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2



2



Answer ALL questions in the spaces provided.

1. The table below refers to some features of mammalian hormones. Complete the table by writing the most appropriate word, or words, in the empty boxes.

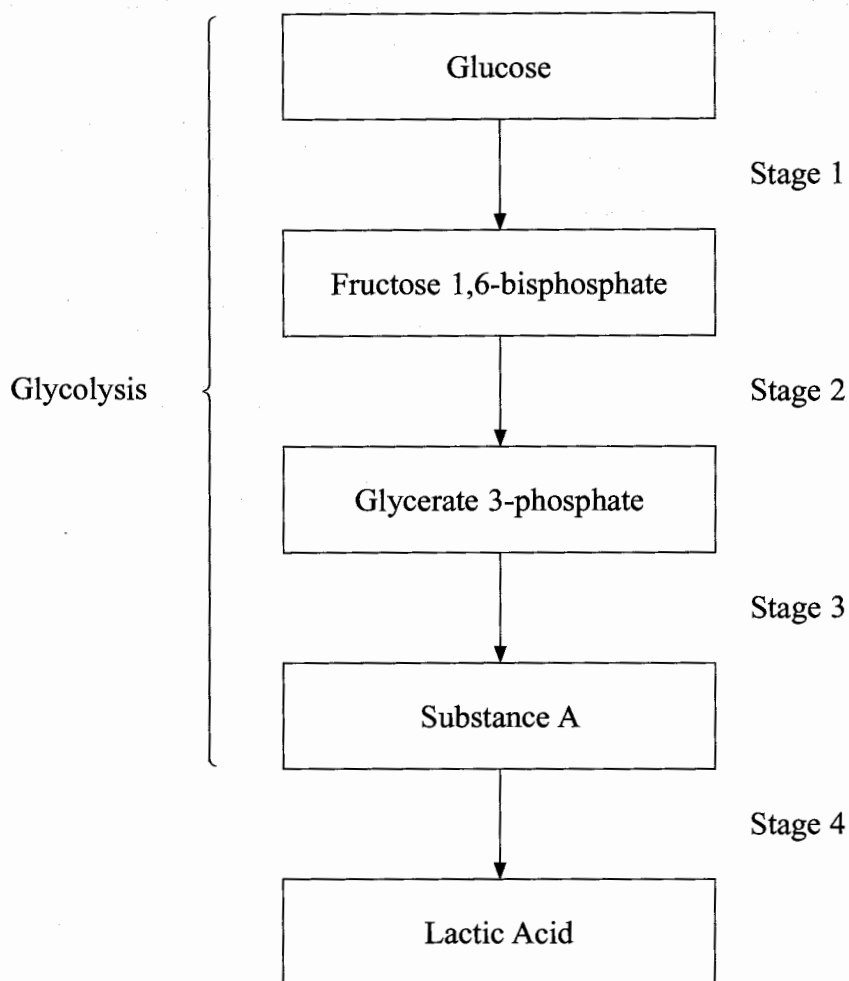
Hormone	Site of secretion	One function
	Pancreas	Raises blood glucose concentration
	Posterior pituitary gland	Contraction of uterine muscle
Luteinising hormone		Release of secondary oocyte
Adrenaline	Adrenal gland	

(Total 4 marks)

Q1



2. (a) The diagram below shows some of the stages of anaerobic respiration in a muscle cell.



(i) Name substance A.

..... (1)

(ii) State which of the stages shown in the diagram:

Uses ATP

Produces ATP

(2)



(b) The Krebs cycle occurs during aerobic respiration and is an example of a metabolic pathway.

(i) Explain why the Krebs cycle is described as a metabolic pathway.

