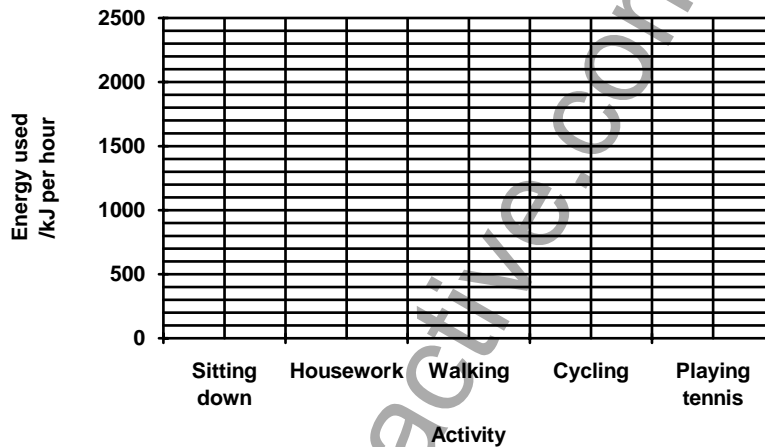


The table show the amount of energy needed per hour for different activities.

Activity	Energy needed kJ per hour
Sitting down	300
Housework	600
Walking	1000
Cycling	1600
Playing tennis	2200

(a) Draw a bar chart of these figures on the grid below.



[3]

(b) Calculate the amount of energy used when cycling for 15 minutes.

.....  
 ..... [2]

(c) What is the relationship between activity and the amount of energy used per hour?

..... [1]

(d) To produce energy, the body normally needs a constant supply of oxygen.

(i) Where does oxygen enter the blood?

..... [1]

(ii) In which activity, shown in the table, would most oxygen be used?

..... [1]

(a) Where in the body does the process of respiration take place?

..... [1]

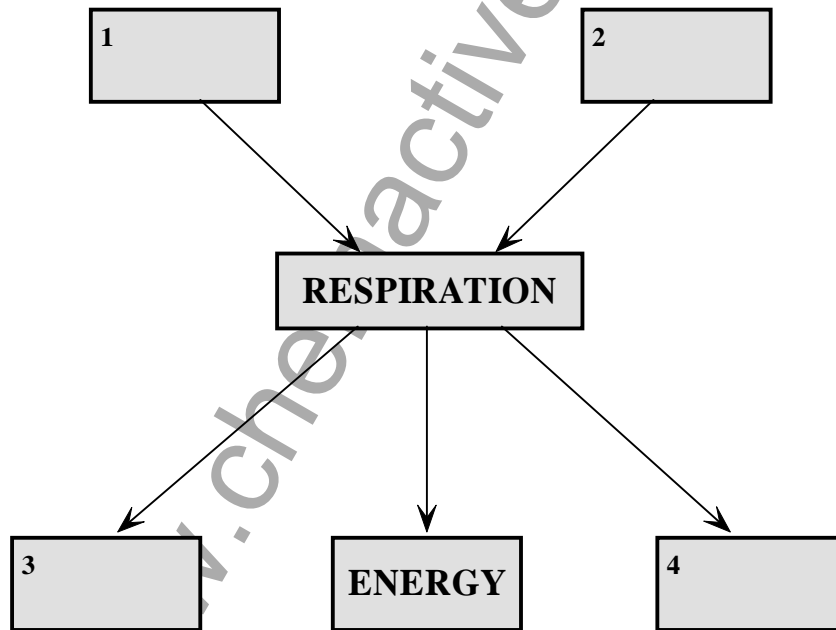
(b) Read the following information.

**During the process of respiration, chemical reactions take place.**

**These chemical reactions:-**

- use up oxygen and glucose
- produce carbon dioxide and water
- release energy

Use this information to complete the following diagram.



[3]

(c) How is the carbon dioxide removed from the body?

..... [1]

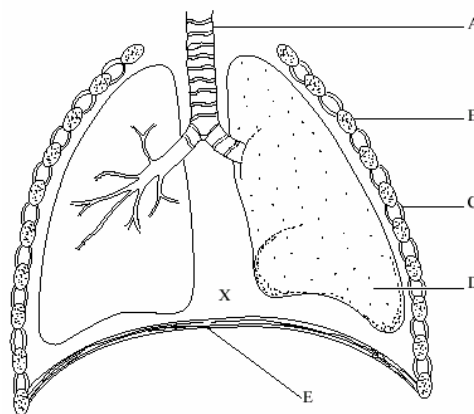
(d) State one way in which muscles use the energy released in respiration.

..... [1]

Low Demand Questions

QUESTIONSHEET 3

The diagram show some of the structures in the thorax.



(a) Name the structures labelled A, B, C, D and E.

A ..... B ..... C .....  
 D ..... E ..... [5]

(b) Match the correct letter from the diagram with the following:

(i) a structure which contains alveoli.

..... [1]

(ii) a structure which carries air into the lungs.

..... [1]

(iii) a structure which contracts and moves downwards when we breath in.

..... [1]

(c) Name the structure found at the position marked X.

