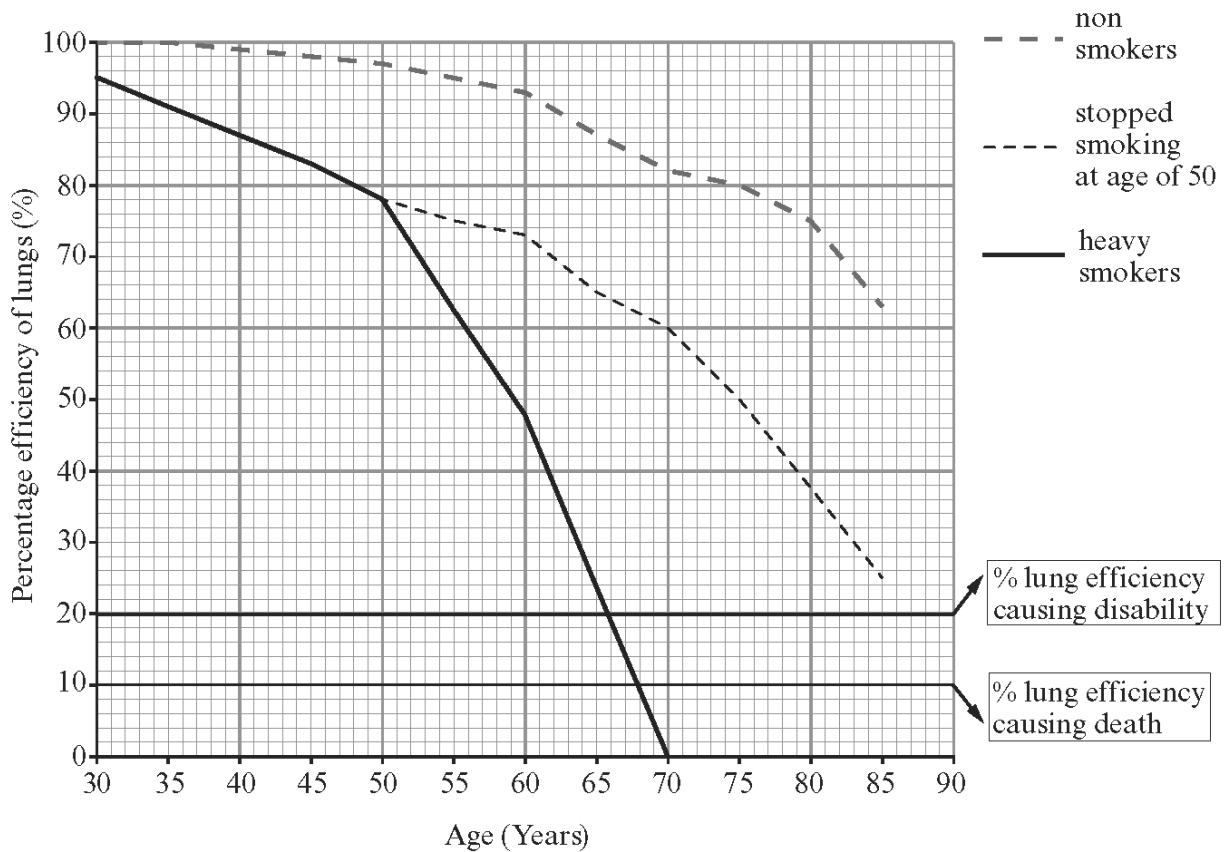


WJEC (Wales) Biology GCSE
Topic 1.2 Respiration and the
Respiratory System in Humans
Questions by Topic

1.

The graph below shows the efficiency of the lungs (how well they work) in three different groups of people: non-smokers, smokers who stopped smoking at the age of 50 and heavy smokers.



(a) What is the difference in percentage efficiency of a 60 year old non-smoker and a 60 year old heavy smoker? [1]

..... %

(b) (i) Continuing to smoke heavily can damage the lungs and lead to disability. At what age does the graph above show this disability occurring? [1]

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(ii) Suggest what the lung damage mentioned in (i) could be. [1]

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(c) Susan is a 50 year old heavy smoker.



Use the graph opposite to suggest what Susan might expect to happen if she gives up smoking now. [2]

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2.

Write an account of the similarities and differences between aerobic and anaerobic respiration in muscle cells. In your account, explain why aerobic respiration is more efficient than anaerobic respiration. [6 QWC]

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3.

Tom jogged for twenty minutes. The table below shows data about the concentration of lactic acid in his blood during this period of exercise.

time from start (min)	concentration of lactic acid in blood (mg/100 cm ³)
0	4
2	15
4	29
6	44
8	42
10	39
12	30
14	22
16	20
18	18
20	16

Use the data given and your knowledge to answer the questions below.

- (a) (i) How many minutes after the start of the exercise was the highest oxygen debt recorded? [1]

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- (ii) What type of respiration results in oxygen debt? [1]

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- (iii) When would Tom be releasing most energy per glucose molecule? Explain your answer. [2]

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- (b) Which type of cell would be producing lactic acid? [1]

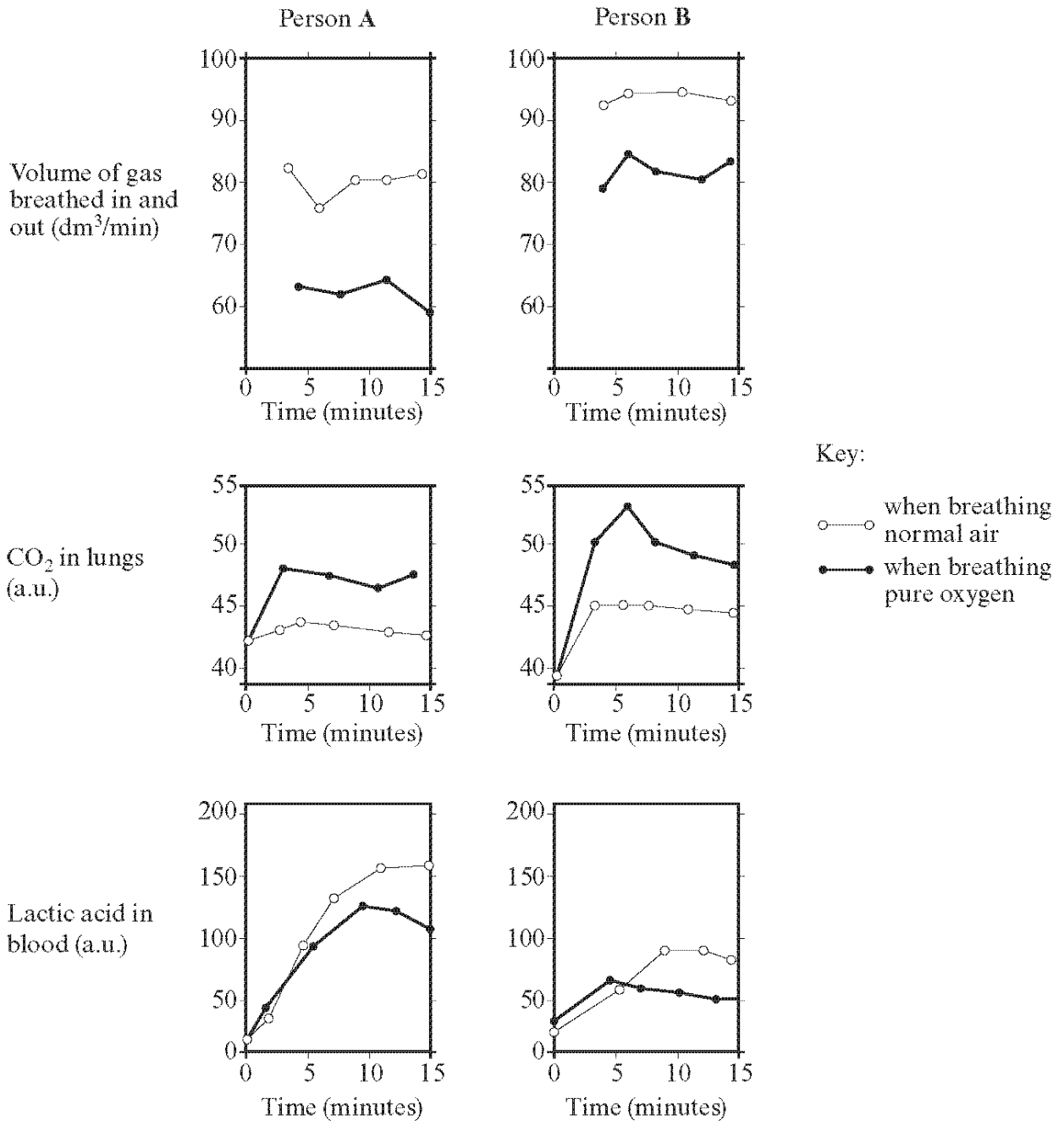
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4.

Two people, **A** and **B**, exercised vigorously for 15 minutes. The following measurements were taken for each person during the exercise:

- volume of gas breathed in and out
- carbon dioxide in the lungs
- lactic acid in the blood

The people then rested and repeated the process while breathing pure oxygen. The results are shown in the following graphs.



(a)

(ii) Person **B** is a trained athlete; person **A** is not. Give **three** pieces of evidence from the graphs to support this. [3]

I.

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II.

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III.

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(b) State the chemical that is changed into lactic acid. [1]

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(c) Suggest why there is more carbon dioxide present in the lungs when pure oxygen is breathed rather than breathing normal air. [1]

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(d) Give a reason for the lower level of lactic acid when pure oxygen is breathed. [1]

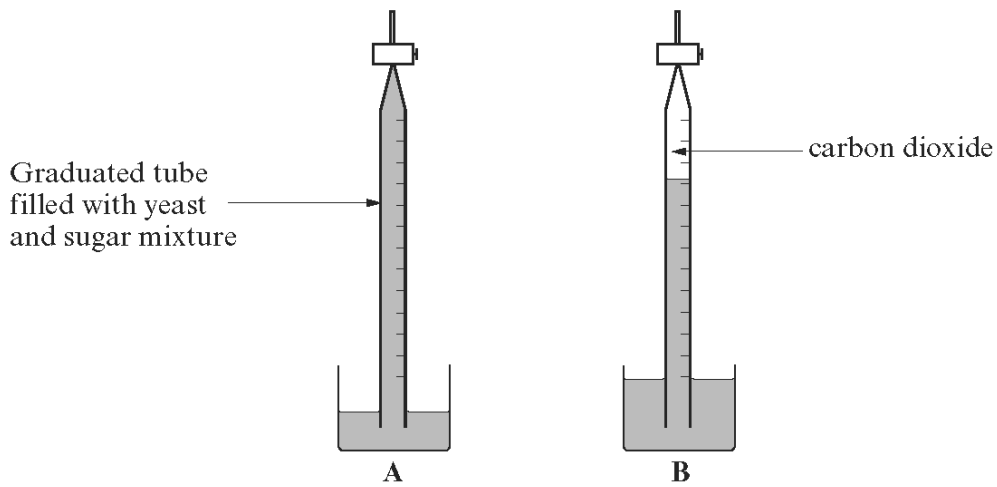
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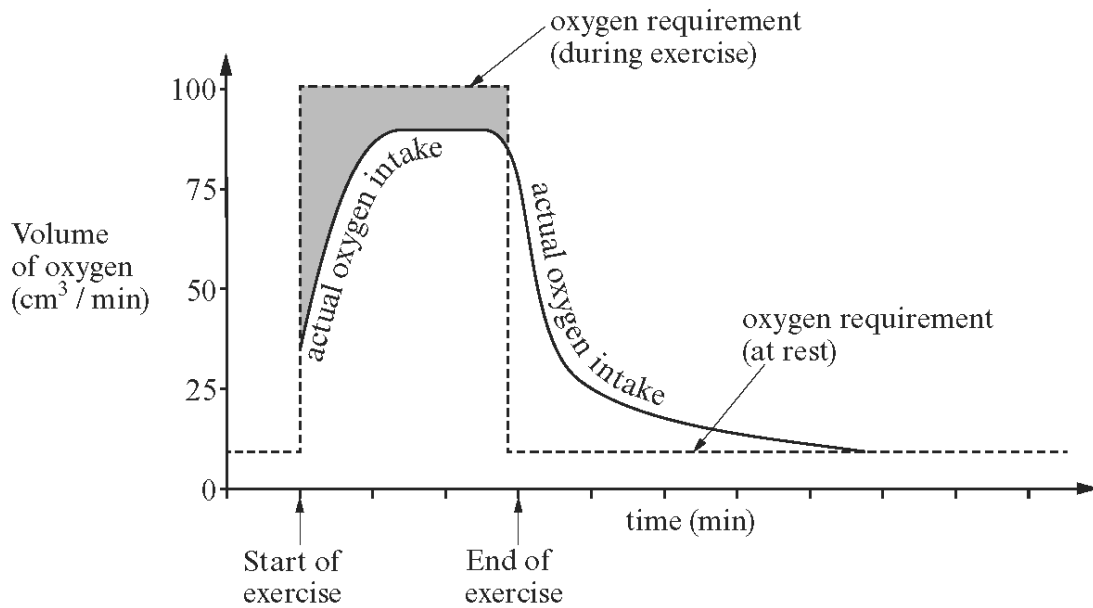
Students investigated the production of ethanol from sugars by yeast. They used solutions of the same concentration of four different types of sugars, **P**, **Q**, **R** and **S**. For each sugar, they set up the apparatus as in diagram A. The volume of carbon dioxide was measured every five minutes for each apparatus as shown in diagram B.



The table below shows the results of the investigation.

Mixture	Volume of carbon dioxide (cm ³)						
	5 min	10 min	15 min	20 min	25 min	30 min	35 min
yeast + sugar P	3.0	10.0	17.0	26.0	35.0	38.0	40.0
yeast + sugar Q	0.5	1.0	1.5	2.0	2.0	2.0	2.0
yeast + sugar R	0.5	1.0	1.0	1.5	1.5	1.5	1.5
yeast + sugar S	4.0	11.0	19.0	27.0	36.0	40.0	42.0
yeast + water	0.5	0.5	0.5	1.0	1.0	1.0	1.0

(b) The graph below shows the volume of oxygen required during exercise and the actual volume of oxygen taken in by an athlete.



(i) State the term used to describe the difference between the volume of oxygen required and the actual oxygen intake, as shown by the shaded area of the graph above. [1]

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(ii) State the chemical that is produced in the shaded area of the graph shown above. [1]

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(iii) How would you expect the shaded area in the graph above to be affected by a long period of regular training by an athlete? [1]

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(iv) State the type of respiration that takes place during rest. [1]

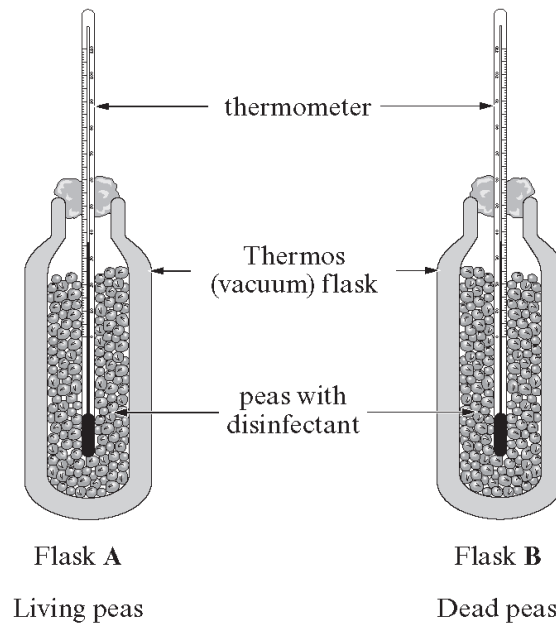
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6.

- (a) Complete the word equation below which shows respiration, the process which releases energy in living cells. [1]

glucose + → + water

- (b) Some students investigated the release of energy during respiration in living peas. They used the apparatus shown in the diagram below and measured the temperature over a period of 11 days.



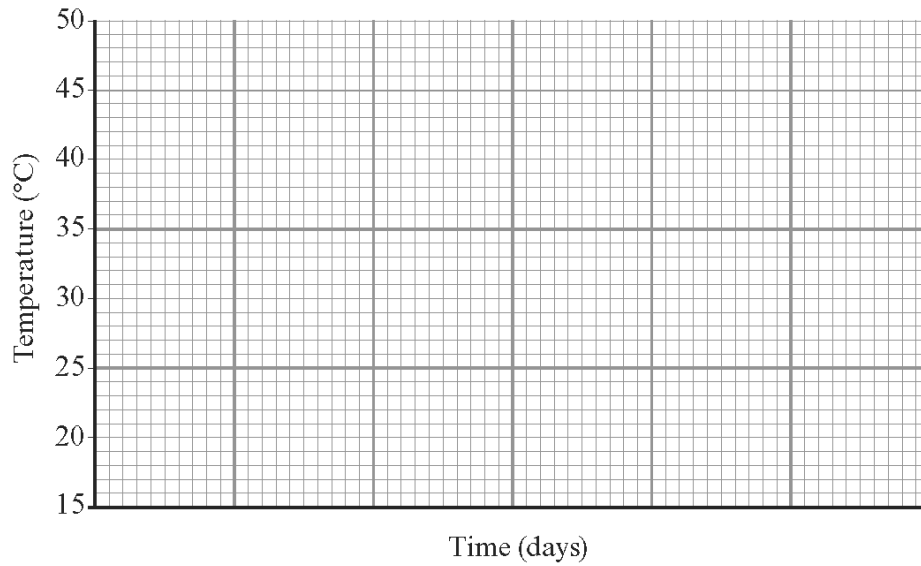
Investigation results

Time (days)	Temperature (°C)	
	Flask A	Flask B
1	18	18
3	20	18
5	23	18
7	35	18
9	38	18
11	38	18

- (i) Complete a line graph of the results for flask A on the grid opposite by:

- I. Choosing the scale on the time axis
- II. Plotting the points
- III. Joining the plots with a ruler

[1]
[2]
[1]



(ii) Use the graph to answer the following questions.

