

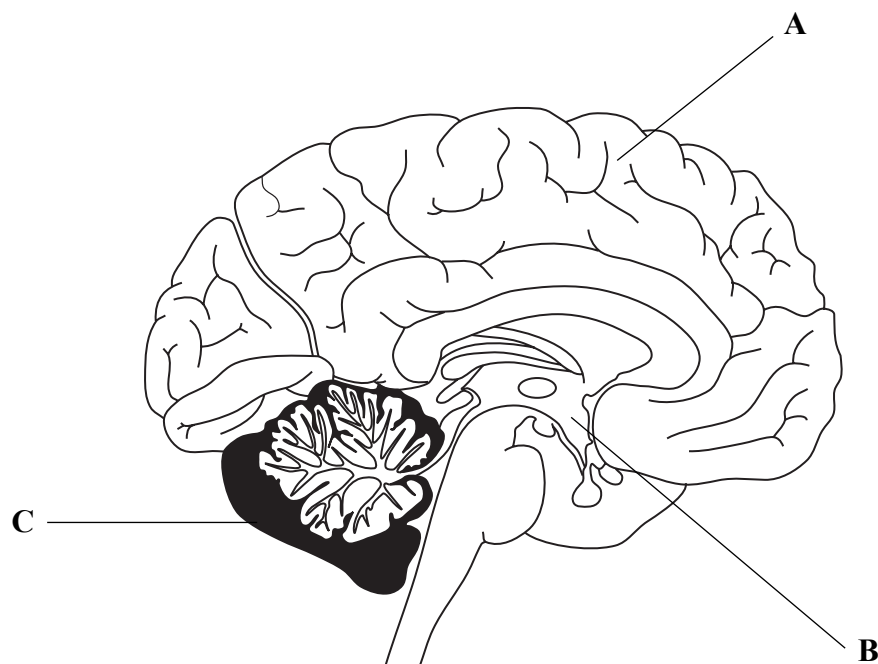


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**Answer ALL questions in the spaces provided.**

1. The diagram below shows a section through a human brain.



(a) Name the parts labelled A and B.

A .....

B .....

(2)

(b) Give **two** functions of the part labelled C.

1 .....

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2 .....

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(2)

