Class: 10th

Subject: Biology

Chapter 10: Gaseous Exchange

Important MCQs:

1. Which structure is mainly responsible for gaseous exchange in leaves?

(a) Xylem

(b) Phloem

(c) Stomata ✅

(d) Lenticels

2. What happens during the night in leaf cells regarding gaseous exchange?

(a) They release oxygen and absorb carbon dioxide

(b) Photosynthesis and respiration occur together

(c) They take in oxygen and release carbon dioxide ✅

(d) Only photosynthesis occurs

3. What are lenticels in woody stems used for?

(a) Absorption of water

(b) Photosynthesis

(c) Gaseous exchange ✅

(d) Transpiration

4. Aquatic plants obtain oxygen from:

(a) The atmosphere

(b) Photosynthesis only

(c) Water in solid form

(d) Oxygen dissolved in water ✅

5. During daytime, the oxygen produced in photosynthesis is:

(a) Released into the environment immediately

(b) Stored in stem tissues

(c) Used in cellular respiration ✅

(d) Used to form glucose

6. Which of the following structures is known as the "voice box"?

(a) Pharynx

(b) Larynx ✅

(c) Trachea

(d) Bronchus

7. What is the function of the mucous in the nasal cavity?

(a) Produces sound

(b) Traps dust and moistens air ✅

(c) Controls breathing

(d) Blocks air entry

8. What prevents the trachea from collapsing in the absence of air?

(a) Smooth muscles

(b) Mucous lining

(c) C-shaped cartilaginous rings ✅

(d) Vocal cords

9. The bronchioles end in tiny air sacs called:

(a) Bronchi

(b) Alveolar ducts

(c) Alveoli ✅

(d) Capillaries

10. Which part of the respiratory system is common to both food and air?

(a) Larynx

(b) Trachea

(c) Pharynx ✅

(d) Nasal cavity

11. The lungs are enclosed by which protective membranes?

(a) Meninges

(b) Pleural membranes ✅

(c) Pericardium

(d) Diaphragm

12. What is the function of the alveoli?

(a) Vocal sound production

(b) Filtering dust

(c) Exchange of gases ✅

(d) Moistening the air

13. Which blood vessel carries oxygenated blood from the lungs to the heart?

(a) Pulmonary artery

(b) Pulmonary vein ✅

(c) Aorta

(d) Vena cava

14. How many lobes does the right lung have?

(a) One

(b) Two

(c) Three ✅

(d) Four

15. What is the function of the diaphragm in breathing?

(a) Produces sound

(b) Filters blood

(c) Helps in expansion and contraction of lungs ✅

(d) Warms the incoming air

16. Which disease is caused by inflammation of bronchi or bronchioles?

(a) Pneumonia

(b) Asthma

(c) Bronchitis ✅

(d) Emphysema

17. What is the main cause of chronic bronchitis?

(a) Virus

(b) Bacteria

(c) Prolonged exposure to irritants ✅

(d) Lack of exercise

18. Emphysema affects which part of the respiratory system?

(a) Vocal cords

(b) Alveoli ✅

(c) Bronchioles

(d) Pharynx

19. In emphysema, why does air get trapped in the lungs?

(a) Mucous production

(b) Muscle spasms

(c) Lungs lose elasticity ✅

(d) Bronchi are blocked

20. Which symptom is common in both emphysema and lung cancer?

(a) Vomiting

(b) Shortness of breath ✅

(c) Skin rash

(d) Tooth pain

21. What causes pneumonia in most cases?

(a) Virus

(b) Fungus

(c) Bacteria ✅

(d) Allergens

22. Which bacterium commonly causes pneumonia?

(a) Mycobacterium tuberculosis

(b) Streptococcus pneumoniae ✅

(c) Bacillus anthracis

(d) Salmonella typhi

23. What fluid fills the alveoli in pneumonia patients?

(a) Blood

(b) Water

(c) Mucous and pus ✅

(d) Air only

24. Asthma is a form of:

(a) Bacterial infection

(b) Viral disease

(c) Allergy ✅

(d) Genetic mutation

25. Which of the following is NOT a common asthma trigger?

(a) Dust

(b) Smoke

(c) Water ✅

(d) Perfumes

26. Inhalers used in asthma contain:

(a) Antibiotics

(b) Painkillers

(c) Bronchodilators ✅

(d) Antivirals