I. Describe how the temperature changed in flask A from day 3 to day 11. [1]

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II. During which time period did the temperature change most rapidly? Place a tick (✓) by your answer. [1]

2-4 days 4-6 days 8-10 days

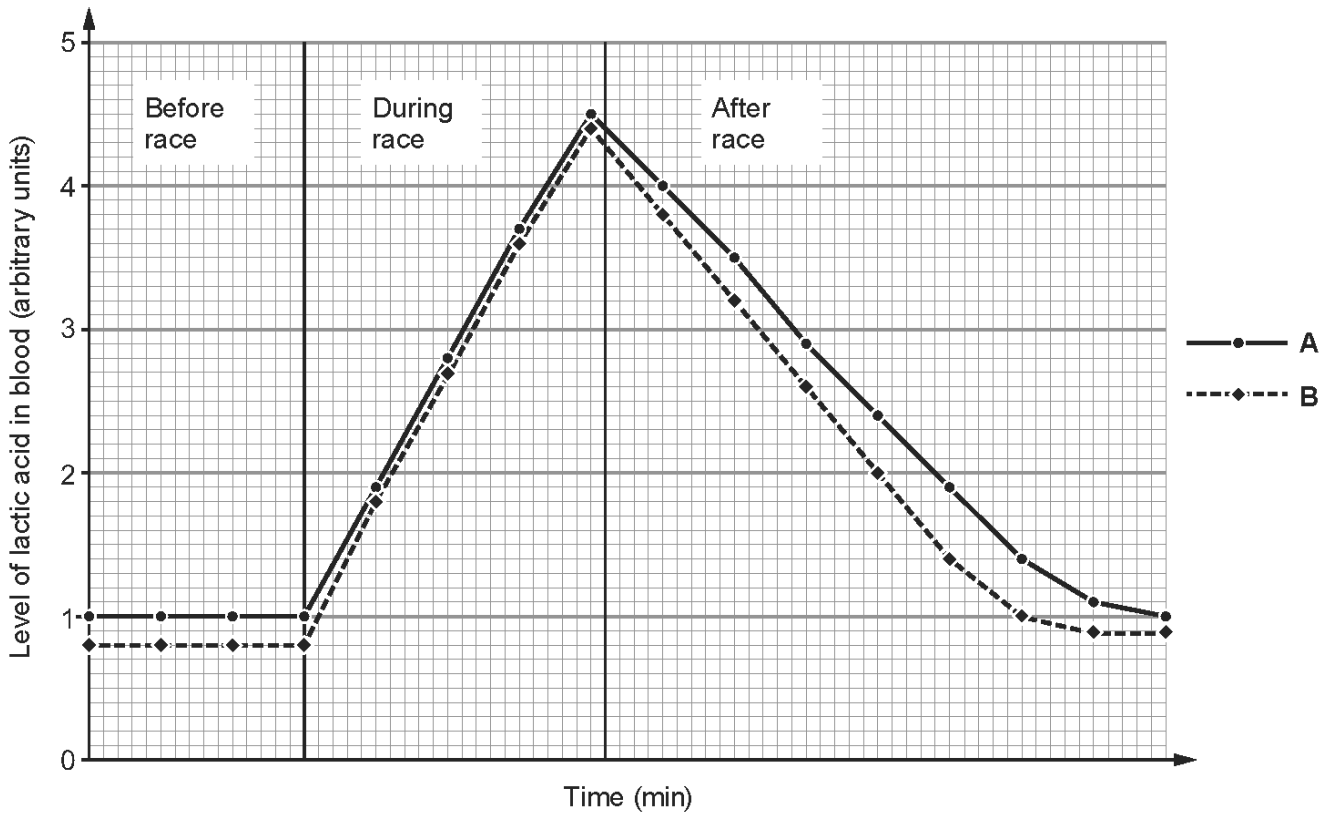
(c) Give the reason for the results obtained in flask B. [1]

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7.

The concentration of lactic acid in the blood of an athlete was measured before, during and after a race. The athlete then followed a two week period of increased regular exercise to improve fitness. The lactic acid measurements were then repeated, as before, for a race of the same distance. The graph shows the results.



(a) Give reasons why line **B** shows evidence that it represents the results **after** the two week period of exercise. [2]

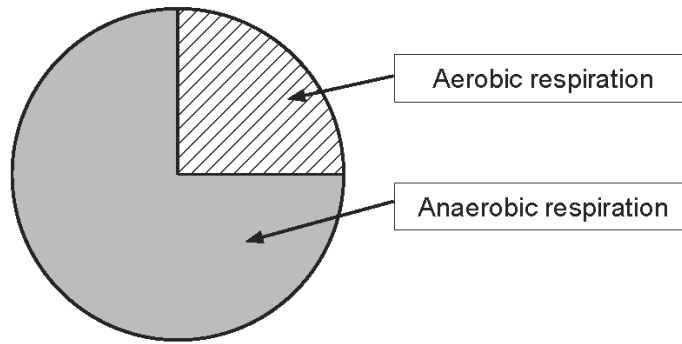
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(b) The pie chart below shows the proportions of aerobic respiration and anaerobic respiration taking place in an athlete during a 100 m race.



(i) State the proportions as a ratio. [1]

..... anaerobic respiration : aerobic respiration

(c) Why is aerobic respiration more efficient than anaerobic respiration? [2]

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8.

The table below shows the concentration of lactic acid in the blood of two athletes, Anjum and Tudor, before and after vigorous exercise that lasted 10 minutes.

The concentration of lactic acid was measured at 10 minute intervals after the exercise for the next 50 minutes.

time (min)	lactic acid concentration (mg / 100cm ³)	
	Anjum	Tudor
0	20	20
10	80	90
20	78	90
30	60	80
40	50	75
50	38	60
60	25	50

(a) Use the data to give reasons why Anjum appears to be fitter than Tudor. [2]

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(b) Give a reason why a marathon runner relies almost totally on aerobic respiration and produces very little lactic acid. [1]

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9. The following word equations show the two types of cell respiration which occur in humans.

Equation 1



Equation 2



Name each of the types of cell respiration shown above and write an account explaining when each occurs in the human body. Include any advantages or disadvantages of each type of respiration. [6 QER]

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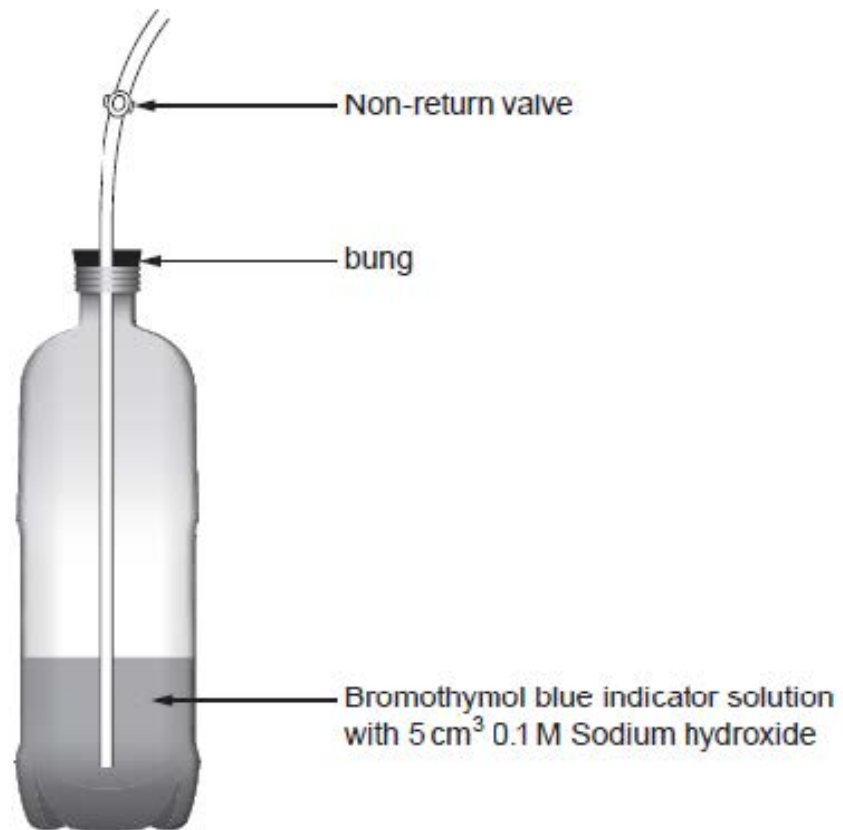
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10. A respirometer is a device used to measure the rate of respiration of a living organism by measuring its rate of exchange of oxygen and/or carbon dioxide. A simple respirometer used in a school laboratory is shown below. It can be used to estimate the volume of carbon dioxide in exhaled air.



Fact file

- Bromothymol blue indicator is green when neutral and blue when alkali.
- 5.6 cm³ of carbon dioxide will neutralise the sodium hydroxide in the respirometer.

The following equation can be used to calculate the volume of carbon dioxide produced per minute.

$$\text{Volume of carbon dioxide per minute} = \text{breathing rate} \times \text{volume of carbon dioxide in one breath}$$

$(\text{cm}^3/\text{minute}) \qquad (\text{breaths}/\text{minute}) \qquad (\text{cm}^3/\text{breath})$

Use the information from the fact file opposite to answer the following questions.

- (a) (i) Alun wanted to investigate the effect of exercise on the volume of carbon dioxide breathed out. While resting, he takes 5 breaths over a period of 25 seconds to change the colour of the Bromothymol indicator from blue to green. Use the equation given in the fact file to calculate the volume of carbon dioxide produced per minute. [3]

volume of carbon dioxide per minute = $\text{cm}^3/\text{minute}$

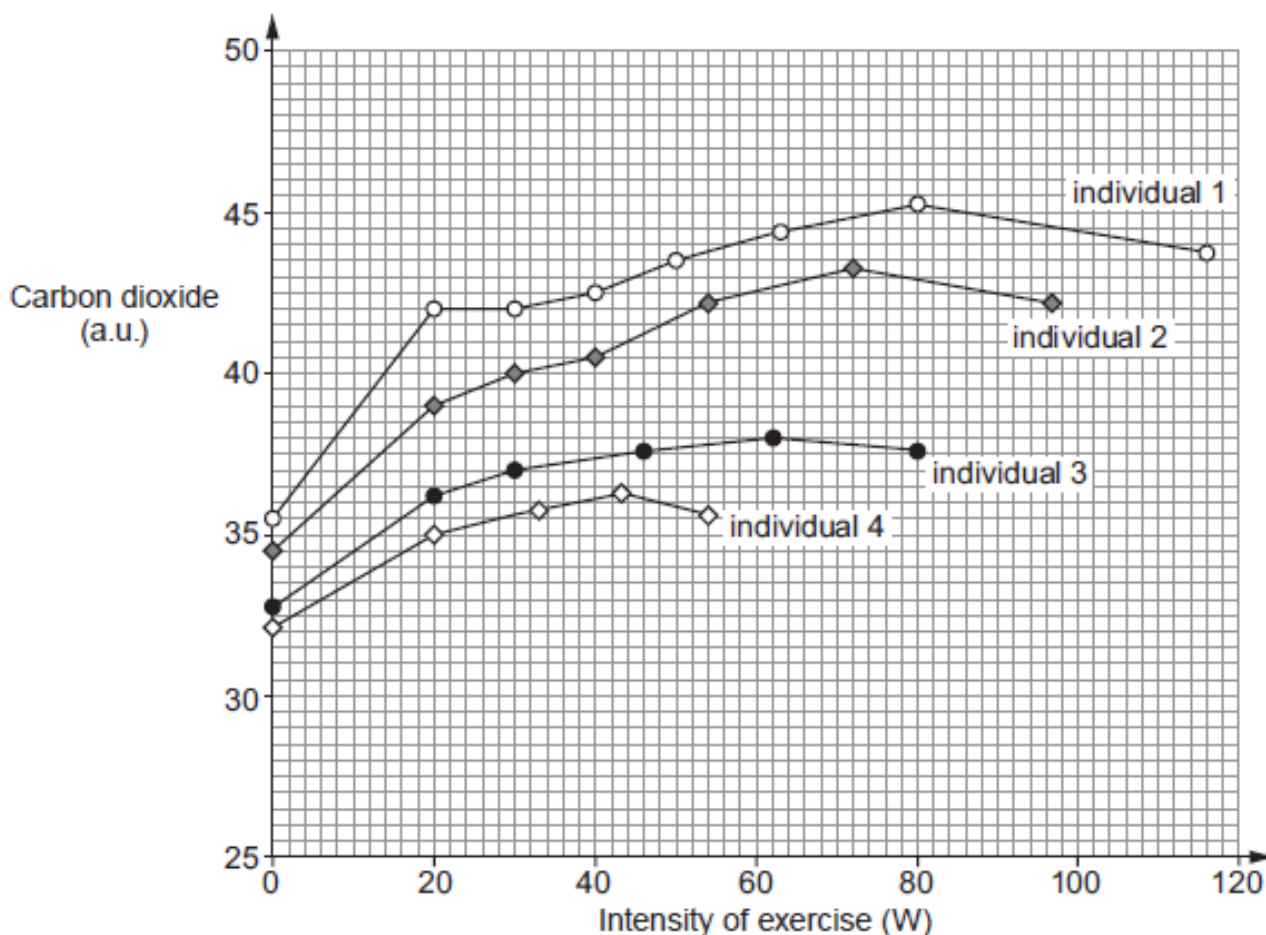
- (ii) Suggest a possible source of error in the experimental method that could lead to inaccurate results. [1]

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- (b) A group of scientists monitored the proportion of carbon dioxide expired in 4 individuals. The individuals were tested on an exercise bike. They were allowed to rest for 4 minutes, and then exercised at an intensity of 20 watts for 4 minutes. After this time the intensity was increased 1 watt every 6 seconds. Individuals stopped exercising when they suffered from cramp in their leg muscles. A gas analyser was used to get an accurate measurement of the expired carbon dioxide level per breath.

The results of the investigation are shown below.



- (i) Explain the increase in carbon dioxide levels between an intensity of exercise 0W and 20W for all the individuals. [2]

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(ii) The decrease in carbon dioxide levels for all individuals at a higher intensity of exercise was linked to cramp in the muscles. Suggest an explanation for this. [2]

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(iii) Suggest which individual is the least fit. Give a reason for your answer. [1]

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(c) State why sports scientists working with athletes would measure oxygen consumption as well as carbon dioxide production. [1]

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11. An investigation compared the composition of inspired and expired air. This is shown in the table below.

Gas	% Concentration of air	
	inspired	expired
oxygen	20.9	16.0
carbon dioxide	0.04	4.0
water vapour	variable	variable
nitrogen	78.1	78.1

- (a) (i) Calculate the difference in the % concentration of oxygen in the expired air and the inspired air. [1]

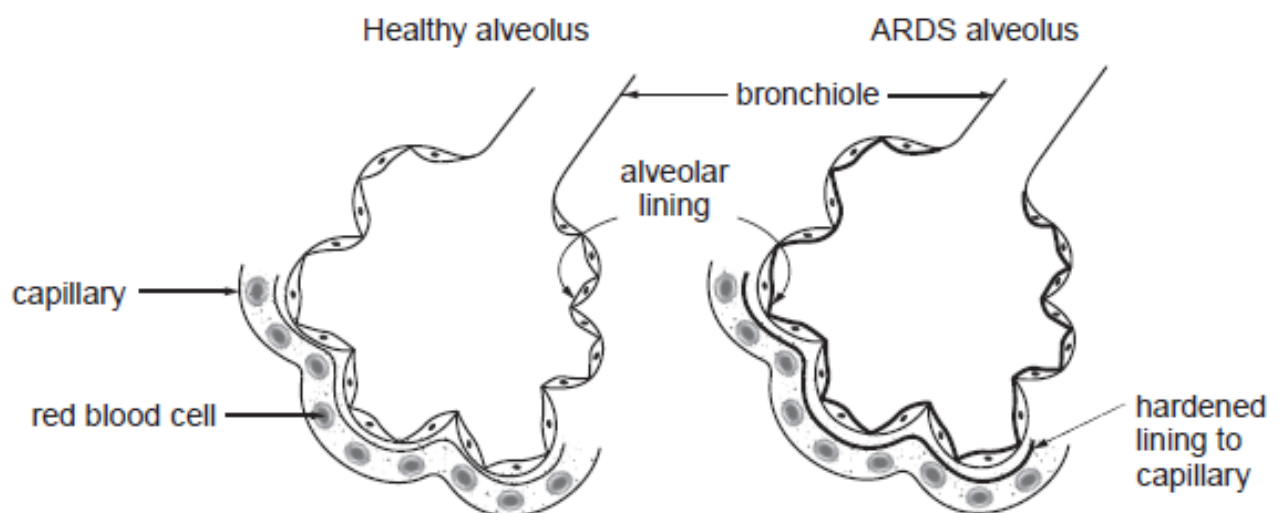
difference = %

- (ii) State the process in cells that uses oxygen and glucose to release energy. [1]

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- (b) People with a disease called ARDS (Acute Respiratory Distress Syndrome) have difficulty getting enough oxygen.

