

CHAPTER # 10

GASEOUS EXCHANGE

Q1. Differentiate between cellular respiration and aerobic respiration?

Ans: Difference between cellular respiration and aerobic respiration:

Cellular respiration:

Cellular respiration is the process in which the C-H bonds in food are broken by oxidation reduction reactions and the energy is transformed into ATP.

Aerobic respiration:

In aerobic respiration, oxygen is used and there is complete oxidation of the food material. Carbon dioxide and water are also produced in this process.

Aerobic respiration	Cellular respiration
i. Cellular respiration is a series of the metabolic reactions occurs in cells in order to convert nutrients into a small energy molecule called adenosine triphosphate (ATP).	i. Cellular respiration is the set of the metabolic reactions and processes that take place in the cells of organisms to convert biochemical energy from nutrients into adenosine triphosphate (ATP), and then release waste products.
ii. Aerobic respiration requires oxygen in order to generate energy molecule ATP, where as an anaerobic respiration synthesize ATP by using the electron transport chain, with inorganic molecules other than oxygen.	ii. The reactions involved in respiration are catabolic reactions, which break large molecules into smaller ones, releasing energy in the process as they break high-energy bonds. Respiration is one of the key ways a cell gains useful energy to fuel cellular activity.

Q2. Differentiate between breathing and cellular respiration.

Ans: Difference between breathing and cellular respiration:

Cellular respiration	Breathing
i. Organisms get the oxygen, needed for cellular respiration , from their environment and provide it to their cells. The carbon dioxide produced during cellular respiration is taken out of the cells and ultimately from the body. Taking in oxygen and giving out of carbon dioxide is termed as Gaseous exchange .	i. The term breathing is used for the process through which animals take air in their bodies to get oxygen from it and then give out the air for getting rid of carbon dioxide.
ii. Respiration involves the mechanical and the bio-chemical processes	ii. Breathing is only the mechanical or physical process of exchange of gases.
iii. Cellular respiration occurs in the cells in the following steps: glycolysis (no O ₂ needed), "prep step", krebs cycle, chemiosmosis / ETC (electron transport chain).	iii. Breathing is exhaling and inhaling. Breathing is what provides the O ₂ needed for cellular respiration, and helps dispose of the waste product of cellular respiration CO ₂ .

Q3. How do the different parts of the plant body exchange gases with the environment?

Ans: See Q # 1 from Exercise (Understanding the Concept)

Q4. How do the different parts of humans body exchange gases with the environment? OR

Explain respiratory system in humans.

Ans: Gaseous Change in Humans:

In humans and other higher animals the exchange of gases is carried out by the respiratory system. We can divide the respiratory system in two parts i.e.

- i. The air passageway
- ii The lungs

i. The Air Passageway:

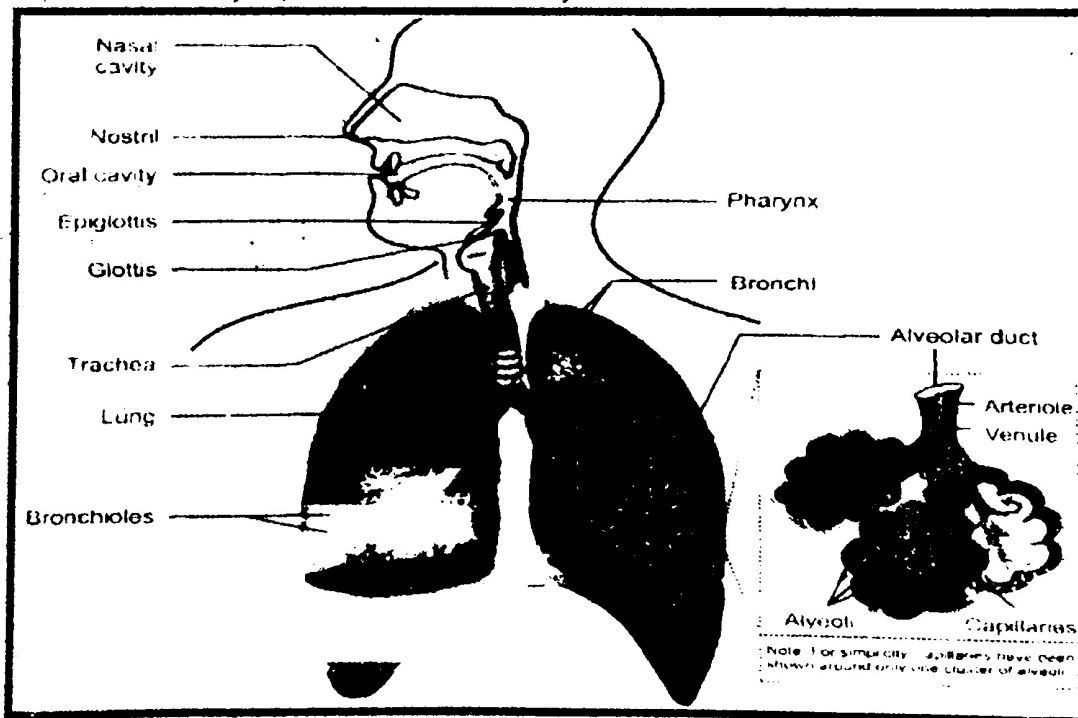
The air passageway consists of the parts through which the outside air comes in the lungs and after the exchange of gases it goes out.

