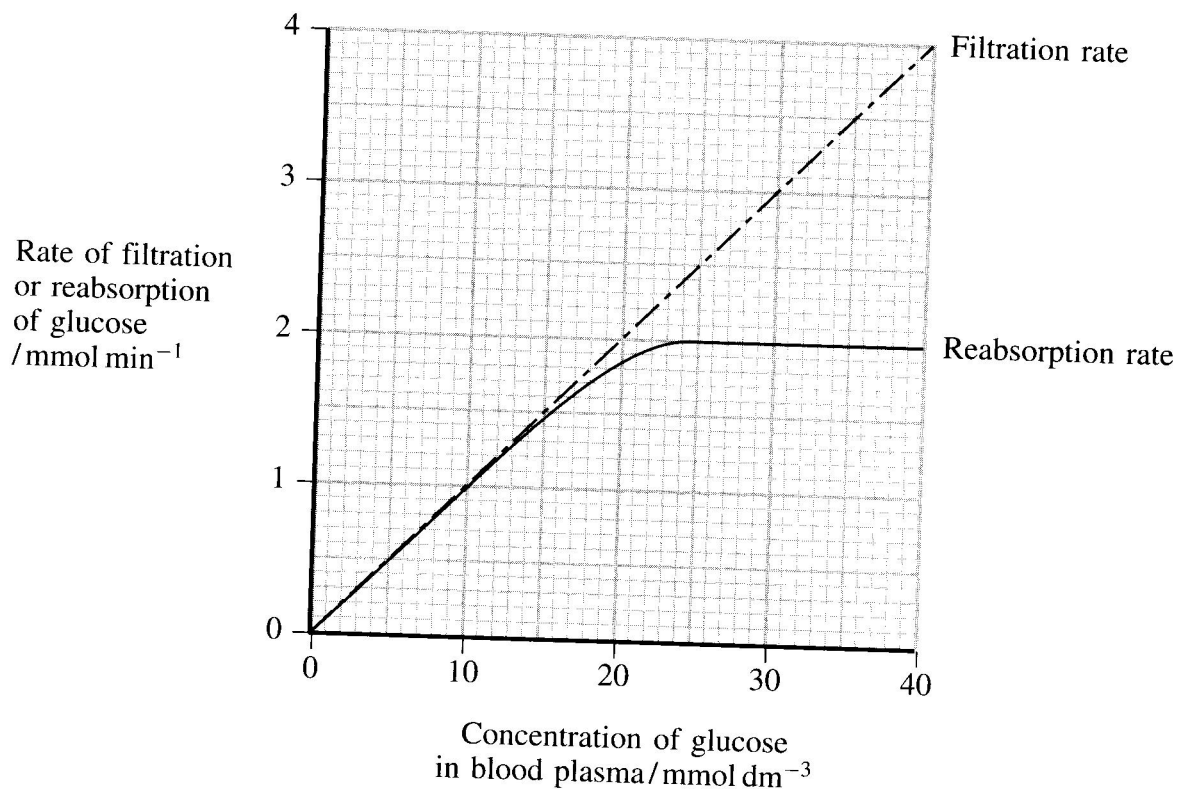
(3)

(Total 11 marks)

Q3

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4. The graph below shows how the rates of filtration and reabsorption of glucose in human nephrons vary with the concentration of glucose in the blood plasma.



(a) Name the region of the nephron where glucose is filtered and the region where it is reabsorbed.

Region of glucose filtration

Region of glucose reabsorption

(2)

(b) Name **one** other substance which is reabsorbed in the same part of the nephron as glucose.

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(1)

(c) With reference to the graph, describe the relationship between filtration rate and reabsorption rate as the concentration of glucose in the blood plasma increases.

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(3)

(d) Using the information in the graph, explain why glucose appears in the urine when the plasma glucose concentration exceeds 10 mmol per dm³.

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(2)

(e) Suggest why the presence of glucose in the urine results in the production of a larger volume of urine than when glucose is not present.

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(3)

(Total 11 marks)

Q4

5. Give an account of the detection of light by pigments in the mammalian eye.

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blank

Dotted lines for writing.

Q5

(Total 9 marks)

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Option C: Human health and fitness.

6. (a) Distinguish between the terms **active immunity** and **passive immunity**.

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(3)

(b) Describe the causes of pneumoconiosis.

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(3)

(Total 6 marks)

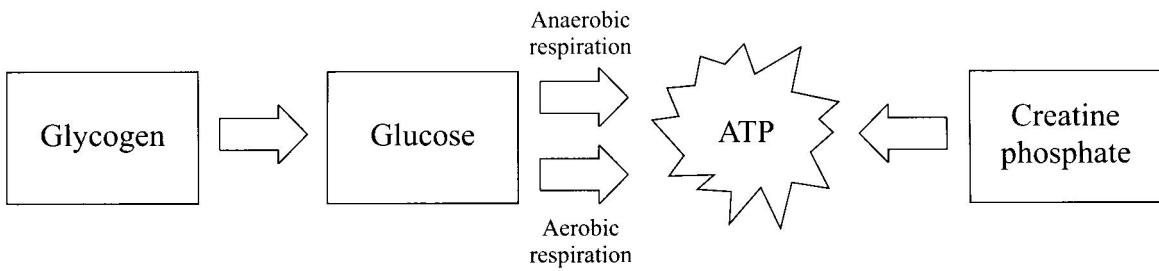
Q6

7. (a) The diet of a professional athlete is usually higher in carbohydrate than that of a non-athlete. Explain why this is necessary.