The diagrams show a healthy alveolus and an alveolus from someone with ARDS.



- (i) Draw an arrow on the diagram of the healthy alveolus, to show the direction of movement of oxygen through the alveolar lining. [1]

- (ii) Describe **two** differences you can see between the two diagrams and explain why people with ARDS have difficulty getting enough oxygen from inspired air. [3]

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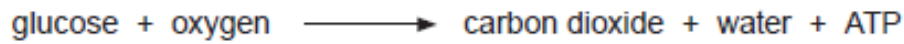
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- (c) Many different types of molecules pass across cell membranes.

Complete the table below to show the direction of movement of molecules between blood and muscles. Place **one** tick (✓) in each row. [3]

Molecule	From blood to muscles	From muscles to blood	To and from blood and muscles
oxygen			
carbon dioxide			
water			

12. The word equation for aerobic respiration is shown below.



(a) In the space below state the word equation for anaerobic respiration in human cells. [1]

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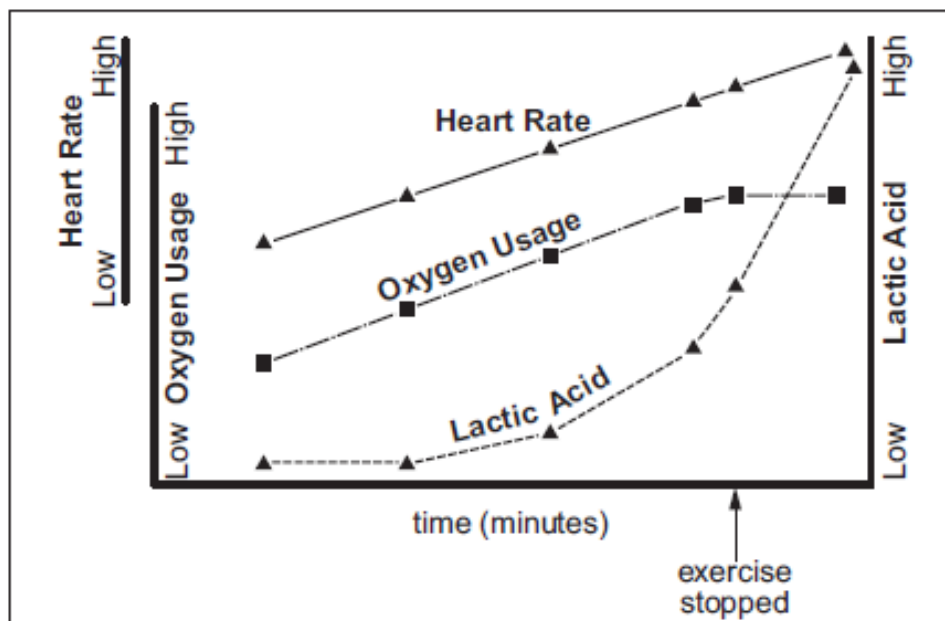
(b) Explain why anaerobic respiration is less efficient than aerobic respiration. [2]

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(c) An Olympic athlete exercised on a treadmill. During the exercise her blood oxygen and lactic acid levels were continuously monitored as was her heart rate. The athlete's fitness coach knew the maximum intensity of exercise she could perform (100%). The athlete increased the intensity of exercise until she reached the maximum intensity of exercise she could perform (100%). She then stopped the exercise but her heart rate and blood levels continued to be monitored. The graph below appeared on a computer screen.



- (i) Explain why, even after exercise stops, the athlete continues to take in and use large volumes of oxygen. [2]

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- (ii) Explain why the heart rate remains high after exercise stops. [1]

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- (d) The ability of oxygen to pass into the capillaries around the alveoli decreases with increasing altitude. Above 1500m physical activity becomes more difficult. In 1968, the Olympic Games were held in Mexico City (altitude 2268m). Athletes and their coaches realised the difficulty of competing at the altitude of Mexico City and many of them arrived, and started training, three months before the games started. As a result of this long period of acclimatisation to altitude, the number of red blood cells per unit volume of blood in the athlete's body increased. This is one of the effects of living and working at altitude. Explain the advantage, to the athletes, of the increased number of red blood cells per unit volume of blood. [2]

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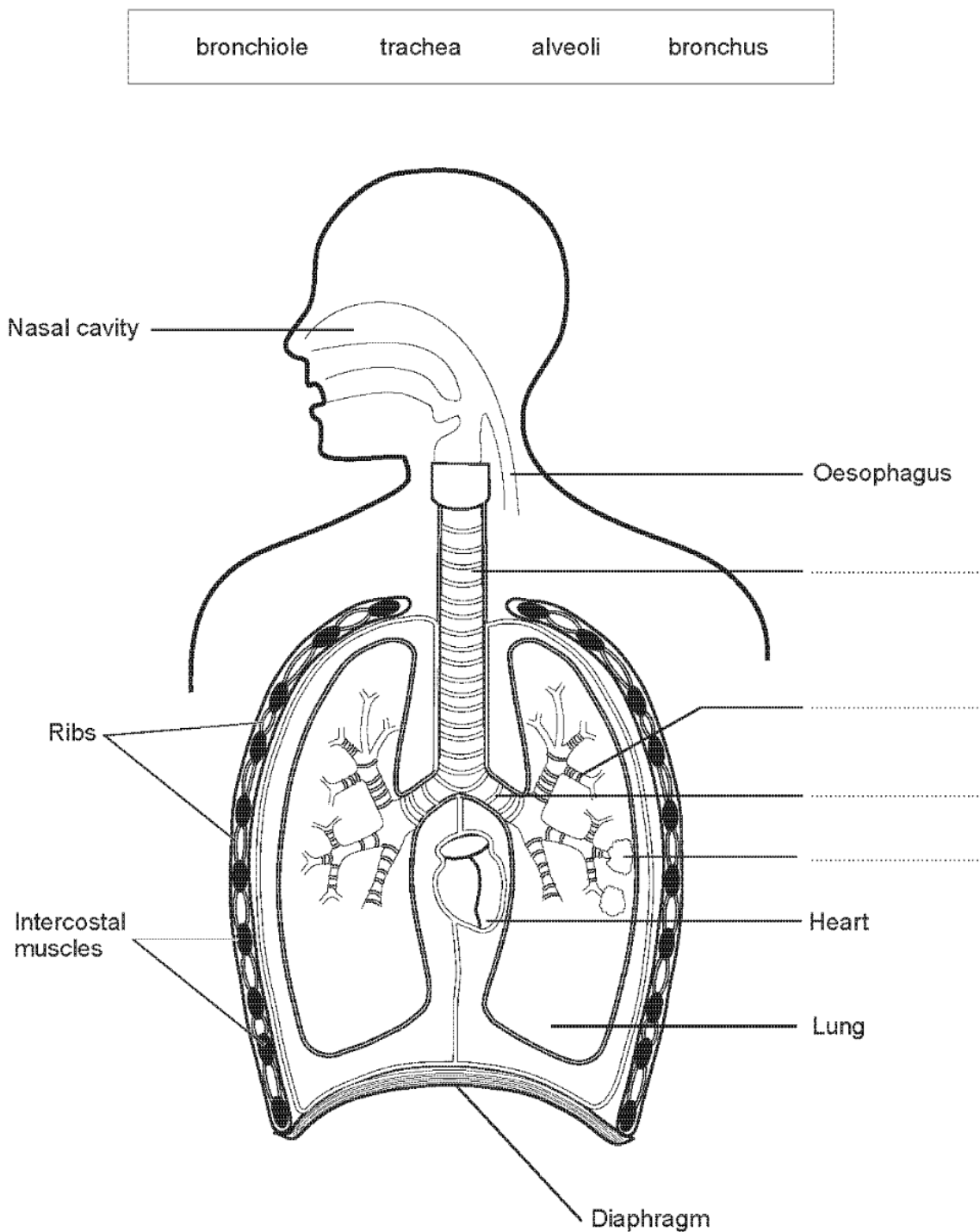
13.

Some healthcare practitioners monitor our respiratory system.

(a) They need to be able to identify the parts of this system.

Label the following parts on the diagram below.

[3]



(b) Describe how air is breathed in and out of the human body.

[6 QWC]

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(d) Explain why the breathing rate changes during exercise.

[2]

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14.

- (a) The table shows a comparison for two athletes, Tomos and Jeremy, who ran in races of different distances.

Athlete	Distance of race (m)	Oxygen needed in the race (dm ³)	Oxygen entering blood in the race (dm ³)
Tomos	100	10	0.5
Jeremy	10 000	150	134.0

- (i) The difference between the oxygen needed and the oxygen actually entering the blood during the race is the oxygen debt. Calculate the oxygen debt for [1]

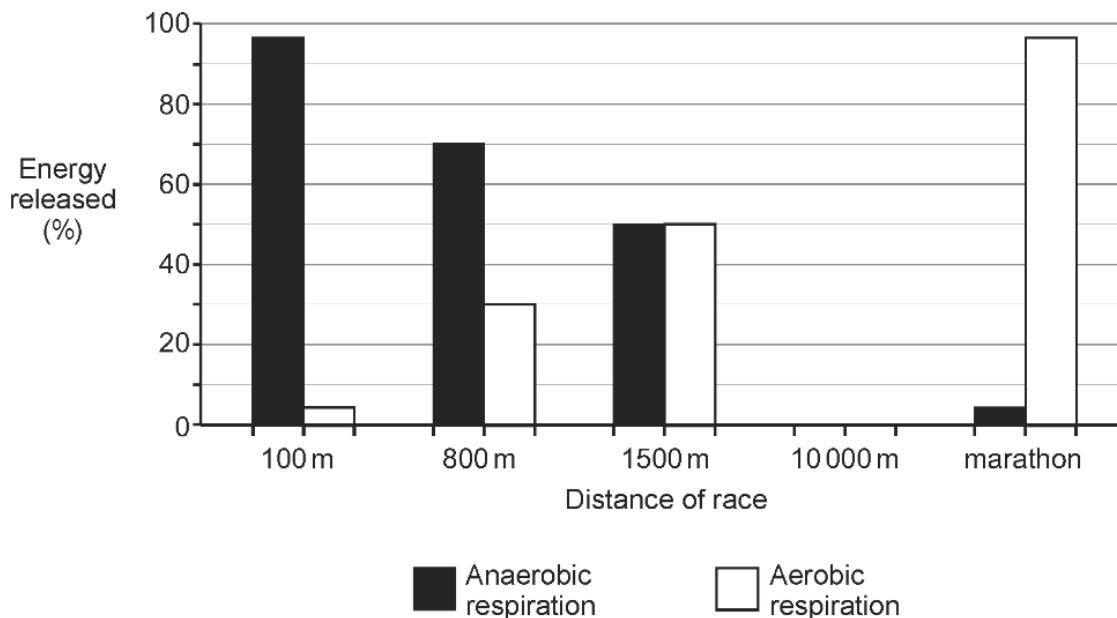
Tomos dm³

Jeremy dm³

- (ii) When the race was over, both athletes continued to breathe more rapidly and more deeply than normal for some time. Give the reason for this. [1]

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- (b) The bar chart shows the percentage of energy released by aerobic and anaerobic respiration for athletes running different distances.



- (i) What can be concluded from the data shown in the table and the bar chart for the athlete running 100m? [1]

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- (ii) **On the bar chart opposite, draw bars** that you would expect for an athlete running in a 10 000m race. [2]

(c) Write the word equations to represent:

- (i) Aerobic respiration in human muscle tissue; [1]

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- (ii) Anaerobic respiration in human muscle tissue. [1]

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- (d) Why is aerobic respiration more efficient than anaerobic respiration? [1]

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15.

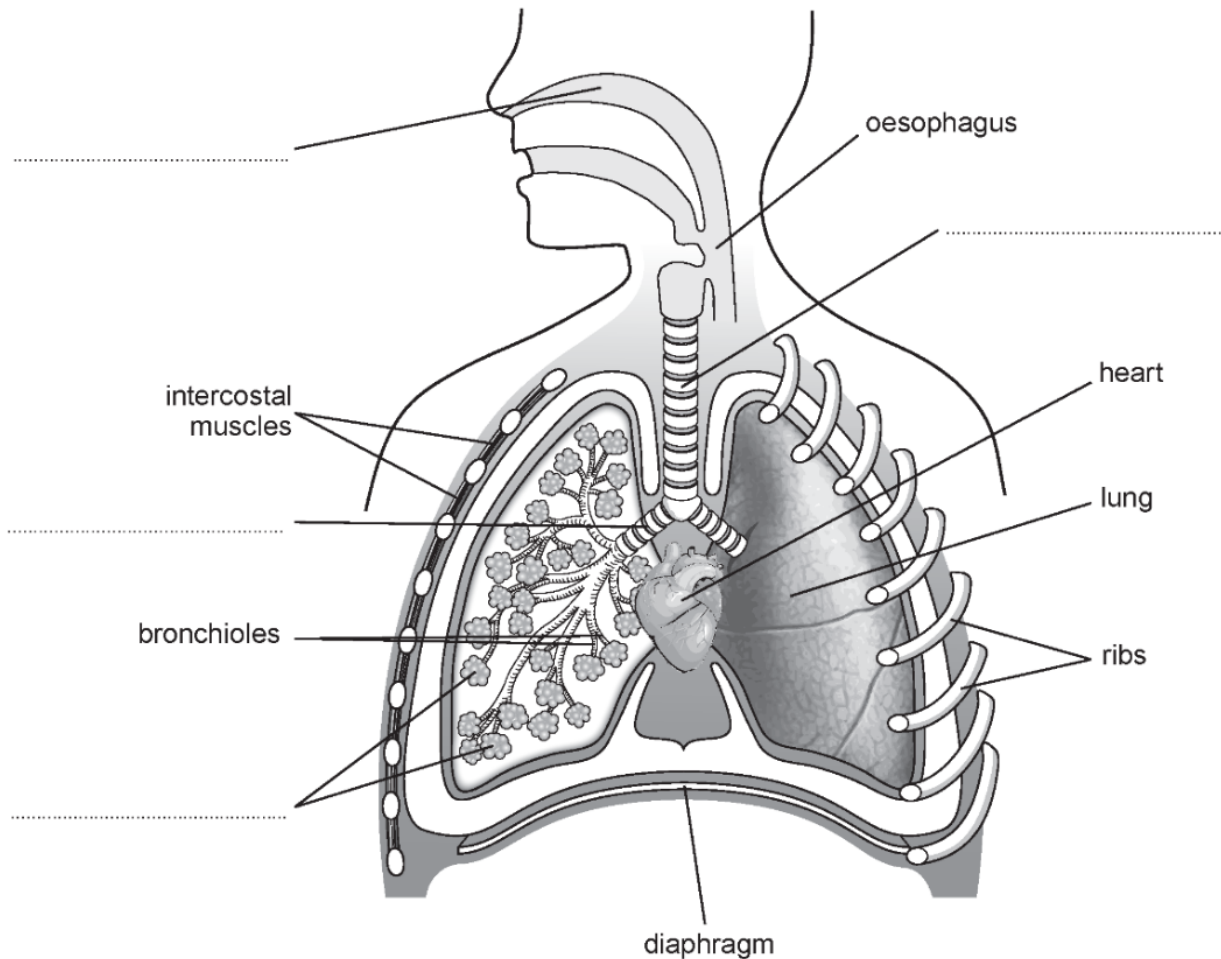
Llinos' response to exercise is being monitored by her health care team.

(a) The team needs to know about the respiratory system.

Label the missing parts on the diagram below using only words from the box.
*One label in the box is **not** needed in the diagram.*

[4]

ventricle	alveoli	nasal cavity	trachea	bronchus
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(b) The air breathed in and out by Llinos was analysed. The analysis is shown below.

Gas	% of gas in air breathed in	% of gas in air breathed out
nitrogen	78	78
oxygen	21	17
carbon dioxide	0.03	4.03
other gases	0.97	0.97

State two differences between the air breathed in and air breathed out. [2]

1.
2.

(c) (i) Complete the following equation. [2]

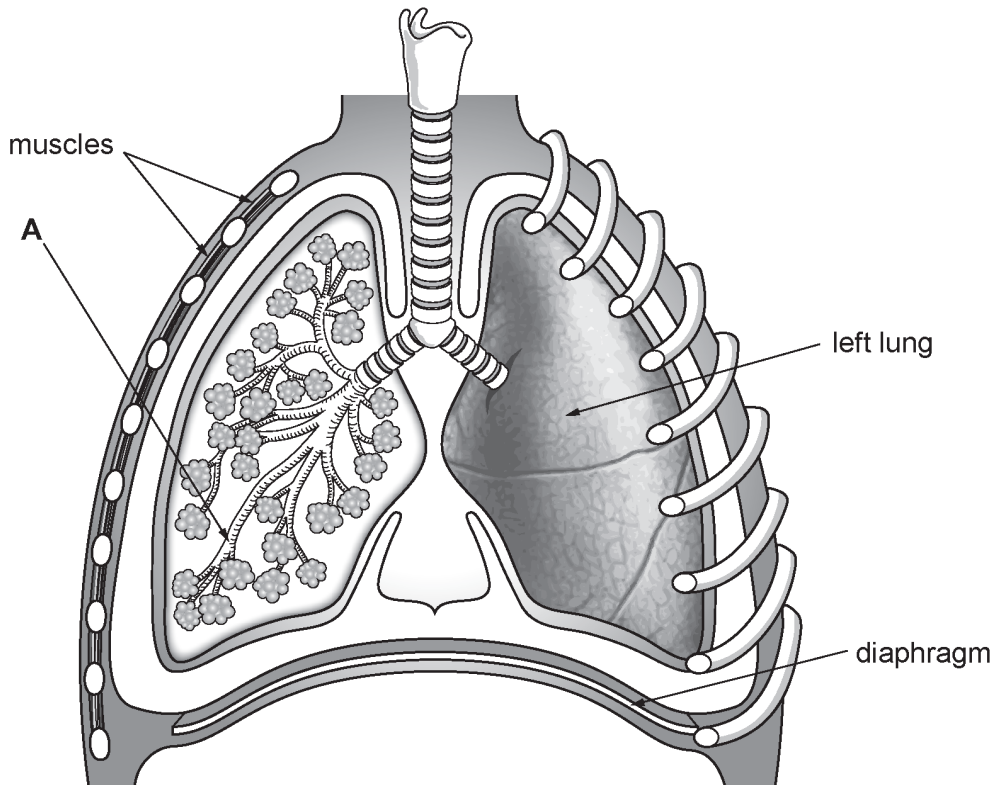
glucose + oxygen \longrightarrow + + energy

(ii) Name the reaction in the equation above. [1]

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16. The diagram below shows the human respiratory system.

