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Answer ALL questions in the spaces provided.

1. The table below refers to the first and second divisions of meiosis.

If the statement is correct, place a tick (✓) in the appropriate box and if the statement is incorrect, place a cross (✗) in the appropriate box.

Statement	First division of meiosis	Second division of meiosis
Pairing of homologous chromosomes occurs.		
Each chromosome consists of a pair of chromatids during prophase.		
Crossing over occurs and chiasmata are formed.		
Independent assortment of chromosomes occurs.		

Q1

(Total 4 marks)



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2. Humans usually masticate (chew) food before it is swallowed.

(a) Describe the effects that mastication has on food.

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(b) When a person masticates a piece of bread for a few minutes, it is noticed that it begins to taste sweet. Give an explanation for this observation.

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(3)

(Total 6 marks)

Q2



3. The table below shows the percentage saturation with oxygen of human haemoglobin and mouse haemoglobin, at a range of partial pressures of oxygen.

Partial pressure of oxygen /kPa	Percentage saturation of haemoglobin with oxygen	
	Human haemoglobin	Mouse haemoglobin
1	8	3
3	40	10
5	71	25
7	85	50
9	92	75
11	96	90
13	98	97
15	98	98

(a) (i) Describe the relationship between the percentage saturation of **human** haemoglobin with oxygen and the partial pressure of oxygen.

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(ii) Small mammals have a higher rate of oxygen use per gram of body mass than larger mammals. From the table, it can be seen that at an oxygen partial pressure of 7 kPa, human haemoglobin is 85% saturated, but mouse haemoglobin is only 50% saturated.

Suggest how this difference might be related to the difference in size of a mouse and a human.

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(b) Haemoglobin combines with oxygen in the lungs. Describe the mechanism by which air is brought into the lungs (inspiration) in humans.

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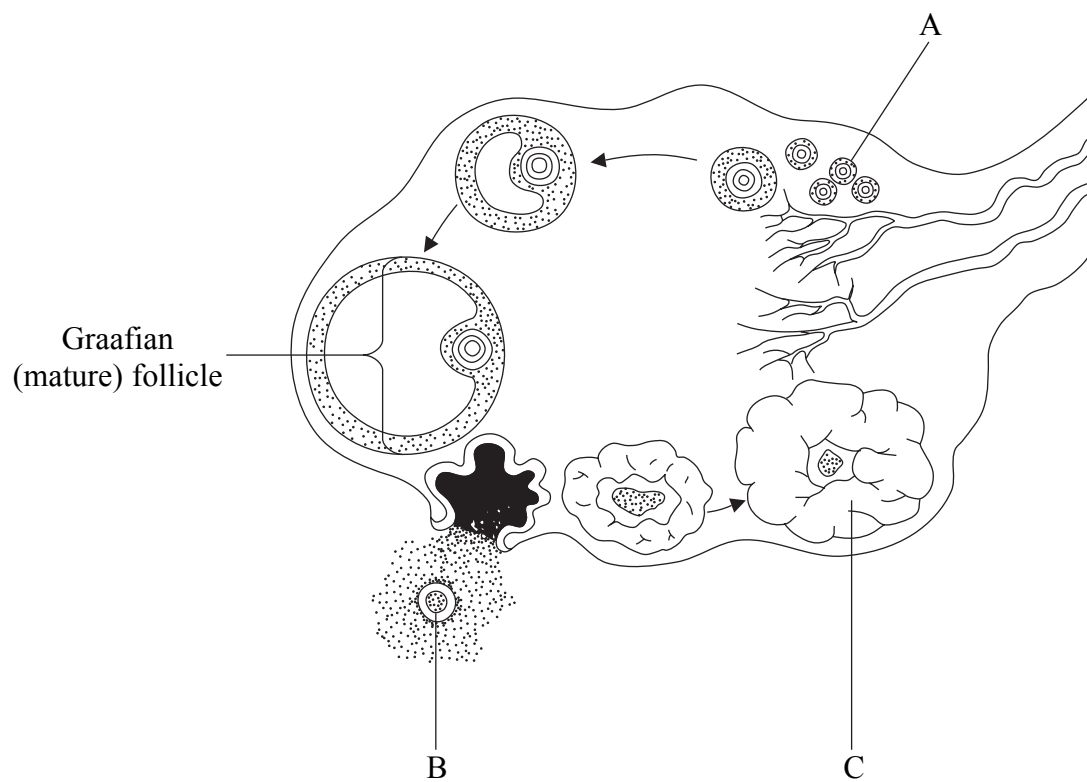
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(Total 8 marks)