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(2)

(b) The diagram below outlines different ways in which ATP can be produced in a muscle.



(i) As a result of training, the level of creatine phosphate in muscles increases. Explain how creatine phosphate generates ATP.

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(2)

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(ii) From the information given above and your own knowledge, suggest how ATP would be produced in the muscles during a 100 metre sprint. Give **two** reasons for your answer.

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(3)

Q7

(Total 7 marks)

8. (a) Studies show that individuals who exercise regularly at 70% of their maximum heart rate significantly reduce their risk of cardiovascular disease. Two reasons for this are that regular exercise reduces both the percentage body fat and the overall cholesterol level in blood plasma.

(i) Describe the procedure for obtaining skinfold measurements to estimate percentage body fat.

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(4)

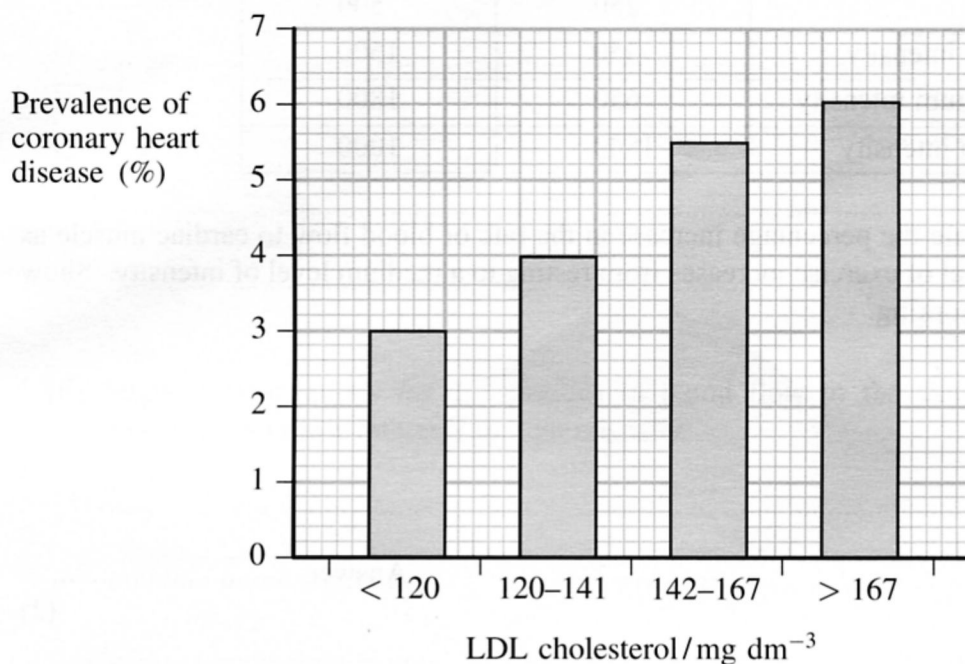
(ii) Explain why having high percentage body fat increases the risk of cardiovascular disease.

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(2)

(b) Cholesterol is transported around the body in the blood by either high density lipoproteins (HDL) or low density lipoproteins (LDL).

The graph below shows the relationship between LDL cholesterol and coronary heart disease.



Describe the relationship between LDL cholesterol and coronary heart disease.

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(2)

Q8

(Total 8 marks)

9. The table below shows the blood flow to cardiac muscle and to the skin at different levels of exercise.

Level of exercise	Blood flow/cm ³ per minute	
	Cardiac muscle	Skin
Rest	250	500
Low intensity	350	1500
Medium intensity	650	1800
High intensity	1800	1000

(a) (i) Calculate the percentage increase in the rate of blood flow to cardiac muscle as the level of exercise increases from resting to a medium level of intensity. Show your working.

Answer
(2)

(ii) Explain why cardiac muscle requires a greater rate of blood flow as the intensity of exercise increases.

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 (2)

(b) An increase in blood flow to the skin allows more heat to be lost through radiation and sweating. This helps to prevent the body temperature from rising above normal during exercise.

(i) Compare the changes in blood flow to cardiac muscle and to the skin, as exercise increases from low intensity to high intensity.

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(2)

(ii) Suggest explanations for the changes in blood flow to the skin as exercise increases from low intensity to high intensity.

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(3)

Q9

(Total 9 marks)

TOTAL FOR PAPER: 70 MARKS

END