27. What is the primary cause of lung cancer?

(a) Dust

(b) Smoking ✅

(c) Exercise

(d) Fungal infection

28. Passive smoking refers to:

(a) Quitting smoking

(b) Using smokeless tobacco

(c) Inhaling someone else's smoke ✅

(d) Smoking less frequently

29. How many known carcinogens are in cigarette smoke?

(a) 10

(b) 20

(c) 50 ✅

(d) 100

30. Which of the following is a circulatory effect of smoking?

(a) Lung bleeding

(b) Tooth decay

(c) Increased blood platelet production ✅

(d) Muscle weakness

Exercise Short Questions:

Q1: Differentiate between Breathing and Cellular

Respiration.

Answer:

- **Breathing** is a physical process that involves the inhalation of oxygen and exhalation of carbon dioxide through the respiratory organs such as the nose, trachea, and lungs. It is a voluntary or involuntary mechanical action that allows air to enter and leave the body.
- **Cellular respiration** is a biochemical process that occurs inside the cells, where oxygen is used to break down glucose to produce energy (ATP). It takes place in the mitochondria of cells and is essential for all life functions.

- Breathing = Air exchange
- Cellular respiration = Energy production

Q2: Trace the Path of Air from the Nasal Cavity to the Alveoli.

Answer:

When air enters the body during inhalation, it follows this path:

1. Nasal Cavity – filters, moistens, and warms the air.

2. **Pharynx** – connects the nasal cavity to the larynx.

3. **Larynx** – also called the voice box; allows air to pass into the trachea.

4. **Trachea** – the windpipe that carries air toward the lungs.

5. **Bronchi** – two main branches of the trachea, each entering a lung.

6. **Bronchioles** – smaller divisions of bronchi within the lungs.

7. **Alveolar Ducts** – tiny tubes leading to alveoli.

8. **Alveoli** – microscopic air sacs where gaseous exchange (oxygen in, carbon dioxide out) takes place.

✅ Nasal cavity ⇒ Pharynx ⇒ Larynx ⇒ Trachea ⇒ Bronchi ⇒ Bronchioles ⇒ Alveoli

Q3: How will you differentiate between a Stoma and a Lenticel?

Answer:

- **A stoma** is a small pore found on the surface of leaves and young stems. It is controlled by guard cells and can open and close to allow the exchange of gases and water vapor.
- **A lenticel** is a small opening found on the bark of woody stems and mature roots. It is always open and helps in gaseous exchange between the internal tissues and the environment.

✅ Stoma ⇒ Found in leaves, has guard cells, opens and closes

✅ Lenticel ⇒ Found in bark, always open, no guard cells

Important Short Questions:

1. Why do plants not require a respiratory system like animals?

Answer:

Plants do not require a respiratory system because

each cell of the plant exchanges gases directly with the environment without the need for specialized organs.

2. How do stomata help in gaseous exchange in plants?

Answer:

Stomata are small pores on the epidermis of leaves and young stems that allow oxygen and carbon dioxide to enter and exit the plant during photosynthesis and respiration.

3. What is the role of lenticels in woody stems and roots?

Answer:

Lenticels are small pores found in the bark of woody stems and mature roots. They allow air to pass through the bark for gaseous exchange with internal tissues.

4. What happens to gaseous exchange in leaf cells at night?

Answer:

At night, photosynthesis stops. Leaf cells take in oxygen from the environment and release carbon dioxide through stomata during cellular respiration.

5. How do aquatic plants perform gaseous exchange in water?

Answer:

Aquatic plants absorb dissolved oxygen from the water and release carbon dioxide into the water through their surface cells.