Q3



4. The diagram below shows the sequence of changes in a follicle in an ovary during one menstrual cycle.



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

A

B

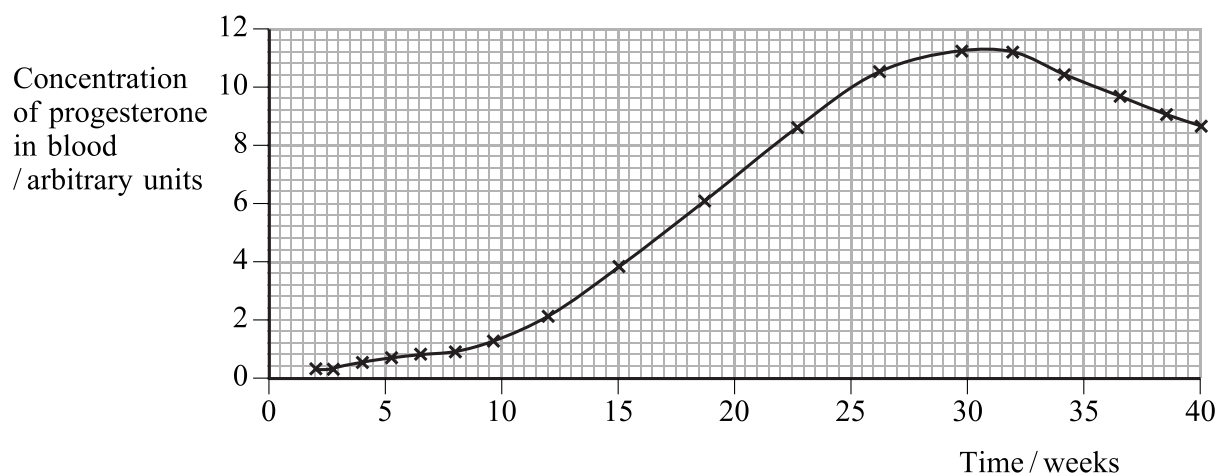
C

(3)



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(b) The graph below shows changes in the concentration of the hormone progesterone during pregnancy.



(i) Describe the changes in the concentration of progesterone during pregnancy, as shown by the graph.

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(ii) State **one** role of progesterone during pregnancy.

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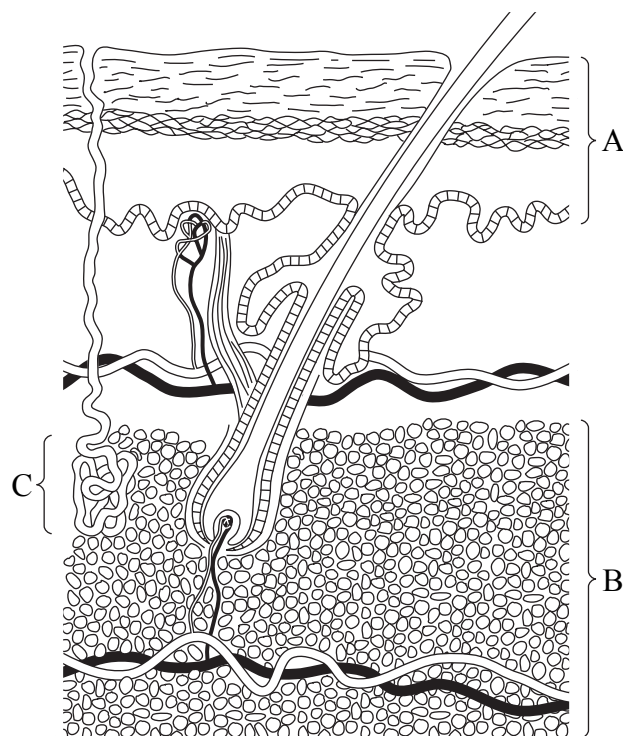
(1)

