

Name:	Target Grade:	Actual Grade:
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RESPIRATION IN HUMANS MCQ and STRUCTURED QUESTIONS

READ THESE INSTRUCTIONS FIRST

INSTRUCTIONS TO CANDIDATES

1. Find a quiet, comfortable spot free place from distractions.
2. Spend one minute on each mark.
3. Time yourself for every single question.
4. Every chapter has their own question types. Ensure that you know the different question type for each chapter.
5. Make a conscientious effort to remember your mistakes, especially in terms of answering techniques. E.g Take a picture for the mistakes that you made, keep it in a photo album, and revise it over and over again.
6. Highlight question types that you tend to keep making mistakes and review them nearing exams.
7. Always review the common questions and question type that you tend to make mistakes nearing exams.
8. During exams, classify the question type and recall what you have learnt, how you need to analyse the questions for the different question type, what you need to take note of and answer with the correct answering techniques!

✦ Wishing you all the best for this test!

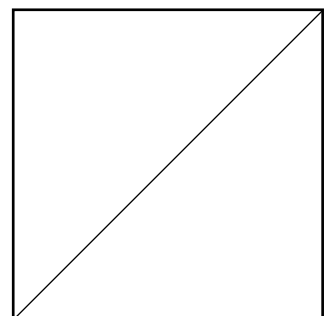
You've got this!

💡 With lots of love,
Bright Culture 🍷



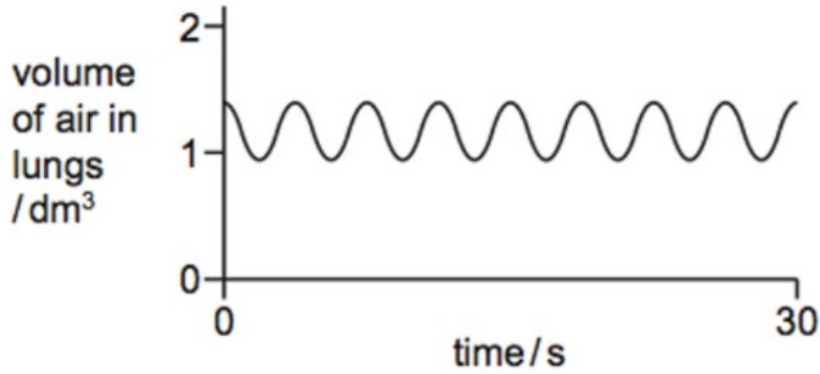
**GOOD LUCK
FOR YOUR EXAM!**

MARKS

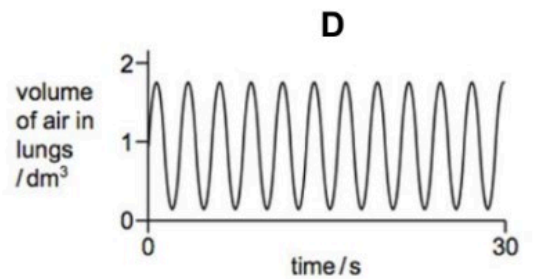
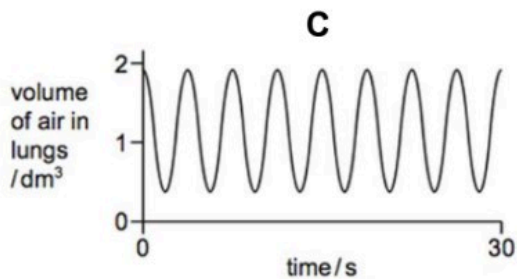
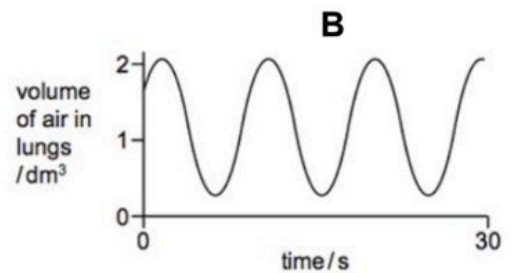
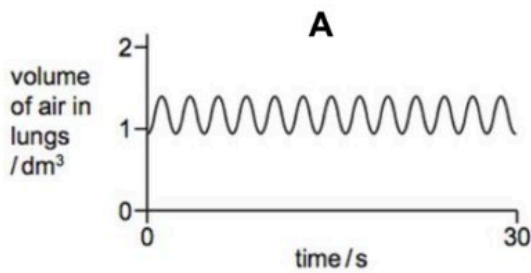


RESPIRATION IN HUMANS MCQ

- 1 The graph shows the changes in volume of air in a person's lungs at rest for a period of 30 s.



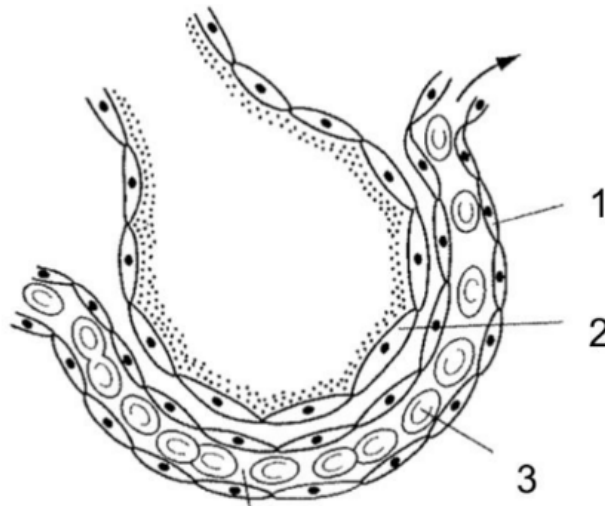
Which option shows the change in volume of air in the person's lungs after he has played an intense game of badminton?



2 Which row is true regarding the effects of the components of tobacco smoke?

	carbon monoxide	tar
A	combines permanently with haemoglobin	paralyses cilia
B	makes blood clot easily	higher risk of emphysema
C	more fatty deposits on walls of coronary arteries	reduced ability of blood to carry oxygen
D	uncontrolled cell division	higher risk of lung cancer

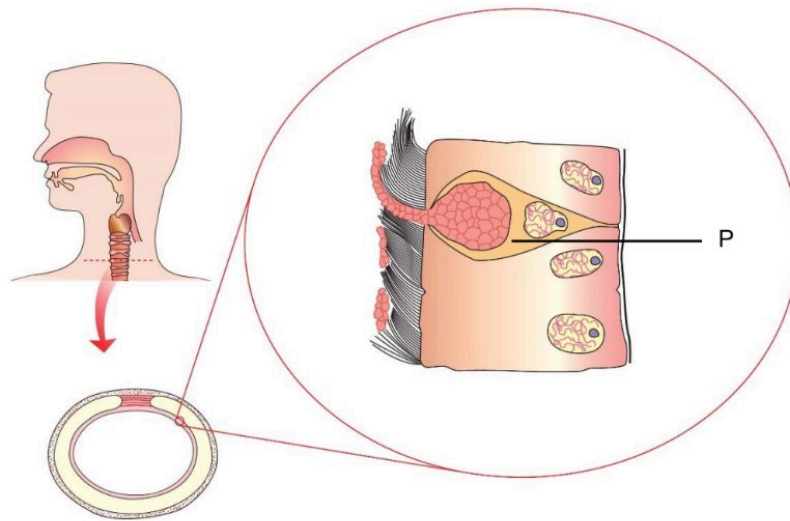
3 The diagram shows an alveolus and the adjacent blood vessels.



Which statement is **not** true? 4

- A 1 and 2 are one-cell thick to reduce distance for diffusion of gases.
- B 2 is coated with a film of moisture to allow carbon dioxide to diffuse in it before diffusing into the bloodstream.
- C 3 does not contain a nucleus to transport more oxygen.
- D 4 contains glucose.

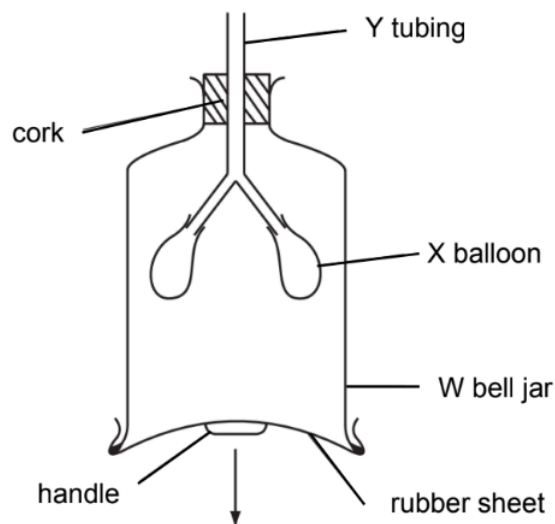
- 4 13 The diagram shows the epithelial cells of the trachea.



A patient was discovered to not possess any cell P. As a result, he constantly complains of his throat being dry and irritated.

Which of the following is a likely function of cell P?

- A the detection of harmful chemicals
 - B the production of mucus
 - C the sweeping of dirt up and out of the trachea
 - D the warming of air entering the lungs
- 5 The diagram shows the apparatus that can be used to demonstrate some of the movements during breathing.



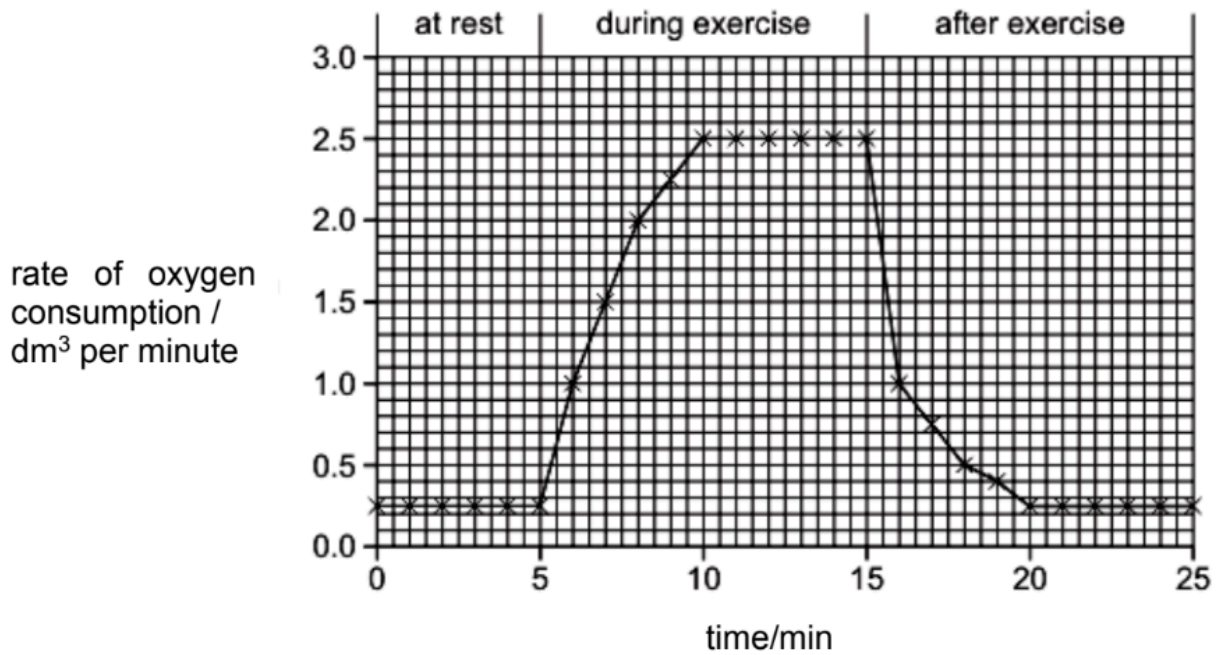
The handle is pulled down moving the rubber sheet in the direction of the arrow. What happens to the air pressure in W, the volume of X and the direction of air flow in Y?

	air pressure in W	volume of X	direction of air flow in Y
A	increases	increases	passes out
B	increases	decreases	passes in
C	decreases	increases	passes in
D	decreases	decreases	passes out

6 How many molecules of carbon dioxide will be produced from the breakdown of two molecules of glucose in aerobic respiration?

- A 2 B 4 C 6 D 12

7 A student measured their oxygen consumption before, during and after exercise. The results are shown in the graph.



At which time is the oxygen debt being removed?

