

The Respiratory System

Name: _____

Date: _____ Score: ____ / 26

Key ideas

Pathway of air: nasal cavity → pharynx → larynx → trachea → bronchi → bronchioles → alveoli. The epiglottis covers the larynx when you swallow.

Breathing works by changing pressure: when the chest volume increases, pressure in the lungs drops and air flows in. **Gas exchange** happens by diffusion across the thin walls of the alveoli and capillaries.

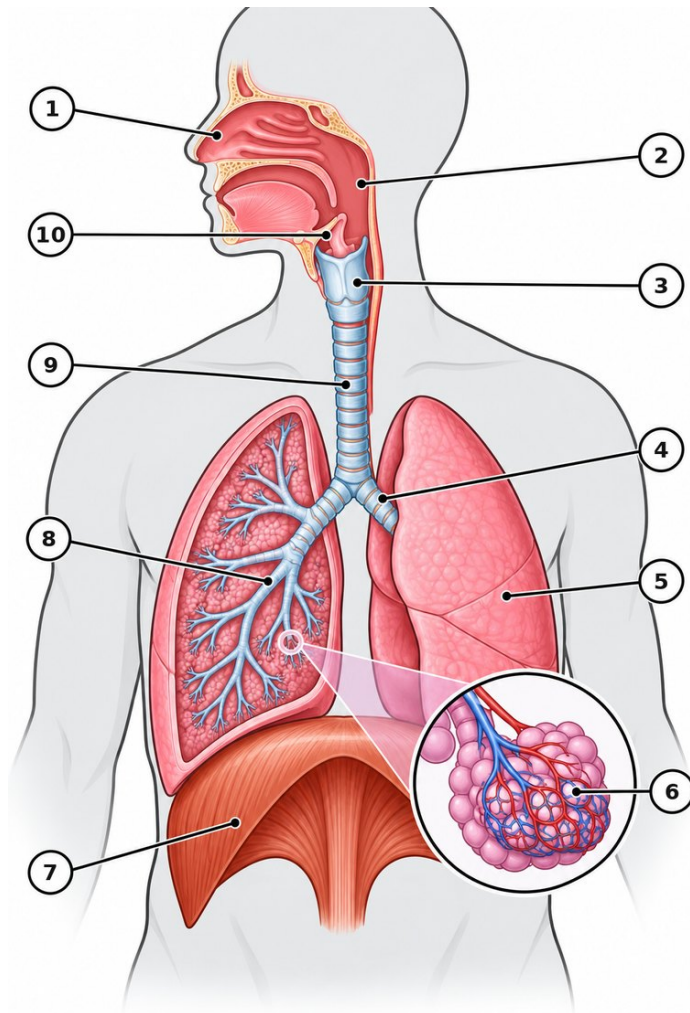
Lung volumes: tidal volume (normal breath), vital capacity (deepest breath in and out), residual volume (air that always stays in the lungs). **Minute ventilation** = tidal volume × breathing rate.

A Label the respiratory system

5 marks

½ mark each.

Word bank: Alveoli · Bronchiole · Bronchus · Diaphragm · Epiglottis · Larynx · Lung · Nasal cavity · Pharynx · Trachea



1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____

B Respiratory disorders

2 marks

Write the letter of the matching description (½ mark each).

- | | |
|-----------------------|--|
| 11. _____ Asthma | a. Alveoli fill with fluid because of a bacterial or viral infection |
| 12. _____ Emphysema | b. Uncontrolled cell growth in lung tissue, strongly linked to smoking |
| 13. _____ Pneumonia | c. Airways become inflamed and narrow, causing wheezing |
| 14. _____ Lung cancer | d. Alveolus walls break down, so the lungs have less surface area |

C Inhaling vs exhaling

4 marks

Fill in the blank cells (1 mark per row).

	Feature	Inhaling	Exhaling
15.	Diaphragm		Relaxes and domes up
16.	Rib cage (intercostal muscles)	Moves up and out	
17.	Volume of the chest cavity		
18.	Air pressure in the lungs		

D Inhaled vs exhaled air

4 marks

Gas	Inhaled air	Exhaled air
Oxygen	21%	16%
Carbon dioxide	0.04%	4%
Nitrogen	78%	78%

20. Why is the percentage of nitrogen the same?

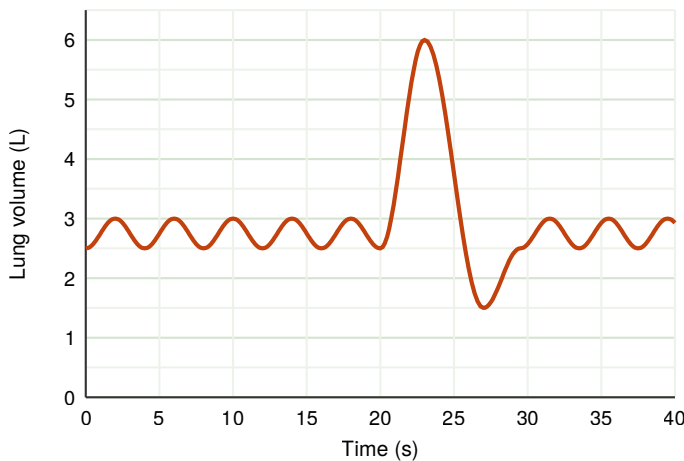
19. Explain why exhaled air has less oxygen and more carbon dioxide than inhaled air. (2 marks)