(Total 6 marks)

Q4



5. (a) The diagram below shows a section through human skin.



(i) Name the parts labelled A, B and C.

A

B

C

(3)

(ii) Explain the role of part C in the regulation of body temperature.

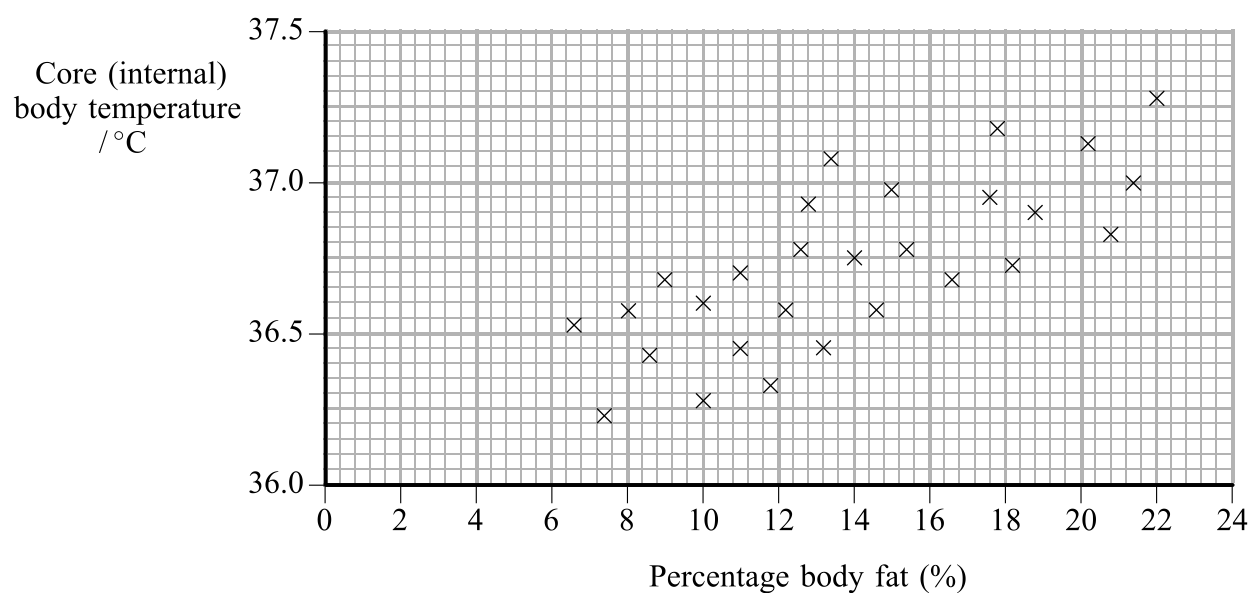
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(b) In an investigation, a number of naked men sat in a room, maintained at an air temperature of 15 °C, for two hours. After this time their core (internal) body temperature was measured. Their percentage body fat was also measured.

The results of this investigation are shown in the graph below.



(i) Describe the trend shown by these results.

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(ii) Suggest explanations for these results.