- A 5-10 minutes
 B 15-20 minutes
 C 15-25 minutes
 D 20-25 minutes

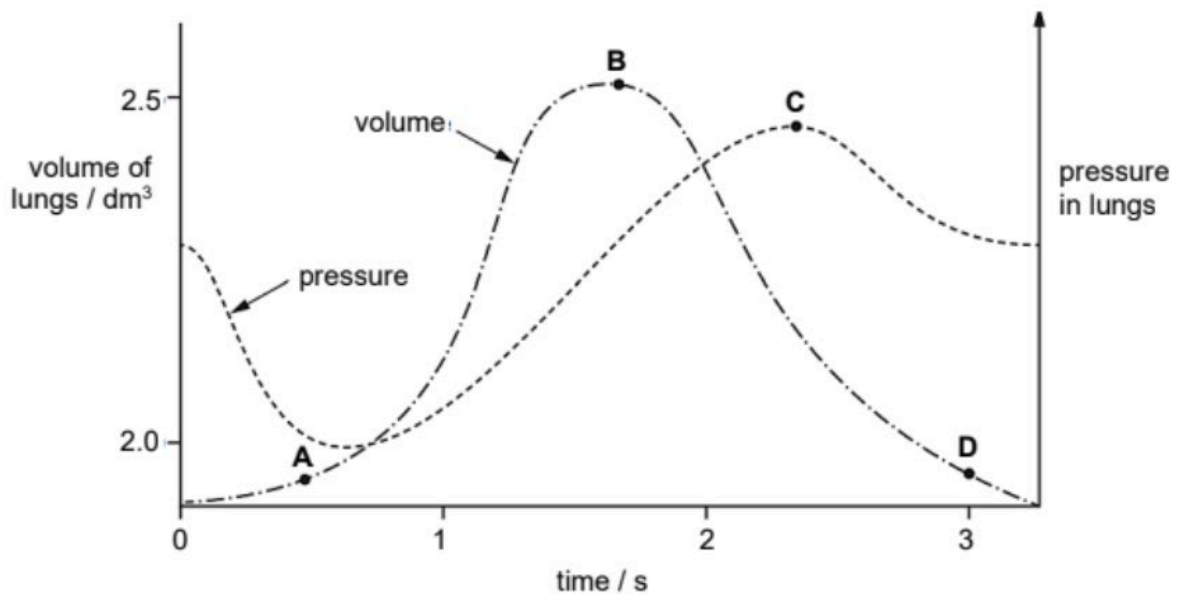
8 The graph shows the number of cigarettes smoked and the percentage of deaths from lung cancer in a country from 1925 to 2000.

Which statement is supported by evidence from the graph?

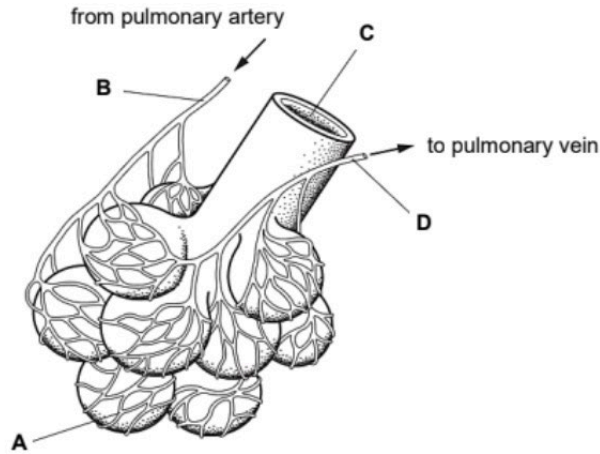
- A A cure for lung cancer was found in 1950.
- B All smokers will get lung cancer.
- C The number of cigarettes smoked increased between 1975 and 1990.
- D There is a possible link between smoking and lung cancer.

9 The diagram shows how the pressure and volume inside the lungs change during one complete breath.

At which point are the muscles of the diaphragm starting to contract?



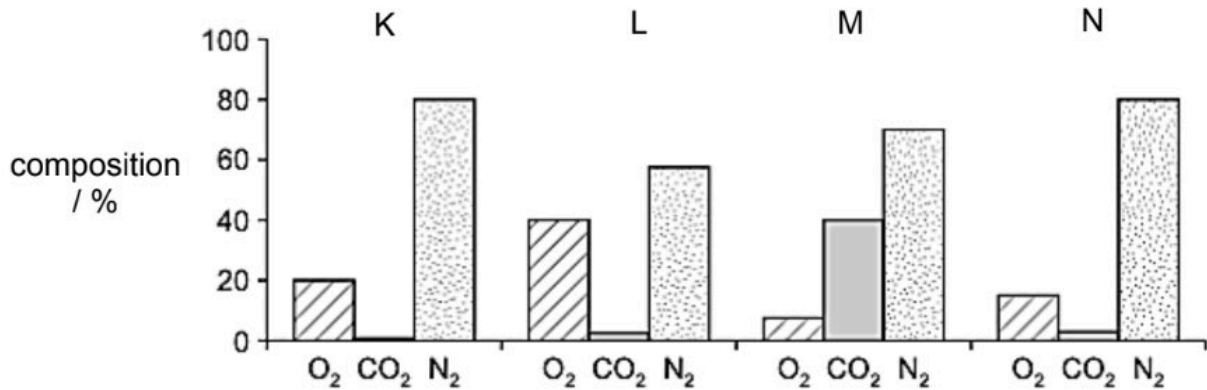
- 10** The diagram shows some of the structures in a human lung.
Where is carbon dioxide concentration the highest?



- 11** What are the functions of the diaphragm muscles and the cilia in the human gas exchange system?

	diaphragm muscles	cilia
A	contracts to cause breathing	to trap bacteria from the air
B	in contracts to cause	to move mucus towards the
C	breathing out relaxes to	throat to trap bacteria from the air
D	cause breathing in relaxes to cause breathing out	to move mucus towards the throat

- 12 The diagram shows the composition of four samples of air (O_2 = oxygen, CO_2 = carbon dioxide, N_2 = nitrogen).



Which sample is inspired air and which sample is expired air?

	inspired air	expired air
A	K	N
B	L	K
C	M	L
D	N	M

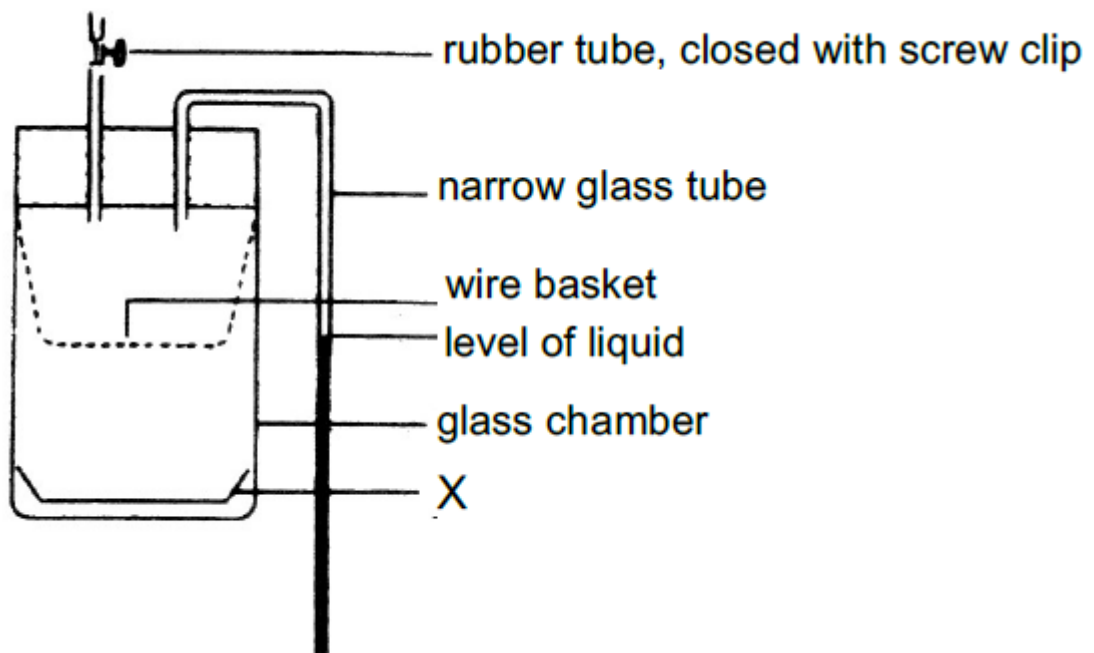
- 13 The table shows the death rates from lung cancer in a country amongst smokers and non- smokers.

average number of cigarettes smoked per day	deaths from lung cancer per year per 100 000 people
0	10
1-14	78
15-25	127
26 or more	251

What can be concluded from the data?

- A** People who do not smoke will not get lung cancer.
- B** People who get lung cancer are likely to be smokers of 26 or more cigarettes per day.
- C** People who smoke have a higher chance of getting lung cancer.
- D** Smoking is the only cause of lung cancer.

- 14** The setup is used for studying gas exchange in living organisms. When in use, the glass chamber is immersed in a water bath maintained at a constant temperature.

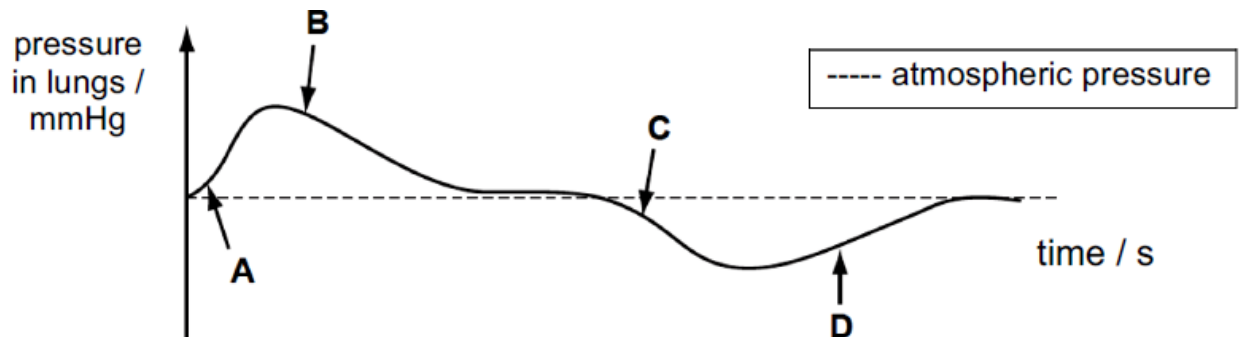


If the experiment were carried out using small invertebrates in the wire basket and a carbon dioxide absorber in X, the level of the liquid would

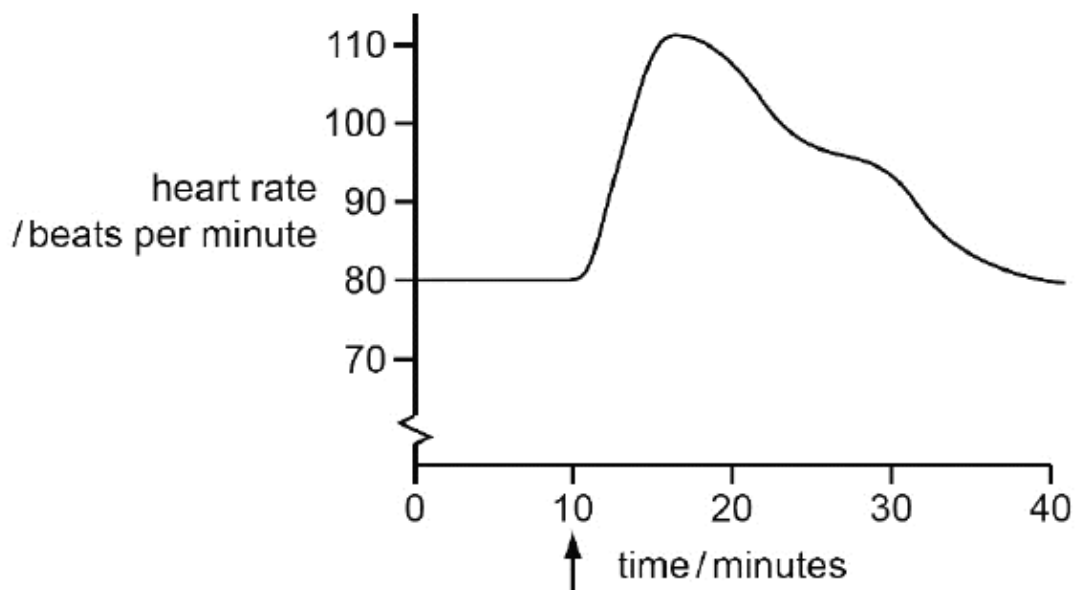
- A** fall.
- B** rise.
- C** not change.
- D** rise and fall regularly

- 15** The diagram illustrates changes in air pressure taking place inside the lungs during a complete cycle of breathing.

Which position on the graph corresponds to the point at which the ribs are beginning to be raised?