Parts of the air passageway:

This passage of air consists of the following parts.

Nasal cavity:

The nose encloses the **nasal cavity**. It opens to the outside through the openings called the **nostrils**. The nasal cavity is divided into two portions by a wall. Each portion is lined by fine hairs and mucous which filter the dust particles from the air. The mucous also moistens and warms the incoming air and keeps its temperature nearly equal to that of the body.



The air passangeway and the lungs

Pharynx:

The nasal cavity opens into the **pharynx** by means of two small openings called internal nostrils. Pharynx is a muscular passage and is common to both food

and air. It extends to the opening of the oesophagus and the larynx. The air goes from the pharynx into the larynx.

Glottis:

Glottis is a narrow opening at the floor of pharynx which leads into larynx. The glottis is guarded by a flap of tissue called the epiglottis.

Larynx (voice box):

The larynx is a box, made of cartilage. It is present between pharynx and trachea. It is also called the **voice box**. Two pairs of fibrous bands called vocal cords are stretched across the larynx.

Function of vocal cords:

The vocal cords vibrate when the air passes through them. This vibration produces sounds.

Trachea (windpipe):

Larynx continues to the **trachea**, which is also called the windpipe. It is about 12 cm long tube which lies in front of the oesophagus. There are C-shaped cartilagenous rings in the wall of trachea. The cartilages keep the trachea from collapsing even when there is no air in it.

Bronchi:

On entering the chest cavity, the trachea divides into two smaller tubes called **bronchi** (Singular: bronchus). The bronchi also have cartilagenous plates in their walls. Each bronchus enters into the lung of its side and then divides into smaller branches.

The bronchi continue dividing in the lungs until they make several fine tubes called **bronchioles**.

Alveolar ducts:

The bronchioles progressively lose the cartilages as they become narrower. The bronchioles end as fine tubules called the alveolar ducts.

Alveoli:

Each alveolar duct opens into a cluster of pouches called alveoli. The alveoli form the respiratory surface in human body. Each alveolus is a sac-like structure lined by a single layer of epithelial cells. It is bound on the outside by a network of capillaries.

The pulmonary artery:

The pulmonary artery from the heart containing deoxygenated blood enters the lungs and branches into arterioles and then into capillaries which surround the alveoli. These then join together to form the venules which form pulmonary vein. The pulmonary vein carries the oxygenated blood back to the heart.

ii. **The Lungs:**

All the alveoli on one side constitute a lung. There is a pair of lungs in the thoracic cavity.

Intercoastal muscles:

The chest wall is made up of 12 pairs of ribs and the rib muscles called **intercoastal muscles**.