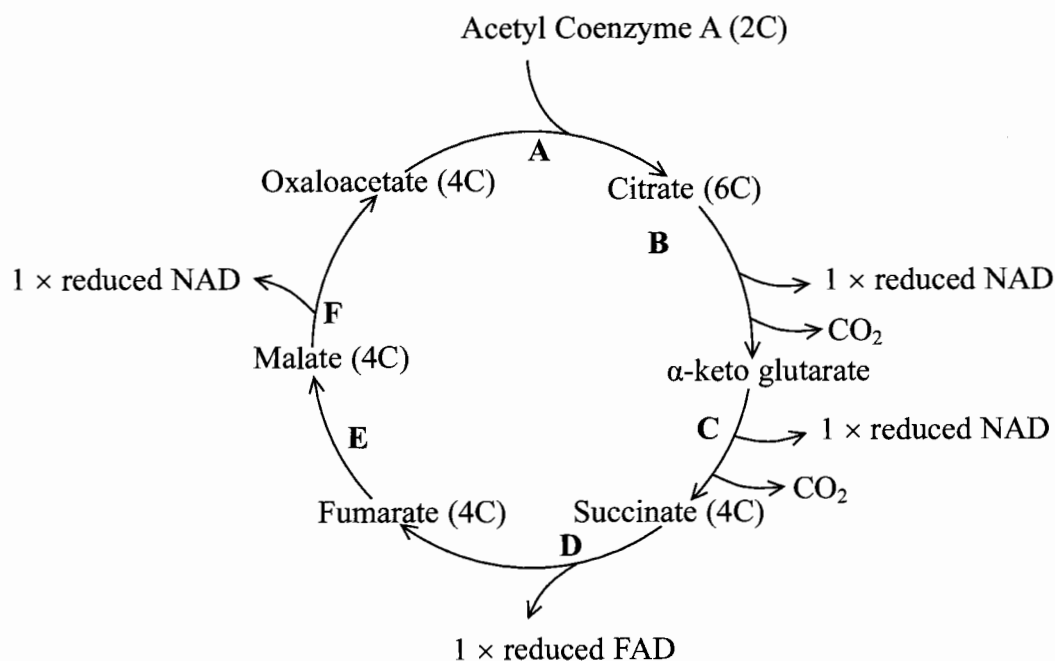
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 (1)

(ii) State precisely where in the cell the Krebs cycle occurs.

.....
 (1)

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



Oxidoreductase enzymes are involved in some of the reactions in the Krebs cycle. Using the letters A to F and the information given in the diagram, list **all** the stages that involve an oxidoreductase enzyme.

.....
 (1)

(Total 6 marks)

Q2



3. Detection of light occurs in both mammals and flowering plants.

(a) In humans, the central region of the retina has very few rod cells. However, in a dog about 80–90% of the photoreceptors in the central region of the retina are rod cells. Suggest **one** advantage to a dog of having more rod cells in this region of the retina.

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(3)

(b) Humans have three types of cone cell. However, dogs only have two types of cone cell. **Graph 1** below shows the percentage of light, of different wavelengths, absorbed by the pigments in the two types of cone cell in a dog's retina.

Graph 2 shows the percentage of light, of different wavelengths, absorbed by the pigments in the three types of cone cell in a human's retina.

Table 1 shows the colour of light of different wavelengths.

Graph 1

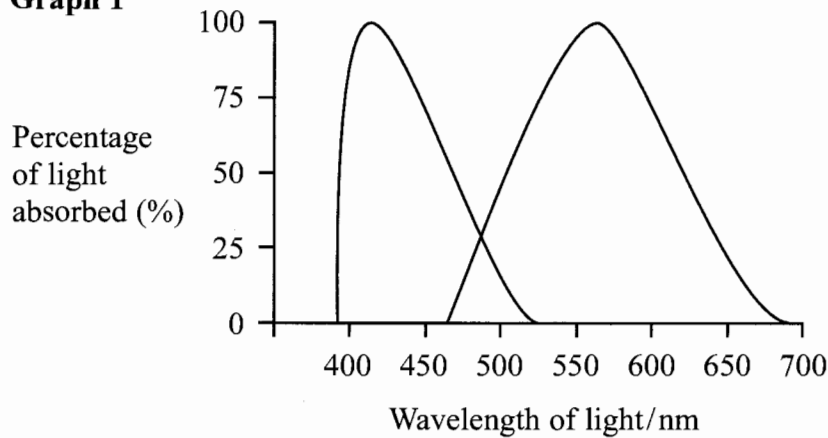
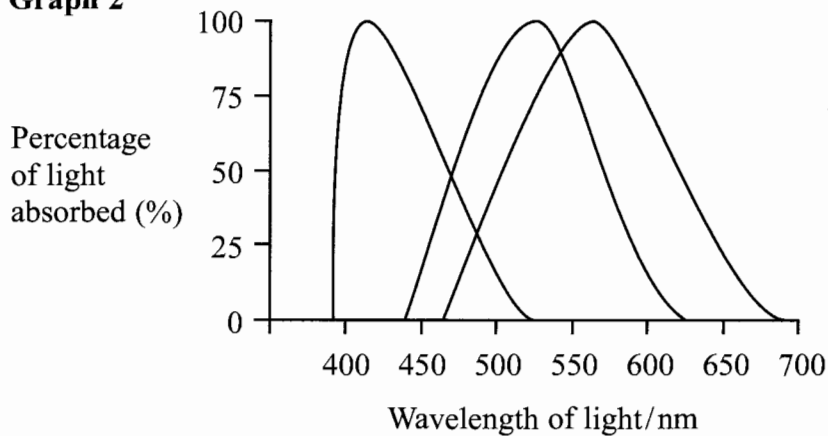