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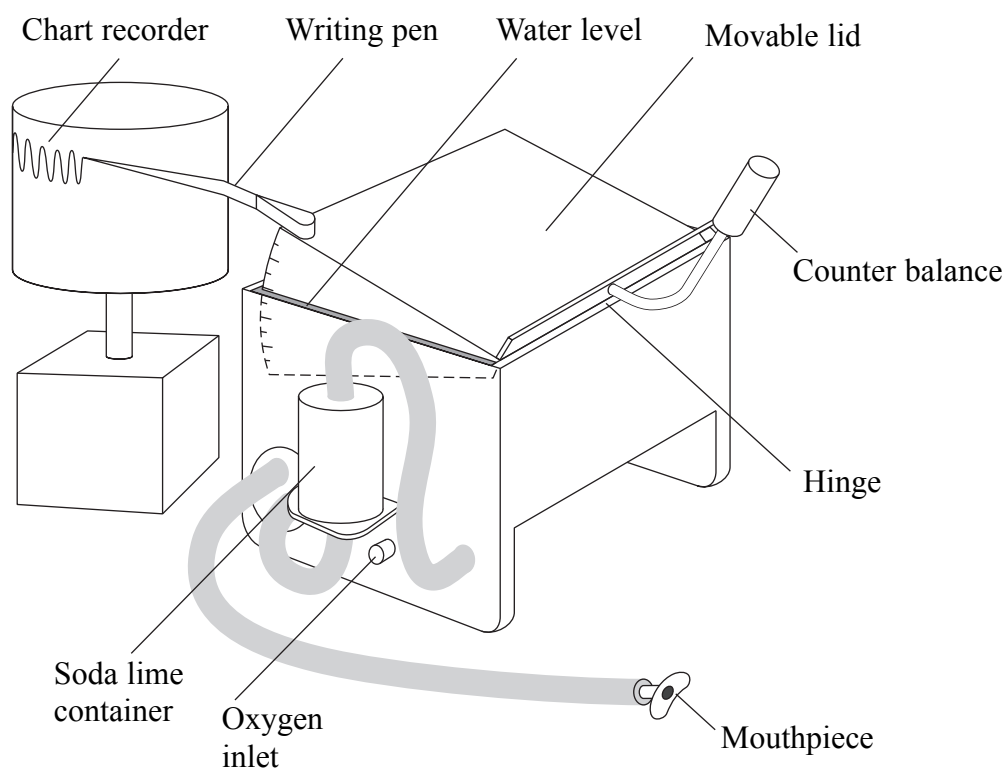
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(Total 11 marks)

Q5



6. (a) The diagram below shows a spirometer, used to measure lung volumes in humans.



(i) State the function of the soda lime.

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(1)

(ii) Describe how you would use a spirometer to measure the **tidal volume** of a person.

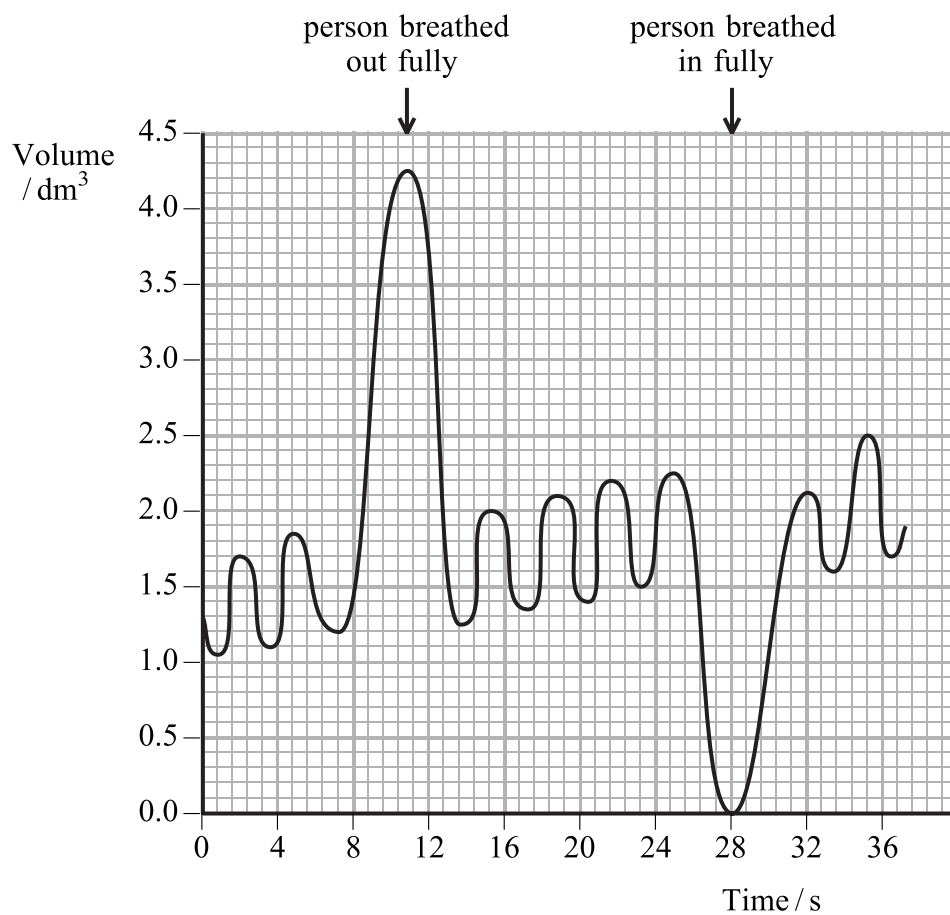
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(b) The graph below shows a spirometer record (spirogram) from a healthy person.