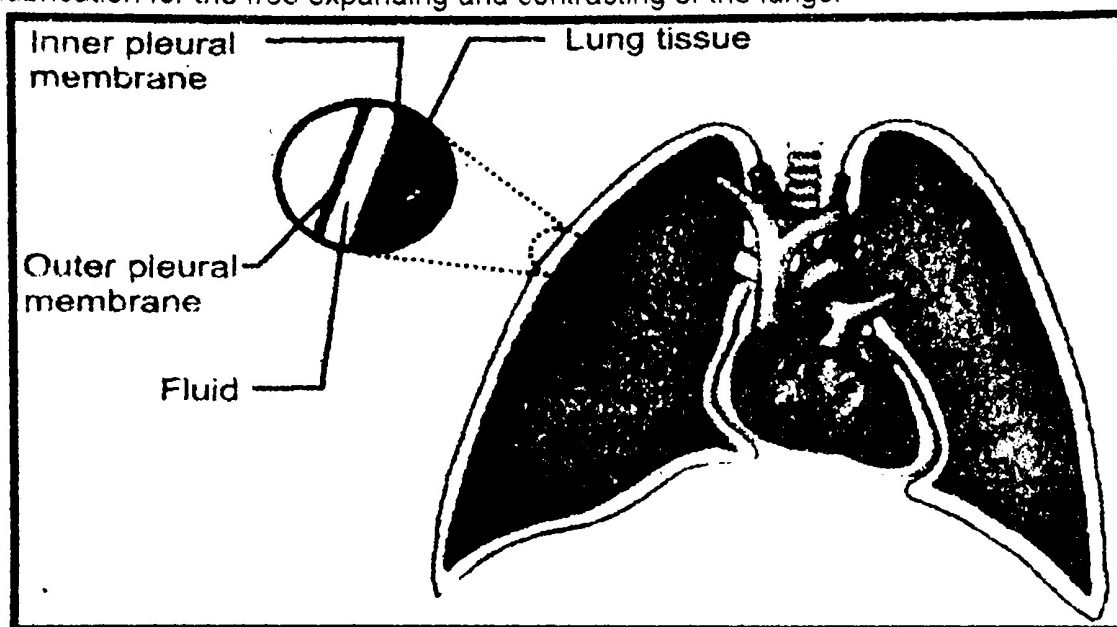
Diaphragm:

A thick muscular structure, called **diaphragm**, is present below the lungs.

The left lung is slightly smaller and has two lobes and the right lung is bigger with three lobes. They are spongy and elastic organs. The lungs also have blood vessels that are the branches of the pulmonary arteries and veins.

Function of membranes in the lungs:

Each lung is enclosed by two membranes called the outer pleural membrane and the inner pleural membrane. The membranes enclose a fluid which provides lubrication for the free expanding and contracting of the lungs.



Lungs and pleural membranes

Interesting Information

The vibrations in vocal cords and the movements of lips, cheeks, tongue and jaws produce specific sounds which result in speech. Speech is an ability that only humans are gifted with and this is one of the characteristics which has put human beings superior to all.

Interesting Information

The trachea and bronchi are also lined with ciliated and glandular cells. The glandular cells secrete mucus which moistens the air and also traps any fine particles of dust or bacteria that have escaped from nasal cavity. The cilia beat with an upward motion so that the foreign particles along the mucus are sent to the oral cavity from where it may be either swallowed or coughed out.

Q5. Write down the steps of inhalation and exhalation.

OR

Explain the mechanism of breathing?

Ans: See Q # 2 from Exercise (Understanding the Concept)

Q6. Briefly describe human breathe rate per minute in different circumstances.

Ans: Human breathe rate during normal circumstances:

Humans breathe 16-20 times per minute in normal circumstances i.e. at rest. The rate of breathing is controlled by the respiratory centre in the brain. The respiratory centre is sensitive to the concentration of carbon dioxide in the blood.

Human breathe rate during exercise:

When we do exercise or some hard job our muscle cells carry out cellular respiration at greater rate. It results in the production of more carbon dioxide which is released in the blood. This greater than normal concentration of carbon dioxide stimulates the respiratory centre of brain. The respiratory centre sends messages to the rib muscles and diaphragm to increase the rate of breathing so that the excess carbon dioxide present in blood can be removed out of body. During exercise or other hard physical works the breathing rate may increase up to 30-40 times per minute.

Note:

The breathing movements are involuntary to a large extent. However, we can control the rate of breathing but not for a long time.

Q7. How will you compare between the inspired and expired air?

Ans: Comparison between the inspired and the expired air:

Feature	Inspired Air	Expired Air
Amount of oxygen	21%	16%
Amount of carbon dioxide	0.04%	4%
Amount of nitrogen	79%	79%
Amount of water vapours	Variable	Saturated
Amount of dust particles	Variable	Almost none
Temperature	Variable	Almost equal to body temperature

Q8. What part of the blood transports oxygen from lungs to the cells of the body?

Ans: Haemoglobin in Red Blood Cells.

Q9. What is the job of breathing system?