6. What are the two main parts of the human respiratory system?

Answer:

- **The two main parts are:**

1. Air passageway

2. Lungs

7. What is the function of the mucous and fine hairs in the nasal cavity?

Answer:

They filter dust particles, moisten, and warm the

incoming air to match body temperature.

8. Why is the pharynx called a common passage?

Answer:

Because it is a common passage for both air and food.

9. What is the function of the larynx and what is it commonly called?

Answer:

The larynx produces sound through vocal cords and is commonly called the voice box.

10. What prevents the trachea from collapsing?

Answer:

The C-shaped cartilaginous rings in the trachea prevent it from collapsing.

11. What is the function of alveoli in the lungs?

Answer:

Alveoli are the site of gaseous exchange between the air and the blood.

12. What is the role of the diaphragm in breathing?

Answer:

During inhalation, the diaphragm contracts and lowers to increase chest cavity volume. During exhalation, it relaxes and rises, decreasing the chest cavity.

13. How many lobes are there in each lung?

Answer:

The left lung has 2 lobes.

The right lung has 3 lobes.

14. How is the breathing rate controlled in humans?

Answer:

The respiratory centre in the brain controls the breathing rate by detecting the carbon dioxide concentration in the blood.

15. What happens to the breathing rate during exercise and why?

Answer:

During exercise, the breathing rate increases to 30–40 times per minute because more carbon

dioxide is produced, which stimulates the brain to speed up breathing.

16. Why are respiratory disorders common in Pakistan?

Answer:

Due to high concentration of air pollutants in both urban and rural areas.

17. What is bronchitis?

Answer:

Bronchitis is the inflammation of bronchi or bronchioles, leading to swelling and narrowing of airways.

18. Name the two types of bronchitis.

Answer:

1. Acute bronchitis

2. Chronic bronchitis

19. Mention two symptoms of bronchitis.

Answer:

1. Cough with wheezing

2. Shortness of breath

20. What is emphysema?

Answer:

Emphysema is the destruction of alveolar walls, causing reduced surface area for gaseous exchange.

21. Write any two symptoms of emphysema.

Answer:

1. Shortness of breath

2. Fatigue and weight loss

22. What is pneumonia?

Answer:

Pneumonia is an infection of lungs in which alveoli are filled with fluid and pus, causing breathing difficulty.

23. Name the bacterium that causes pneumonia.

Answer:

Streptococcus pneumoniae

24. What is double pneumonia?

Answer:

When both lungs are infected by pneumonia, it is called double pneumonia.

25. What is asthma?

Answer:

Asthma is a chronic allergic disorder in which bronchi and bronchioles become inflamed and narrowed.

26. List two symptoms of asthma.

Answer:

1. Wheezing (whistling sound)

2. Chest tightness and shortness of breath

27. What is lung cancer?

Answer:

Lung cancer is uncontrolled cell division in lung tissues, forming tumours and affecting breathing.

28. What is the main cause of lung cancer?

Answer:

The main cause is smoking, which contains more than 50 carcinogens.

29. What is passive smoking?

Answer:

Passive smoking is the inhalation of smoke from someone else's cigarette, and it also increases cancer risk.