..... [1]

(d) The table shows some of the differences between inhaled and exhaled air.

	Oxygen	Carbon dioxide
Inhaled air	21%	0.03%
Exhaled air	16%	3.0%

(i) Explain why exhaled air contains less oxygen than inhaled air.

..... [2]

(ii) Why does exhaled air contain more carbon dioxide than inhaled air?

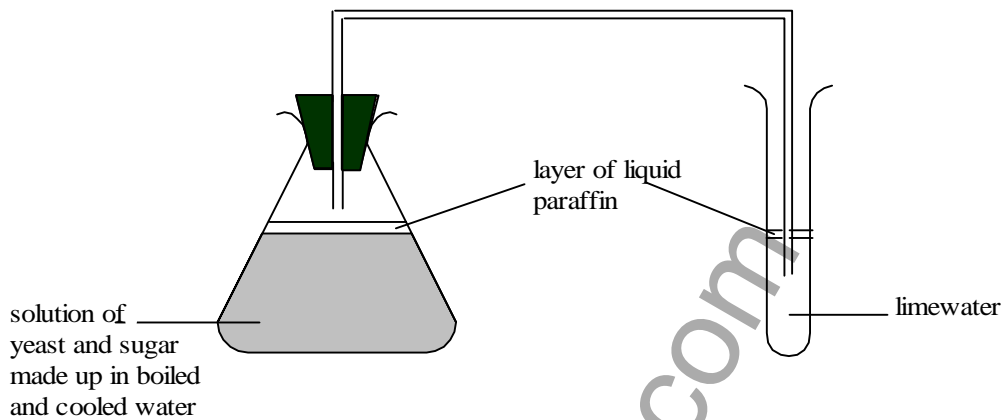
..... [2]

TOTAL /13

Low Demand Questions

QUESTIONSHEET 4

Yeast is a microscopic fungus which is able to respire without oxygen. A student set up the following apparatus to investigate respiration in yeast.

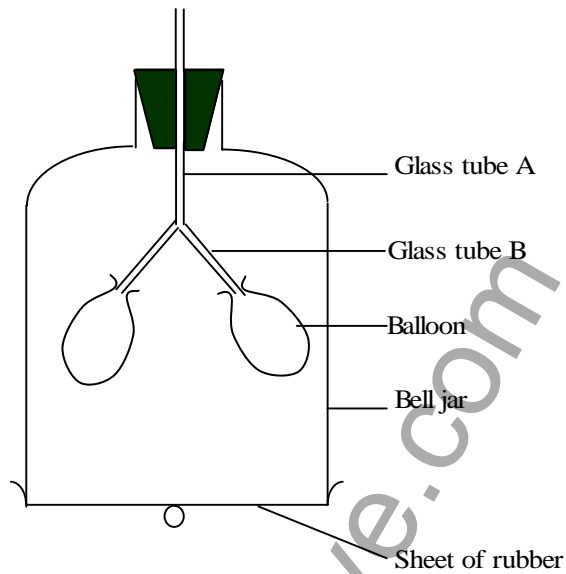


- (a) Explain why the yeast and sugar solution was made up in boiled and cooled water.  
 .....  
 ..... [2]
- (b) After some time bubbles of a gas were seen in the test tube. What was this gas?  
 ..... [1]
- (c) The limewater was clear at the start of the investigation. What colour would it be after 20 minutes?  
 ..... [1]
- (d) A student set up two sets of apparatus, one at 10°C and one at 30°C. The student timed how long it took for the limewater to change colour.
  - (i) Name three things you would do to make sure this was a fair test?  
 .....  
 .....  
 ..... [3]
  - (ii) At which temperature would the limewater change colour most quickly?  
 ..... [1]
  - (iii) Give a reason for your answer.  
 .....  
 ..... [2]

Medium Demand Questions

QUESTIONSHEET 5

The diagram shows a model which can be used to demonstrate breathing.



(a) Name the part of the body represented by

(i) the balloon

..... [1]

(ii) the glass tube A

..... [1]

(iii) the glass tube B

..... [1]

(iv) the sheet of rubber.

..... [1]

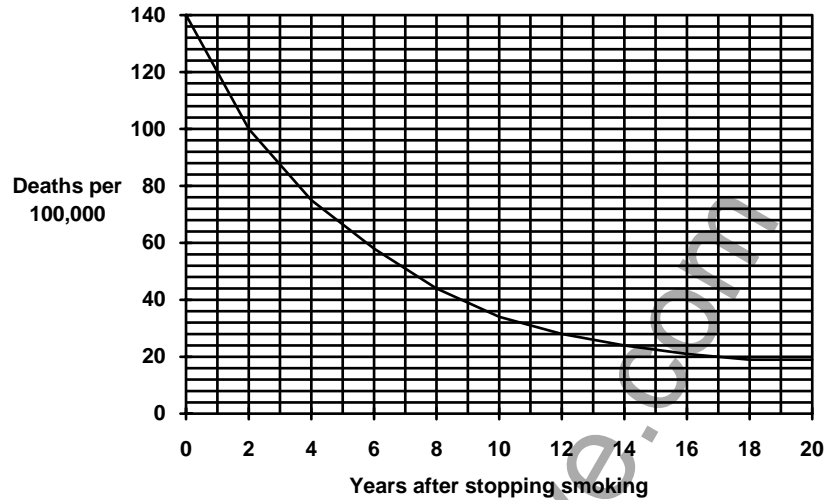
(b) When the rubber sheet is pulled down the balloons inflate. Explain how this is caused.