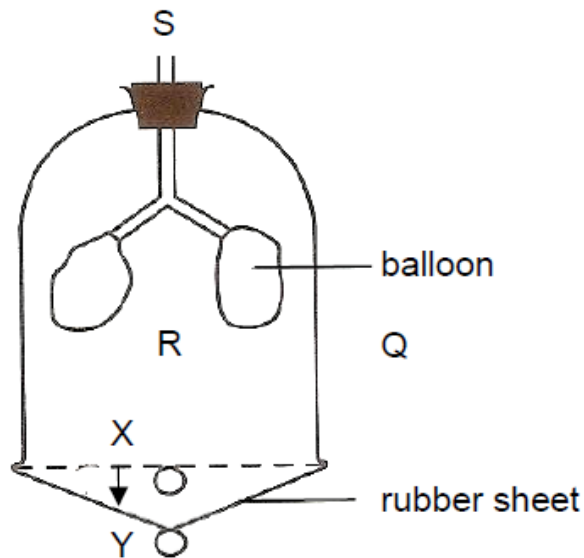
- 16** A person begins to smoke a cigarette at time X. The graph shows how the heart rate changes.



Which substance in cigarette smoke is the main cause of the change in heart rate between 10 and 18 minutes?

- A** tar
- B** nicotine
- C** carbon dioxide
- D** smoke particles

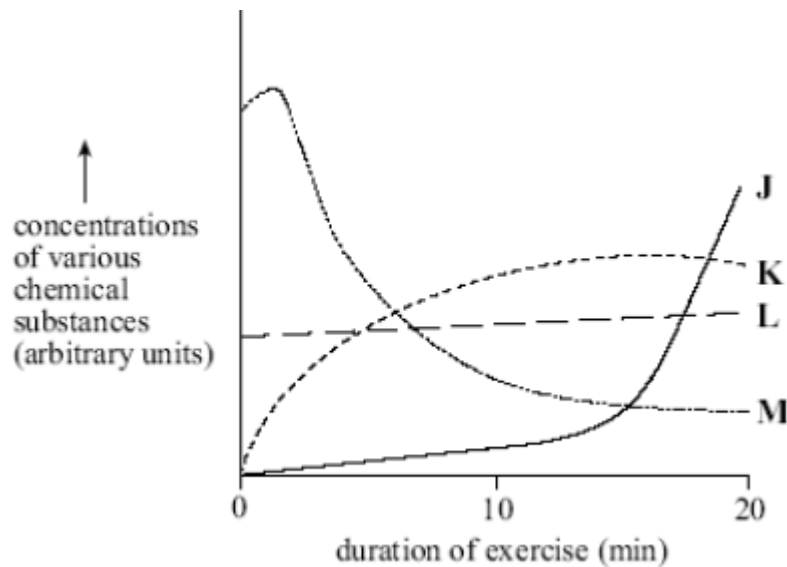
- 17 Which process does not utilise energy?
- A active uptake of potassium ions
 - B cellular division and growth
 - C cellular respiration
 - D contraction of arm muscles
- 18 Which of the following represents the reaction for carbonic anhydrase at the lungs?
- A $H^+ + HCO_3^- \rightarrow H_2CO_3$
 - B $H_2CO_3 \rightarrow H^+ + HCO_3^-$
 - C $H_2O + CO_2 \rightarrow H_2CO_3$
 - D $H_2CO_3 \rightarrow H_2O + CO_2$
- 19 The diagram represents the apparatus used to demonstrate the action of the diaphragm in the human respiratory system.



Which of the following will occur if the rubber sheet moves from X to Y?

- A The pressure at Q becomes higher than R.
- B The pressure at R becomes higher than Q.
- C Air will leave the bell jar through S.
- D The volume inside the balloons will decrease

- 20 How does tar in cigarette smoke increase health risk?
- A by increasing build-up of fatty deposits on inner arterial wall
 - B by increasing the risk of blood clotting
 - C by paralysing cilia lining of the air passages
 - D by stimulating the release of adrenaline
- 21 Why is mucus secreted from the epithelial cells of the trachea?
- A to moisten the surface of the trachea for gas exchange to take place
 - B to lubricate the trachea to facilitate the passage of air into the lungs
 - C to trap dust particles in the incoming air
 - D to warm the incoming air so that the airway does not constrict
- 22 The following graph shows changes in the concentrations of various chemical substances in the thigh muscles of a person exercising vigorously on a bicycle.



Which statement is correct?

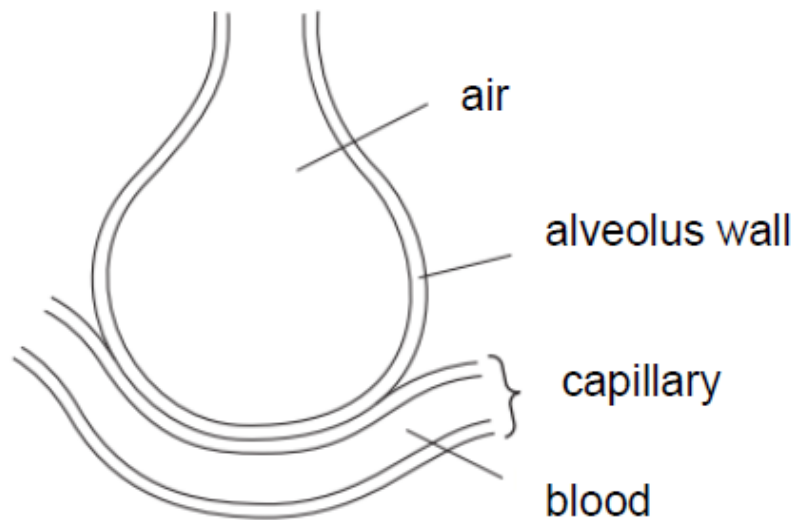
- A J represents glycogen.
- B K represents carbon dioxide.
- C L represents oxygen.
- D M represents lactic acid.

23 Which reactions are catalysed by carbonic anhydrase when red blood cells pass through the lungs?

- 1 $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3$
- 2 $\text{HCO}_3^- + \text{H}^+ \rightarrow \text{H}_2\text{CO}_3$
- 3 $\text{H}_2\text{CO}_3 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$
- 4 $\text{H}_2\text{CO}_3 \rightarrow \text{HCO}_3^- + \text{H}^+$

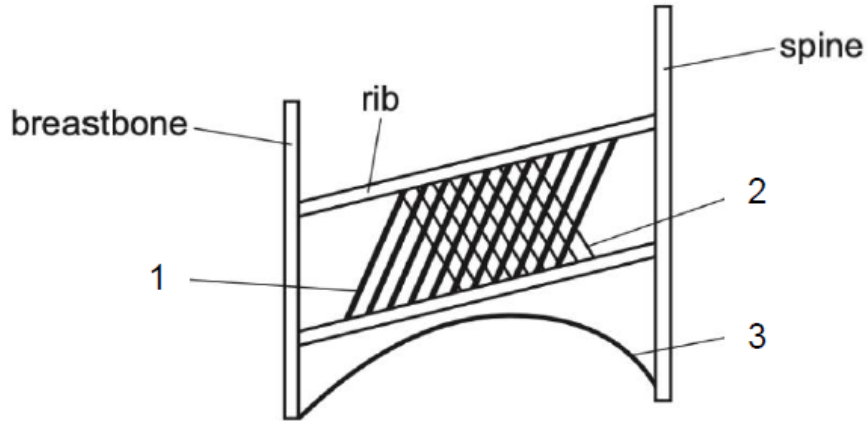
- A** 1 only
B 3 only
C 2 and 3
D 3 and 4

24 The diagram shows an alveolus and part of a nearby capillary. What would increase the rate of absorption of oxygen into the capillary?



- A** decreasing the concentration of oxygen in the alveolus
B decreasing the rate of blood flow through the capillary
C decreasing the thickness of the alveolar wall
D decreasing the rate of breathing

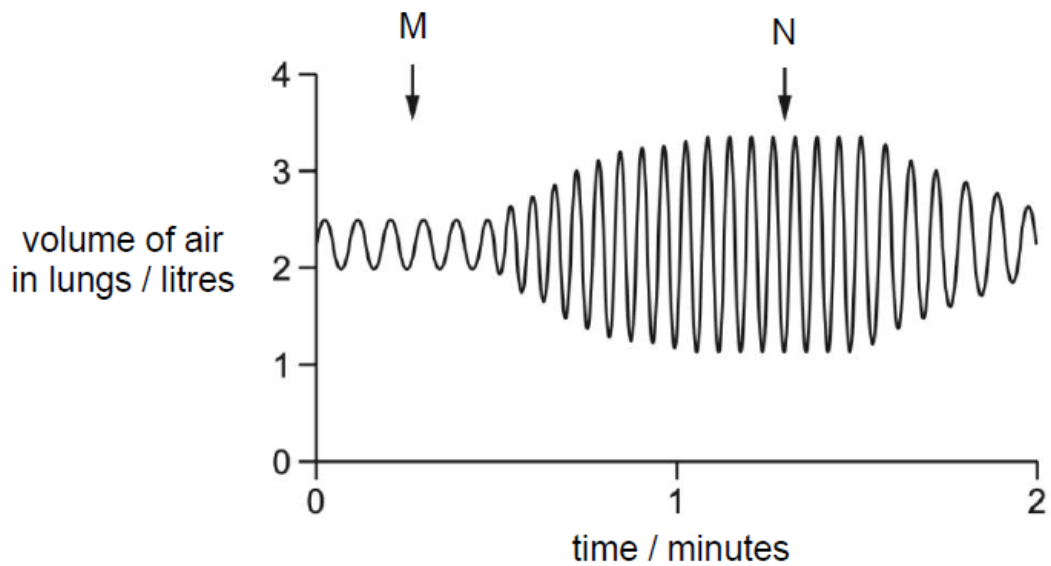
25 The diagram represents some of the muscles involved with breathing.



Which muscles are contracting during inspiration?

- A 1 and 2
- B 1 and 3
- C 1, 2 and 3
- D 2 and 3

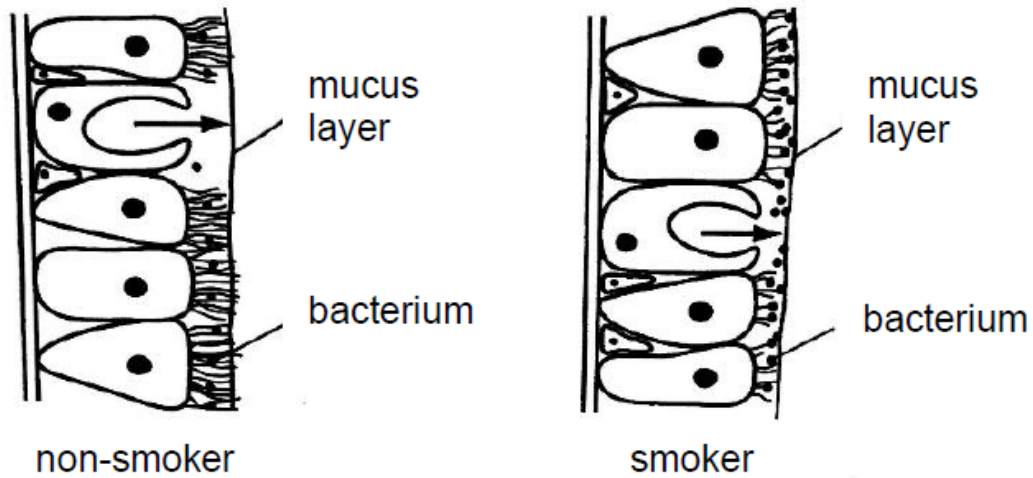
26 The diagram shows changes in the volume of a person's lungs over a period of two minutes.



What could cause the change in the pattern of the graph between points M and N?

- A changing from running to walking
- B changing from walking to running
- C increased frequency of contractions of internal intercostal muscles
- D increased strength of contractions of internal intercostal muscles

- 27 The diagrams show the epithelium lining the bronchioles in a non-smoker and a smoker.



Based on the differences seen in the diagrams, what will the smoker experience as a result of these differences?

- A more lung infections
 - B more mucus running down the nose
 - C the bronchioles become wider
 - D the cilia will beat more rapidly
- 28 What is the chemical equation for aerobic respiration in humans?
- A $6 \text{CO}_2 + 6 \text{H}_2\text{O} \rightarrow \text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2$
 - B $\text{C}_6\text{H}_{12}\text{O}_6 + 6 \text{O}_2 \rightarrow 6 \text{CO}_2 + 6 \text{H}_2\text{O}$
 - C $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2 \text{C}_3\text{H}_6\text{O}_3$
 - D $\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2 \text{CO}_2 + 2 \text{C}_2\text{H}_5\text{OH}$
- 29 What is the effect of nicotine on the human body?
- A It decreases the ability of red blood cells to carry oxygen.
 - B It increases the chances of blood clot formation.
 - C It increases the risk of emphysema.
 - D It increases the risk of lung cancer.