21. What percentage of the oxygen in each breath is absorbed?

E Reading a spirometer graph

5 marks

The graph shows a student breathing normally, then taking the deepest breath in and out that they can.



22. What is the tidal volume (a normal breath)?

23. What is the vital capacity (deepest breath in to deepest breath out)?

24. Use the first 20 seconds to find the breathing rate in breaths per minute.

25. Minute ventilation = tidal volume $\times$ breathing rate. Calculate it in L/min.

26. The volume never drops below 1.5 L. What is this volume called, and why is it useful?

F Gas exchange

4 marks

27. Describe the path of an oxygen molecule from the air inside an alveolus to a red blood cell. (2 marks)

28. Your lungs contain about 480 million alveoli. Explain why having so many tiny alveoli, instead of one large air sac, makes gas exchange efficient. (2 marks)

G Spot the mistake

2 marks

29. A student writes: "We breathe in oxygen and breathe out carbon dioxide." Explain the error and correct it.

30. A student writes: "The lungs have muscles that pull air in." Explain the error and correct it.

The Respiratory System

ANSWER KEY

Key ideas

Pathway of air: nasal cavity → pharynx → larynx → trachea → bronchi → bronchioles → alveoli. The epiglottis covers the larynx when you swallow.

Breathing works by changing pressure: when the chest volume increases, pressure in the lungs drops and air flows in. **Gas exchange** happens by diffusion across the thin walls of the alveoli and capillaries.

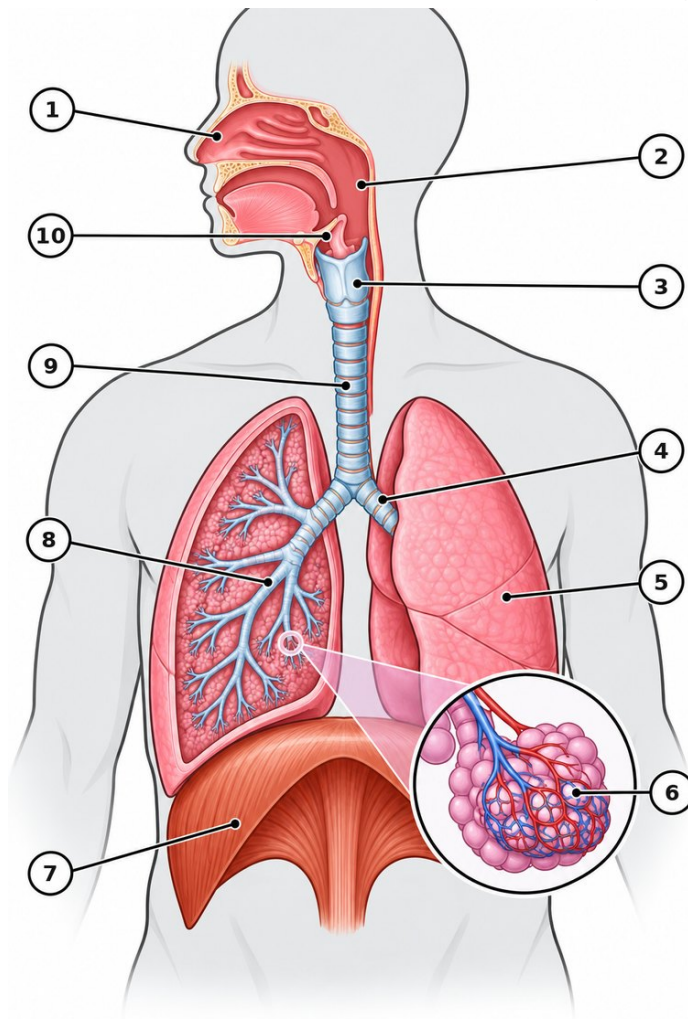
Lung volumes: tidal volume (normal breath), vital capacity (deepest breath in and out), residual volume (air that always stays in the lungs). **Minute ventilation** = tidal volume × breathing rate.

A Label the respiratory system

5 marks

½ mark each.

Word bank: Alveoli · Bronchiole · Bronchus · Diaphragm · Epiglottis · Larynx · Lung · Nasal cavity · Pharynx · Trachea

1. **Nasal cavity**2. **Pharynx**3. **Larynx**4. **Bronchus**5. **Lung**6. **Alveoli**7. **Diaphragm**8. **Bronchiole**9. **Trachea**10. **Epiglottis**

B Respiratory disorders

2 marks

Write the letter of the matching description (½ mark each).

