



INDIAN SCHOOL AL WADI AL KABIR



Class: XI	DEPARTMENT OF SCIENCE 2026– 2027 SUBJECT: BIOLOGY	Date: 19/07/2026
Worksheet: 04	UNIT- V- Human Physiology CHAPTER:14- Breathing and Exchange of Gases	Note: A4 FILE FORMAT
CLASS & SEC:	NAME OF THE STUDENT:	ROLL NO.

I. MULTIPLE CHOICE QUESTIONS (1M)

1. What is the primary site for the exchange of gases in the lungs?
A. Larynx
B. Trachea
C. Bronchi
D. Alveoli
2. The solubility of CO₂ in the blood is how many times higher than that of O₂?
A. 2–5 times
B. 10–15 times
C. 20–25 times
D. 50 times
3. A healthy man can inspire or expire approximately how much air per minute?
A. 2000–3000 mL
B. 6000–8000 mL
C. 1000–1200 mL
D. 500–600 mL
4. Which of the following layers is NOT a part of the diffusion membrane between alveoli and capillaries?
A. Thin squamous epithelium of alveoli
B. Endothelium of alveolar capillaries
C. Basement substance composed of thin basement membranes
D. Ciliated columnar epithelium of bronchioles
5. Which respiratory disorder is characterized by damage to alveolar walls and is often caused by cigarette smoking?
A. Asthma
B. Bronchitis
C. Emphysema
D. Occupational Respiratory Disorder

Two statements are given - one labelled as **Assertion (A)** and the other labelled as **Reason (R)**.

Select the correct answer to these questions from the codes (A), (B), (C), and (D) as given below.

- A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
 - B. Both Assertion (A) and Reason (R) are true, but Reason (R) is not the correct explanation of the Assertion (A).
 - C. Assertion (A) is true, Reason (R) is false.
 - D. Assertion (A) is false, Reason (R) is true.
6. **Assertion (A):** The pneumotaxic centre can moderate the functions of the respiratory rhythm centre.
Reason (R): Neural signals from this centre can reduce the duration of inspiration and thereby altering the respiratory rate.
7. **Assertion (A):** Vital Capacity is the maximum volume of air a person can breathe in after a forced expiration.
Reason (R): It includes Tidal Volume, Inspiratory Reserve Volume, and Residual Volume.
8. **Assertion (A):** In the alveoli, CO₂ dissociates from carbamino-hemoglobin.
Reason (R): Alveoli have high pCO₂ and low pO₂.
9. **Assertion (A):** Exchange of gases in the alveoli occurs through active transport.
Reason (R): Alveoli have a very large surface area and thin walls to facilitate gas movement.

II. VERY SHORT ANSWER TYPE QUESTIONS(2M)

- 10. What happens to the respiratory process in a man going up a hill?
- 11. Distinguish between IRV and ERV.
- 12. Mention the factors that interfere with the binding of Oxygen with Hemoglobin.
- 13. How is Carbon dioxide transported in the blood? Give the percentage of each method.
- 14. Define oxygen dissociation curve. Can you suggest any reason for its sigmoidal pattern?
- 15. What is the site of gaseous exchange in an insect?

III. SHORT ANSWER TYPE QUESTIONS (3M)

- 16. How does the body regulate respiratory rhythm? Mention the centers involved.
- 17. Why does the diffusion of gases occur only in the alveolar region?

IV. CASE STUDY BASED QUESTIONS (4M)

- 18. A 58-year-old chronic cigarette smoker visits a hospital complaining of persistent breathlessness, a chronic cough, and difficulty exhaling. Clinical examination reveals that his alveolar walls are significantly damaged, thereby decreasing the surface area available for gas exchange. The doctor diagnoses him with a chronic respiratory disorder and explains that the damage is irreversible, but lifestyle changes and bronchodilators can manage the symptoms.