- 30** Pneumonia is a lung infection caused by certain types of bacteria or viruses. It causes the airways to swell and fill up with liquid. Patients often feel faint as less oxygen is absorbed and transported around the body. Based on the information given, which region of the human respiratory system is most affected when a patient has pneumonia?
- A** alveoli
 - B** bronchiole
 - C** pharynx
 - D** trachea

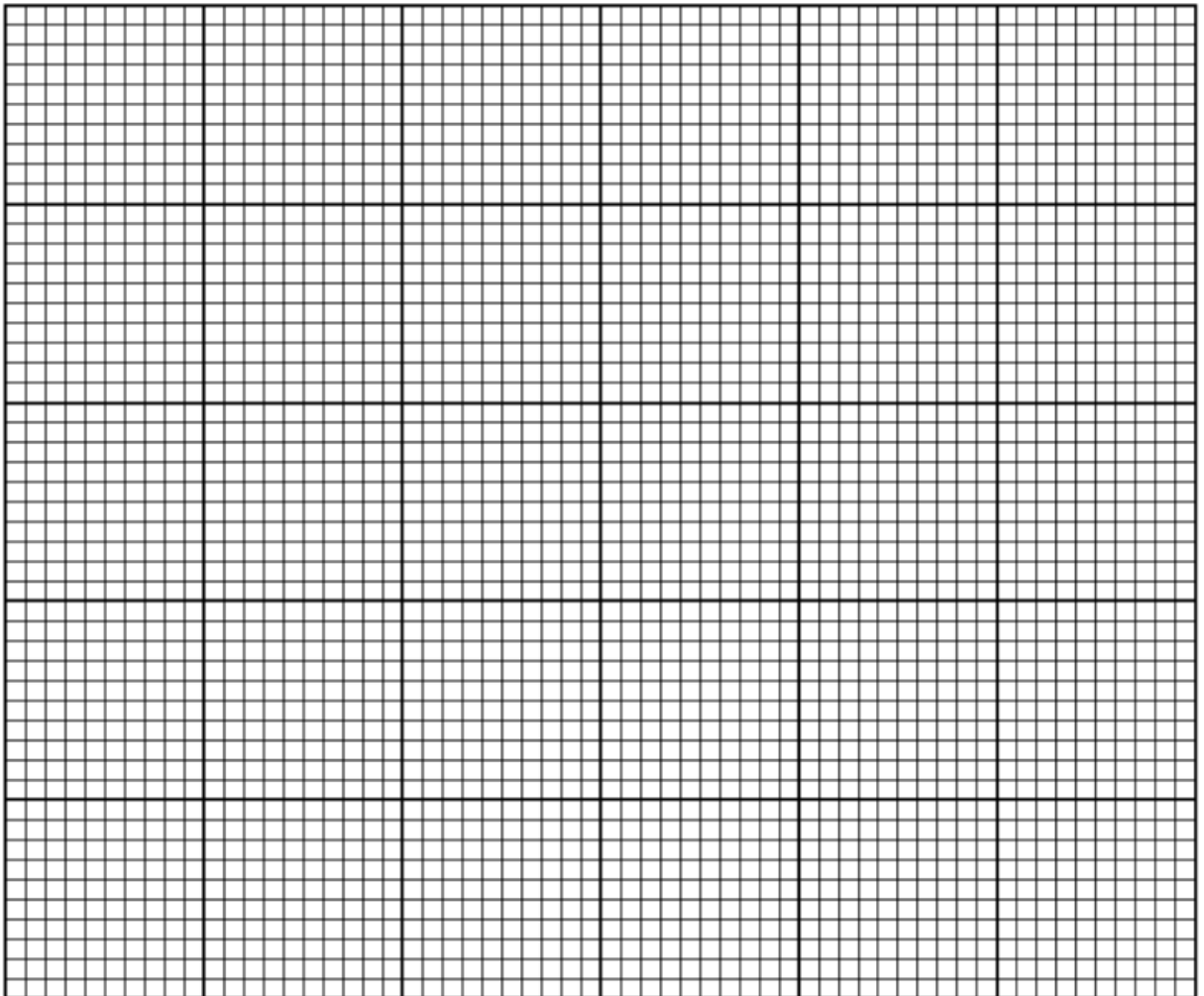
RESPIRATION IN HUMANS STRUCTURED QUESTIONS

- 1 An athlete engages in strenuous physical exercise.
Table 9.1 shows the concentration of lactic acid in the athlete's blood over a period of 6 minutes.

Table 9.1

time / min	0	1	2	3	4	5	6
lactic acid concentration / arbitrary units	6.0	6.0	17.0	38.0	35.0	26.0	20.0

- (a) Plot a graph of the data in Table 9.1.



(b) (i) With reference to the graph in (a), describe the change in lactic acid concentration in the blood over the 6 minutes.

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.....[2]

(ii) Explain the change in lactic acid concentration from the 3rd to 6th minute.

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(iii) Suggest what would happen to the lactic acid concentration in the blood after the 6th minute.

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.....[1]

(c) Diaphragm muscle spasms occur when the diaphragm is unable to relax and remains in a contracted position. The athlete experiences diaphragm muscle spasms during an exercise session.

Describe and explain how this condition affects the volume of air exhaled by the athlete.

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..... [3]

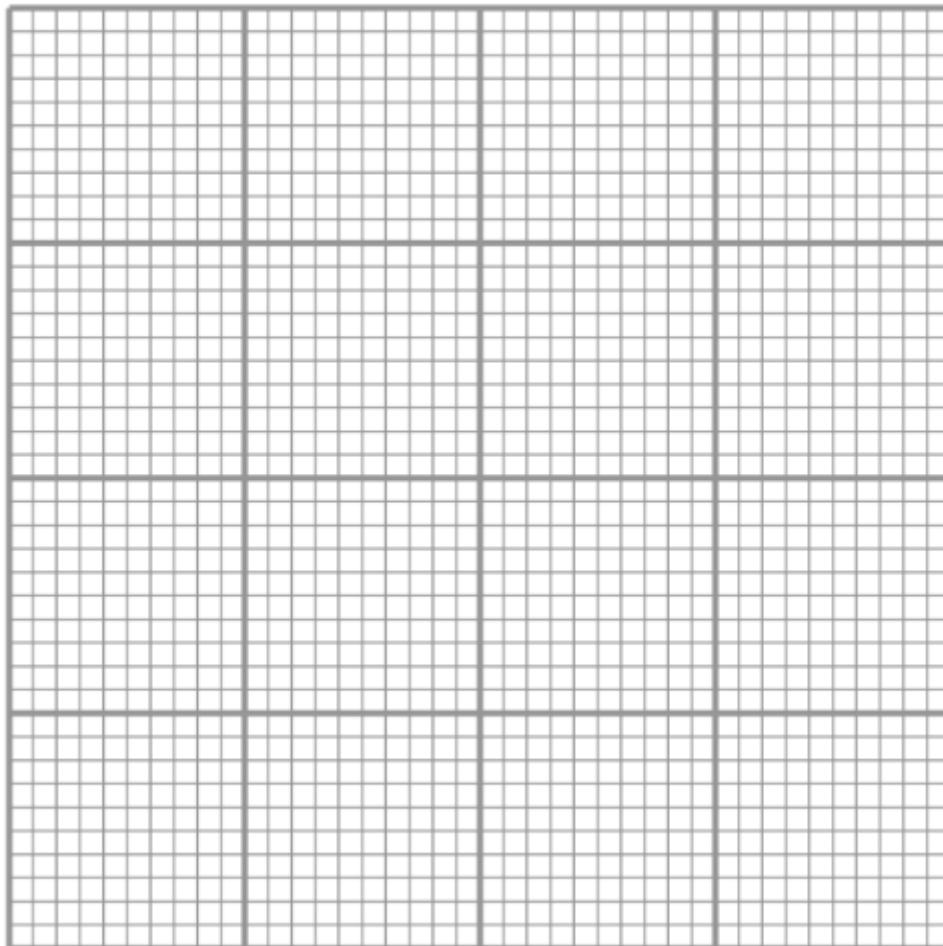
- 2 Pulmonary edema is a condition where fluid accumulates in the lungs, making it difficult to breathe. In recent years, doctors have seen increasing cases of pulmonary edema especially in young adults.

Table 7.1 shows the partial pressure of oxygen levels in patients with pulmonary edema.

Table 7.1

time (hours)	0	6	12	24	48
Partial pressure of oxygen levels (mmHg)	75	70	65	60	55

- (a) (i) Plot a graph of these data.



[4]

- (ii) Describe the trend shown by the data in your graph.

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..... [2]

(b) Accumulation of fluid in the alveoli occurs in patients suffering from pulmonary edema.

Explain how the structure of the alveolus is adapted for efficient gas exchange.

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.....[4]

[Total: 10]

3 Microorganisms can be grown in the laboratory on agar (a jelly-like medium) in a Petri dish.

Nutrients required by the microorganisms are added to the agar.

(a) Name a nutrient that should be added to ensure the maximum rates of

(i) respiration[1]

(ii) growth[1]

(b) Respiration and growth are enzyme-controlled processes.

A student is provided with a Petri dish containing agar with the optimum concentration of nutrients. Explain how the student could speed up the rate of growth of microorganisms growing in this Petri dish.

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.....[2]

- 4 (a) Describe how an oxygen molecule in the atmospheric air can end up in a liver cell, stating clearly the role of diaphragm muscles and intercostal muscles in the pathway.

There is no need to mention the blood vessels.

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- (b) Describe how a glycogen molecule stored in the liver cell can be broken down into carbon dioxide and water.

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[Total: 10]

5 Gardeners often turn dead plant material from their gardens into compost and add it to the soil where they are growing plants. Compost can be made in a composting bin. In the bin aerobic bacteria turn dead plant material into compost. Some people use a different way of making compost, called bokashi. In this process the compost is made anaerobically.

Fig. 7.1 shows a normal composting bin and a bokashi bin.

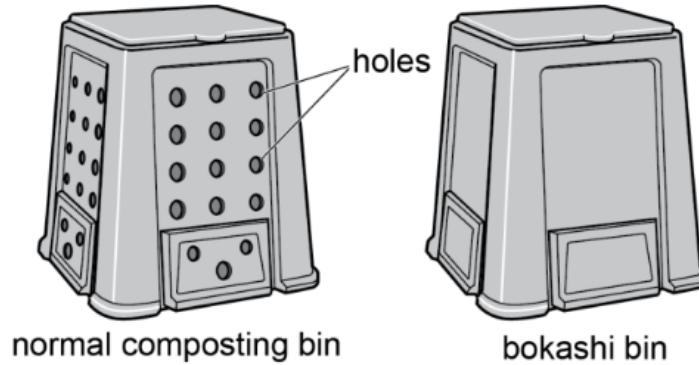


Fig. 7.1

(a) Explain the difference in the design of the two composting bins.

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.....[2]

(b) Scientists investigated the two methods of making compost with the following steps:

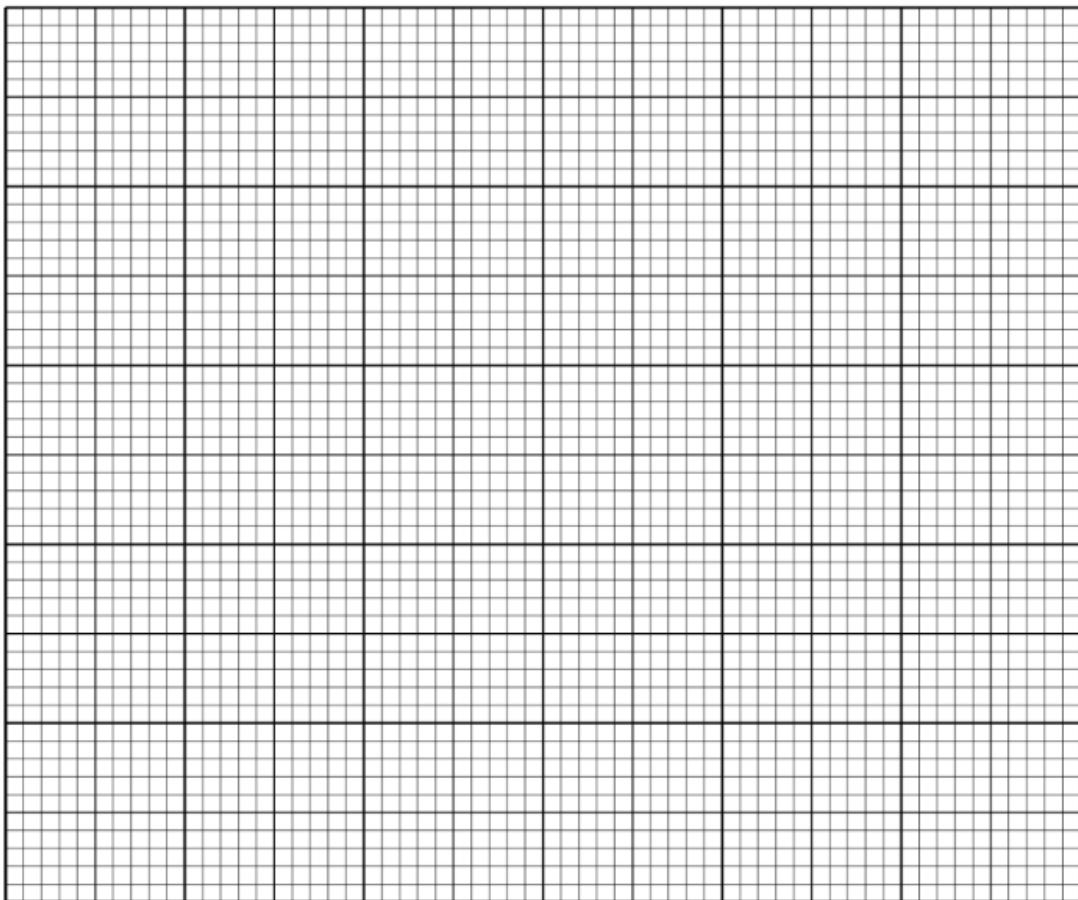
- Take a pile of dead plant material and divide it into two smaller samples of equal mass.
- Place one sample into the normal composter and the other into the bokashi composter.
- Measure the temperature in each composter every 10 days.
- After 40 days, measure the mass of the compost.