.....

.....

..... [3]

The graph shows the death rates from lung cancer of people who have stopped smoking



- (a) What is the death rate for smokers?  
 ..... [1]
- (b) How does the death rate change.
  - (i) 2 years after stopping smoking?  
 .....  
 ..... [1]
  - (ii) 8 years after stopping smoking?  
 .....  
 ..... [1]
- (c) How many years does it take for the death rate to drop from 100 deaths per 100,000 to 28 deaths per 100,000?  
 ..... [1]
- (d) Describe how you would use the information in the graph to persuade someone who had just stopped smoking not to start again.  
 .....  
 ..... [2]

## Medium Demand Questions

## QUESTIONSHEET 7

The following statements concern breathing. Some of these statements are correct and some are incorrect. Tick the ones which are correct.

1. Inhaled air contains approximately 20% oxygen.
2. When we breathe in the diaphragm relaxes.
3. When we breathe in the volume of the lungs increase.
4. Exhaled air contains approximately 5% oxygen.
5. The air we breathe out contains more carbon dioxide than the air we breathe in.
6. When we exercise vigorously, the volume of each breath increases.
7. The air we breathe out contains the same amount of nitrogen as the air we breathe in.
8. Exhaled air contains approximately 10% carbon dioxide.
9. Gases enter and leave the blood through the walls of the bronchioles.
10. When we breathe in the intercostal muscles relax.

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## Medium Demand Questions

## QUESTIONSHEET 8

The table shows the breathing rates of 5 people, A, B, C, D and E as they walk at different speeds.

Walking speed (km per hour)	Breathing rate (Breaths per minute)				
	Person A	Person B	Person C	Person D	Person E
0	16	15	16	14	14
1	17	16	17	15	16
2	20	18	19	17	18
3	21	19	20	19	21
4	22	20	23	20	23
5	27	23	28	23	26

- (a) Calculate the mean (average) breathing rate for the five people when walking at 3 km per hour. Show your working.

Answer..... [2]

- (b) What is the relationship between speed of walking and breathing rate?

..... [1]

- (c) For person A, what change in speed of walking increases the breathing rate by 10%?

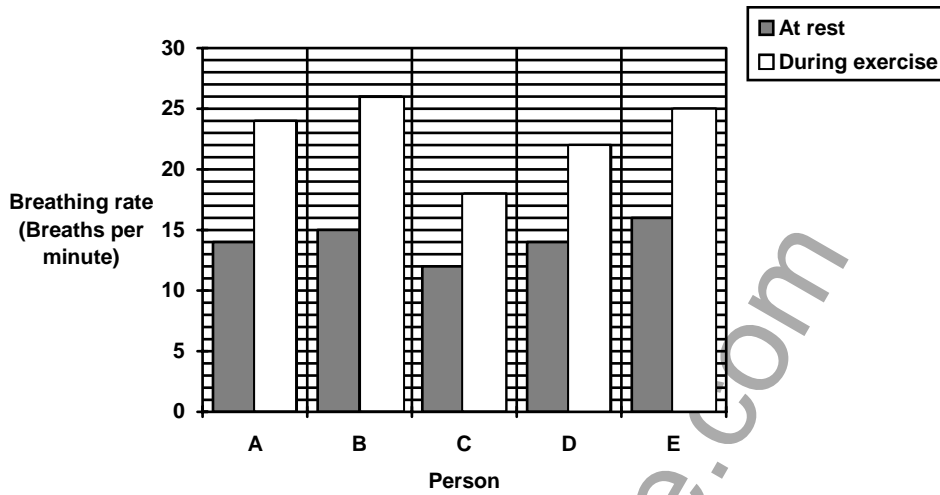
..... [1]

- (d) Calculate the percentage increase in the breathing rate when person D changes from walking at 1 km per hour to 4 km per hour. Show your working.

Answer ..... [2]



The bar chart shows the breathing rates of 5 people, A, B, C, D and E, at rest and during exercise.