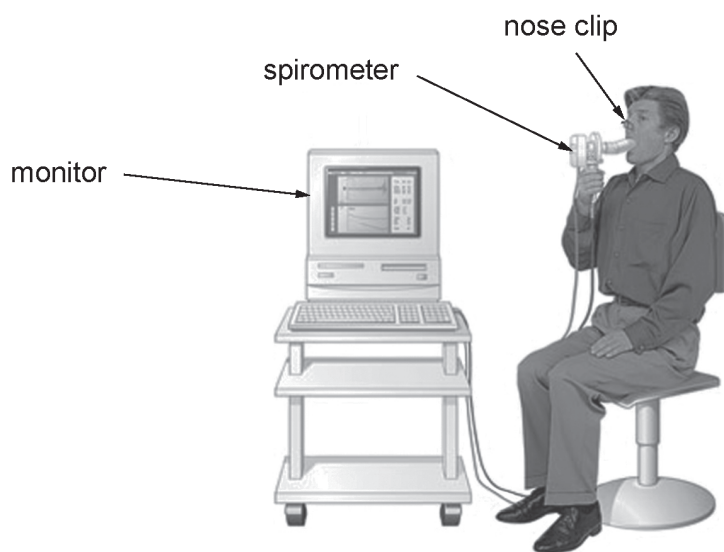


(a) Name structure A on the diagram.

[1]

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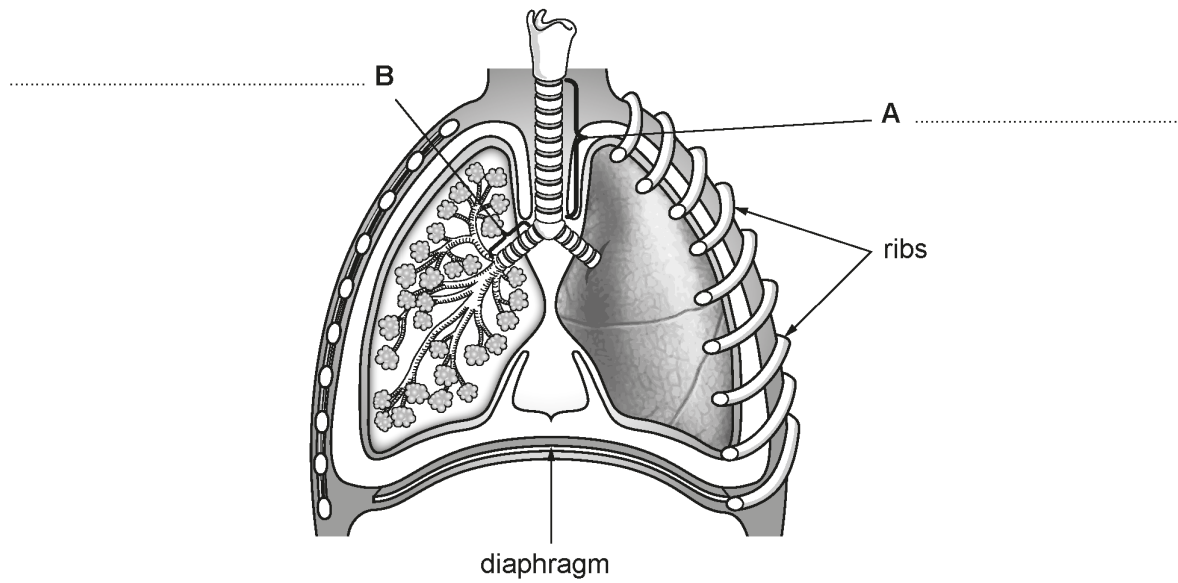
(b) A person's breathing rate was measured on a spirometer for 120 seconds.



17.

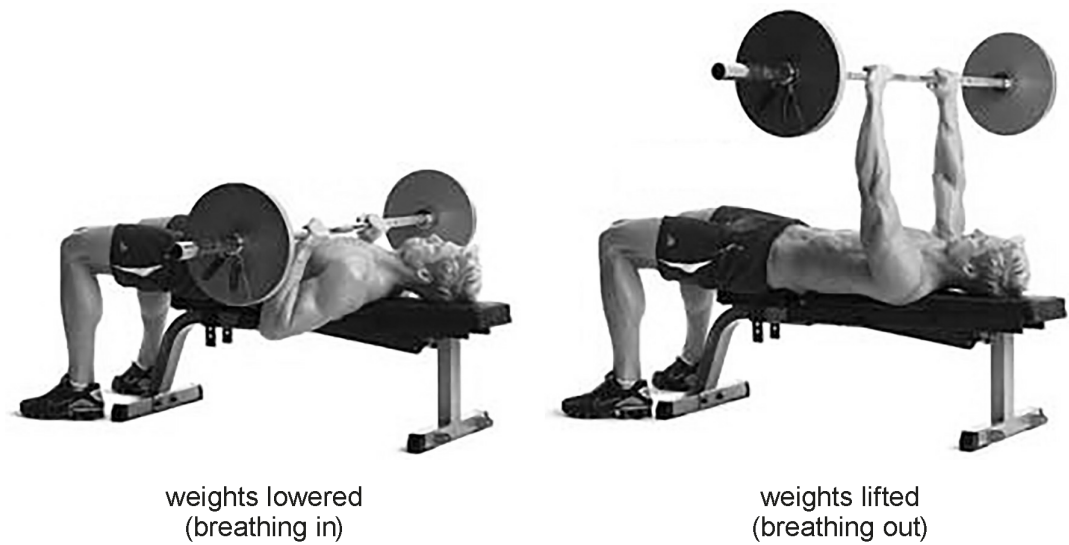
- (a) The diagram shows a section through the human chest.
Label structures A and B.

[2]



- (b) Rhodri visits the gym to do regular weight training.

His coach investigated how his chest measurement changed when he lifted and lowered his weights.



Results of investigation

trial	chest measurement (cm)		
	weights lowered (breathing in)	weights lifted (breathing out)	decrease
1	105	90
2	107	92	15
3	104	91

- (i) **Complete the table** to show the decrease in chest measurement for trials 1 and 3. [1]
- (ii) Calculate the mean decrease in Rhodri's chest measurement when he lifts the weights. Give your answer to one decimal place. [2]

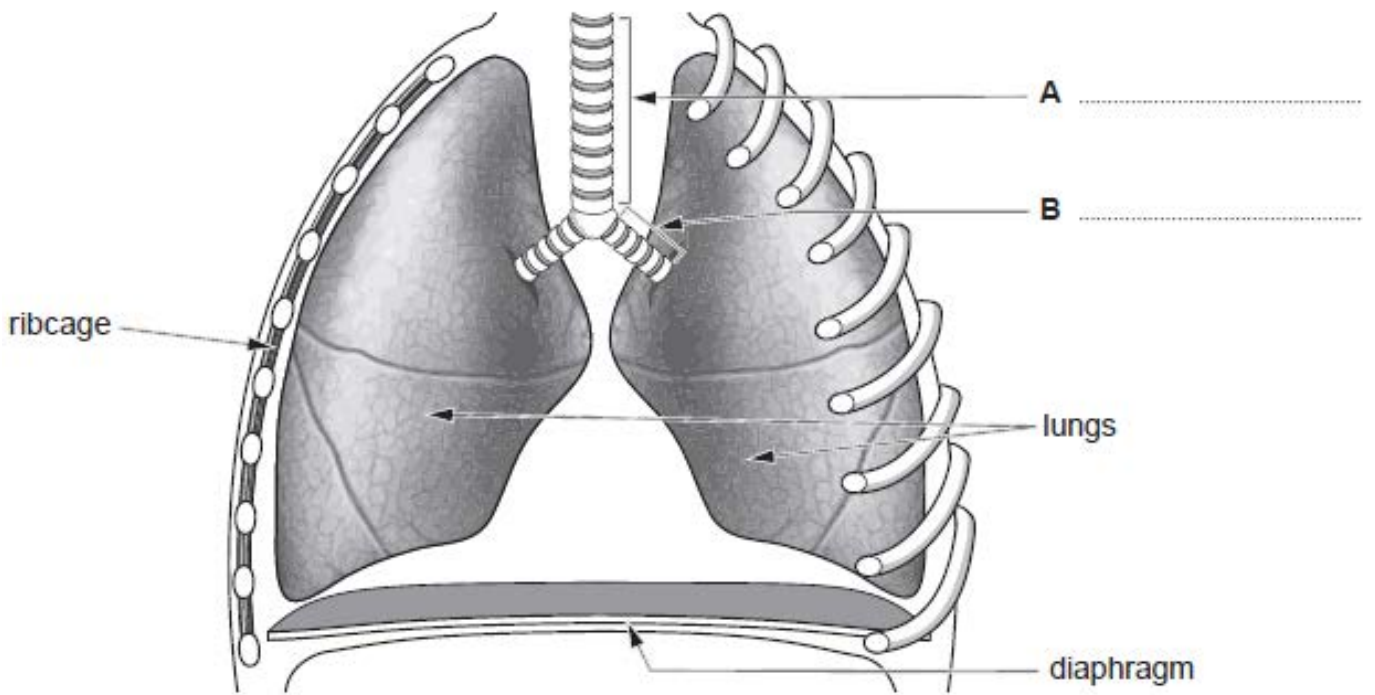
Mean decrease = cm

- (iii) **Complete the table** below to show what happens to Rhodri's chest when he **breathes out** and lifts the weights. Choose words from the list below. [3]

down and in increased decreased up and out no change

diaphragm movement	rib cage movement	volume	pressure
upwards			

18. The diagram shows a vertical section through the human thorax after inspiration.



- (a) (i) Label structures **A** and **B** on the diagram. [1]
- (ii) Describe the movement of the diaphragm during **expiration** and how this affects the volume and pressure in the chest cavity. [3]

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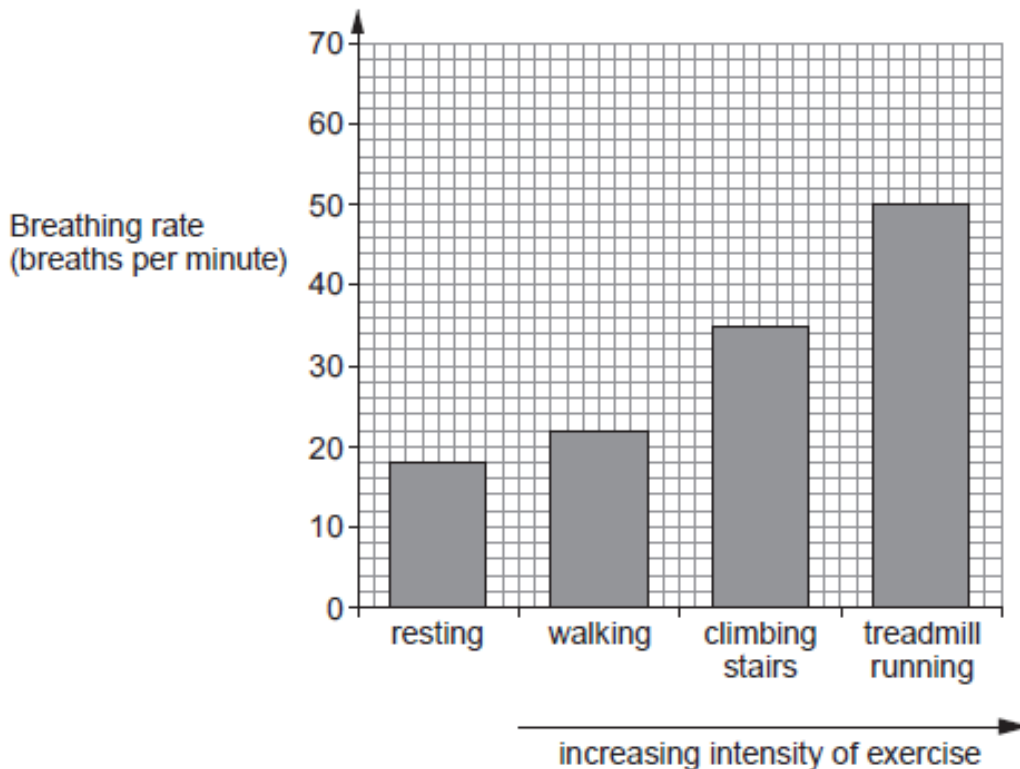
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- (b) Two students investigated breathing rates (the number of breaths per minute) while at rest for five minutes and during three different activities, each of which lasted five minutes.

One student did the activities and the other recorded the results.



- (i) From these results, what could you conclude about the effect of exercise on the breathing rate? [2]

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- (ii) State **one** way in which the students could have increased the confidence they had in their results. [1]

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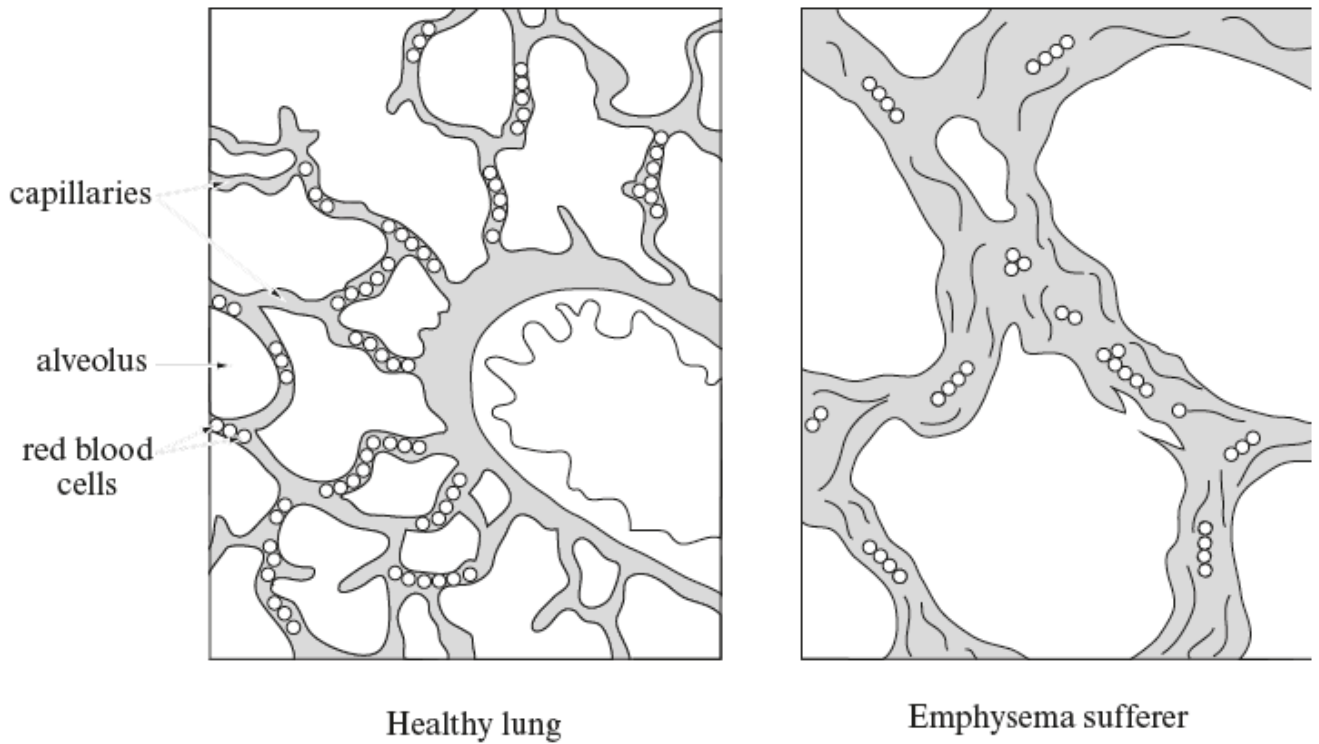
- (c) Explain why the breathing rate changes when a person starts exercising. [2]

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19. The diagrams below show a section through a healthy lung and a section through a lung from a patient suffering from emphysema. Both diagrams are drawn to the same scale.



(a) List **three** adaptations for gas exchange **shown** in the healthy lung diagram above.

[3]

(i)

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(ii)

.....

(iii)

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(b) Describe how **one** of the adaptations listed in part (a) aids gas exchange.