30. Name any two harmful effects of smoking on health.

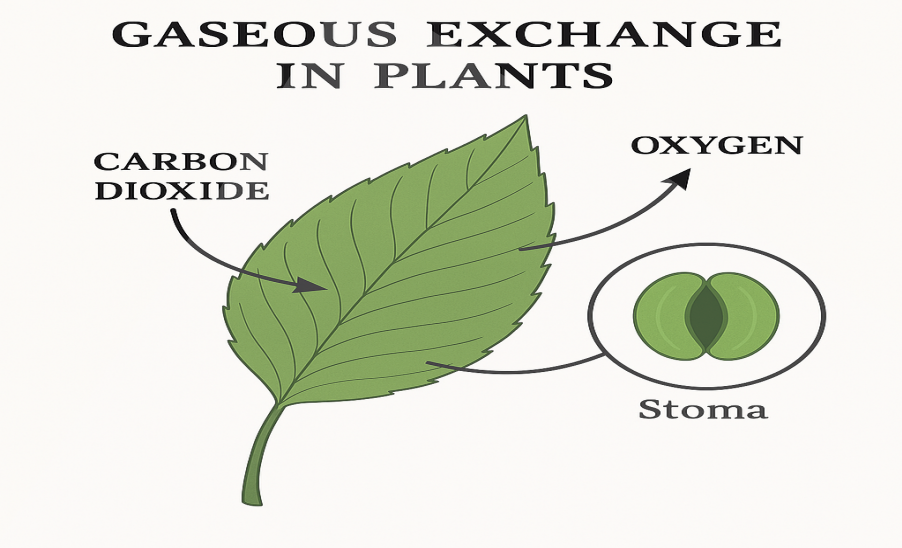
Answer:

1. Reduces oxygen-carrying capacity of haemoglobin

2. Increases risk of lung cancer, heart disease, and respiratory infections

Important Long Questions:

Q1: Describe the process of gaseous exchange in plants.



Answer:

Plants do not have a specialized respiratory system like animals. Every plant cell exchanges gases directly with the environment. The process of gaseous exchange in plants takes place through the following ways:

1. Role of Stomata:

- Stomata are tiny pores present in the epidermis of leaves and young stems.
- These pores allow the exchange of oxygen and carbon dioxide.
- During daytime, both photosynthesis and respiration occur simultaneously.

- Oxygen produced in photosynthesis is used in respiration.
- Carbon dioxide from respiration is used in photosynthesis.

During night, only respiration occurs. So, oxygen is taken in and carbon dioxide is released through stomata.

2. Role of Air Spaces in Mesophyll:

- Mesophyll cells inside the leaf have intercellular air spaces.
- These spaces help in the circulation of gases within the leaf tissues.

3. Role of Lenticels:

- In woody stems and mature roots, the outer bark is impervious to gases.
- Lenticels are small pores in the bark that allow gaseous exchange.
- Air passes through lenticels into inner tissues of the stem and root.

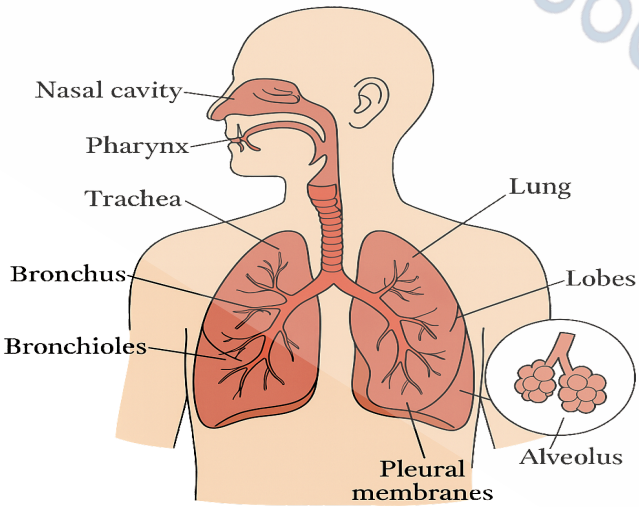
4. Gaseous Exchange in Roots:

- In young roots, gases are exchanged directly through the general surface.
- Gases are found dissolved in the soil water surrounding the roots.

5. Gaseous Exchange in Aquatic Plants:

- Aquatic plants absorb oxygen dissolved in water.
- They release carbon dioxide into the water through their surface cells.

🫁 **Q2: Describe the structure of the human respiratory system and explain the function of each part.**



🟢 Introduction:

The human respiratory system is a specialized organ system responsible for the exchange of gases (oxygen and carbon dioxide) between the body and the environment. It consists of the air passageway and the lungs. This system ensures that oxygen enters the bloodstream and carbon dioxide is removed from it.