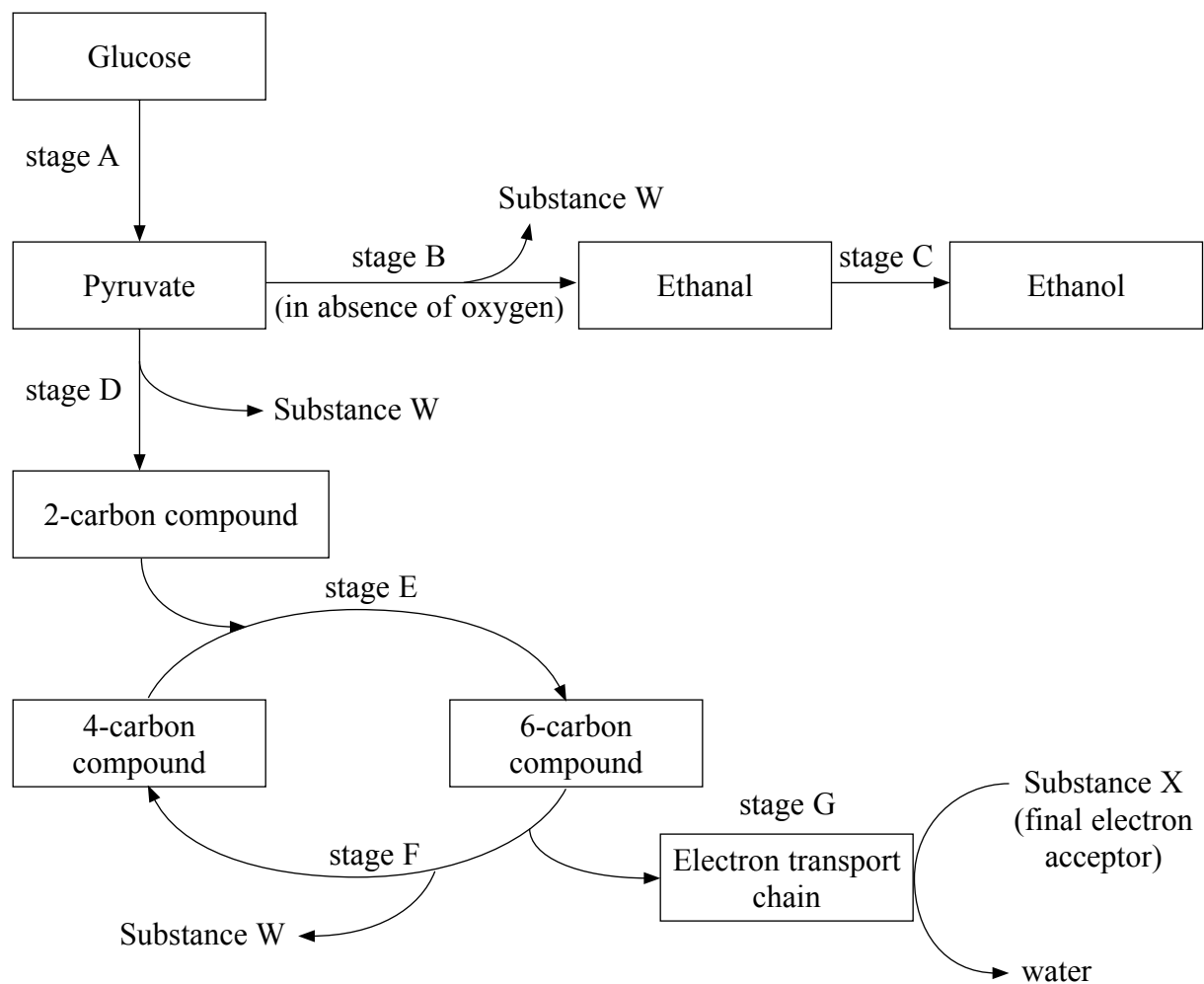
(Total 4 marks)

Q1



N 3 3 8 9 3 A 0 3 2 0

2. (a) The diagram below represents some of the stages of respiration in a yeast cell.



(i) Name the substances represented by the letters **W** and **X**.

**W** .....

**X** .....

(2)

(ii) State which letter represents the stage during which most ATP is produced.

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(1)

(iii) State **two** letters that represent stages during which no ATP is made.

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(1)

(iv) State which letters represent stages that occur in the cytoplasm of a yeast cell.

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(1)



(b) During glycolysis, the coenzyme  $\text{NAD}^+$  is reduced to  $\text{NADH} + \text{H}^+$ . State what happens to this reduced coenzyme when a yeast cell is respiring anaerobically.

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(1)

(Total 6 marks)

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Q2



N 3 3 8 9 3 A 0 5 2 0

3. During an investigation, a volunteer drank 1 dm<sup>3</sup> of water and the total volume of urine he produced was collected and measured every 30 minutes for three hours. The investigation was repeated, but this time the volunteer drank 1 dm<sup>3</sup> of saline (salt solution).

The results are shown in the table below.

Time after drinking / mins	Total volume of urine produced / cm <sup>3</sup>	
	After drinking water	After drinking saline
0	0	0
30	100	30
60	300	62
90	750	93
120	900	126
150	975	158
180	981	190

- (a) Describe the change in **rate** of urine production after drinking **water**.

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(3)

- (b) Describe **two** differences in the **rate** of urine production after drinking saline compared with the rate of urine production after drinking water.

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(2)



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(c) Explain why the volume of urine produced was less after drinking saline than after drinking water.

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(3)

(d) Suggest **one** reason why it was important for the volunteer to remain at rest during both parts of this investigation.