- (a) Which person has the highest resting breathing rate?  
 ..... [1]
- (b) Calculate the mean (average) breathing rate of the 5 people. Show your working.  
 (i) at rest  
 Answer ..... [3]
- (ii) during exercise.  
 Answer ..... [3]
- (c) Calculate the percentage increase in the breathing rate for person C during exercise.  
 Answer ..... [2]
- (d) What two pieces of information in the bar chart indicate that person C is the fittest?  
 .....  
 ..... [2]
- (e) Why does the breathing rate during exercise?  
 .....  
 .....  
 .....  
 ..... [4]

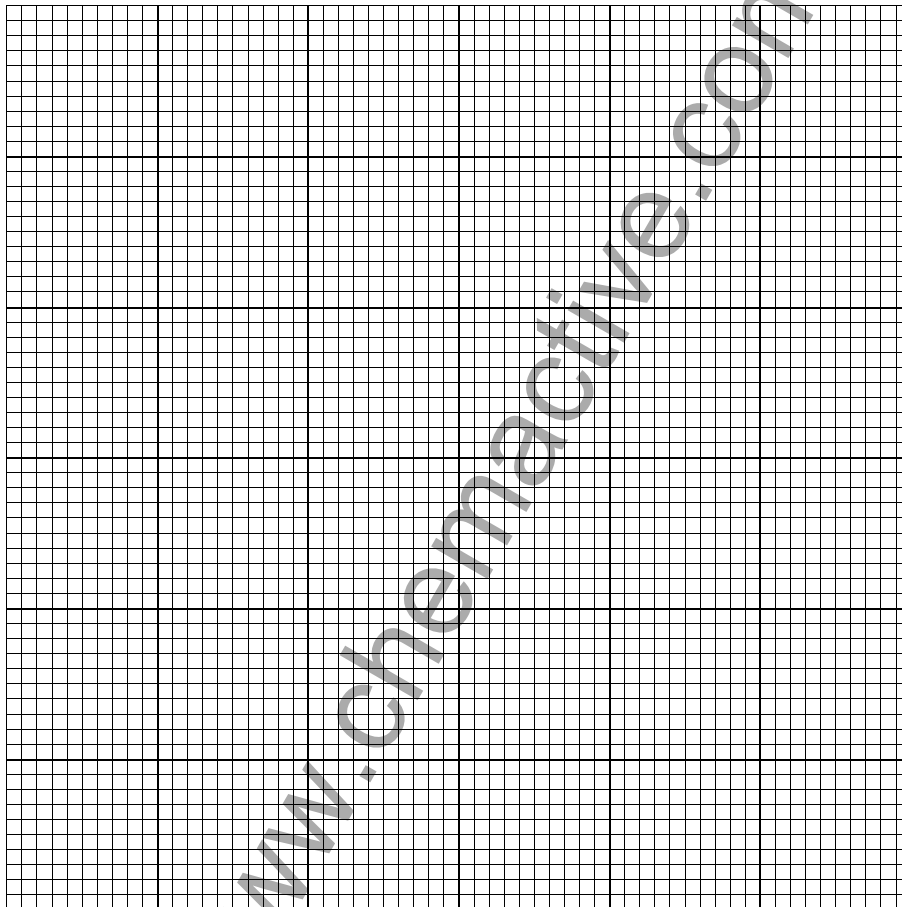
Medium Demand Questions

QUESTIONSHEET 10

The table shows the effect on the breathing rate of inhaling air containing different amounts of carbon dioxide

<b>Concentration of Carbon dioxide in air (%)</b>	0.5	1.0	1.5	2.0	2.5	3.0	4.0	5.0
<b>Breathing rate (breaths per minute)</b>	14	15	16	18	20	23	27	32

- (a) Plot a graph of these figures on the grid below.



[4]

- (b) How does increasing the carbon dioxide from 0.5% to 2.0% affect the breathing rate?

..... [2]

- (c) At a carbon dioxide level of 2.0%, the volume of each breath is 1.1 litres. Calculate the volume of air breathed in per minute at a carbon dioxide concentration of 2.0%.

Answer ..... [2]

TOTAL / 8

The table shows a person's breathing rate and the volume of each breath at rest and during exercise.

Activity	Breathing rate /Breaths per minute	volume of each breath / dm <sup>3</sup>
At rest	18	0.5
During gentle exercise	22	1.4
During vigorous exercise	28	2.0

- (a) How does exercise affect the breathing rate?

..... [1]

- (b) Calculate the amount of air entering the lungs:

- (i) at rest.

Answer ..... [2]

- (ii) during vigorous exercise.

Answer ..... [2]