Table 1

Wavelength/nm	Colour
400	Violet
475	Blue
510	Green
570	Yellow
590	Orange
650	Red

Graph 2



Three balls, that differed only in their colour, were placed in front of a dog and a human. One ball was red, one yellow and one orange. Using this data, explain why only the human would be able to detect a difference between the colour of the three balls.

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(2)

(c) Describe the detection of light in flowering plants.

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(3)

(Total 8 marks)

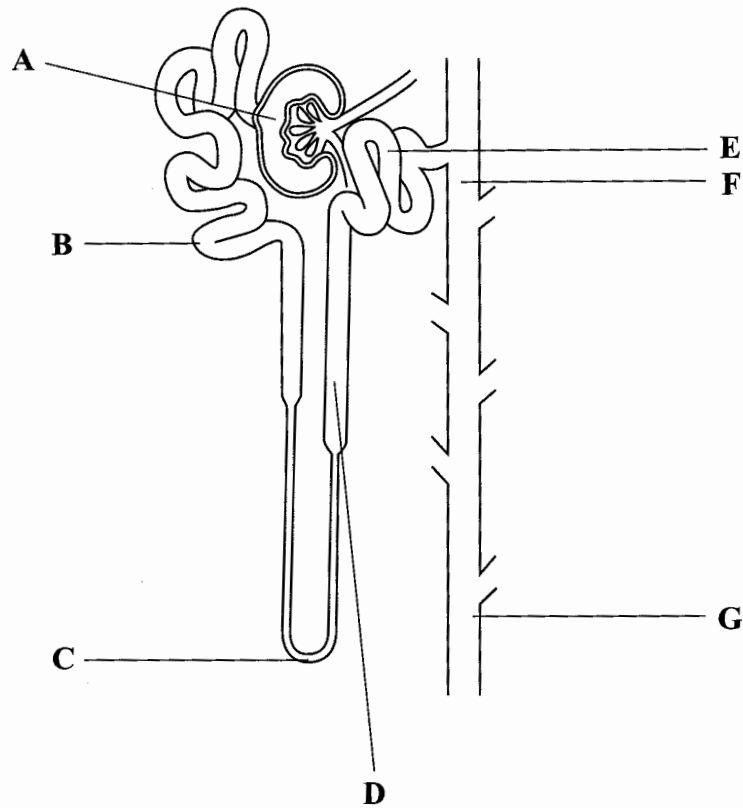
Q3



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



(i) Name the parts labelled **A** and **B**.

A

B

(1)