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(1)

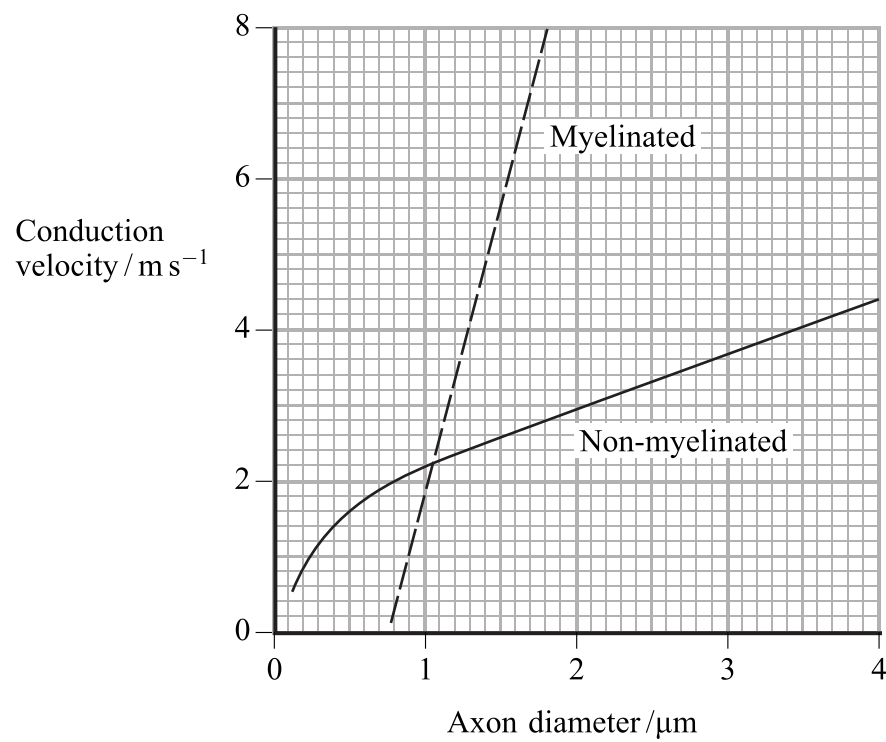
Q3

(Total 9 marks)



4. Myelinated and non-myelinated neurones carry impulses at various speeds. The speed of a nerve impulse along an axon is known as the conduction velocity.

(a) The graph below shows the conduction velocities of myelinated and non-myelinated neurones of different axon diameters.



Compare the conduction velocities of myelinated and non-myelinated neurones.

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(3)





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(b) Explain how the presence of myelin affects the conduction velocity of nerve impulses along an axon.

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(3)

(c) An investigation was carried out to determine the conduction velocity of a nerve impulse along an axon of a myelinated neurone. A stimulus was applied at a point on the axon that was 25 mm from the synapse. It took 3.4 milliseconds (ms) for an action potential to arrive at the synapse.

(i) Calculate the conduction velocity in **metres per second**. Show your working.

..... metres per second  
(2)

(ii) Use the information in the graph to estimate the diameter of this axon.

Diameter of axon .....  $\mu\text{m}$   
(1)

(d) Some snakes produce a toxin that has a similar structure to acetylcholine. When a person has been bitten by a snake, this toxin blocks nerve pathways.

Suggest how this toxin could stop post-synaptic neurones from being stimulated.

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(2)

(Total 11 marks)

Q4

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**Option C: Human Health and Fitness**

6. The table below refers to the nervous control of ventilation mechanisms involved in initiating and terminating inspiration in the lungs. Complete the table by writing the most appropriate word or words in the empty boxes.