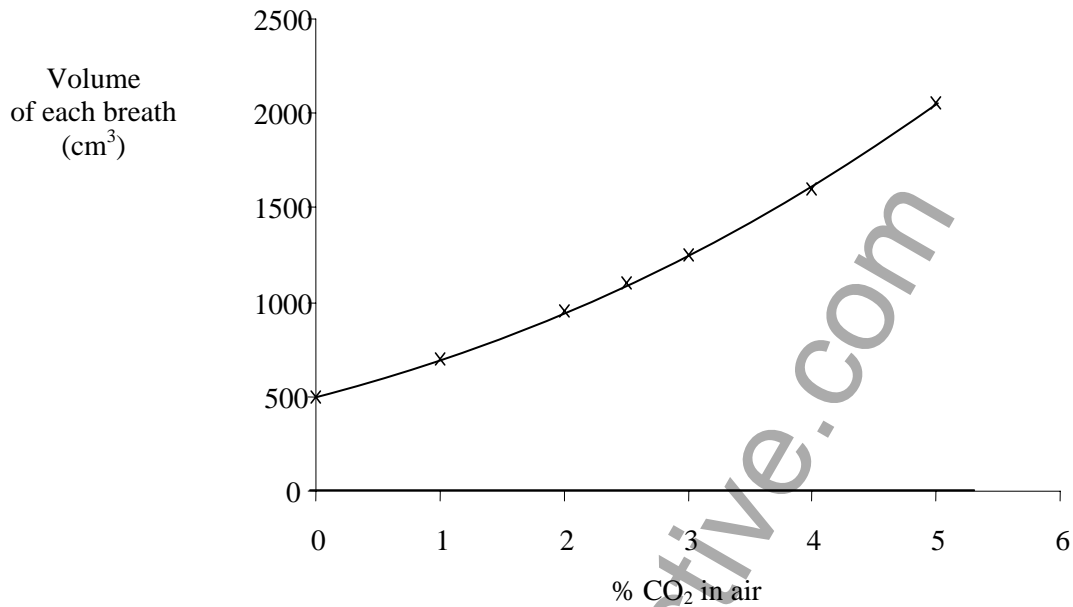
- (c) Air contains 20% oxygen. How much oxygen entered the lungs during gentle exercise?

.....  
.....  
.....  
..... [3]

Medium Demand Questions

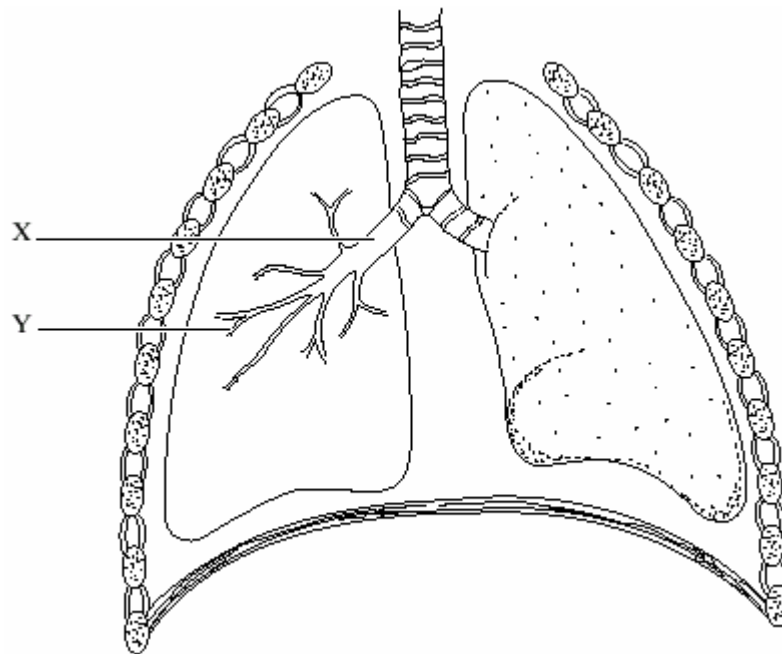
QUESTIONSHEET 12

The graph shows how the volume of a person's breath changes when breathing in air containing different amounts of carbon dioxide.



- (a) What was the volume of each breath when the level of carbon dioxide was 0 %?  
 ..... [1]
- (b) Use the graph to find the volume of each breath when the level of carbon dioxide was 2.5%.  
 ..... [1]
- (c) What is the relationship between the volume of each breath and the level of carbon dioxide in the air?  
 ..... [1]
- (d) What would you expect to happen to the rate of breathing as the carbon dioxide level increases?  
 ..... [1]

The diagram shows some of the structures in the thorax.



(a) Name the structures labelled X and Y.

.....  
..... [2]

(b) Name the structures which form the gas exchange surface in the lungs.

..... [1]

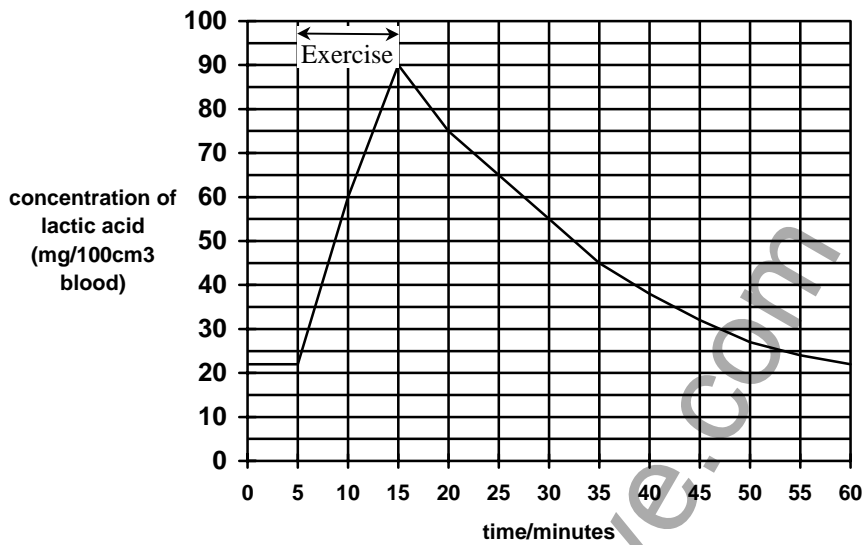
(c) State three ways in which the lungs are adapted for the exchange of gases.