A. Identify the chronic respiratory disorder described in the case study and state its primary cause.

OR

- B. How does the structural damage to the alveolar walls directly affect the process of respiration?
- C. Distinguish emphysema from occupational respiratory disorders.
- D. How does asthma differ from emphysema in terms of its anatomical target and reversibility?

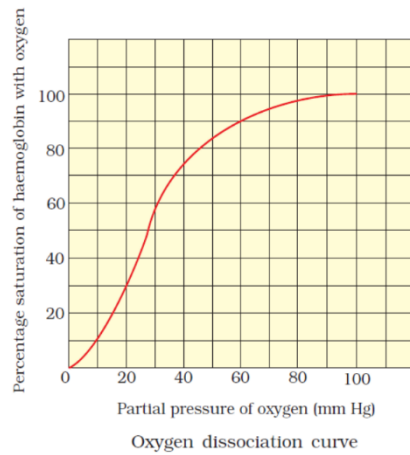
V. LONG ANSWER TYPE QUESTIONS (5M)

19. With the help of a neat labelled diagram, explain the structure of the human respiratory system.
20. A. Describe the process of breathing in humans.
B. How do the internal intercostal muscles and abdominal muscles contribute to the process of breathing during forceful expiration?

Answer Key

Q. No.	Answer
I.	MULTIPLE CHOICE QUESTIONS (1M)
1	D. Alveoli
2	C. 20–25 times
3	B. 6000–8000 mL
4	D. Ciliated columnar epithelium of bronchioles
5	C. Emphysema
	ASSERTION & REASONING
6	A. Both Assertion (A) and Reason (R) are true, and Reason (R) is the correct explanation of the Assertion (A).
7	C. Assertion (A) is true, Reason (R) is false.
8	C. Assertion (A) is true, Reason (R) is false.
9.	D. Assertion (A) is false, Reason (R) is true.
II	VERY SHORT ANSWER TYPE QUESTIONS(2M)
10	As we go up higher, the altitude increases. At this altitude, the concentration of atmospheric oxygen is lesser, which means to say that the partial pressure of oxygen declines. This situation of inadequate oxygen-supply, demands more of oxygen. In order to increase the supply of oxygen to the blood, the man begins to breathe rapidly. Therefore, it causes an increase in the heart rate to be able to meet the demand of oxygen supply.
11	Inspiratory Reserve Volume (IRV): The additional volume of air a person can inspire by a forcible inspiration (2500) to (3000\) mL. Expiratory Reserve Volume (ERV): The additional volume of air a person can expire by a forcible expiration (1000) to (1100) mL.
12	Partial pressure of pCO₂: High levels of CO ₂ interfere with oxygen binding. Hydrogen ion concentration H⁺/pH: Higher acidity (lower pH) decreases the affinity of hemoglobin for oxygen. Temperature: Higher temperatures interfere with the binding and promote the dissociation of oxygen. Partial pressure of O₂: Low pO ₂ levels (as found in tissues) lead to the release of oxygen from hemoglobin.
13	CO ₂ is transported in three ways: 1. As Bicarbonate ions: About 70% (facilitated by the enzyme carbonic anhydrase). 2. In a bound state with Hemoglobin: About 20-25% (as carbamino-hemoglobin). 3. In dissolved state through Plasma: About 7%.
14	A graph is attained when the percentage saturation of haemoglobin with oxygen is plotted against the partial pressure of oxygen. The affinity of the second molecule of oxygen escalates when the first molecule of oxygen

binds to haemoglobin. This is why the Oxyhaemoglobin formation is rapid and is represented by the steep slope of the S-curve as observed. When the formation of Oxyhaemoglobin comes to a halt, or when haemoglobin molecules are not available for binding, the curve attains a plateau phase.



15 The respiratory organs of insects is trachea. Trachea has openings known as spiracles through which air enters. Spiracles are located on either side of the abdomen of the insect. A pair of spiracles are found on each segment of the abdomen. Furthermore, the trachea branches into smaller tubes until they reach the level of tissues. The oxygen that enters the trachea is exchanged by diffusion with the tissues. Simultaneously, carbon dioxide that reaches the trachea from the tissues is forced out of the body.