[1]

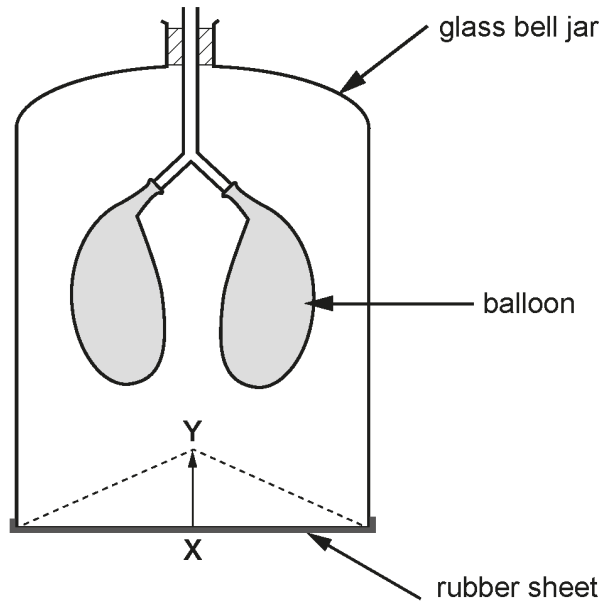
Adaptation

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Description

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20. The diagram below shows a model which can be used to demonstrate the breathing mechanism.



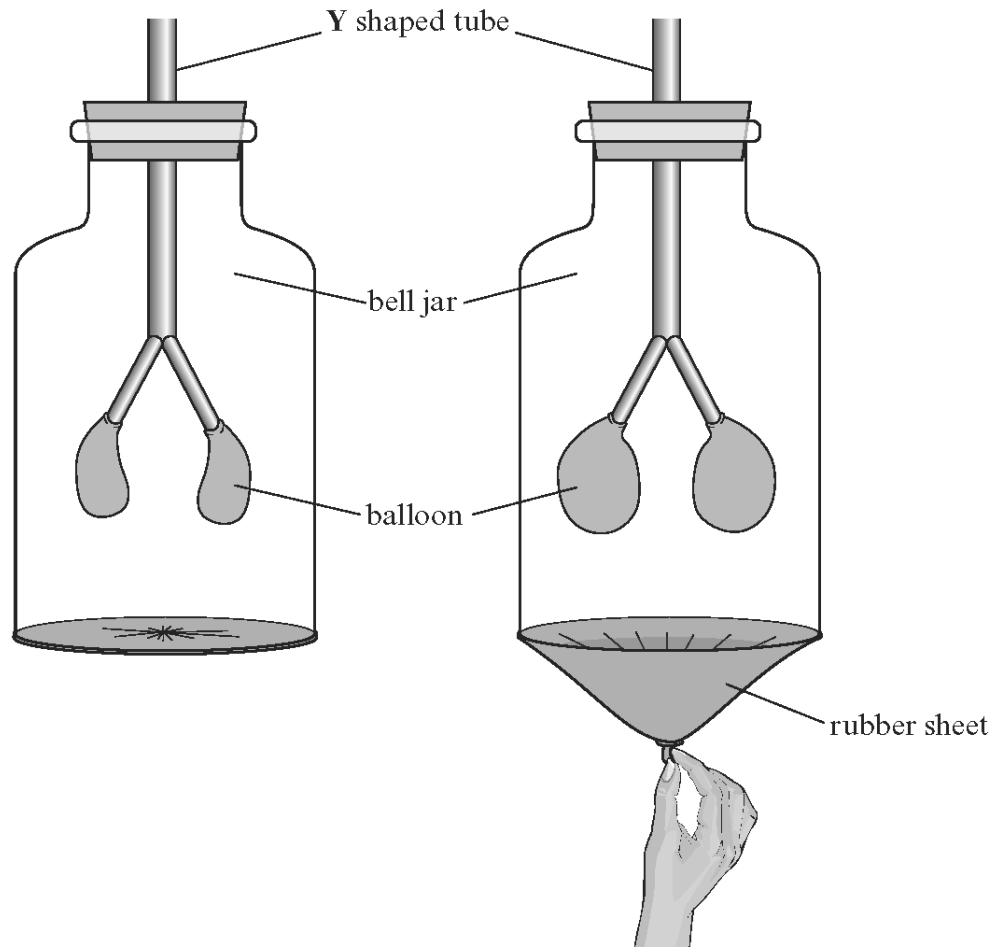
- (a) Name the structure in the body that is represented by the rubber sheet. [1]

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- (b) The rubber sheet is moved from position X to position Y resulting in the balloons deflating. Explain why this happens. [3]

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21. Explain how the bell jar model shown below can be used to illustrate **inspiration** (breathing in). In your explanation you must state which organs in the body are represented by the balloons and rubber sheet in the model. [6 QWC]



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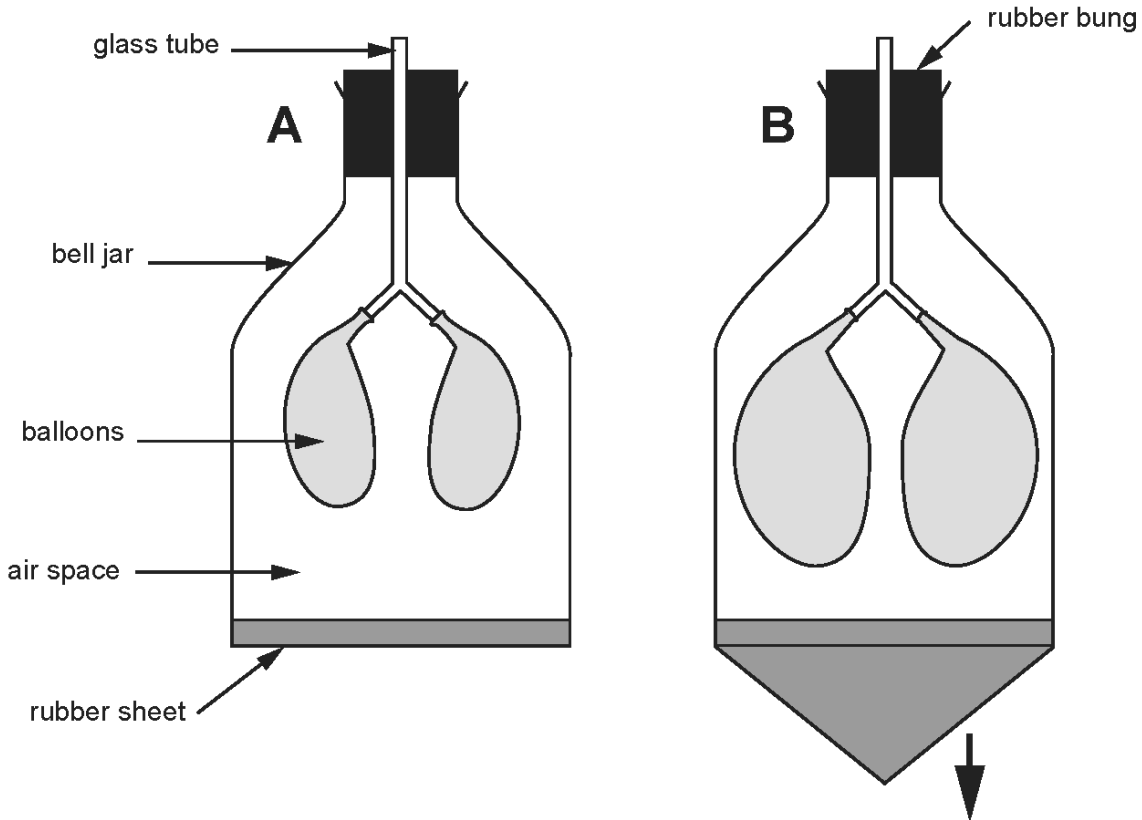
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22. The model below represents the human thorax (chest) during expiration and inspiration.



(a) Complete the following sentences by using one of the following choices. [4]

the same greater less

- (i) Compared to diagram A, the 'lung' volume in diagram B is
- (ii) Compared to diagram A, the 'lung' pressure in diagram B is
- (iii) Compared to diagram A, the 'thoracic' volume in diagram B is
- (iv) Compared to diagram A, the 'thoracic' pressure in diagram B is

(b) Give reasons why the bell jar model above is not a true representation of the human thorax. [2]

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23. (a) Describe and explain the process of **inspiration** in a mammal.

[4]

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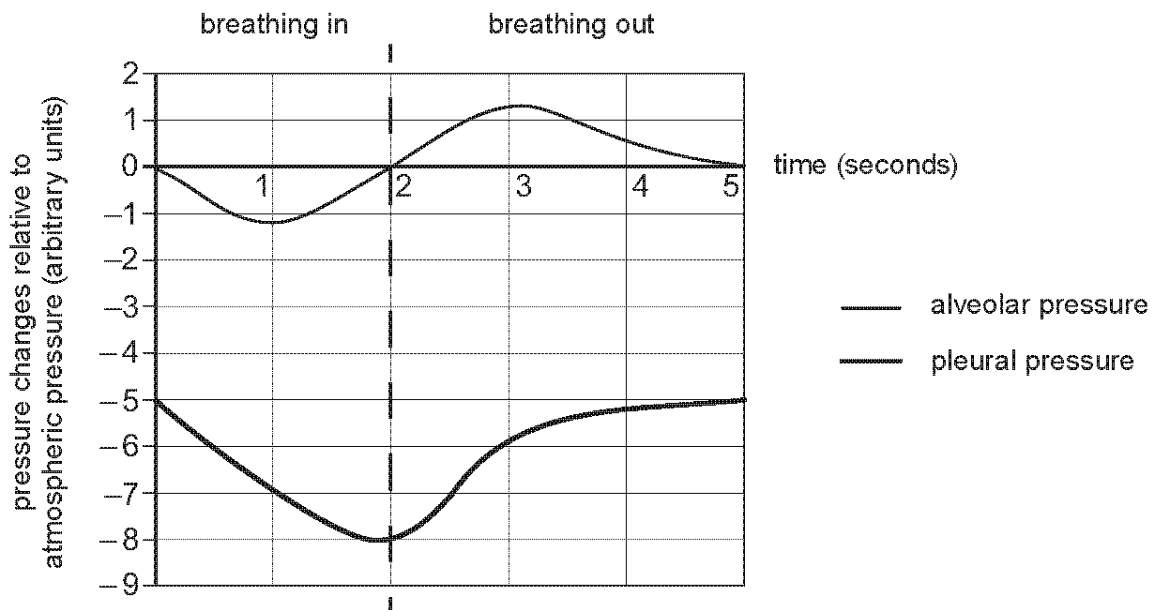
24. (a) Give two advantages of humans having internal gas exchange surfaces. [1]

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Lungs are enclosed inside the body and so humans have to breathe in actively to get oxygen to the gas exchange surface. Breathing out at rest relies mainly on elastic recoil.

The graph below shows how the pressures in the alveoli and the pleural cavity change during breathing in and out.



- (b) The outer pleural membrane is attached to the ribcage and the inner pleural membrane is attached to the outer surface of the lungs. Using your knowledge of ventilation, and with reference to the graph, explain how the outward movement of the ribcage causes the changes in the pleural and alveolar pressures during breathing in. [4]

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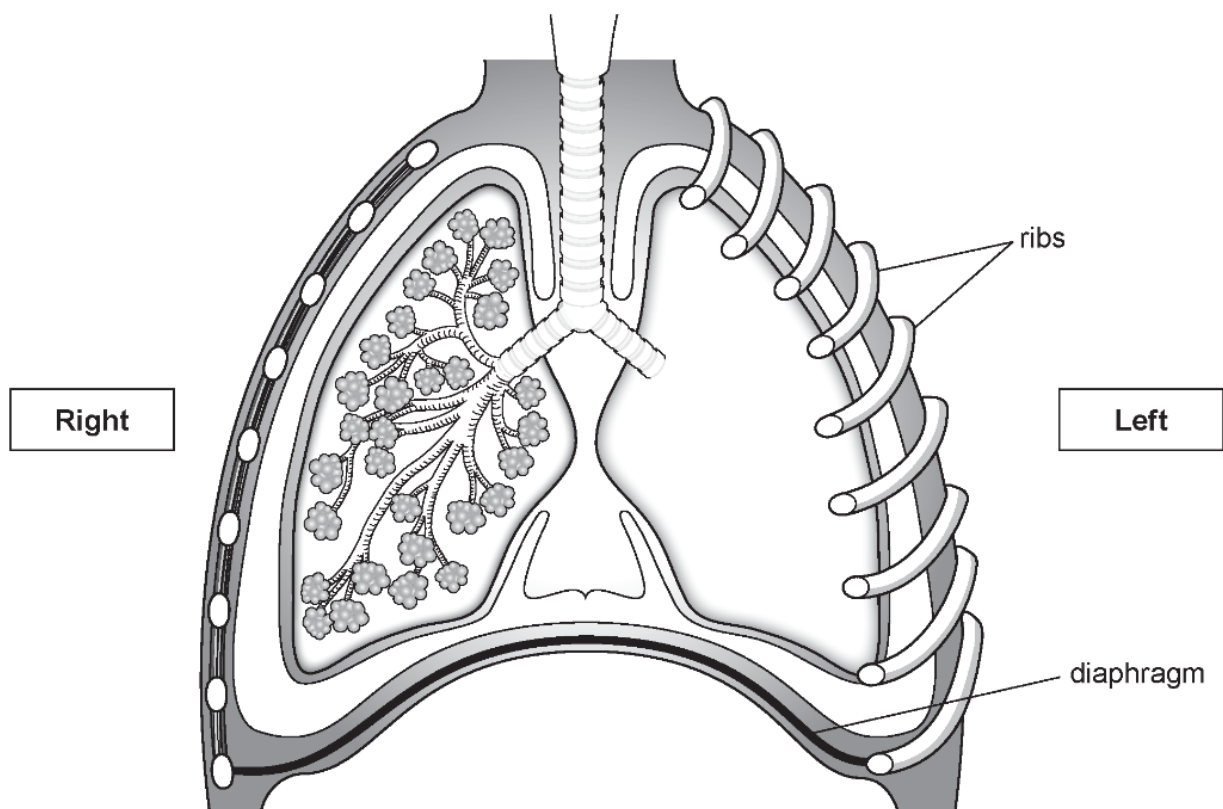
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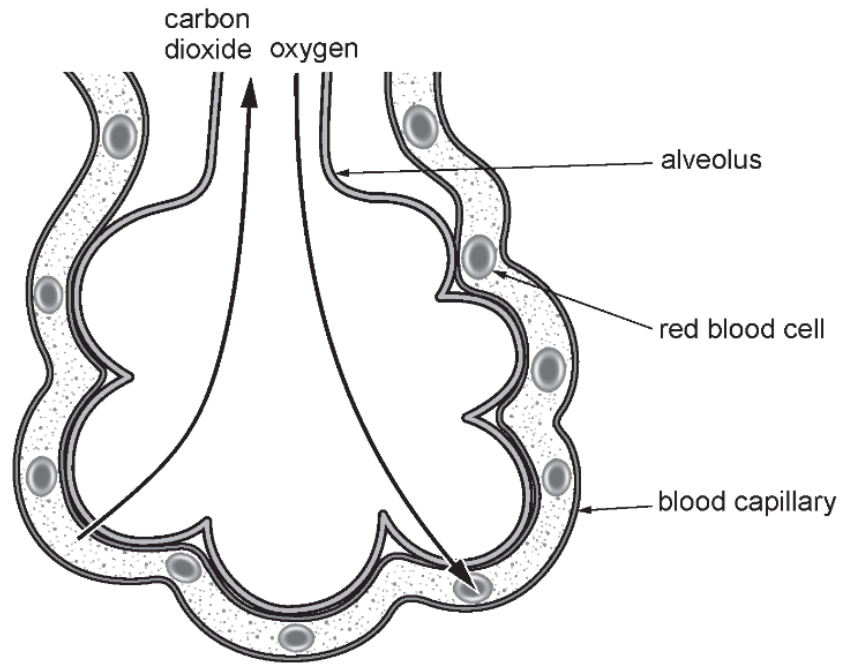
- (a) The diagram below is a section through the human thorax during expiration (breathing out).



On the diagram, **draw**

- (i) **a line** to show the shape of the diaphragm at the end of inspiration (breathing in); [1]

(b) The diagram below shows a single alveolus.



Gas exchange between the alveolus and the blood in the capillary occurs through the wall of the alveolus.