.....  
.....  
..... [3]

(d) Explain how the process of inhalation takes place.

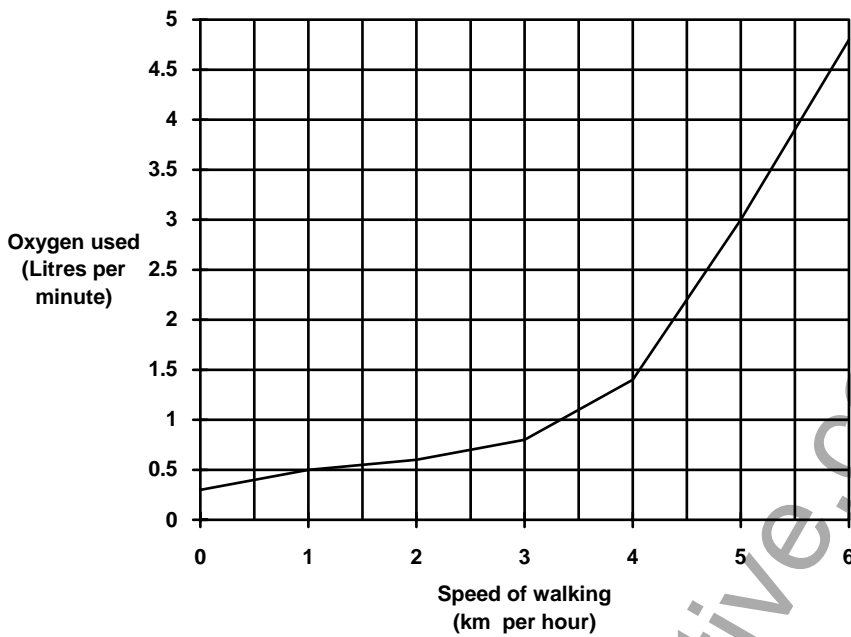
.....  
.....  
.....  
.....  
..... [6]

The graph shows the level of lactic acid in the blood before, during and after a period of exercise.



- (a) What was the normal level of lactic acid in the blood?  
..... [1]
- (b) By how much did the level of lactic acid increase during exercise?  
..... [1]
- (c) How long after the period of exercise did it take for the lactic acid concentration to return to normal?  
..... [1]
- (d) Name the process which produces lactic acid.  
..... [1]
- (e) After exercise the amount of oxygen taken in is approximately double the normal intake. Account for this difference.  
.....  
..... [2]

The graph shows the amount of oxygen used by the body when walking at different speeds.



(a) How much oxygen is used when walking

(i) at 1 km per hour?

..... [1]

(ii) at 5.5 km per hour?

..... [1]

(b) (i) What happens to the amount of oxygen used as the speed of walking increases?

..... [1]

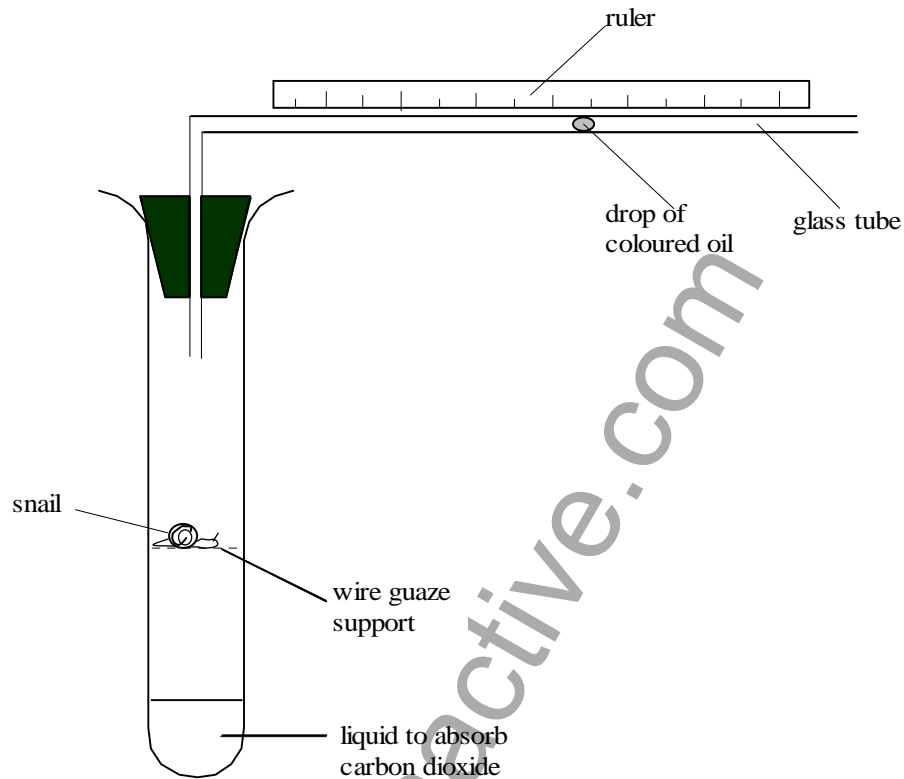
(ii) Explain the reason for this change.