🟢 1. Air Passageway:

Nose and Nasal Cavity:

- The nose opens to the outside through nostrils and leads to the nasal cavity.
- The nasal cavity is lined with fine hairs and mucous.

Functions:

- Filters dust and microbes from the air.
- Moistens and warms incoming air.
- Maintains air temperature close to body temperature.

Pharynx:

- A muscular passageway common to both food and air.
- Air from the nasal cavity enters the pharynx and then moves into the larynx.

Larynx (Voice Box):

- Located between the pharynx and trachea.
- Contains vocal cords that produce sound when air passes through.
- Made of cartilage for support.

Trachea (Windpipe):

- A 12 cm long tube in front of the esophagus.
- Has C-shaped cartilage rings that keep it open.
- Conducts air from the larynx to the bronchi.

Bronchi and Bronchioles:

- The trachea divides into right and left bronchi, each entering a lung.
- Bronchi branch into smaller bronchioles.

Function: Transport air deeper into the lungs.

Alveolar Ducts and Alveoli:

- Bronchioles end in alveolar ducts, which open into alveoli.
- Alveoli are thin-walled sacs surrounded by blood capillaries.
- Function: Site of actual gaseous exchange.

🟢 2. The Lungs:

Structure:

- Pair of spongy and elastic organs located in the thoracic cavity.
- The right lung has three lobes, and the left lung has two lobes (due to the position of the heart).

Pleural Membranes:

- **Each lung is enclosed by:**
  - Outer pleural membrane
  - Inner pleural membrane
- **A fluid is present between them which:**

- Reduces friction
- Helps in easy expansion and contraction of lungs during breathing

🫁 **Q3: Explain the mechanism of breathing in humans.**

🟢 **Introduction:**

Breathing is the physical movement of air in and out of the lungs. It involves two main phases:

Inhalation (Inspiration)

Exhalation (Expiration)

This process is controlled by muscles and the respiratory centre in the brain.

🟢 **1. Inhalation (Inspiration):**

Muscle Contraction:

- The intercostal muscles (rib muscles) contract, lifting the rib cage upwards and outwards.
- The diaphragm contracts, flattening and moving downward.

Thoracic Volume Increases:

These muscle actions increase the volume of the chest cavity (thoracic cavity).

Pressure Decreases:

Due to the increase in volume, the pressure inside the lungs becomes lower than atmospheric pressure.

Air Enters the Lungs:

Air moves from the high-pressure atmosphere into the low-pressure lungs.

🟢 2. Exhalation (Expiration):

Muscle Relaxation:

- The intercostal muscles relax, and the rib cage moves downward.
- The diaphragm relaxes, becoming dome-shaped again.

Thoracic Volume Decreases:

The volume of the chest cavity reduces.

Pressure Increases:

The pressure in the lungs becomes higher than

outside.

Air is Expelled:

Air is pushed out of the lungs to equalize the pressure.

🟢 3. Role of Respiratory Centre:

- The respiratory centre is located in the brain (medulla).
- It detects the CO_2 concentration in the blood.
- When CO_2 level increases, the brain sends signals to the diaphragm and intercostal muscles to increase the breathing rate.

🟢 4. Breathing Rate During Exercise:

- During exercise or hard work:
- Muscles need more oxygen.
- More CO_2 is produced in cells.

The respiratory centre increases the breathing rate (up to 30–40 breaths per minute) to remove extra CO_2 and supply more O_2.

🌟 **Q4: Describe the causes, symptoms, and**

treatment of asthma. How does it affect the airways?

➤ **Definition**:

Asthma is a chronic respiratory disorder and a form of allergy in which the bronchi and bronchioles become inflamed and sensitive to certain allergens. This leads to narrowing of the airways and difficulty in breathing.

➤ **Causes of Asthma:**

Asthma is caused by hypersensitivity of airways to specific allergens (allergy-causing substances) such as:

- Dust
- Tobacco smoke
- Perfumes
- Pollens
- Air pollution

Upon exposure to these allergens, the bronchi and bronchioles react excessively, producing more

mucus and narrowing the airways.