Ans: Job of breathing system:

Breathing system exchanges oxygen and carbon dioxide.

Q10. Name five types of respiratory disorder in your body?

Ans: Respiratory Disorders:

There are a number of respiratory disorders which affect people. The percentage of such disorders is particularly high in Pakistan. It is due to the more concentration of air pollutants not only in the urban but also in the rural atmosphere. Some of the important respiratory disorders are described next.

1. Bronchitis
2. Emphysema
3. Pneumonia
4. Asthma
5. Lung Cancer

Q11. State the signs and symptoms, causes and treatments of bronchitis, emphysema and pneumonia.

OR

Explain respiratory disorders in human beings?

Ans: See Q # 3 from Exercise (Understanding the Concept)

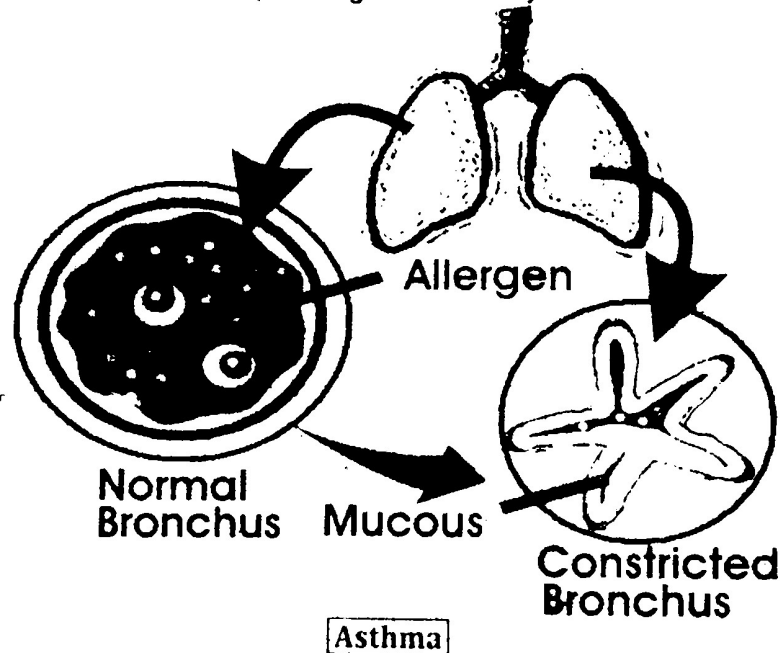
Interesting Information

Prior to the discovery of antibiotics, one-third of pneumonia patients died from the infection

Q12. State the signs and symptoms, causes and treatments of asthma?

Ans: Asthma:

Asthma is a form of allergy, in which there is inflammation of the bronchi, more mucous production and narrowing of the airways.



Causes of asthma:

In asthma patients, the bronchi and bronchioles become sensitive to different allergens (allergy causing factors) e.g. dust, smoke, perfumes, pollens etc. When exposed to any of such allergens, the sensitive airways show immediate and excessive response of constriction. In this condition, the patient feels difficulty in breathing.

Sign and symptoms:

The symptoms of asthma vary from person to person. The major symptoms include shortness of breath (especially with exertion or at night), wheezing (whistling sound when breathing out), cough and chest tightness.

Treatment and drugs:

The chemicals with ability to dilate the bronchi and bronchioles are used in the treatment of asthma. Such medicine is given in the form of inhalers

Q13. State the signs and symptoms, causes and treatments of lung cancer?

Ans: Lung Cancer:

Lung cancer is a disease of uncontrolled cell divisions in the tissues of the lung. The cells continue to divide without any control and form tumours. The cellular growth may also invade adjacent tissues beyond the lungs.

Sign and symptoms:

The most common symptoms are shortness of breath, coughing (including coughing up blood) and weight loss.