.....

..... [2]

(c) When walking at 5 km per hour the amount of oxygen used is 3 litres per minute. The volume of each breath is 3.0 litres. Air contains 20% oxygen of which the body uses 20%. Use this information to calculate how many breaths per minute a person would take when walking at 5 km per hour.

A student set up the following apparatus to investigate gas exchange in small invertebrates.



(a) (i) After the apparatus had been set up for some time, the drop of oil was seen to have moved. In which direction would the drop of oil move? [1]

..... [1]

(ii) Explain why the drop of oil moved in this direction. [4]

..... [4]

(b) The test tube contains a liquid to absorb carbon dioxide given out by the snail. Name one other substance breathed out by the snail. [1]

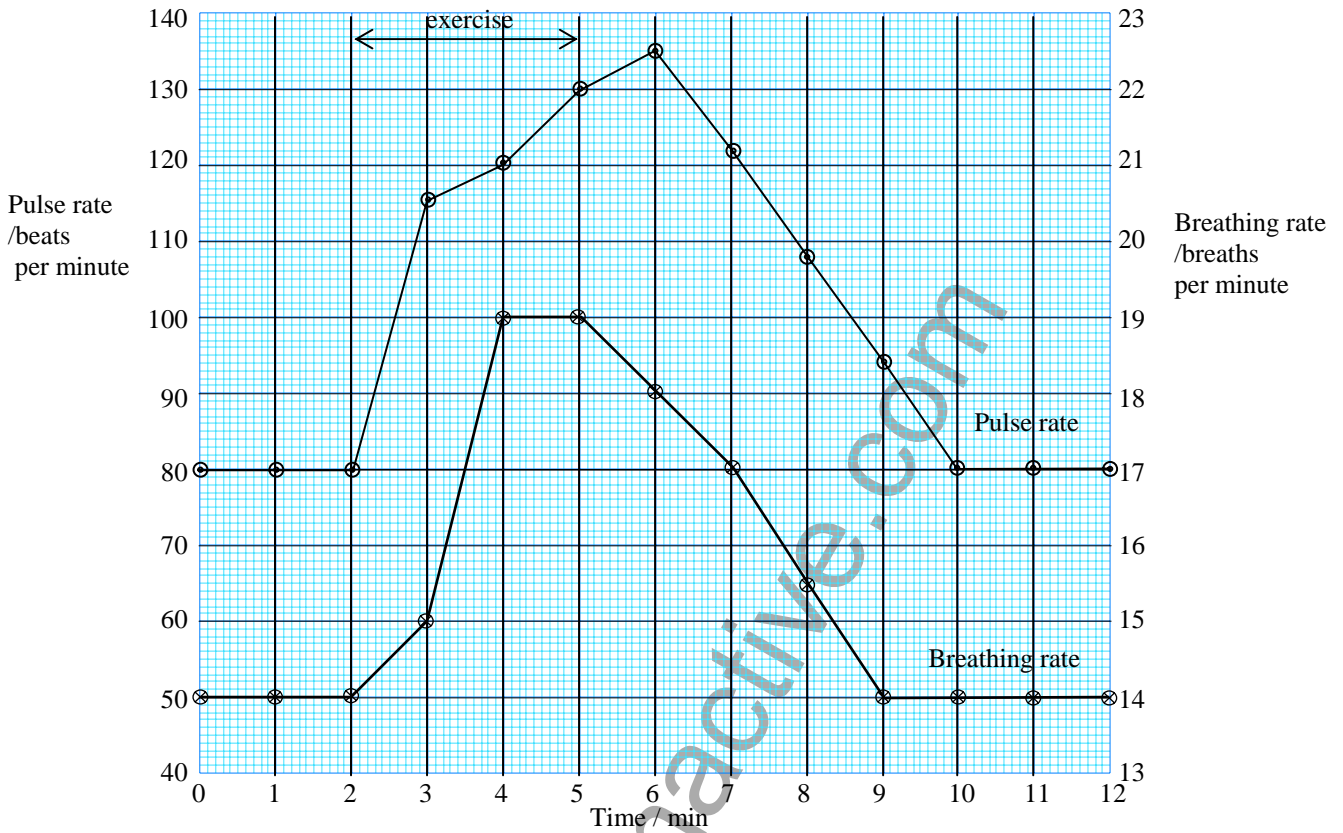
..... [1]

(c) If the temperature around the apparatus is increased the drop of oil is seen to move more quickly. Explain why the oil moves more quickly. [3]

..... [3]



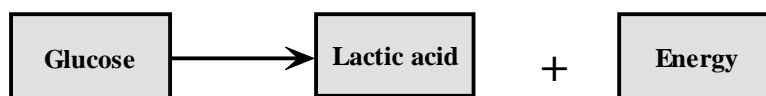
The graph shows the pulse rate and breathing rate of a person before, during and after exercise.