➤ **How Asthma Affects the Airways:**

- The lining of bronchi swells (inflammation).
- Muscles around the bronchi tighten (bronchoconstriction).
- Excess mucus is produced in the tubes.
- This leads to narrowing of the airways, reducing airflow and making breathing difficult.

➤ **Symptoms of Asthma:**

- Shortness of breath, especially during exertion or at night
- Wheezing (whistling sound when breathing out)
- Coughing, especially at night or early morning
- Chest tightness or pain

Note: Symptoms vary from person to person and may be mild, moderate, or severe.

➤ **Treatment of Asthma:**

Bronchodilators are used to relax the muscles of the airways.

These medicines are usually taken using inhalers.

Avoidance of known allergens is also important to prevent asthma attacks.

Severe cases may require long-term medication and monitoring.

🌟 **Q5: What is lung cancer? Explain its causes, symptoms, and prevention.**

➤ **Definition:**

Lung cancer is a malignant disease in which uncontrolled cell division occurs in the tissues of the lungs. These abnormal cells may form a tumor and invade nearby tissues or spread to other parts of the body.

➤ **Tumor Formation and Spread:**

- Cancer cells multiply rapidly without control.
- They form masses or tumors in the lungs.
- These tumors can spread to nearby organs, damaging tissues beyond the lungs (metastasis).

➤ **Causes of Lung Cancer:**

1. Carcinogens (cancer-causing substances), especially in cigarette smoke

2. Ionizing radiation

3. Viral infections

4. Passive smoking (inhaling someone else's cigarette smoke)

👉 Cigarette smoke contains more than 50 carcinogens.

➤ **Symptoms of Lung Cancer:**

Persistent cough

Coughing up blood

Shortness of breath

Chest pain

Weight loss

Fatigue

Most symptoms appear in later stages, making early detection difficult.

➤ **Lung Cancer Statistics:**

- It is the most common cause of cancer-related deaths worldwide.
- Over 1.3 million deaths occur annually due to lung cancer.

➤ **Prevention:**

- Quit smoking – the main preventive measure
- Avoid exposure to passive smoking
- Avoid air pollutants and carcinogens

🌟 **Q6: Discuss the bad effects of smoking on the human body.**

➤ **Harmful Chemicals in Cigarette Smoke:**

- Cigarette smoke contains over 4000 chemicals
- 50+ are carcinogens (cancer-causing)
- Many are toxic and poisonous

➤ **Effect on Respiratory System:**

Lung cancer: Most common cause of death in smokers

Emphysema: Destroys alveoli and reduces lung capacity

Chronic bronchitis: Persistent inflammation of bronchi

Asthma and other airway problems are worsened by smoking

➤ **Effect on Circulatory System:**

- Carbon monoxide in smoke reduces oxygen-carrying capacity of hemoglobin
- Smoking increases blood platelet production, making blood thicker
- This can cause arteriosclerosis (hardening of arteries), increasing heart disease risk

➤ **Increased Risk of Diseases:**

- Tuberculosis (2 to 4 times more common in smokers)
- Pneumonia (4 times more common)
- Other cancers: Kidney, oral cavity, larynx, bladder, pancreas, breast

➤ **Dental and Oral Effects:**

- Tooth loss is 2 to 3 times more common in smokers
- Stains on teeth, gum disease, and bad breath

➤ **Passive Smoking:**

- Non-smokers exposed to second-hand smoke:
- 25–30% increased risk of heart disease
- 20–30% increased risk of lung cancer

➤ **WHO Recommendations:**

- Ban tobacco advertising
- Educate public about smoking risks
- Implement public smoking restrictions
- Support programs for smoking cessation

Note:

This chapter is designed to provide a solid foundation of knowledge, with the goal of deepening understanding and encouraging

further exploration of the subject. The content has been carefully selected to support effective learning and inspire students to engage with the topic more deeply.

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Purpose: To contribute to education by offering insightful, valuable content that enhances learning and understanding.

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