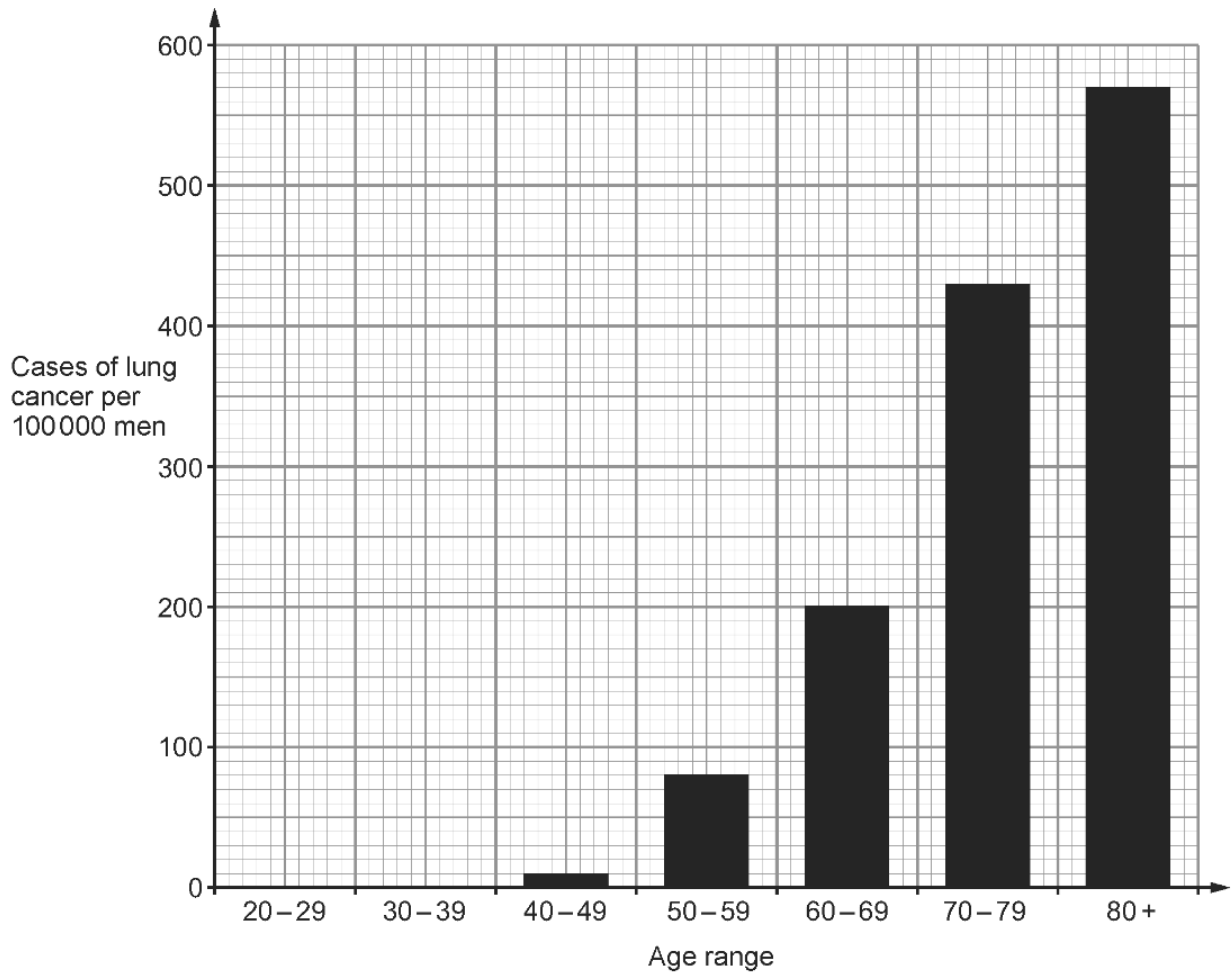
Answer the following questions using information from the alveolus diagram above and your own knowledge.

(ii) Describe **two** ways in which the structure of the alveolus is adapted for this function. [2]

1.

2.

- (c) Cigarette smoking damages the lungs and causes lung cancer. In 2009, doctors investigated lung cancer and cigarette smoking in men in a city in the UK. The highest proportion of smokers was found to be in the age range 20-29. The cases of lung cancer are shown in the graph below.



(i) State the conclusion the doctors should reach using the data given in the graph. [1]

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 (ii) What is the evidence that lung cancer takes a long time to develop? [1]

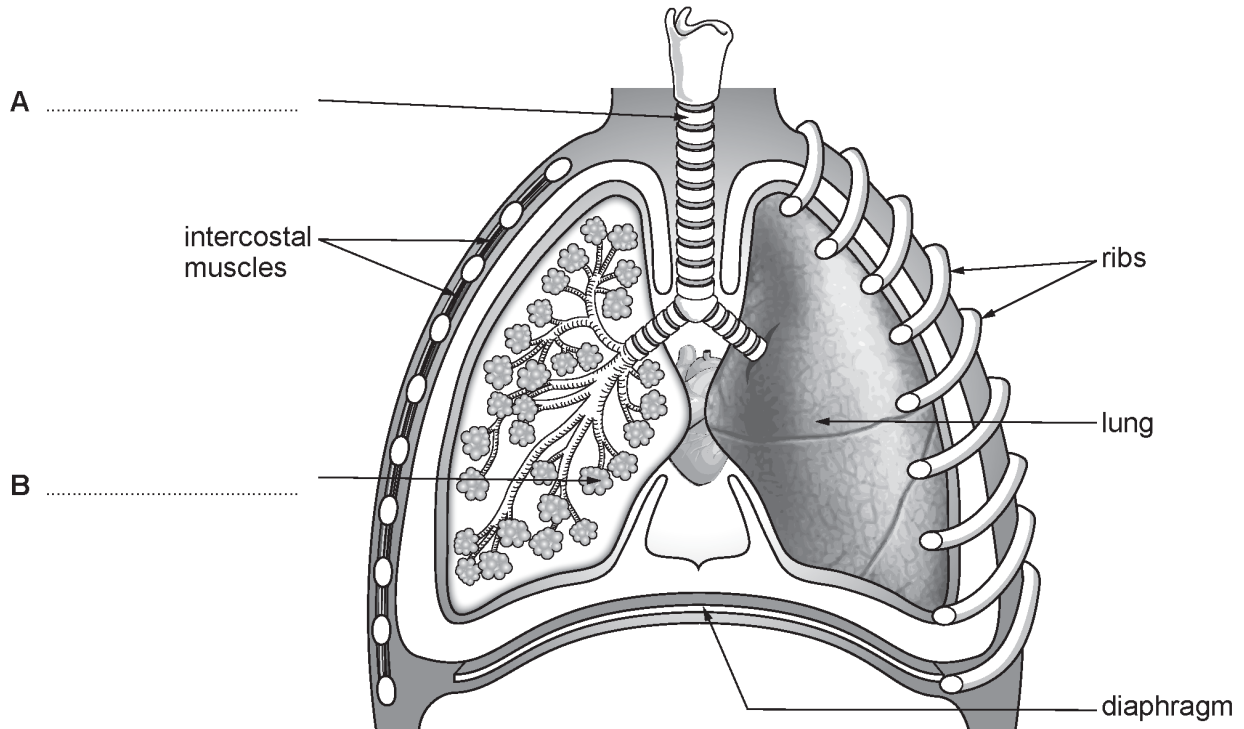
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(iii) State **two** ways in which this investigation could be improved so that the doctors could be more confident that their results were representative of the whole of the population of the UK. [2]

1.
2.

26.

The diagram shows a section through the chest of a human.



(a) Label **A** and **B** on the diagram above. [2]

(b) While a person is breathing in, the volume of the lungs increases.

(i) Describe the movements of the diaphragm and ribs as they bring about the increase in volume. [2]

Diaphragm

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Ribs

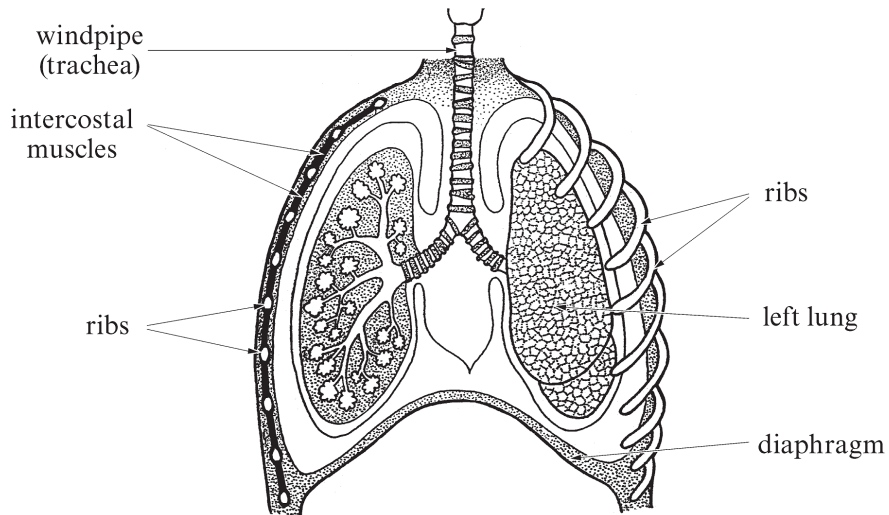
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(ii) How does the *pressure* in the lungs change when the volume increases? [1]

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27.

The diagram below shows a section through the chest.



Use the above diagram **and your own knowledge** to explain how air is drawn into the lungs during inspiration (breathing in). [6 QWC]

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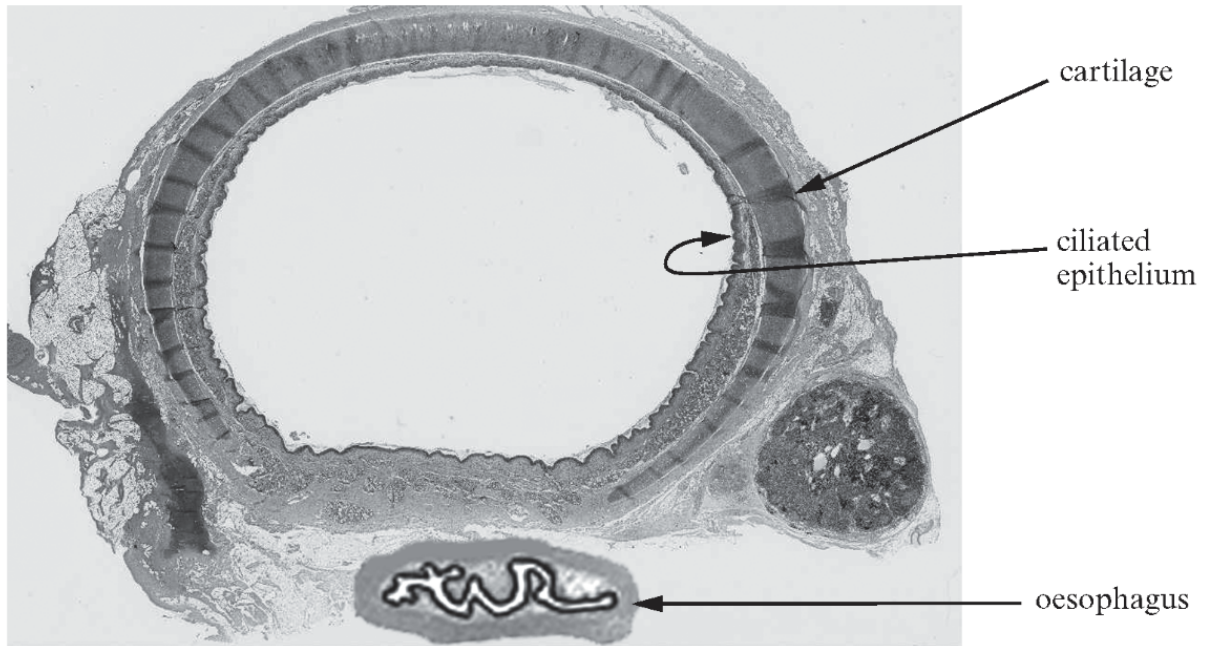
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28. The micrograph shows a section of the trachea of a human.



(a) What is the function of the ciliated epithelial layer? [2]

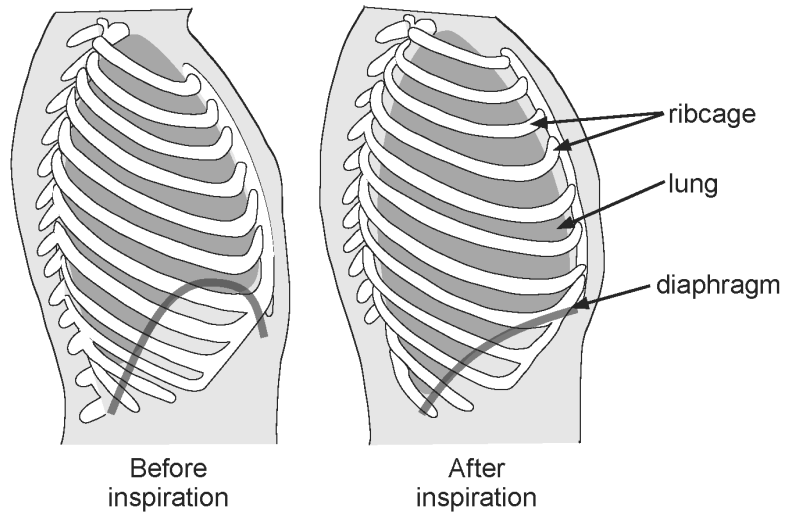
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29. The diagrams below show side views of the chest cavity before and after inspiration (breathing in).



Using both diagrams, explain how the movements of the **diaphragm and ribcage** bring about inspiration (breathing in). [6 QWC]

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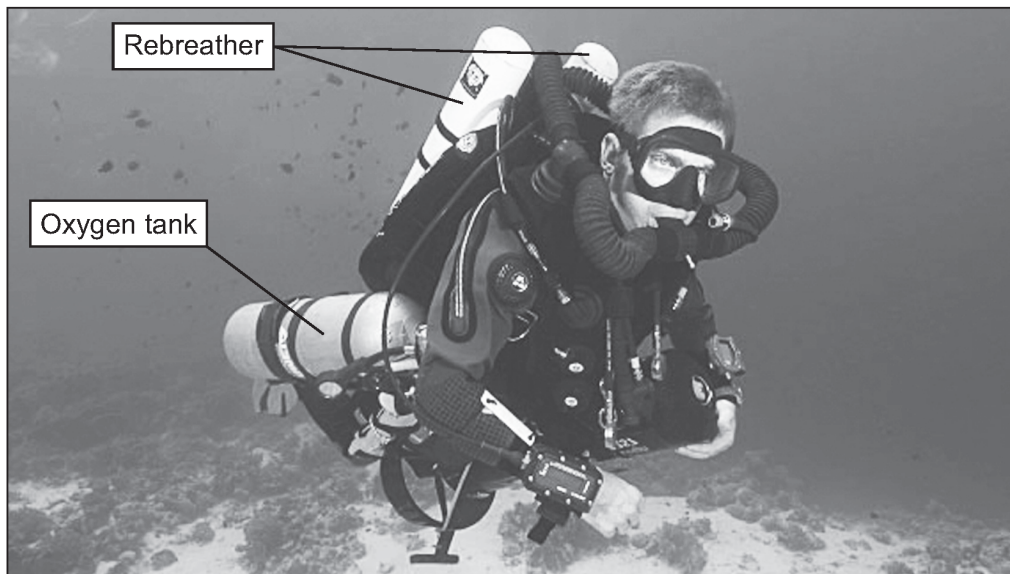
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30.

Look, no bubbles!

SCUBA diver wearing a rebreather



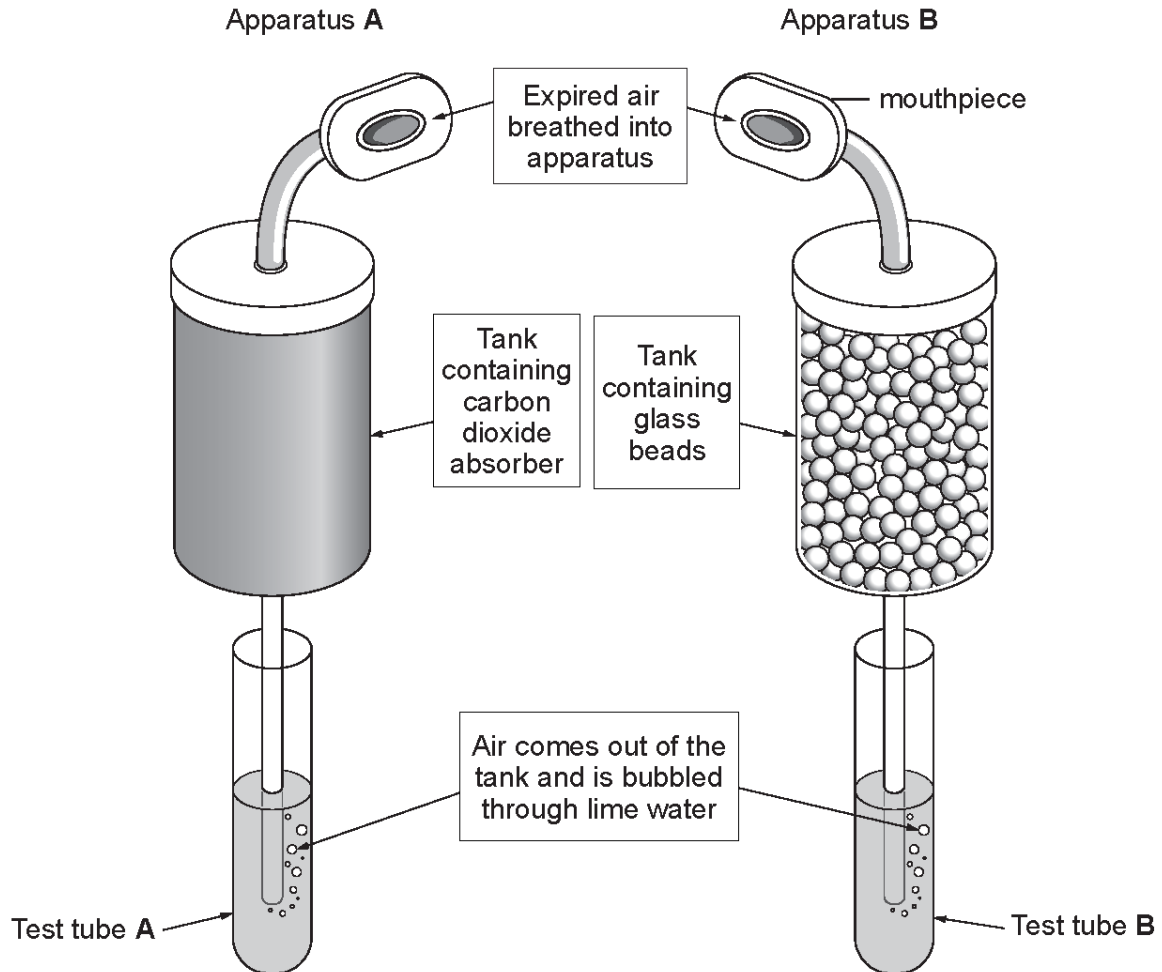
In standard SCUBA equipment when you breathe in through the mouthpiece you get a lungful of fresh air from the tank on your back. When you breathe out, the expired air goes out from the equipment into the water in the form of bubbles.