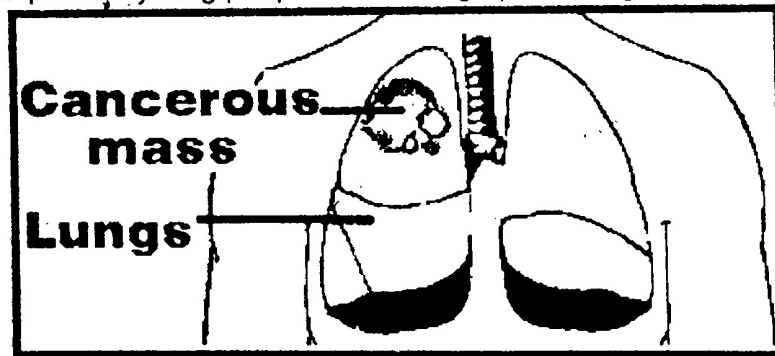
Causes of lung cancer:

The main causes of any cancer include carcinogens (such as those in cigarette smoke), ionizing radiation and viral infection. Smoking is the main cause of lung cancer. This risk of lung cancer is significantly lower in nonsmokers. Cigarette smoke contains over 50 known carcinogens.

Passive smoking (the inhalation of smoke from another's smoking) is also a cause of lung cancer. The smoke from the burning end of a cigarette is more dangerous than the smoke from the filter end.

Prevention of lung cancer:

Eliminating tobacco smoking is a primary goal in the prevention of lung cancer. The World Health Organization has called for governments to stop tobacco advertising to prevent young people from taking up smoking.



Lung Cancer

Cancer related deaths

Lung cancer is the most common cause of cancer-related death responsible for more than 1.3 million deaths worldwide annually.

If a person stops smoking, the chance to develop cancer decreases as damage to the lungs is repaired and contaminant particles are gradually removed.

Nicotine

Nicotine is a powerful poison and was widely used as an insecticide in the past. When inhaled through tobacco smoking, it reaches our circulatory system and not only hardens the walls of the arteries but also damages the brain tissues.

Rates of smoking

According to the WHO, the rates of smoking have declined in the developed world. In the developing world, however it is rising by 3.4% per year as of 2002. The World No Tobacco Day is celebrated on the 31st of May every year.

Q14. How does the tobacco smoke damage the respiratory system?

Ans: Damaging of respiratory system:

While nicotine has effects on blood flow, these effects are not as significant as the damage to the lung and irritation of the air passages to the lung. One such problem is "smoker's cough", caused by damage to the epithelia of the windpipe. Emphysema caused by the body's immune response to cigarette smoke causes a major loss in lung function and debilitating disease.

Q15. How would you associate the bad effects of smoking on human body systems?

Ans: Bad Effects of Smoking:

i. Chemicals in smoke:

Smoking is harmful due to the chemicals in cigarettes and smoke. Tobacco smoke contains over 4,000 different chemicals, out of which at least 50 are carcinogens and many are poisonous.



Normal Lungs

Smoker's Lungs

ii. Smoking lead to the cancers:

Smoking may also lead to the cancers in kidneys, oral cavity, larynx, breast, bladder and pancreas etc. Many chemicals in tobacco smoke damage the air passageway, which leads to emphysema and other respiratory disorders.

iii. Effect on circulatory system:

Smoking also has effects on the circulatory system. The carbon monoxide present in tobacco smoke lessens the oxygen-carrying capacity of haemoglobin.

Many other chemicals in smoke increase the production of blood platelets. When platelets are more than the normal numbers, they make the blood viscous and it can lead to arteriosclerosis:

iv. Infections in the lungs:

Smokers are at greater risk of developing infections, particularly in the lungs. For example, smoking increases the risk of tuberculosis by two to four times, and of pneumonia by four times.

v. Weakening and staining of teeth:

Smoking is also responsible for weakening, and staining the teeth. Tooth loss is 2 to 3 times higher in smokers than in non-smokers.

World No Tobacco Day

The World No Tobacco Day is celebrated on 31st of May every year.

second-hand smoke (passive smoke)

Non-smokers who are exposed to second-hand smoke (passive smoke) at home or work increase their heart cancer risk by 20-30% and their lung disease risk by 25-30%.

Affects on social life

Smoking also affects the social life of a Person. Smokers may face social un-acceptance because other people may not want to be exposed to other's smoke.