Ventilation mechanism	Site of nervous control of ventilation	Name of nerve involved in ventilation mechanism
Initiation of inspiration		
Termination of inspiration		

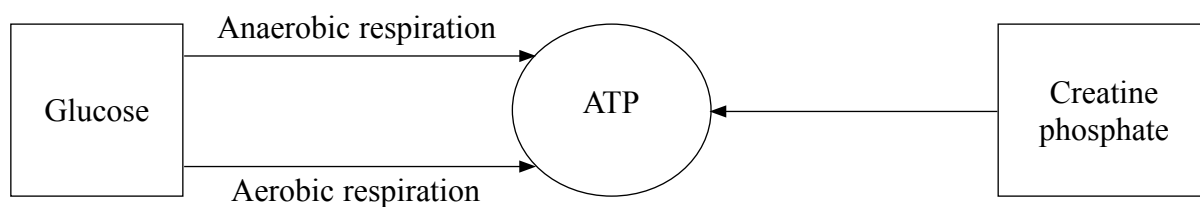
Q6

(Total 4 marks)



7. Muscle contraction requires the presence of ATP, which can be produced from a variety of sources.

(a) The diagram below summarises the different sources of ATP in muscle.



Describe the role of **creatine phosphate** in the production of ATP for muscles.

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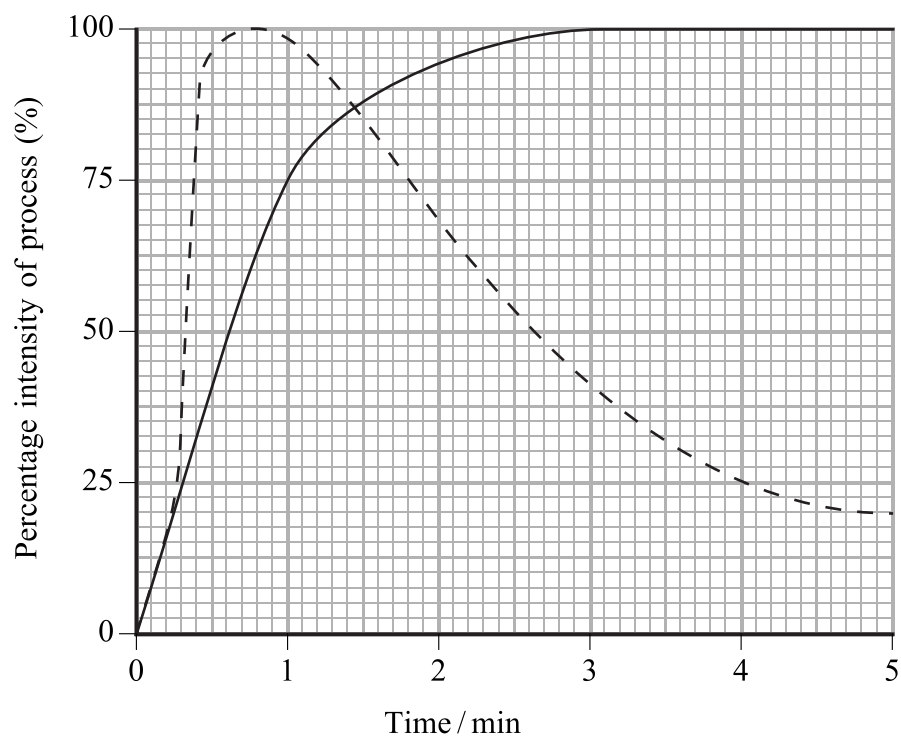
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(2)



(b) The graph below shows the percentage intensity of the processes of aerobic and anaerobic respiration during a five minute period of exercise.



— Aerobic respiration  
- - - Anaerobic respiration

Compare the percentage intensities of aerobic and anaerobic respiration in the first 0.5 minutes of exercise with those in the next three minutes of exercise.

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(3) Q7

(Total 5 marks)



8. Osteoarthritis is a disease that can affect parts of the skeleton.

(a) Describe the causes and effects of **osteoarthritis**.

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(4)

(b) The table below shows the numbers of males and females, from different age ranges in the UK, diagnosed with osteoarthritis of the hand, hip or knee.

Age / yrs	Gender	Number of individuals diagnosed with osteoarthritis		
		Hand	Hip	Knee
25 to 44	male	27 000	9000	5400
	female	53 000	9000	21 600
45 to 64	male	466 000	15 500	18 200
	female	934 000	15 500	72 800
65 +	male	970 000	77 000	74 000
	female	2 803 000	77 000	296 000





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- (i) Calculate the percentage difference between the total number of males and females diagnosed with osteoarthritis of the knee.  
Show your working.