- | | |
|--------------------------|--|
| 11. <u>c</u> Asthma | a. Alveoli fill with fluid because of a bacterial or viral infection |
| 12. <u>d</u> Emphysema | b. Uncontrolled cell growth in lung tissue, strongly linked to smoking |
| 13. <u>a</u> Pneumonia | c. Airways become inflamed and narrow, causing wheezing |
| 14. <u>b</u> Lung cancer | d. Alveolus walls break down, so the lungs have less surface area |

C Inhaling vs exhaling

4 marks

Fill in the blank cells (1 mark per row).

	Feature	Inhaling	Exhaling
15.	Diaphragm	Contracts and flattens (moves down)	Relaxes and domes up
16.	Rib cage (intercostal muscles)	Moves up and out	Moves down and in
17.	Volume of the chest cavity	Increases	Decreases
18.	Air pressure in the lungs	Drops below outside air pressure	Rises above outside air pressure

D Inhaled vs exhaled air

4 marks

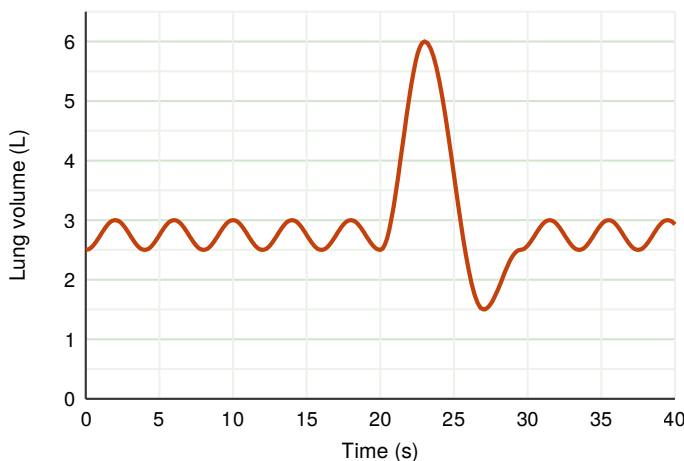
Gas	Inhaled air	Exhaled air
Oxygen	21%	16%
Carbon dioxide	0.04%	4%
Nitrogen	78%	78%

20. Why is the percentage of nitrogen the same?
The body doesn't use nitrogen gas, so it is breathed in and out unchanged.

E Reading a spirometer graph

5 marks

The graph shows a student breathing normally, then taking the deepest breath in and out that they can.



25. Minute ventilation = tidal volume $\times$ breathing rate.
Calculate it in L/min.
 $0.5 \times 15 = 7.5$ L/min

F Gas exchange

4 marks

27. Describe the path of an oxygen molecule from the air inside an alveolus to a red blood cell. (2 marks)
It dissolves in the moist lining, then diffuses across the thin alveolus wall and the thin capillary wall into the blood, where it binds to haemoglobin in a red blood cell.

G Spot the mistake

2 marks

29. A student writes: "We breathe in oxygen and breathe out carbon dioxide." Explain the error and correct it.
Both inhaled and exhaled air are mostly nitrogen, and exhaled air still contains about 16% oxygen. We breathe out more CO_2 , not only CO_2 .

19. Explain why exhaled air has less oxygen and more carbon dioxide than inhaled air. (2 marks)

Oxygen diffuses into the blood in the alveoli and is used by cells in cellular respiration, which produces carbon dioxide. CO_2 diffuses from the blood into the alveoli and is breathed out.

21. What percentage of the oxygen in each breath is absorbed?
 $(21 - 16) \div 21 \times 100 = 24\%$

22. What is the tidal volume (a normal breath)?
 $3.0 - 2.5 = 0.5$ L

23. What is the vital capacity (deepest breath in to deepest breath out)?
 $6.0 - 1.5 = 4.5$ L

24. Use the first 20 seconds to find the breathing rate in breaths per minute.
5 breaths in 20 s $\times 3 = 15$ breaths/min

26. The volume never drops below 1.5 L. What is this volume called, and why is it useful?
Residual volume. Air always stays in the lungs, which keeps the alveoli from collapsing and lets gas exchange continue between breaths.

28. Your lungs contain about 480 million alveoli. Explain why having so many tiny alveoli, instead of one large air sac, makes gas exchange efficient. (2 marks)
Many tiny alveoli give a huge surface area (about the size of half a tennis court), so much more oxygen and carbon dioxide can diffuse at the same time.

30. A student writes: "The lungs have muscles that pull air in." Explain the error and correct it.
The lungs have no skeletal muscle. The diaphragm and intercostal muscles change the chest volume, which changes the pressure, and air flows in.