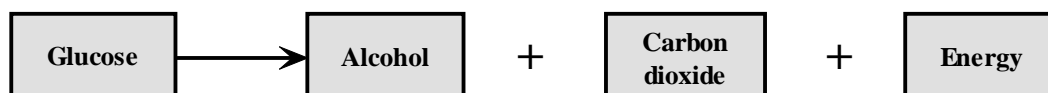
- (a) What was the person's
  - (i) resting pulse rate?  
..... [1]
  - (ii) resting breathing rate?  
..... [1]
- (b) What was the person's pulse rate 1 minute after the exercise started?  
..... [1]
- (c) What was the person's breathing rate at the end of the period of exercise?  
..... [1]
- (d) Calculate the time taken for each heart beat
  - (i) before exercise.  
  
Answer..... [2]
  - (ii) at 6 minutes.  
  
Answer..... [2]
- (e) How long after the exercise stopped did it take for the breathing rate to return to normal?  
..... [1]

The diagrams below show the equations for anaerobic respiration in humans and in yeast.

**Anaerobic  
respiration  
in Man**



**Anaerobic  
respiration  
in yeast**



(a) (i) State two similarities between the two reactions.

.....  
 ..... [2]

(ii) State two differences between the two reactions.

.....  
 ..... [2]

(b) (i) Explain what is meant by the term anaerobic respiration.

.....  
 ..... [2]

(ii) In what circumstances does anaerobic respiration occur in humans?

..... [1]

(c) A student investigated the effect of temperature on the production of carbon dioxide by yeast.

A solution of yeast and sugar was kept at different temperatures and the volume of carbon dioxide given off at 5 minutes intervals was recorded. The table shows the results.

Temperature $^{\circ}\text{C}$	Volume of carbon dioxide/ $\text{cm}^3$				
	5 minutes	10 minutes	15 minutes	25 minutes	30 minutes
5	5	15	26	31	42
15	10	25	45	59	76
25	22	38	46	67	90
35	32	58	75	95	135
55	10	12	12	12	12

(Continued...)

(i) At which temperature was most carbon dioxide produced?

..... [1]

(ii) Suggest why.

.....  
..... [2]

(d) Explain why so little carbon dioxide was produced at 55°C.

..... [1]

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The table below shows the percentage of male to female smokers and non-smokers in 1978, 1988 and 1998

	1978		1988		1998	
	Male	Female	Male	Female	Male	Female
Smokers / %	48.2	36.3	45.6	33.6	39.3	41.6
Ex-smoker	21.7	13.5	23.2	16.0	29.5	22.1
Non-smoker / %	30.1	50.2	31.2	50.4	31.2	36.3

(a) What percentage of women smoked in:

(i) 1978?

..... [1]

(ii) 1998?

..... [1]

(b) What percentage of men did not smoke in 1988?

..... [1]

(c) What happened to the percentage of male smokers between 1978 and 1998?

..... [2]

(d) Which group showed the largest change between 1988 and 1998?

..... [1]

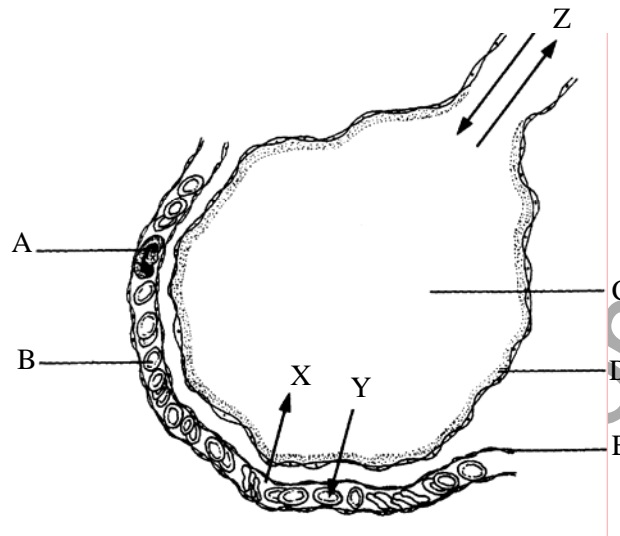
(e) Describe the pattern of female smokers over the period of time shown in the table.

.....  
 .....  
 .....  
 ..... [2]

(f) Suggest a reason for change in the smoking habits of women from 1988 to 1998.

.....  
 ..... [1]

The diagram shows a section through an alveolus and a surrounding blood vessel



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

A ..... B.....  
 C ..... D..... [4]

(b) What type of blood vessel is E?

..... [1]

(c) Name the gas moving in the direction shown by

(i) arrow X. .... [1]

(ii) arrow Y. .... [1]

(d) Name the process by which gases pass across the alveolar walls.

..... [1]

(e) What do the arrows Z represent?

..... [1]

(f) What happens to oxygen once it has entered the blood?

.....  
 ..... [2]

(g) The air breathed into the body often contains dust and bacteria. How are these prevented from entering the alveoli?

.....  
 .....  
 ..... [3]