Answer ..... %  
**(3)**

- (ii) Using the data in the table, describe the relationship between the occurrence of arthritis in the hands and hips with age and gender.

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**(3)**

- (c) Over the last 10 years, there has been a significant increase in the number of people with osteoarthritis. Suggest **one** reason for this increase.

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**(1)**

**(Total 11 marks)**

**Q8**

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9. Exercise has an effect on the cardiac output of the heart and on the distribution of blood in the body.

(a) Explain what is meant by the term **cardiac output**.

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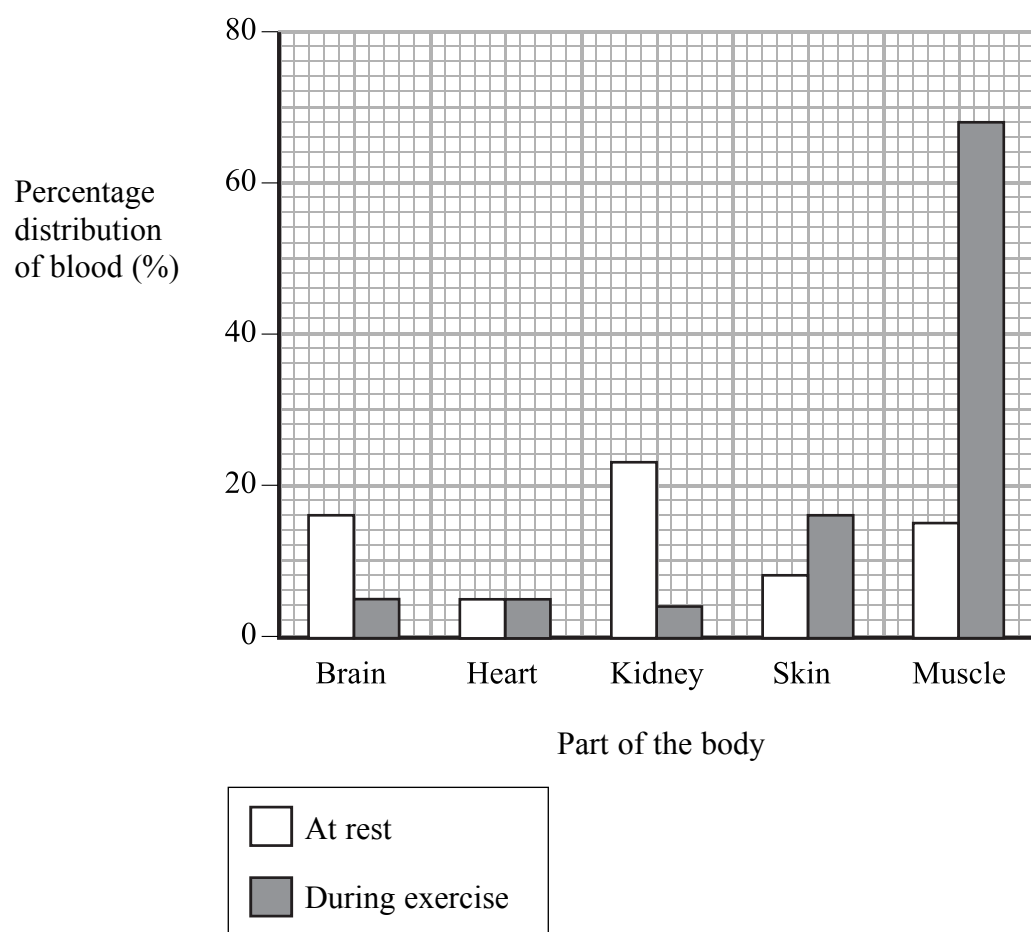
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(2)

(b) The graph below shows the percentage distribution of blood in some parts of the body, at rest and during exercise.





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