From the recording, find the **vital capacity** of the person.

Answer dm^3
(1)

(Total 5 marks)

Q6



7. Exercise affects pulse rate and blood pressure.

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

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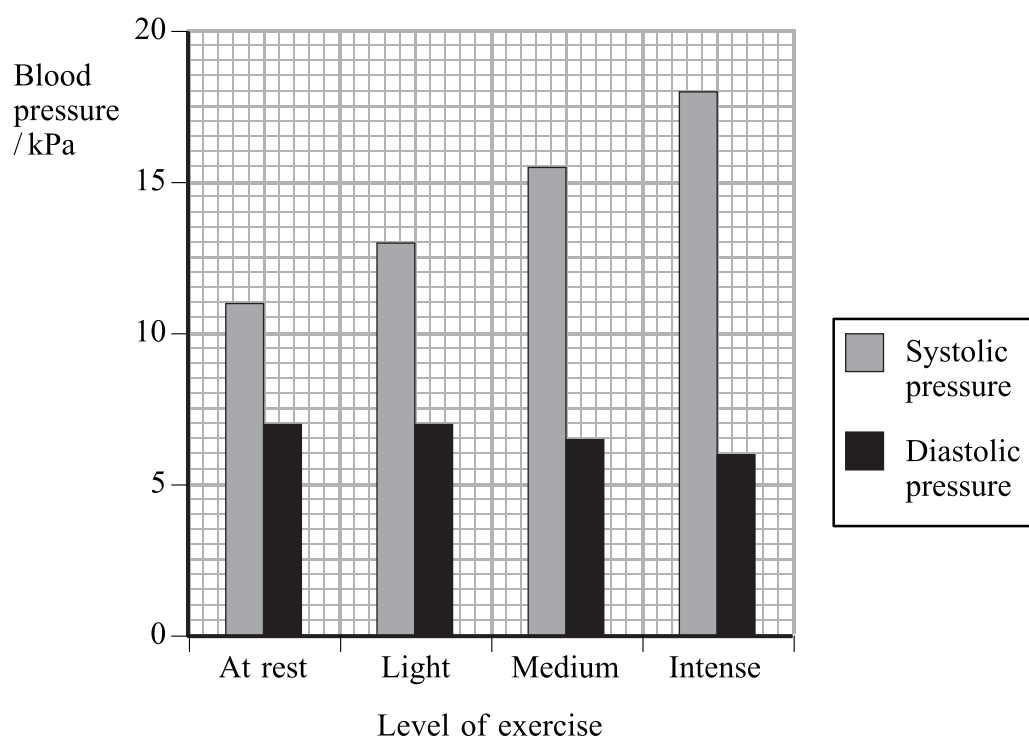
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(b) The graph below shows typical blood pressures at different levels of exercise.