Table 7.1 shows the results of the experiment.

Table 7.1

time / days	temperature of the compost / °C	
	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

(i) Plot the results on the grid provided.



[4]

(ii) Explain the temperature changes in the normal compost bin.

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..... [2]

(iii) Explain the difference in the temperature changes between the normal compost and the bokashi compost.

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..... [2]

[Total: 10]

6 Fig. 6.1 shows changes in the volume of air in a person's lungs during breathing.

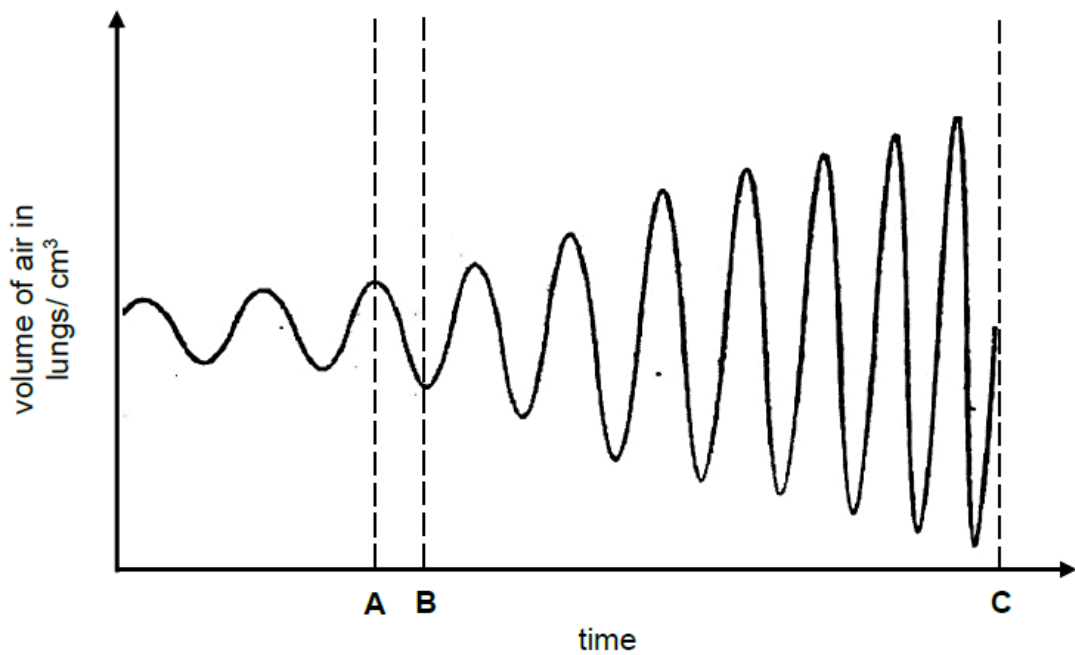


Fig. 6.1

(a) Explain the role of the diaphragm and the intercostal muscles to effect a change in volume of air in the lungs from times **A** to **B**.

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.....[4]

(b) Suggest one cause of the change in the person's breathing from times **B** to **C**.

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(c) Name one adaptation of the alveolus to allow rapid exchange of gases between air in the alveoli and the blood capillaries surrounding them.

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.....[1]

- 8 Fig. 4.1 shows two diagrams of a model used to demonstrate the process of human breathing. Diagram **G** shows the model after breathing in, and diagram **H** after breathing out.

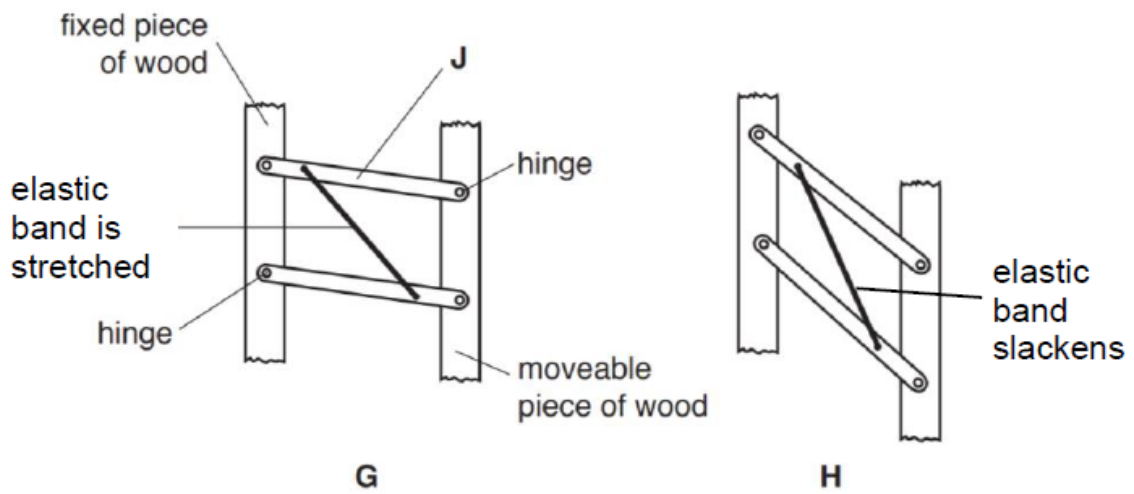


Fig. 4.1

- (a) According to Fig. 4.1, name the structures in the respiratory system represented by:

- (i) the elastic band
- (ii) J [2]

- (b) During exhalation, state the actions of the elastic band and J.

.....

[2]

- (c) Name a muscle that is used in human breathing, but is not represented in the model. State the action of this muscle during the process of breathing out.

muscle

action

.....[3]

(d) Describe and explain the effect of increasing the volume of the thorax on the movement of air during human breathing.

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.....[3]

[Total: 10]

9 Fig. 1.1 shows two specialized cells, 1 and 2, from the gaseous exchange system. S and T are organelles found in cell 1 and 2 respectively.

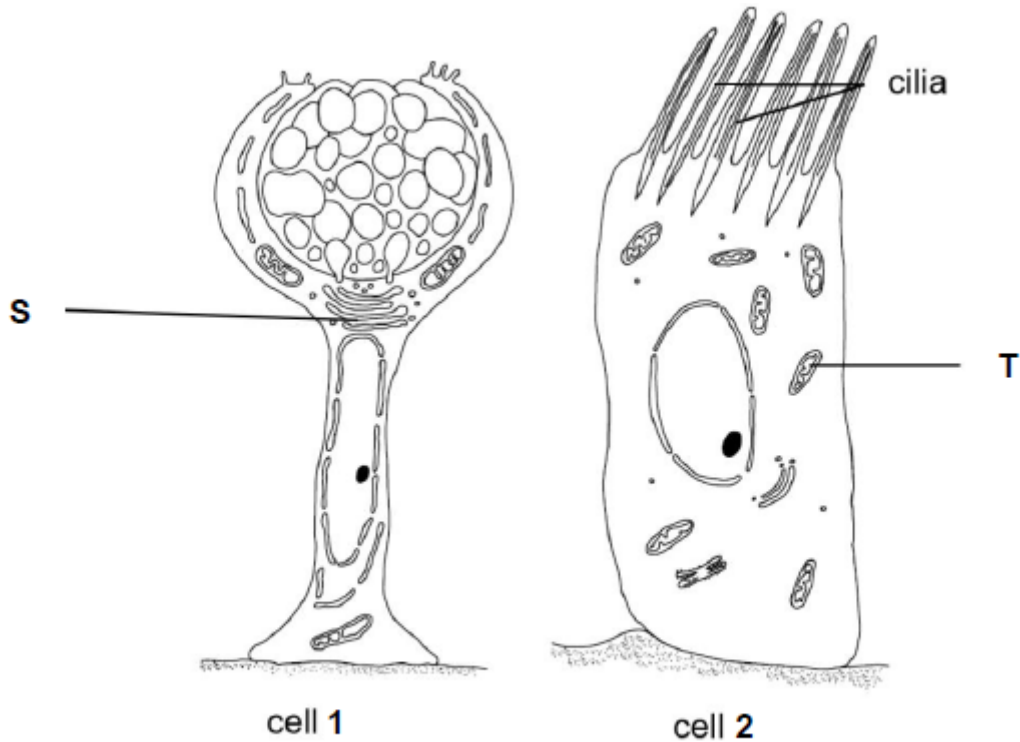


Fig. 1.1

(a) Identify organelles S and T.

S

T [1]

- (b) (i) Organelle **S** in cell **1** produces secretions that line the trachea and bronchi. State a function of these secretions.

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.....[1]

- (ii) With reference to Fig. 1.1, describe the function of cell **2**.

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

- (d) Suggest how cigarette smoke affects the function of organelle **T** in cell **2**.

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.....[2]

- 10 The average rate of oxygen consumption for a person engaging in four different types of exercises was measured. The results are shown in Fig. 7.1.

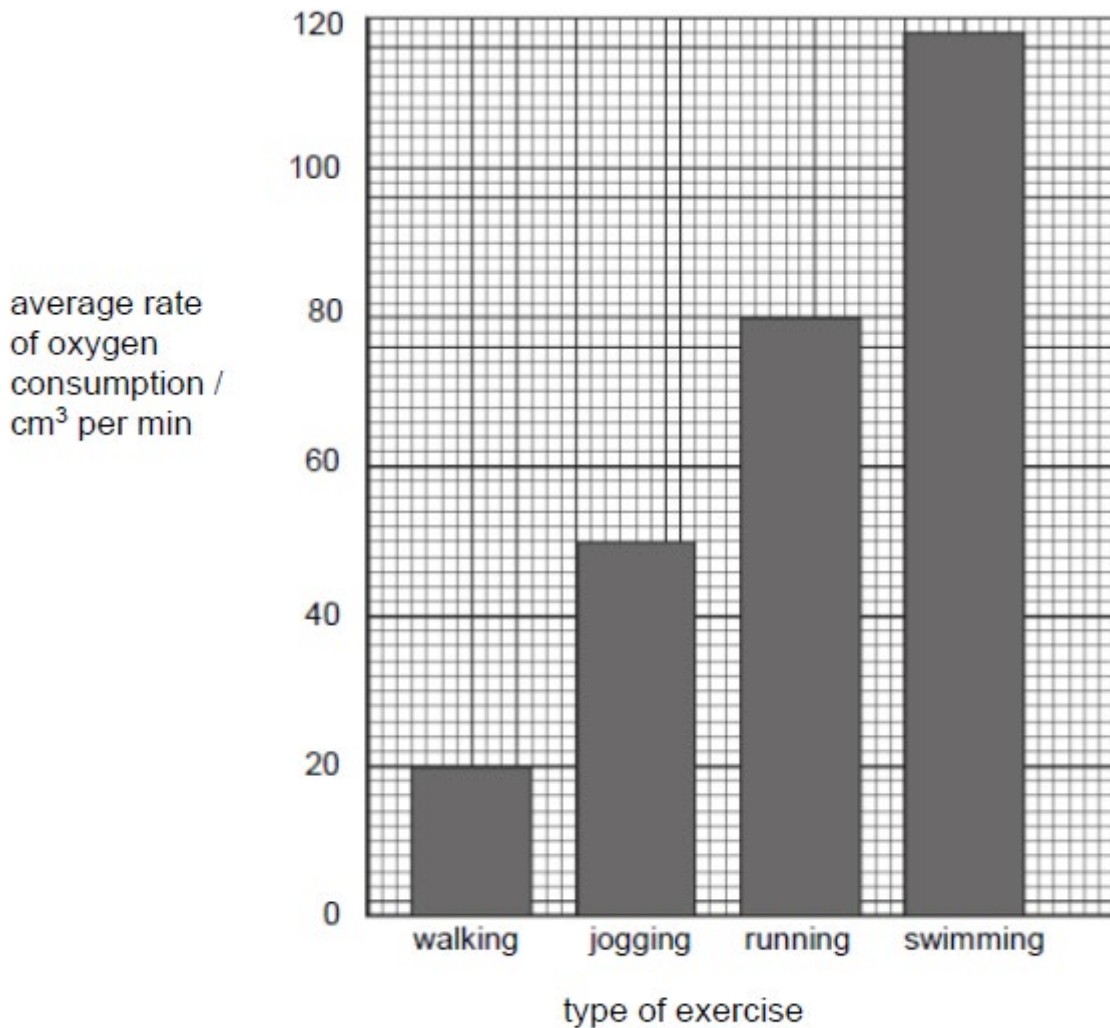


Fig. 7.1

- (a) (i) Calculate the percentage change in the average rate of oxygen consumption as the person changes from walking to jogging.