III SHORT ANSWER TYPE QUESTIONS (3M)

16 The human body has a significant ability to maintain and modulate the respiratory rhythm to meet the demands of the body's tissues. This is done via the nervous system:

- **Respiratory Rhythm Center:** Located in the medulla oblongata, it is primarily responsible for the basic rhythm of breathing.
- **Pneumotaxic Center:** Located in the pons, it acts as a "switch-off" point for inspiration. By sending neural signals, it limits the duration of inspiration, thereby increasing the breathing rate.
- **Chemosensitive Area:** Situated adjacent to the rhythm center, it is highly sensitive to **(CO₂) and hydrogen ions**. An increase in these substances activates this center, which then signals the rhythm center to make necessary adjustments (like faster breathing) to eliminate these substances.

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1. **Thin membrane:** The alveolar walls are extremely thin, allowing easy gas movement.

	2. Close blood supply: The alveoli are surrounded by capillaries for efficient oxygen and carbon dioxide exchange. 3. Pressure difference: The alveolar air has higher oxygen and lower carbon dioxide levels compared to blood, promoting diffusion. Other parts of the respiratory system, like the bronchi and trachea, are not designed for gas exchange.
IV	CASE STUDY BASED QUESTIONS (4M)
18	A. The disorder is emphysema, a chronic and progressive respiratory condition. Its primary cause is long-term cigarette smoking or exposure to toxic pollutants. These irritants damage and break down the delicate walls of the alveoli. OR B. The breakdown of alveolar walls reduces the total surface area available for gaseous exchange. The lungs lose their natural elastic recoil, causing air to become trapped in the alveoli during exhalation. This significantly lowers the efficiency of oxygen absorption and carbon dioxide removal. C. Emphysema is caused by chemical irritants like smoke that destroy alveolar tissue. Occupational disorders are caused by inhaling industrial stone or mineral dust. Occupational dust leads to severe tissue inflammation, fibrosis, and serious lung damage. D. Emphysema specifically targets and destroys the alveolar sacs. Asthma symptoms are usually reversible with treatment, whereas emphysema tissue damage is permanent.
V	LONG ANSWER TYPE QUESTIONS (5M)
19	Nose/Nasal Cavity: Filters, moistens, and warms air. Pharynx: Passage for air from the nasal cavity to the larynx. Larynx: Contains vocal cords; involved in sound production. Trachea: A tube that carries air to the bronchi; lined with cilia. Bronchi: Two tubes branching from the trachea leading to the lungs. Bronchioles: Smaller airways within the lungs. Alveoli: Tiny air sacs where gas exchange (O_2 and CO_2) occurs. Lungs: Main organs for respiration; responsible for gas exchange. Diaphragm: A muscle that aids in breathing by expanding and contracting the lungs. FIG 14.1 FROM NCERT
20	A. INSPIRATION: It is initiated by the contraction of the diaphragm muscles and external intercostal muscles. The muscles pull the ribs and sternum upwards and outwards, and increase the thoracic volume, forcing the lungs to expand the pulmonary volume. The increase in pulmonary volume and decrease in intrapulmonary pressure force the air from outside to enter the air passages into the lungs. EXPIRATION: Relaxation of the diaphragm allows the diaphragm and sternum to return to their original shape, and the internal intercostal muscles contract, pulling the ribs downward and reducing the thoracic volume and pulmonary volume. This results in an increase in the Intrapulmonary pressure is slightly above the atmospheric pressure, causing the expulsion of air from the lungs. B. Forceful expiration is an active process that relies on the contraction of internal intercostal and

	abdominal muscles. Contraction of these muscles pulls the ribs downward and compresses the abdomen, rapidly decreasing thoracic volume and forcing air out.
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