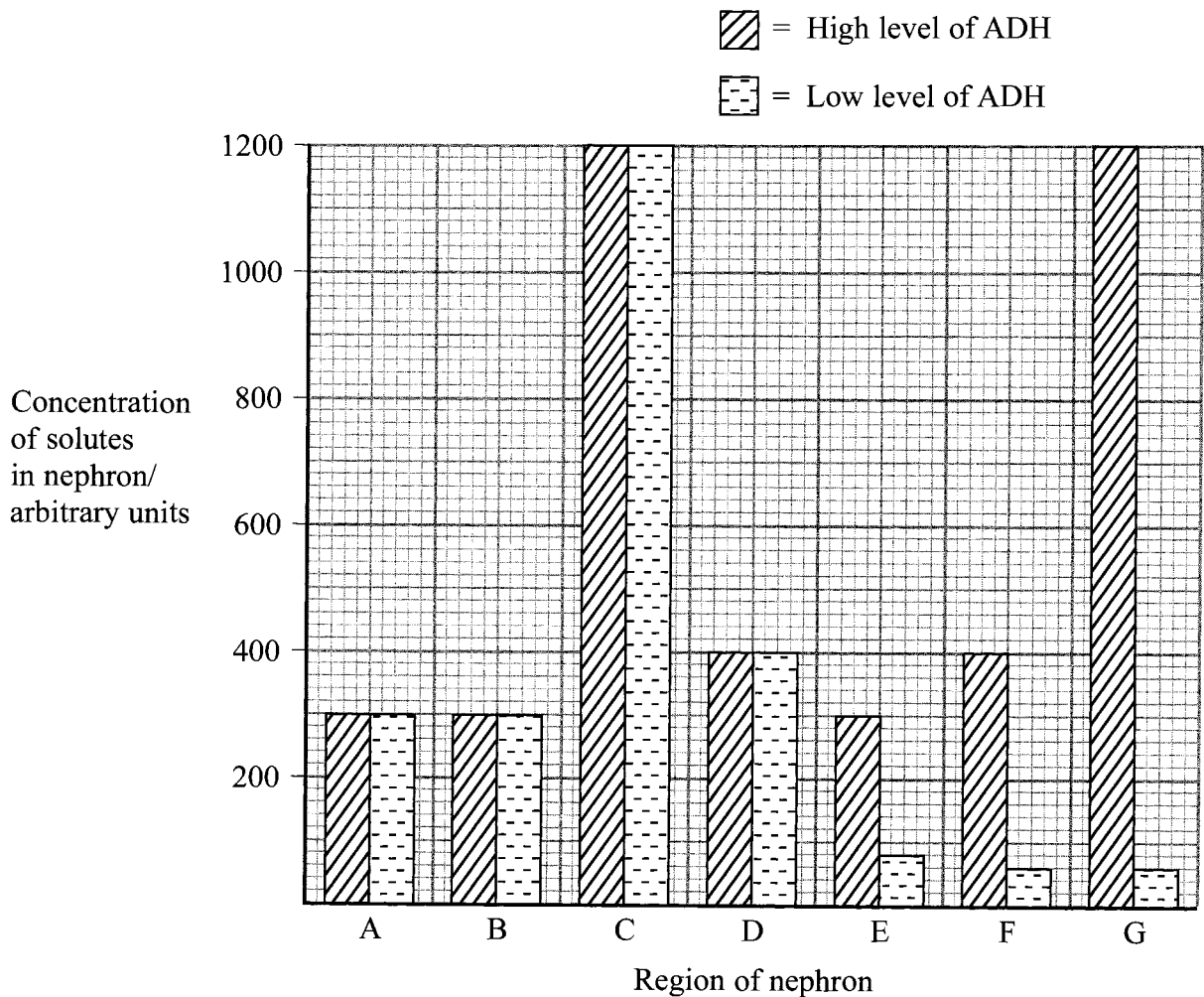
(ii) All the glucose in region **A** is reabsorbed back into the bloodstream as the fluid in the nephron passes from region **A** to region **B**. Explain how this glucose reabsorption occurs.

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.....
.....

(2)



(b) The graph below shows the concentration of solutes in the fluid in the nephron in each of the labelled regions shown in the diagram. The graph shows the concentration of solutes when there is a high level of ADH (antidiuretic hormone) in the blood and when there is a low level of ADH in the blood.



(i) Calculate the percentage decrease in the concentration of solutes between regions A and G when there is a **low** level of ADH in the blood. Show your working.

..... %
(3)



(ii) The concentration of solutes in the fluid changes as it passes from region A to region G. Compare the changes that occur when the level of ADH in the blood is high with changes that occur when the level of ADH is low.

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(3)

(iii) Use the information in the graph to explain how a rise in the level of ADH results in the production of a more concentrated urine.

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(3)

(Total 12 marks)

Q4

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5. Give an account of the structure and functions of sensory, relay and effector (motor) neurones.

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Area with horizontal dotted lines for writing.

(Total 10 marks)

Q5

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Option C: Human Health and Fitness

6. The table below refers to parts of the human cardiovascular system that change in response to training. Complete the table by describing the correct effect in the empty boxes.