Show your working.

percentage change = [2]

(ii) The oxygen debt for each type of exercise was also calculated. It was found that the person developed a larger oxygen debt when running compared to walking. Explain why the person developed an oxygen debt.

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(b) After the run, the person’s heart rate and breathing rate remained high for several minutes to pay off the oxygen debt. Explain how the oxygen debt is paid.

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.....[2]

(c) Describe how carbon dioxide produced by respiring tissues is transported in the blood for gaseous exchange in the lungs. Details of blood vessels and the pathway of blood in the heart are not required.

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.....[4]

ANSWERS FOR RESPIRATION IN HUMANS MCQ

Q1: D	Q6: D	Q11: D	Q16: B	Q21: C	Q26: B
Q2: A	Q7: B	Q12: A	Q17: C	Q22: B	Q27: A
Q3: B	Q8: D	Q13: C	Q18: D	Q23: B	Q28: B
Q4: B	Q9: A	Q14: B	Q19: A	Q24: C	Q29: B
Q5: C	Q10: B	Q15: C	Q20: C	Q25: B	Q30: A

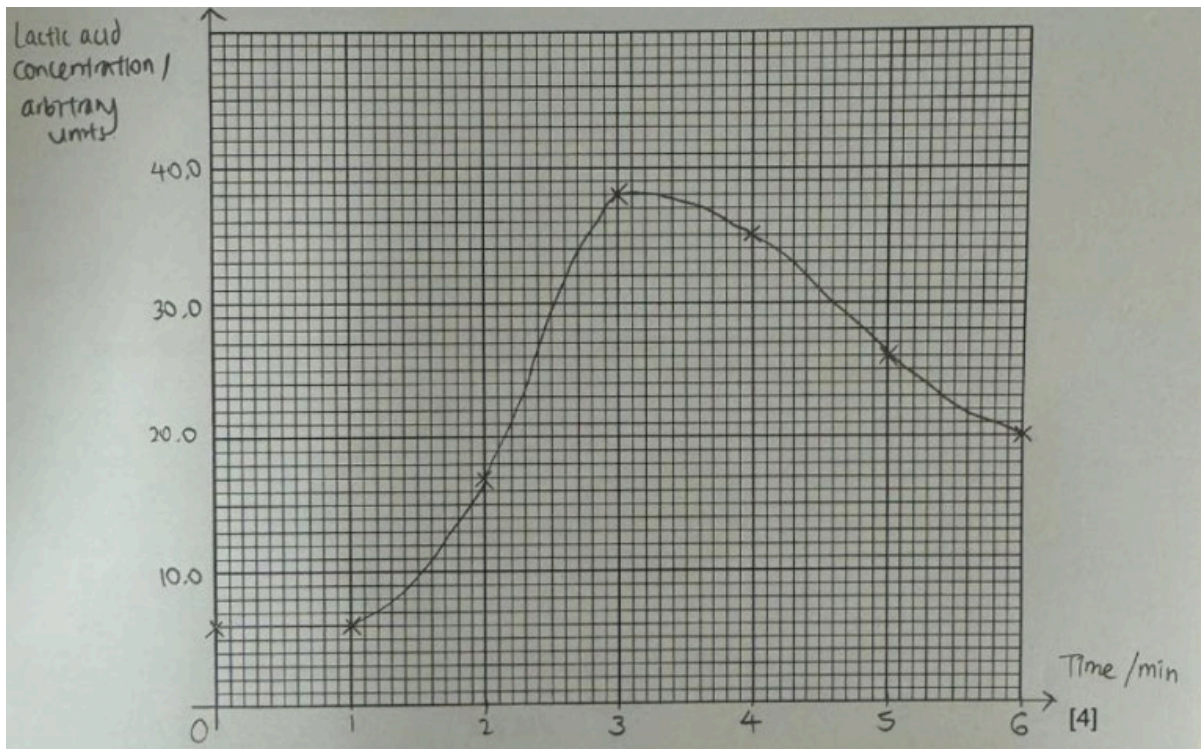
ANSWERS FOR RESPIRATION IN HUMANS STRUCTURED QUESTIONS

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lactic acid concentration / arbitrary units	6.0	6.0	17.0	38.0	35.0	26.0	20.0

- (a) Plot a graph of the data in Table 9.1.



- S – Scale
- L – Line
- A – Axes
- P – Points

- (b) (i) With reference to the graph in (a), describe the change in lactic acid concentration in the blood over the 6 minutes.

From 0 to 1 min. lactic acid concentration remained constant at 6.0 arbitrary units.

From 1 to 3 min, it increased from 6.0 arbitrary units to 38.0 arbitrary units.

From 3 to 6 min, it decreased from 38.0 to 20.0 min.

3 pts for 2m, 2 pts – 1m, 1 pt – 0m

No data quoted – 1m (if all points are correct) [2]

- (ii) Explain the change in lactic acid concentration from the 3rd to 6th minute.

Exercise has stopped

Lactic acid is gradually transported to the liver where oxygen is used to remove it from the bloodstream/broken down in the liver [2]

- (iii) Suggest what would happen to the lactic acid concentration in the blood after the 6th minute.

It will gradually decrease and remain constant at 6.0 arbitrary units.

[1]

- (c) Diaphragm muscle spasms occur when the diaphragm is unable to relax and remains in a contracted position. The athlete experiences diaphragm muscle spasms during an exercise session.

Describe and explain how this condition affects the volume of air exhaled by the athlete.

Diaphragm is unable to relax and curve upwards;

Volume of lungs does not decrease/remains constant

Pressure in lungs does not increase/is similar to atmospheric pressure;

Lower volume of air exhaled.

4 pts – 3m, 3 pts – 2m, 2 pts – 1m, 1 pt – 0m [3]

- 2 Pulmonary edema is a condition where fluid accumulates in the lungs, making it difficult to breathe. In recent years, doctors have seen increasing cases of pulmonary edema especially in young adults.

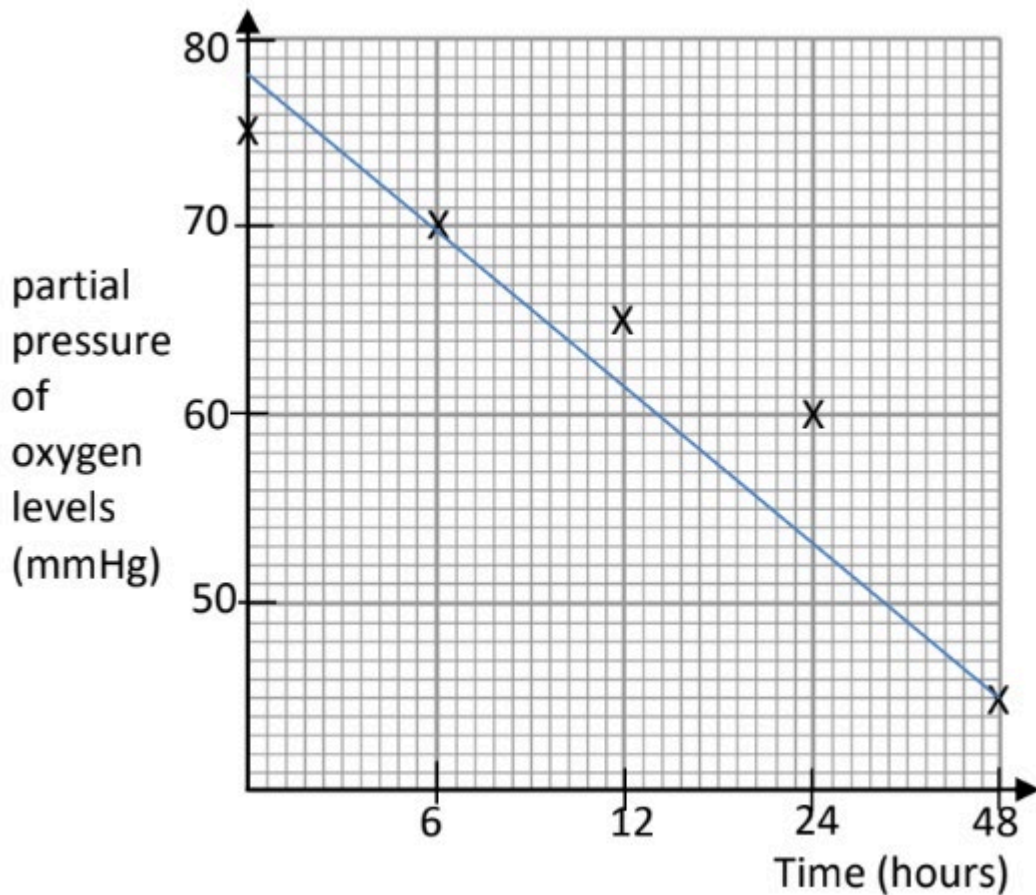
Table 7.1 shows the partial pressure of oxygen levels in patients with pulmonary edema.

Table 7.1

time (hours)	0	6	12	24	48
Partial pressure of oxygen levels (mmHg)	75	70	65	60	55

- (a) (i) Plot a graph of these data.

Scale; Best-Fit line; Axis Titles; Plotting points



[4]

(ii) Describe the trend shown by the data in your graph.

As the time increases, the partial pressure of oxygen levels decreases from 75 mmHg to 55 mmHg / by 20 mmHg.

Every 6 hours, the partial pressure of oxygen levels decreases by 5 mmHg. [AW]

[2]

(b) Accumulation of fluid in the alveoli occurs in patients suffering from pulmonary edema.

Explain how the structure of the alveolus is adapted for efficient gas exchange.

[1a] walls of alveolus has a thin film of moisture

[1b] to allow gases to dissolve to diffuse into the blood capillary

[2a] walls of alveolus is made up of one cell thick

[2b] to allow faster diffusion of gases

[3a] alveolus is surrounded by a dense network of blood capillaries.

[3b] to transport gases quickly to maintain a steep concentration gradient of gases.

Any four points 4

[4]

[Total: 10]

3 Microorganisms can be grown in the laboratory on agar (a jelly-like medium) in a Petri dish.

Nutrients required by the microorganisms are added to the agar.

(a) Name a nutrient that should be added to ensure the maximum rates of

(i) respiration carbohydrate/sugar / glucose / maltose / sucrose / starch [1]

(ii) growth protein / amino acids (vitamins / ions etc.) (lg: glucose) [1]

(b) Respiration and growth are enzyme-controlled processes.

A student is provided with a Petri dish containing agar with the optimum concentration of nutrients. Explain how the student could speed up the rate of growth of microorganisms growing in this Petri dish.

incubate/ place in + suitable/ optimum temperature [1]

OR

add pH buffer + suitable/ optimum pH; speeds up rate of enzyme reaction / enzyme most active / faster formation of enzyme-substrate complex / higher rate of effective collision between enzyme and substrate ;[1] [2]

- 4 (a) Describe how an oxygen molecule in the atmospheric air can end up in a liver cell, stating clearly the role of diaphragm muscles and intercostal muscles in the pathway.

There is no need to mention the blood vessels.

diaphragm muscle contracts/ flattens + volume of chest cavity increases
(R: diaphragm muscle relaxes and flattens)

external intercostal muscles contract/ internal intercostal muscles relax + rib cage moves upward and outward/ volume of chest cavity increases;
(R: intercoastal)

pressure of atmospheric air is higher than in the lungs + air containing oxygen rushes into lungs;

passing nostrils, trachea, bronchi, bronchioles (any 2);

(sequence must make logical sense, else no mark for subsequent points)

oxygen dissolves in the thin film of moisture lining the inner surface of alveolus;

then diffuses through the one-cell thick wall of alveolus into the blood plasma;

oxygen diffuses into RBC and combines with haemoglobin/ forms oxyhaemoglobin;

The RBC is carried from the lungs to the left atrium, left ventricle;

when blood passes the liver cell, oxygen diffuses from the RBC into the tissue fluid and into liver cell
(max 7)

[7]

- (b) Describe how a glycogen molecule stored in the liver cell can be broken down into carbon dioxide and water.