Modern SCUBA equipment contains a rebreather. This allows you to breathe the same air many times and produces no bubbles.

(a)

- (iii) Expired air contains 4% carbon dioxide. This concentration of carbon dioxide in air is poisonous. Rebreathers also contain a tank which absorbs the carbon dioxide making the air rebreathable for the diver.
Suggest the name of the chemical compound which absorbs the carbon dioxide. [1]

A scientist tested the air coming out of the tank using apparatus A and B as shown below.



- (b) What result would you expect to see in test tubes A and B after bubbling the expired air through lime water for 2 minutes? [2]

Test tube A

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Test tube B

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31.

(a) Complete the table by matching some of the scientific terms below to the information about aerobic respiration in humans. [4]

oxygen nitrogen glucose cells
enzymes energy water

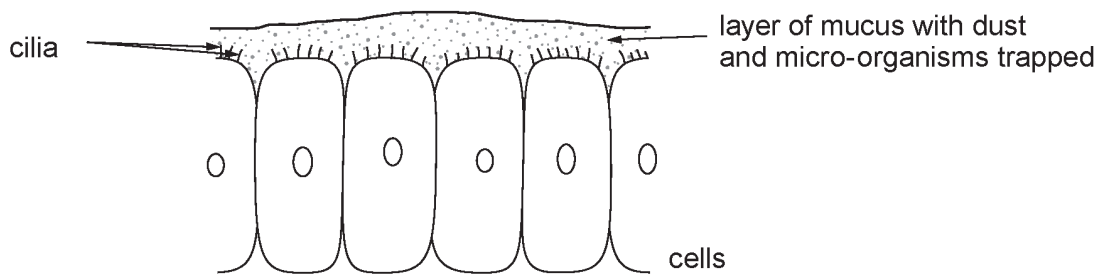
feature of aerobic respiration in humans	scientific term
where aerobic respiration occurs
gas required for aerobic respiration
waste product of aerobic respiration
control the chemical reactions of respiration

(b) Name the gas which is produced during aerobic respiration and describe how lime water can be used to identify it. [2]

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32.

The diagram below shows some cells from the inner surface of the human lung.



- (a) (i) Describe how cigarette smoke affects the cilia and mucus. [2]

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- (ii) State the substance which is present in cigarette smoke and causes lung cancer. [1]

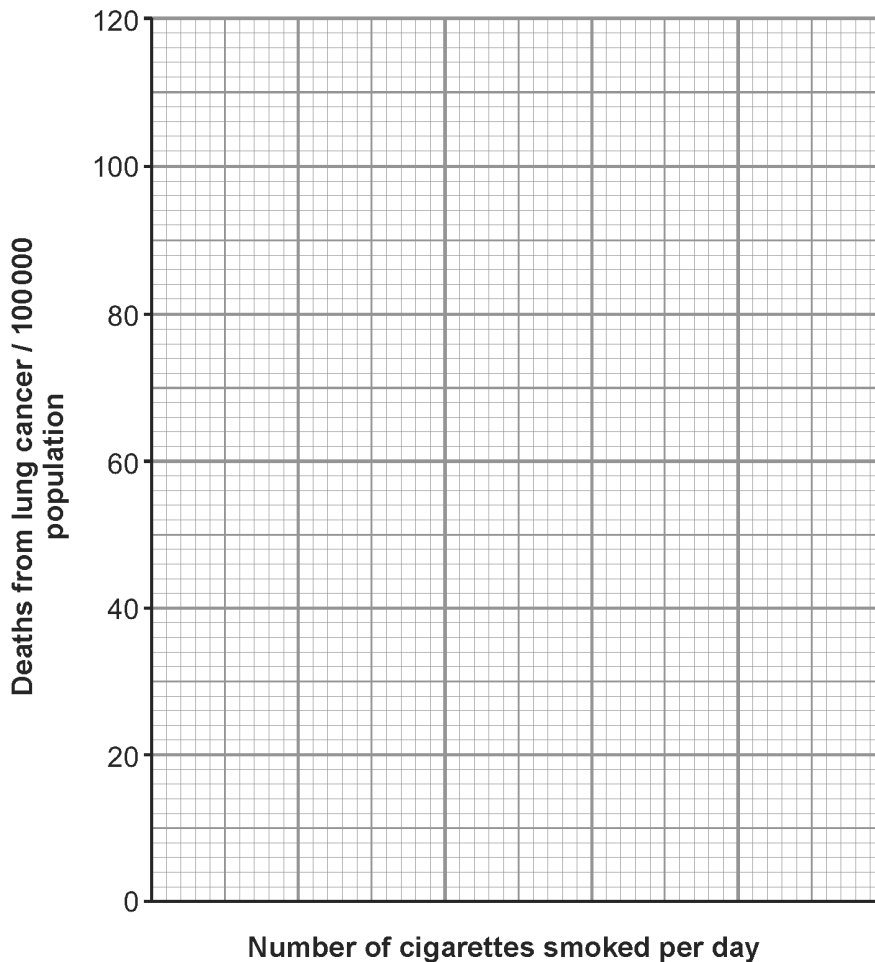
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- (b) In the 1960s doctors carried out investigations on men over the age of 35 to see if there was a link between smoking cigarettes and lung cancer. The results are shown in the table below.

number of cigarettes smoked per day	deaths from lung cancer (per 100 000) population
0	2
5	4
10	8
20	18
40	104

- (i) Plot a line graph of the results above on the grid opposite by: [4]

- I. choosing a scale for the number of cigarettes smoked per day,
- II. plotting the values,
- III. using a ruler, drawing a line to join the plots.



- (ii) From your graph, describe in detail how an increase in the number of cigarettes smoked relates to the number of deaths from lung cancer. [2]

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- (iii) Use your graph to estimate the deaths from lung cancer for people smoking 30 cigarettes a day. [1]

Deaths per 100 000 =

- (iv) Cigarette manufacturers argued that **this set of results** did not prove that lung cancer was caused by cigarettes and could be caused by other factors. Use the data to suggest a reason for their statement. [1]

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- (c) In April 2007 the Welsh government banned people from smoking in enclosed public spaces such as cinemas. What was the reason for this ban? [1]

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33. Describe how smoking tobacco harms the respiratory system and how and why attitudes to smoking have changed in recent years. [6 QWC]

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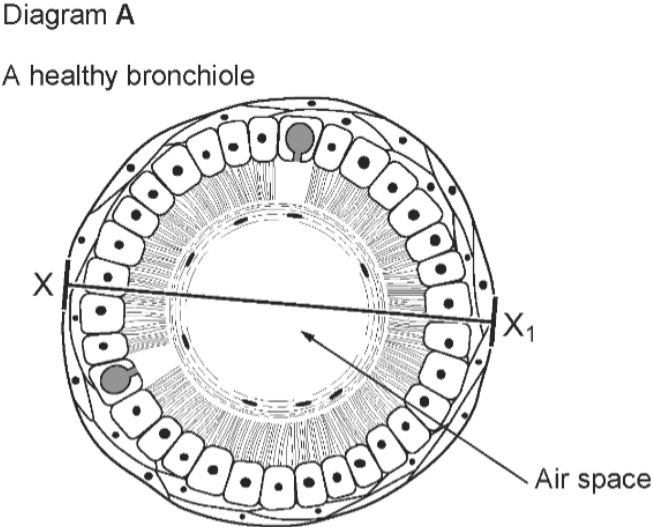
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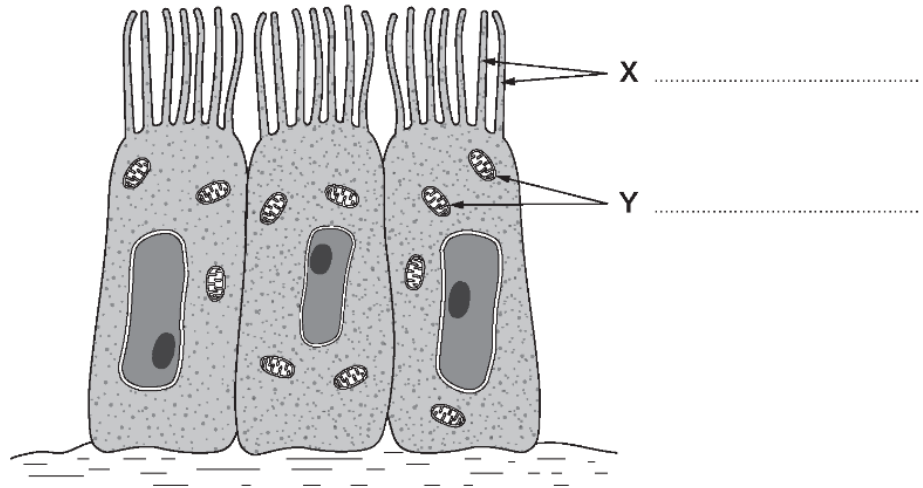
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34. The diagram below shows a cross section of a healthy bronchiole.



- (b) (i) Diagram B below shows a highly magnified close-up of three cells of the lining of the bronchiole.
 Label parts X and Y on diagram B. [2]

Diagram B



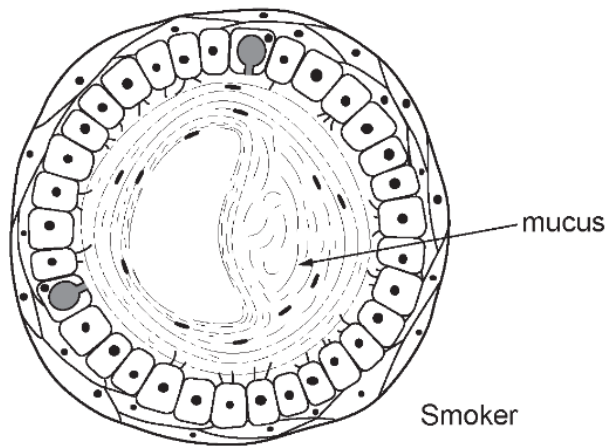
- (ii) Explain how the process taking place in part Y allows part X to carry out its function. [3]

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The following diagram shows a section through a bronchiole from a person who had smoked for 20 years.



- (c) What would you expect to find in the mucus of this person? [1]

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- (d) Nicotine is the addictive substance in tobacco. People can be helped to stop the habit of smoking by giving them nicotine replacement therapy (NRT). The table gives the results of the trials of different types of NRT. The placebo is a neutral substance which does not contain nicotine.

Type of NRT	Smokers given NRT		Smokers given a placebo	
	Numbers of smokers in trial	Percentage of smokers who gave up smoking	Numbers of smokers in trial	Percentage of smokers who gave up smoking
chewing gum	7708	20	9319	12
patch on skin	7387	14	5969	8
nasal spray	448	24	439	12
inhaier	490	14	486	8
tablet	243	20	245	13

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- (ii) Use the results to state the type of NRT in which scientists would have the greatest confidence. Give a reason for your answer. [2]

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- (iii) Which type of NRT was most effective? Give a reason for your answer. [2]

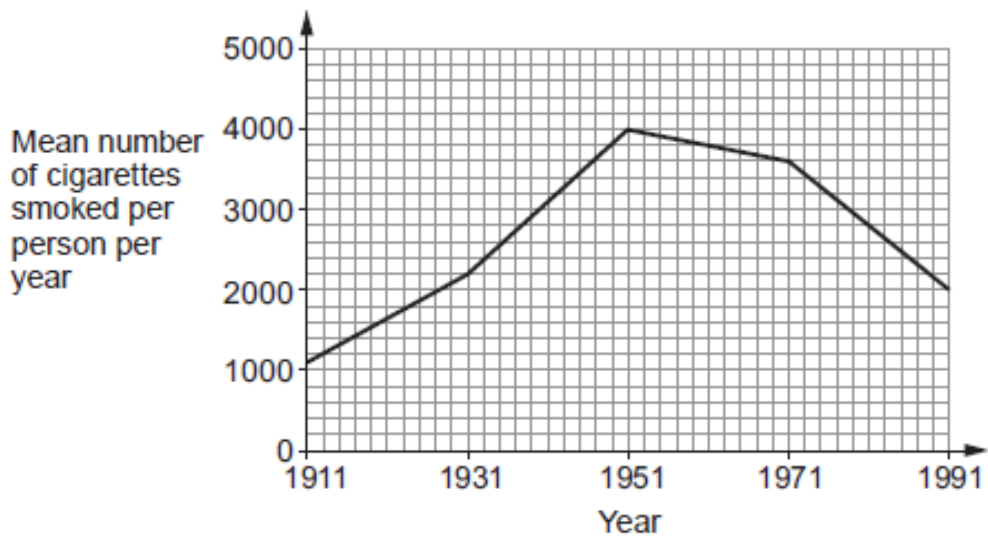
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35. (a) Cigarettes contain chemicals which cause cancer.

The graph below shows the mean number of cigarettes smoked per person per year and the table shows the number of deaths caused by lung cancer in the UK over a period of 80 years.



Year	Deaths per year from lung cancer
1911	600
1931	1500
1951	14000
1971	22000
1991	19000

Describe what the data in the graph and the table show about the link between the mean number of cigarettes smoked per year and the deaths from lung cancer over the time period 1911-1991. [3]

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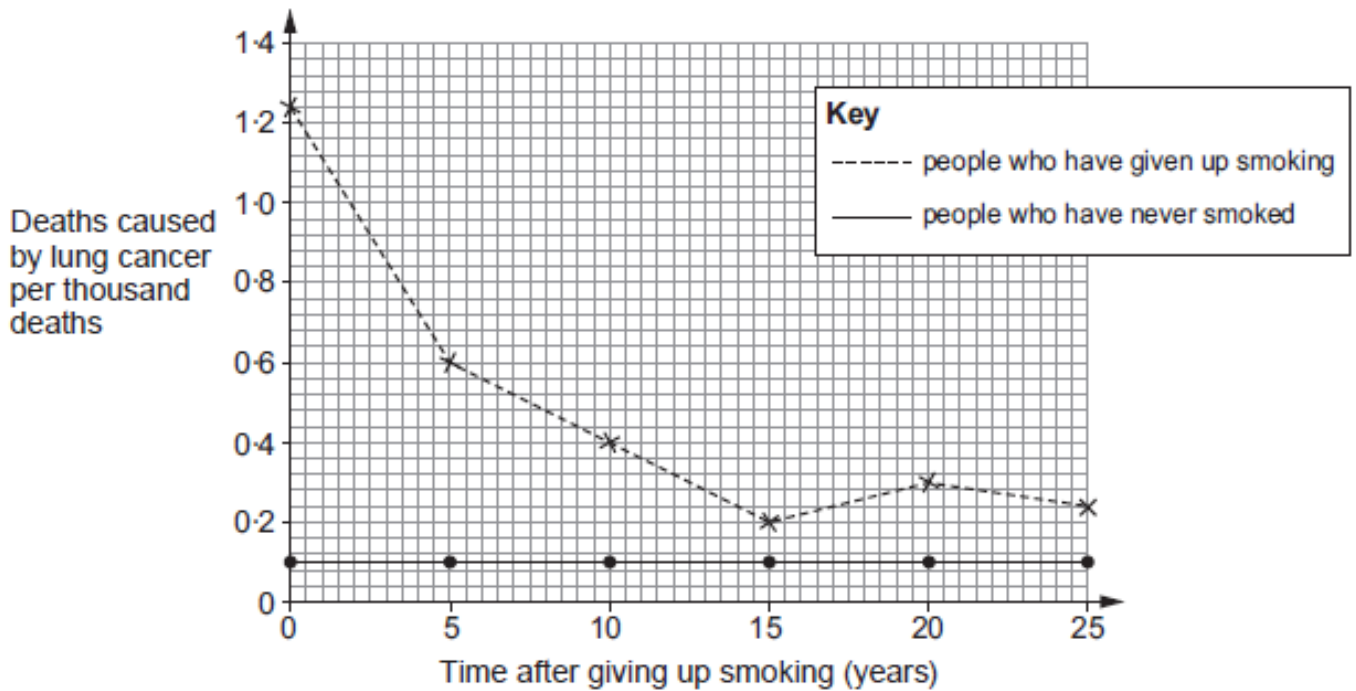
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(b) The graph shows the effect of giving up smoking on deaths from lung cancer.



Use the graph above to complete the sentences. Choose the correct answer.

(i) If a person gives up smoking, the risk of dying from lung cancer will be: [1]

- A the same as a non-smoker after 10 years.
- B twice the risk of a non-smoker after 15 years.
- C removed completely after 25 years.
- D unchanged even after 20 years.

Answer

(ii) The data in the graph show that: [1]

- A Cigarettes cause lung cancer.
- B Over 1200 smokers die from lung cancer every year.
- C It is possible for a non-smoker to die from lung cancer.
- D The number of people who do not smoke has increased in recent years.

Answer

- (c) In an investigation of 600 cigarette smokers, almost half said they wanted to give up. At the end of one year only 42 had actually succeeded.