(i) Using the data in the graph, calculate the increase in systolic blood pressure from rest to a light level of exercise. Show your working.

Answer

(2)



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(ii) Suggest why the systolic pressure increases with exercise.

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(iii) Using the information in the graph, compare the effects of exercise on the systolic and diastolic blood pressures.

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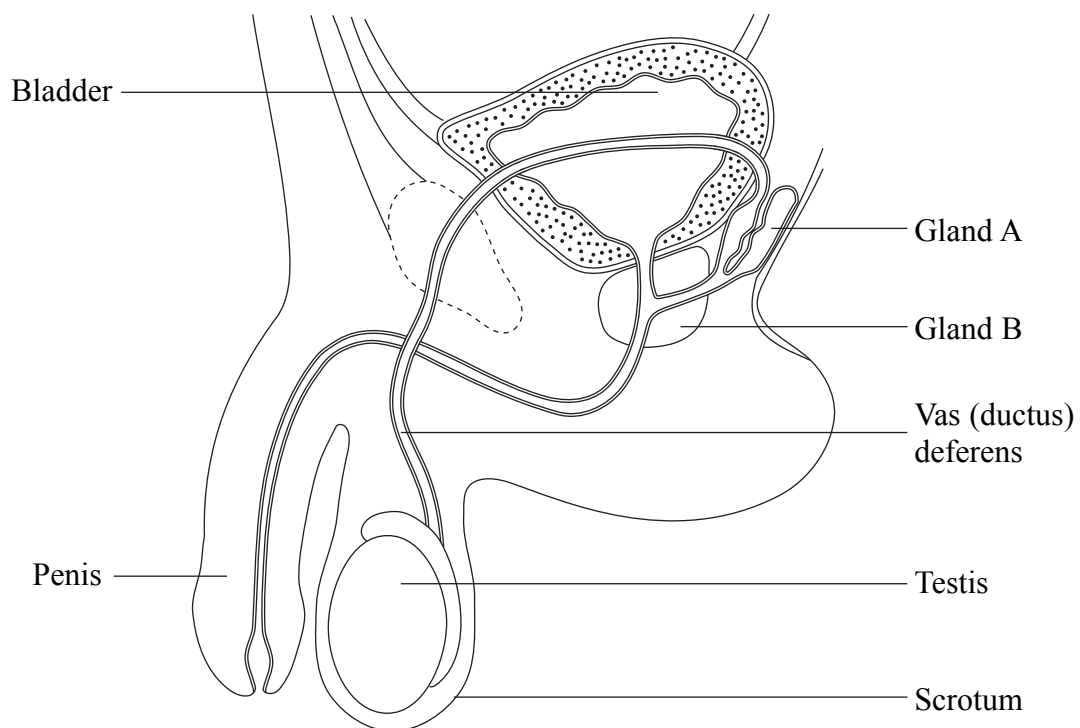
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(Total 9 marks)

Q7



8. The diagram below shows the structure of the reproductive system of a human male, as seen in side view.



(a) Name the glands labelled A and B.

A

B

(2)

(b) The secretions from glands A and B both contribute to the formation of semen.

Give **two** roles of these secretions in semen.

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(c) Semen contains the male gametes (sperm). Describe how these gametes are transferred into the female.

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(4)

(d) In men, an average sperm count is about 100 million sperm per cm³ of semen. The table below gives the percentage of men with higher and lower than average sperm counts in 1950 and 1990.

Year	Percentage of men with higher sperm counts (%)	Percentage of men with lower sperm counts (%)
1950	50	5
1990	15	18

(i) Suggest explanations for the changes shown in the table.

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(ii) Suggest **one** possible consequence of these changes.

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(1)

(Total 11 marks)

Q8

TOTAL FOR PAPER: 60 MARKS

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