Glucagon is secreted by pancreas to stimulate the liver cell (when blood glucose concentration drops below the norm);

(R: stimulate liver) (R: stimulate liver and muscle)

To convert/ break down stored glycogen in the liver cell into glucose;

Glucose is involved in aerobic respiration

[3]

[Total: 10]

- 5 Gardeners often turn dead plant material from their gardens into compost and add it to the soil where they are growing plants. Compost can be made in a composting bin. In the bin aerobic bacteria turn dead plant material into compost. Some people use a different way of making compost, called bokashi. In this process the compost is made anaerobically.

Fig. 7.1 shows a normal composting bin and a bokashi bin.

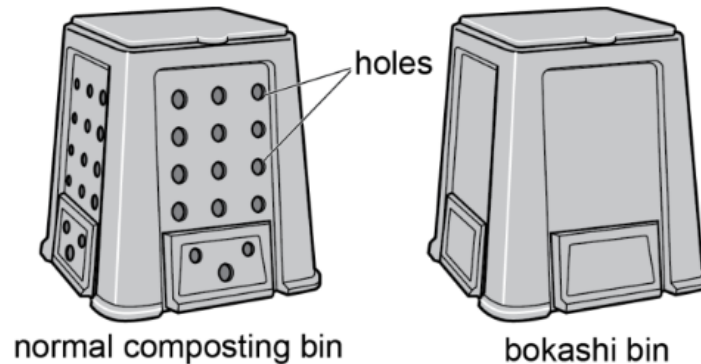


Fig. 7.1

- (a) Explain the difference in the design of the two composting bins.

Holes in normal composting bin allow more oxygen to enter so that aerobic respiration of bacteria can occur [1]

Lack of holes in bokashi bin does not allow oxygen to enter therefore anaerobic respiration of bacteria can occur when the oxygen in the bin is used up. [1]

[2]

- (b) Scientists investigated the two methods of making compost with the following steps:

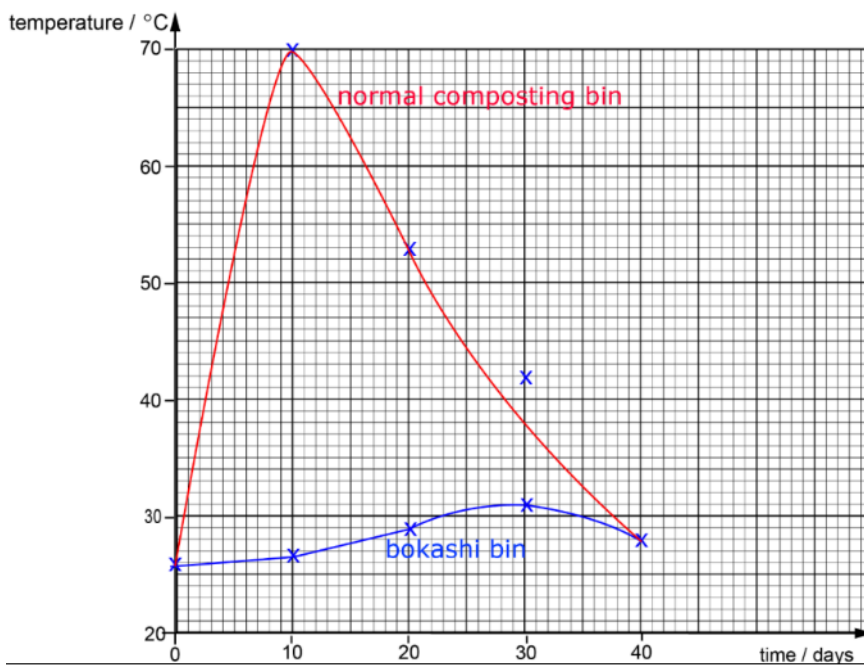
- Take a pile of dead plant material and divide it into two smaller samples of equal mass.
- Place one sample into the normal composter and the other into the bokashi composter.
- Measure the temperature in each composter every 10 days.
- After 40 days, measure the mass of the compost.

Table 7.1 shows the results of the experiment.

Table 7.1

time / days	temperature of the compost / °C	
	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

(i) Plot the results on the grid provided.



- Correct scale such that graph occupies at least half of the grid space [1]
- Best-fit lines labelled or with a key [1]
- Axes with correct units [1]
- Plot all data points correctly [1]

[4]

(ii) Explain the temperature changes in the normal compost bin.

Any two:

Temperature increases from 26°C to 70°C for first 10 days as the bacteria release heat / energy from respiration. [1]

The temperature decreases after 10 days as the rate of aerobic respiration of bacteria decreases / decomposition slows down.[1]

Accept temperature starts to drop as enzymes involved in respiration denature beyond the optimal temperature of the enzyme.[1]

[2]

(iii) Explain the difference in the temperature changes between the normal compost and the bokashi compost.

Aerobic respiration of bacteria in normal composting bin releases more heat compared to anaerobic respiration of the bacteria in the bokashi bin [1] ORA

Rate of respiration in normal bin occurs faster in normal composting bin than in bokashi bin [1] ORA

[2]

[Total: 10]

6 Fig. 6.1 shows changes in the volume of air in a person's lungs during breathing.

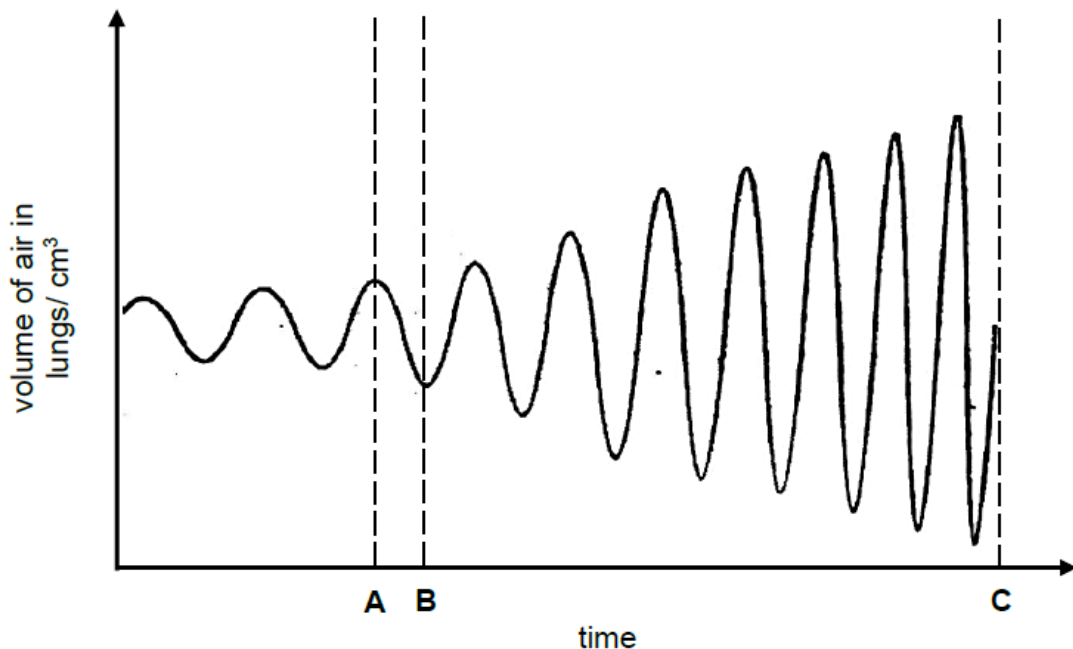


Fig. 6.1

- (a) Explain the role of the diaphragm and the intercostal muscles to effect a change in volume of air in the lungs from times **A** to **B**.

External intercostal muscles relaxes, internal intercostal muscles contracts.

(Reject: Intercoastal)

Ribs move downwards and inwards.

Diaphragm relaxes and arch upwards/ dome

Volume of chest cavity decreases and air pressure increases, air forced out of the lungs. [4]

- (b) Suggest one cause of the change in the person's breathing from times **B** to **C**.

Exercise / running / jogging/ jumping rope etc

(Reject: vigorous activity/ intentionally breathe faster)

[1]

- (c) Name one adaptation of the alveolus to allow rapid exchange of gases between air in the alveoli and the blood capillaries surrounding them.

The one cell thick alveolus wall ensures a faster rate of diffusion of gases through it OR

A thin film of moisture covers the surface of the alveolus, allowing oxygen to dissolve in it.

(Accepted relevant answers: numerous alveoli to increase s.a. to vol. ratio/ short distance between capillary and alveolar wall.) [1]

- 7 Blood samples were taken from an athlete's finger before, during and after vigorous exercise and was tested for lactic acid. The results of the test of lactic acid are shown in Fig. 9.1.

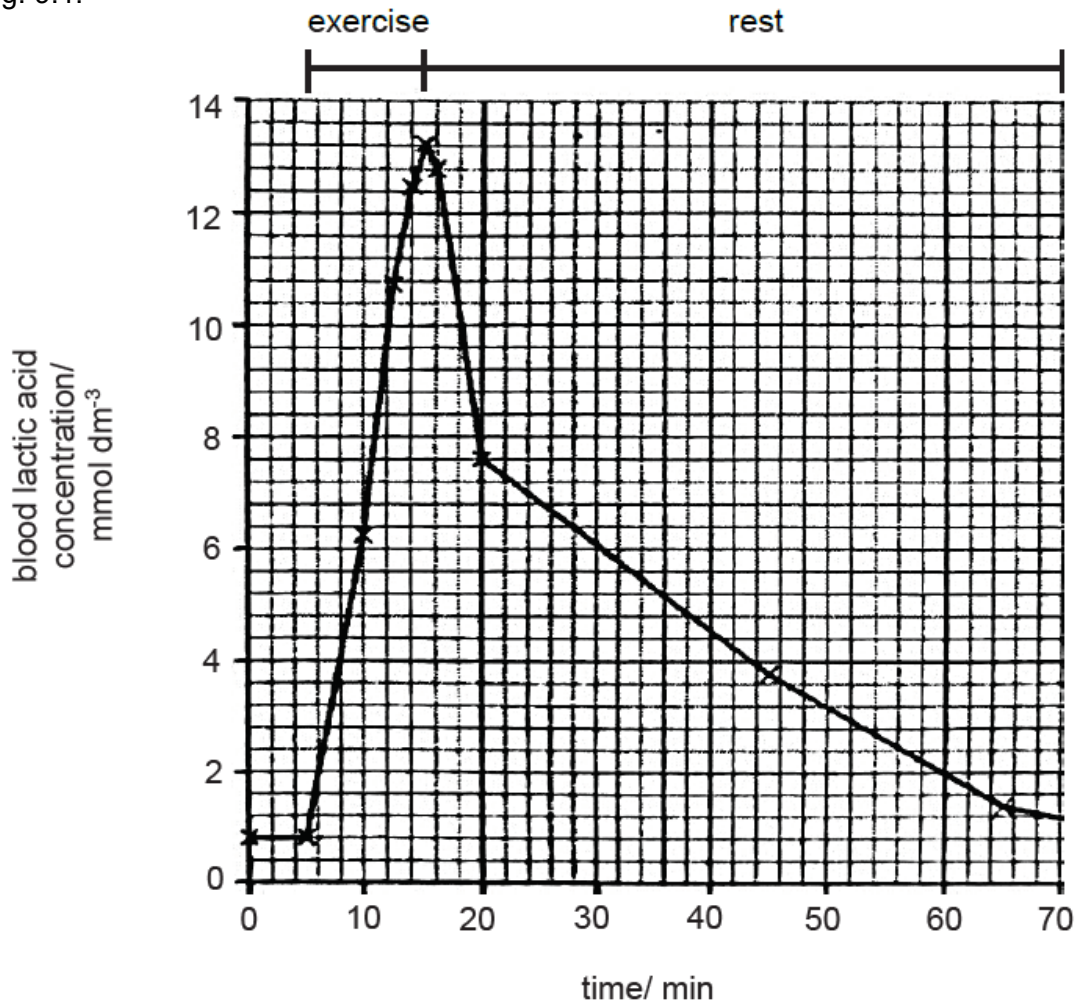


Fig. 9.1

- (a) With reference to Fig. 9.1, describe how blood lactic acid concentration changes from the start of vigorous exercise until the 60-minute mark.

During exercise, blood lactic acid concentration increases by 12.4 mmol dm⁻³
 During rest, blood lactic acid concentration decreases steeply by 5.6 mmol dm⁻³
 Then decreases gradually by 5.6 mmol dm⁻³

Note:

- Quotation of data – “0.8 to 13.2 mmol dm⁻³/ 13.2 to 7.6 mmol dm⁻³/ 7.6 to 2 mol dm⁻³), but deduct 1 mark overall for no manipulation of data [3]

- (b) Explain the changes in blood lactic acid concentration during and after exercise.