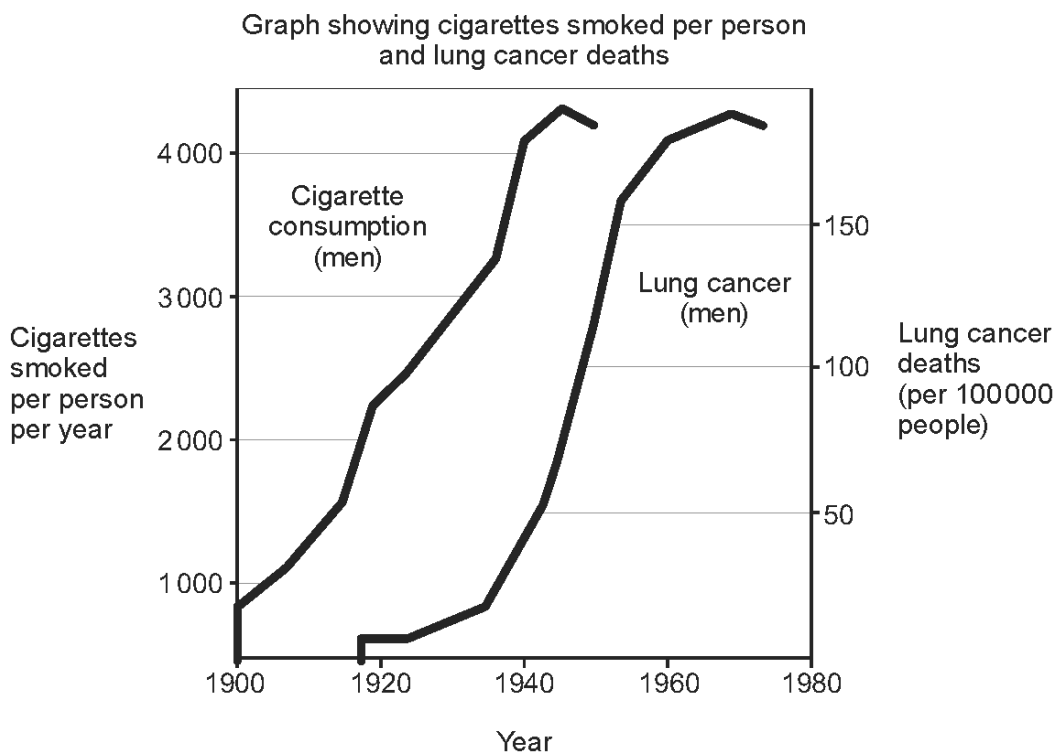
Explain why many people find it very difficult to give up smoking cigarettes. [2]

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36. The major rise in cigarette smoking amongst the UK population occurred at the start of the 20th century.



- (a) From the graph, describe fully the relationship between cigarette smoking and lung cancer deaths in men. [2]

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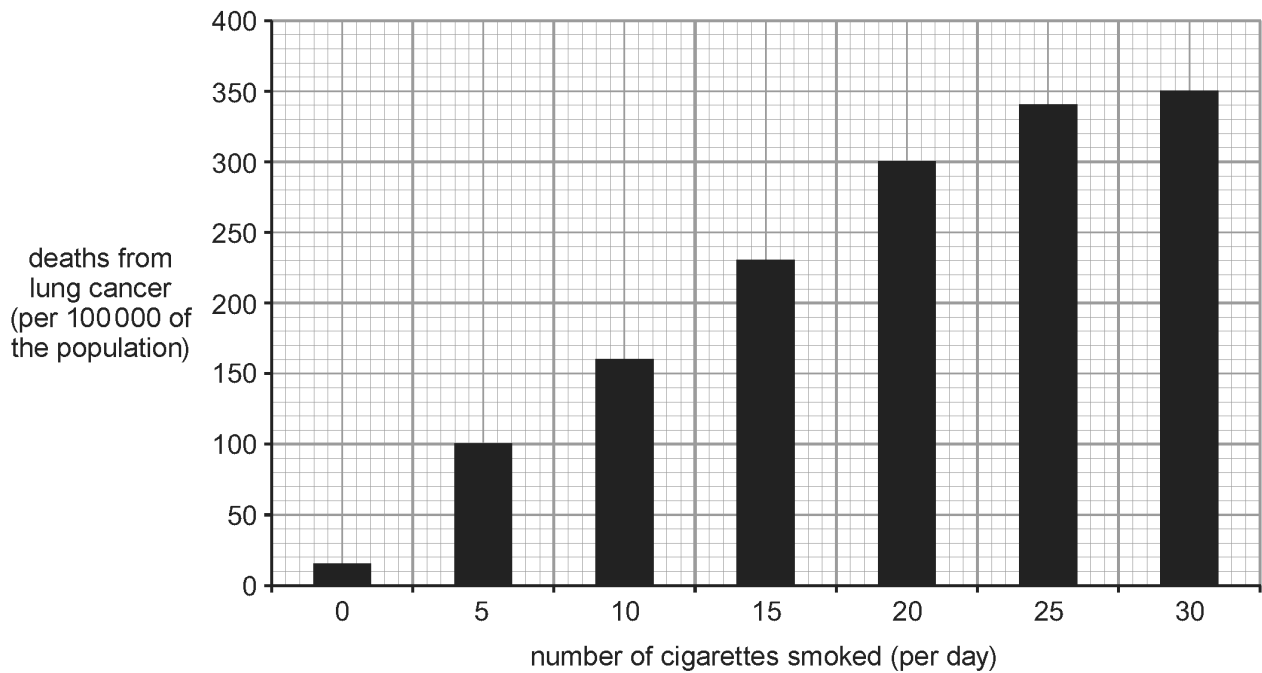
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- (b) The link between smoking and lung cancer was first made by Sir Richard Doll, Professor of Medicine at the University of Oxford. Use the information in the graph to suggest when he first made the public aware of the link between cigarette smoking and lung cancer. [1]

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37.

The graph below shows the relationship between the number of cigarettes smoked per day and deaths of people due to lung cancer.



(a) Use **only** the information in the graph to answer the following questions.

(i) Describe the trend shown in the graph. [1]

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.....

(ii) i. Calculate the difference in the number of deaths, per 100 000 of the population, in those who smoke 10 cigarettes per day and those who smoke 30 cigarettes per day. [1]

Difference = per 100 000

- II. In 2014 the population of Wales was 3 million. How many of the population, who smoke 15 cigarettes a day, are likely to die from lung cancer? [1]

Number of population =

- (iii) Use the graph to state why the following statement is incorrect. [1]

'Smoking is the only cause of lung cancer.'

.....
.....

- (b) Name the substance in cigarette smoke which causes lung cancer. [1]

38. (a) Smoking affects health. State how people are made aware of this when they buy packets of cigarettes. [1]
-

- (b) (i) Cigarette smoke contains tar which causes cancer. Following laboratory observations in 1971, doctors predicted rates of lung cancer linked to cigarettes containing different levels of tar. Their predictions were based on people smoking 15 cigarettes per day.

tar content (mg/cigarette)	predicted rates of lung cancer (cases/100 000 population)
7	10
9	15
11	108
17	146
22	174

Giving evidence from the table, describe the effect of different levels of tar on the predicted rate of lung cancer. [2]

- (ii) In the 1970s, low tar cigarettes became cheaper and many people were smoking far more than 15 cigarettes per day. Suggest the effects on the rates of lung cancer in these people. [1]

39. Smoking is the largest single cause of avoidable ill health and early death in Wales. In order to reduce this, the Welsh Government has focused on three areas in recent years: discouraging young people from starting to smoke, helping smokers to give up and extending smoke-free environments.

(a) Tobacco smoke contains carcinogens.

State the type of disease caused by carcinogens. [1]

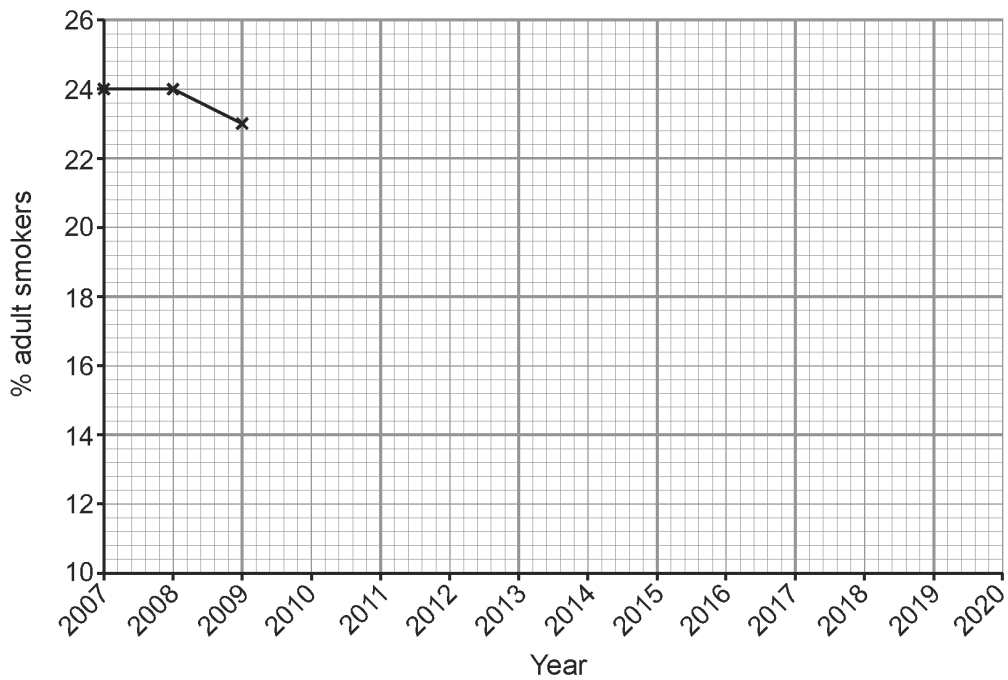
(b) The table below shows the percentage of the adult population of Wales between 2007 and 2014 who smoked cigarettes.

Year	Percentage of the adult population who smoke (%)
2007	24
2008	24
2009	23
2010	22
2011	22
2012	21
2013	20
2014	19

Sources: National Public Health Service for Wales, Welsh Assembly Government, Office for National Statistics

(i) Complete the graph of the data above on the grid opposite by: [3]

- I. plotting the points from 2010 to 2014
- II. joining all the plots using a ruler.



- (ii) In 2007, the Welsh Government banned smoking in enclosed public places as part of a policy to reduce the percentage of adults who smoke.

Give the evidence that the ban had no immediate effect on the percentage of adults who smoke. [1]

- (iii) In 2012, the Welsh Government produced a Tobacco Control Action Plan. One aim was that by 2020 no more than 16% of adults would smoke.

- I. **Extend the line on the graph to predict the % of adult smokers in 2020.**
Write your answer below. [1]

adult smokers in 2020 = %

- (iv) Suggest **one other** step that could further reduce the percentage of adults who smoke. [1]

40. (a) Give **one** harmful effect that may result from each of the following lifestyle choices. [1]

(ii) smoking cigarettes

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(b) Many people who smoke cigarettes would like to stop.

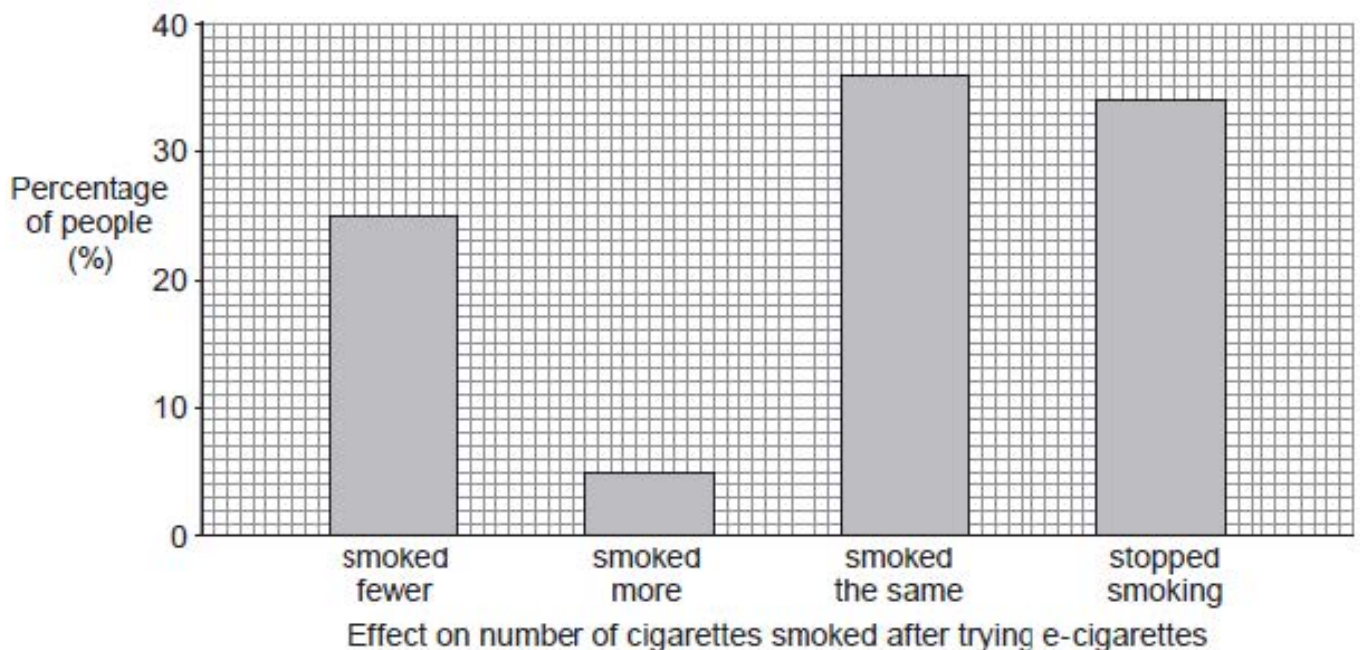
One method aimed at helping people stop smoking is by using an e-cigarette as shown in the photograph.



In 2016, 838 young people living in Wales were asked about using an e-cigarette.

Some of those questioned were cigarette smokers who had tried using e-cigarettes to help them cut down or stop smoking tobacco. [ASH survey 2016]

The bar chart shows how trying e-cigarettes affected their cigarette smoking.



- (i) How successful was using e-cigarettes in helping young people cut down or stop smoking? Use **all** the results in the bar chart to justify your answer. [4]

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- (ii) The original sample involved 838 young people. A second survey is planned to include 10000 people. Suggest **two** factors which should be considered in the selection of the people to take part in the second survey, to make it more representative of the population of Wales. [2]

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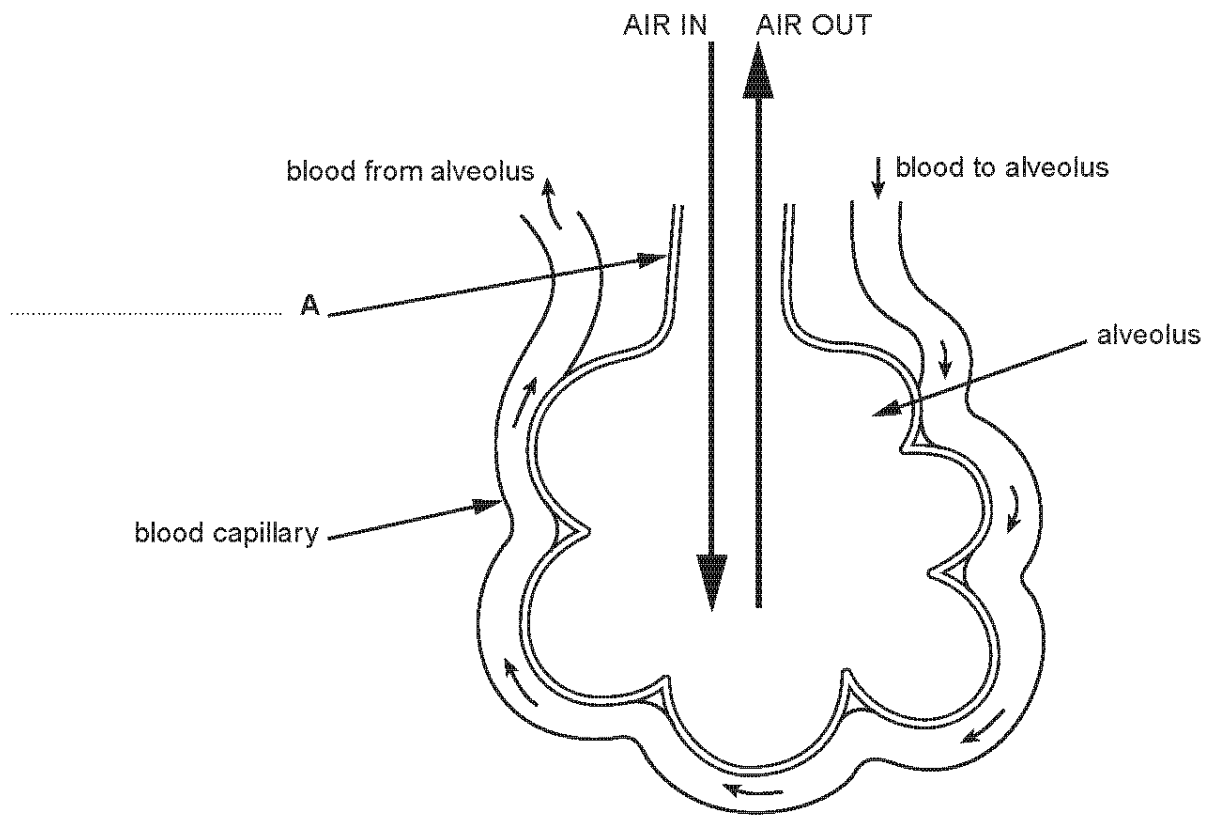
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41.

The diagram shows an alveolus and its blood supply.



(a) Complete label A on the diagram above.

[1]