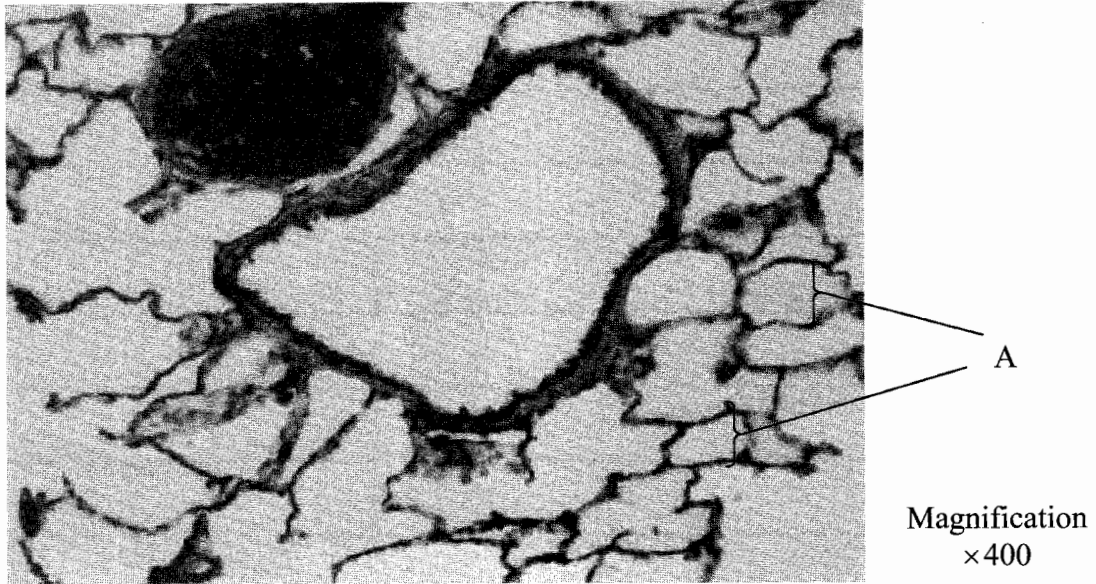
Part of the cardiovascular system	Effect of training
Heart size	
Heart rate	
Recovery rate	
Stroke volume	

(Total 4 marks)

Q6



7. The photograph below shows lung tissue, as seen using a light microscope.



(a) Describe and explain how **three** features of the structures labelled A are adapted to their function.

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2

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3

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(3)

(b) Describe how ventilation rate is controlled by the brain.

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(3)

(Total 6 marks)

Q7



8. (a) Describe the roles of the aortic reflex, the sinoatrial node (SAN) and the atrioventricular node (AVN) in controlling (systemic) blood pressure.

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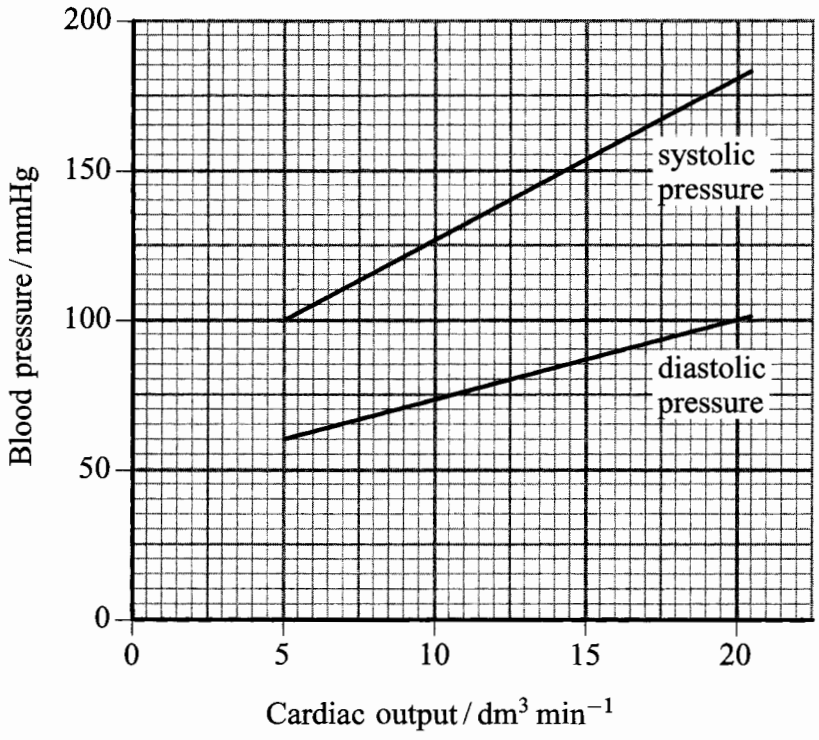
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(4)

(b) The graph below shows the effect that increasing cardiac output has on the systolic and diastolic blood pressure.