During vigorous exercise, muscles carry out anaerobic respiration to release more energy;

Equation of anaerobic respiration/ release small amounts of energy and lactic acid from glucose

Oxygen debt occurs;

During rest, lactic acid is transported to the liver;

Some lactic acid is oxidised to release energy;

Energy is used to convert lactic acid to glucose;

Note:

- Lactic acid is converted to glucose – [1] [3]

- 8 Fig. 4.1 shows two diagrams of a model used to demonstrate the process of human breathing. Diagram G shows the model after breathing in, and diagram H after breathing out.

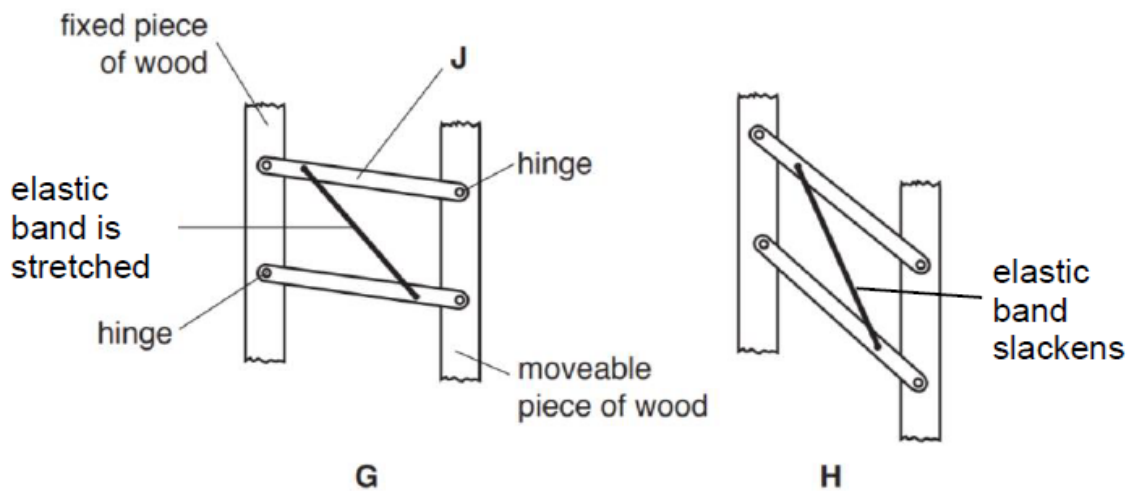


Fig. 4.1

- (a) According to Fig. 4.1, name the structures in the respiratory system represented by:

- (i) the elastic band External intercostal muscles;
 (R: diaphragm - wrong location!)
- (ii) J Ribcage;
 (A: rib – but take note that the entire ribcage moves upwards and outwards / downwards and inwards, not just one rib) [2]

- (b) During exhalation, state the actions of the elastic band and J.

Elastic band: relax;

J: move downwards and inwards;

[2]

- (c) Name a muscle that is used in human breathing, but is not represented in the model. State the action of this muscle during the process of breathing out.

muscle diaphragm muscle

action relaxes;

curves upwards / becomes dome shaped;[3]

- (d) Describe and explain the effect of increasing the volume of the thorax on the movement of air during human breathing.

Pressure in the lungs decrease;

Pressure of atmospheric air (R: environment) is higher than pressure in lungs;

Air is forced into lungs from atmosphere, causing inhalation; [3]

[Total: 10]

- 9 Fig. 1.1 shows two specialized cells, 1 and 2, from the gaseous exchange system. S and T are organelles found in cell 1 and 2 respectively.

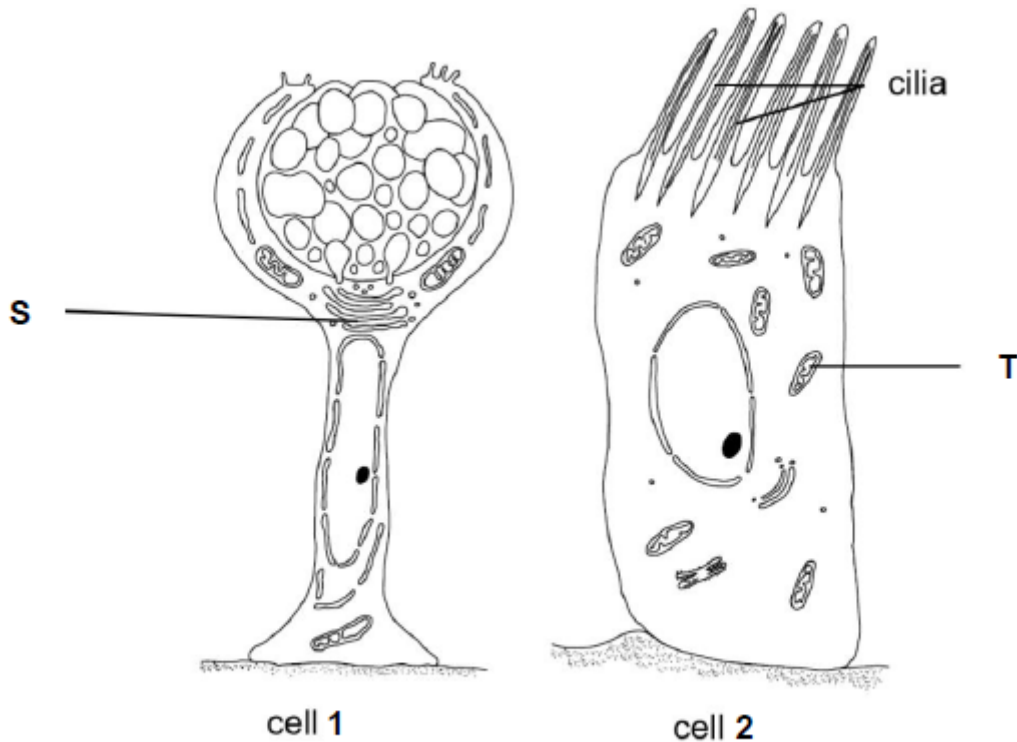


Fig. 1.1

- (a) Identify organelles S and T.

S golgi body / golgi apparatus

T mitochondrion (R: mitochondria)

[1]

Both correct 1m

R: spelling errors

- (b) (i) Organelle S in cell 1 produces secretions that line the trachea and bronchi. State a function of these secretions.

To trap bacteria and impurities/dust in air ;

R: trap dirt (too general)

R: filter bacteria

[1]

(ii) With reference to Fig. 1.1, describe the function of cell 2.

Cell 2 has cilia, which sweeps the mucus up the trachea/ towards the back of throat

Reject:

- sweeps mucus down the trachea
- sweeps mucus up/down the throat

[1]

(c) Suggest how cigarette smoke affects the function of organelle T in cell 2.

Carbon monoxide from cigarette smoke reduces the ability of red blood cells to transport oxygen;

Reduced oxygen reduces aerobic respiration of B, less energy to move cilia;

R: T is unable to release energy to carry out aerobic respiration [2]

- 10 The average rate of oxygen consumption for a person engaging in four different types of exercises was measured. The results are shown in Fig. 7.1.

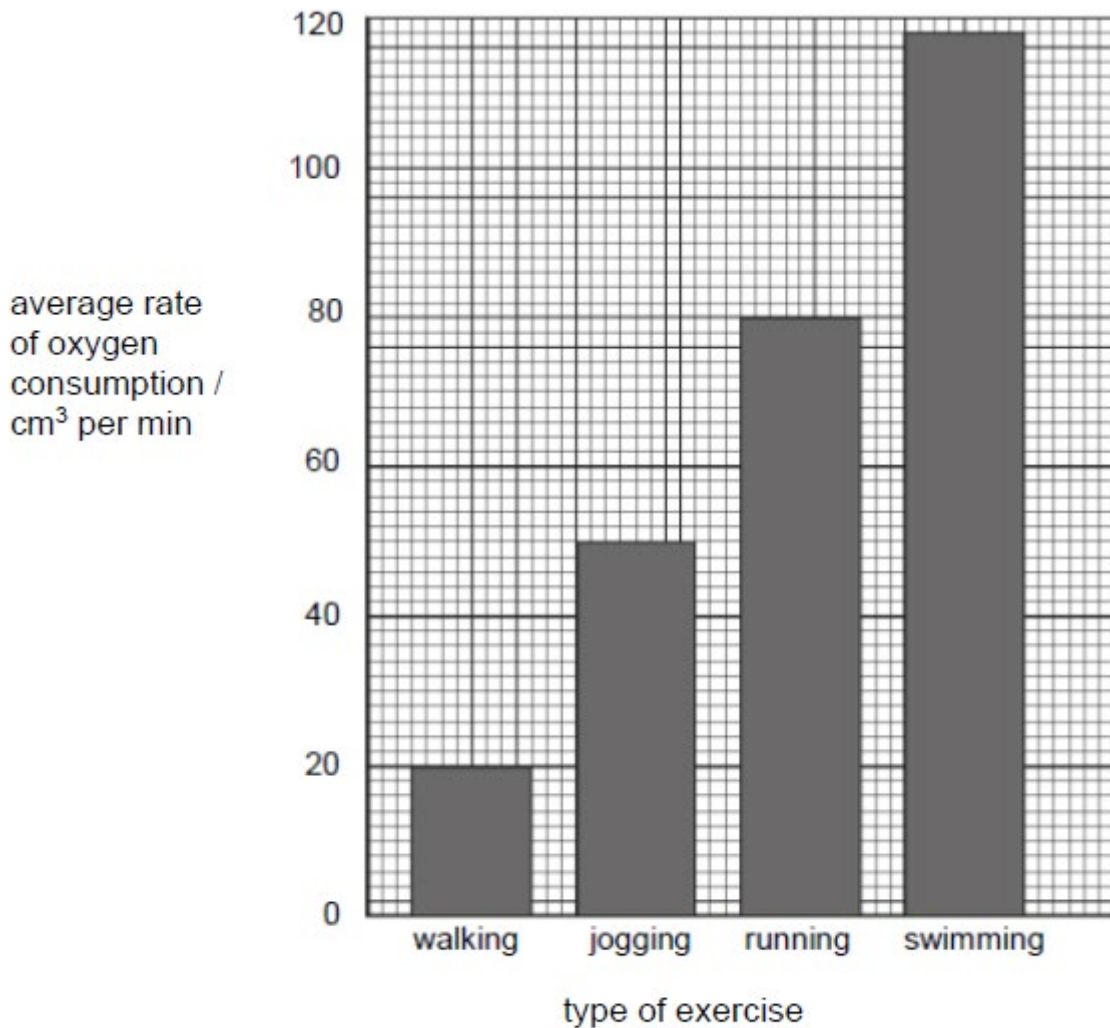


Fig. 7.1

- (a) (i) Calculate the percentage change in the average rate of oxygen consumption as the person changes from walking to jogging.
Show your working.

- correct working $[(50-20)/20] \times 100\%$
- Answer (+ 150%) with '+' sign indicated

percentage change = [2]

- (ii) The oxygen debt for each type of exercise was also calculated. It was found that the person developed a larger oxygen debt when running compared to walking. Explain why the person developed an oxygen debt.

There is more vigorous muscular contractions during running as compared to walking;

The demand for oxygen / energy is higher;

Maximum heart rate/ breathing rate is still unable to provide oxygen to muscles fast enough;

Also, aerobic respiration is unable to release energy fast enough to meet energy demands so anaerobic respiration occurs in addition to aerobic respiration;

When there is insufficient oxygen supply, lactic acid is built up and the body is said to have suffered an oxygen debt ;

R: produce energy. [4]

- (b) After the run, the person's heart rate and breathing rate remained high for several minutes to pay off the oxygen debt. Explain how the oxygen debt is paid.

(In the liver) the oxygen is used to oxidise lactic acid to release energy;

The energy is then used to convert the remaining lactic acid into glucose; [2]

- (c) Describe how carbon dioxide produced by respiring tissues is transported in the blood for gaseous exchange in the lungs. Details of blood vessels and the pathway of blood in the heart are not required.

Carbon dioxide from the respiring tissue diffuses into the blood plasma and into red blood cells;

Carbonic anhydrase catalyses the conversion of carbon dioxide into carbonic acid;

Carbonic acid dissociates into hydrogencarbonate ions;

Hydrogencarbonate ions diffuse into and is transported in the blood plasma towards the lungs;

At the lungs, hydrogencarbonate ions diffuse back into red blood cells and are converted back into carbonic acid;

Carbonic anhydrase then catalyse the conversion of carbonic acid to carbon dioxide;

Carbon dioxide then diffuse out of the red blood cell into the blood plasma, and diffuses into the alveoli before it is expelled during exhalation;

[4]