(i) Compare the effect of increasing cardiac output on the diastolic pressure with the effect of increasing cardiac output on the systolic pressure.

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(3)

(ii) Describe how an investigation could be carried out to measure the effect of increasing cardiac output on the systolic and diastolic pressures.

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(4)

(Total 11 marks)

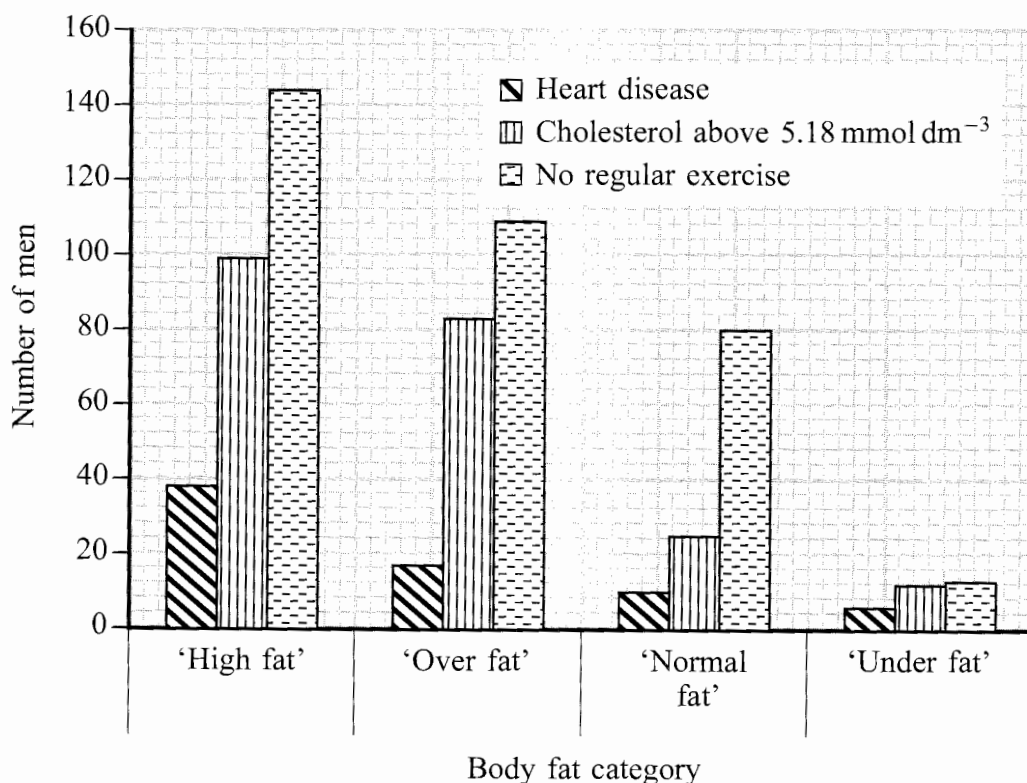
Q8



9. (a) An investigation was carried out to examine the relationship between percentage body fat, heart disease and lifestyle. Body fat is the mass of fat expressed as a percentage of the total body mass.

Four categories of body fat were defined: 'high fat' where body fat is above 25%; 'over fat' where body fat is between 20% and 25%; 'normal fat' where body fat is between 10% and 20% and 'under fat' where body fat is below 10%.

In each of these four categories of body fat, 200 men of a similar age were surveyed. The graph below shows the number of men in each category that have been diagnosed with heart disease, have a high blood cholesterol level (above $5.18 \text{ mmol dm}^{-3}$) and do not take regular exercise.



- (i) Calculate the percentage increase in the occurrence of heart disease between men in the 'normal fat' category compared with men in the 'high fat' category. Show your working.

Answer%
(3)



(ii) Describe and suggest an explanation for the relationship between the following.

High blood cholesterol level and body fat

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No regular exercise and body fat

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(3)

(b) In order to calculate the percentage body fat, it is necessary to obtain an estimate of the subcutaneous fat level of the men being surveyed. Describe how you would use skinfold measurements to obtain such an estimate.

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(3)

(Total 9 marks)

Q9

TOTAL FOR PAPER: 70 MARKS

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