REVIEW QUESTIONS

MULTIPLE CHOICE

- The process of gaseous exchange involves;**
 - Breakdown of C-H bonds to yield energy
 - Physical movements that take air in and out of body
 - Getting oxygen from the air and removing carbon dioxide
 - Transport of oxygen by the blood to different parts of the body
- Most of the gaseous exchange in a leaf occurs through;**
 - Stomata
 - General surface
 - Cuticle
 - Lenticels
- How many bronchi are there in the air passageway?**
 - One
 - Two
 - Many
 - None
- Where does the gaseous exchange occur in humans?**
 - Pharynx
 - Trachea
 - Bronchi
 - Alveoli
- Which structure actively helps in taking the air out of lungs?**
 - Nasal cavity
 - Bronchus
 - Bronchiole
 - Diaphragm
- The primary chemical stimulus for breathing is the concentration of;**
 - Carbon dioxide in blood
 - Oxygen in blood
 - Carbon dioxide in muscles
 - Oxygen in muscles
- Point out the FALSE statement about respiration.**
 - Gases can easily pass through the walls of the alveoli
 - Gas exchange in lungs is very efficient because lungs provide large surface area
 - In emphysema the walls of alveoli break and there is more surface area
 - Dust particles can damage the lung by irritating the inner alveoli surface

8. **A disease involving the breakdown of air sacs of the lungs is;**
 A. Pneumonia B. Bronchitis
 C. Asthma D. Emphysema
9. **Which process does NOT occur in the nasal cavity?**
 A. Trapping of large dust particles B. Humidification of the inhaled air
 C. Warming of the inhaled air D. Exchange of gases
10. **What type of blood vessels surrounds the alveoli?**
 A. Artery B. Arteriole
 C. Capillary D. Vein

Answers

1. C	2. A	3. B	4. D	5. D
6. A	7. C	8. D	9. D	10. C

SHORT QUESTIONS

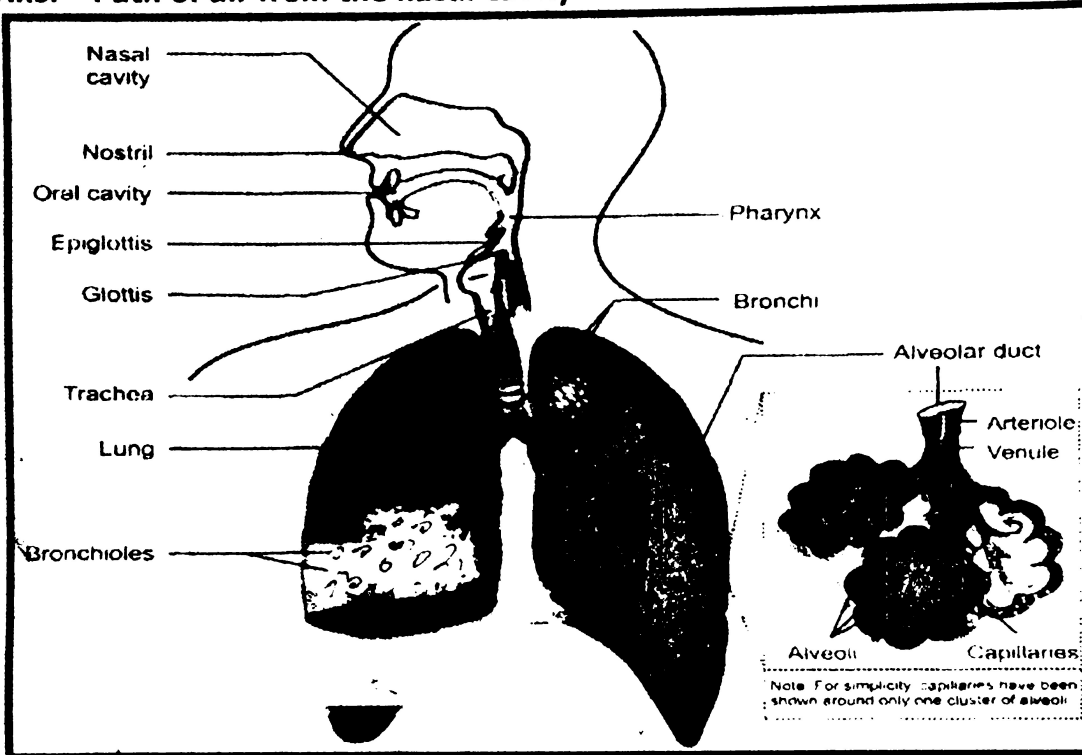
1. **Differentiate between breathing and cellular respiration.**

Ans. Difference between breathing and cellular respiration:

Cellular respiration	Breathing
i. Organisms get the oxygen needed for cellular respiration , from their environment and provide it to their cells. The carbon dioxide produced during cellular respiration is taken out of the cells and ultimately from the body. Taking in oxygen and giving out of carbon dioxide is termed as Gaseous exchange .	i. The term breathing is used for the process through which animals take air in their bodies to get oxygen from it and then give out the air for getting rid of carbon dioxide.
ii. Respiration involves the mechanical and the bio-chemical processes	ii. Breathing is only the mechanical or physical process of exchange of gases.
iii. Cellular respiration occurs in the cells in the following steps: glycolysis (no O ₂ needed), "prep step", krebs cycle, chemiosmosis / ETC (electron transport chain).	iii. Breathing is exhaling and inhaling. Breathing is what provides the O ₂ needed for cellular respiration, and helps dispose of the waste product of cellular respiration CO ₂ .

2. Trace the path of air from the nasal cavity to the alveoli.

Ans. Path of air from the nasal cavity to the alveoli:



3. How will you differentiate between a stoma and a lenticel?

Ans. Difference between a stoma and a lenticels:

Stoma	Lenticels
i. Stoma are present on the lower surface of leaf.	i. Lenticels are present on the outer layer of woody or hard stem.
ii. They are involved in gaseous exchange, transpiration, removal of extra water and waste.	ii. They are used for removal of waste.
iii. Stomata occur in the epidermis.	iii. Lenticels present in the cork surfaces of the stems, roots, and other parts of vascular plants.
iv. Stoma has guard cells.	iv. Lenticel has no guard cells.

OR

1) Stomata (singular stoma) In botany, a stoma (also stomate, plural stomata) is a pore, found in the leaf and stem epidermis that is used for gas exchange

The pore is formed by a pair of specialized parenchyma cells known as guard cells which are responsible for regulating the size of the opening

Air containing carbon dioxide enters the plant through these openings where it is used in photosynthesis and respiration

2) **Lenticel** = A lenticel is a spongy area present in the cork surfaces of the stems, roots, and other parts of vascular plants.

It appears on the surface as a lenticular (lens-shaped) spot, which acts as a pore.

These structures allow for the exchange of gases between the internal tissues and atmosphere to occur across the periderm, which would otherwise prevent this exchange of gases.

UNDERSTANDING THE CONCEPT

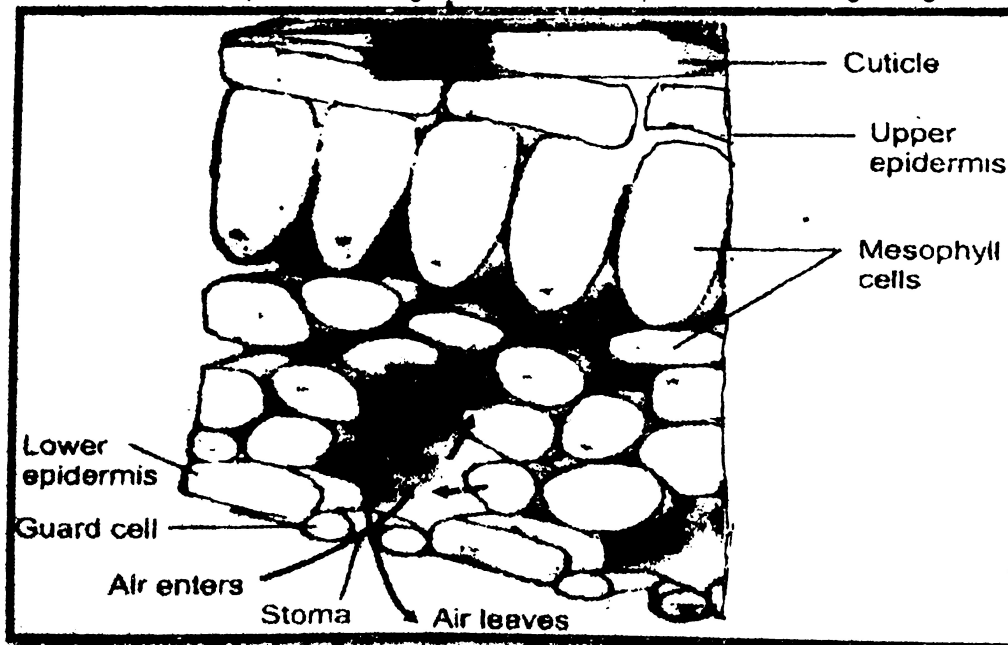
1. **How do the different parts of the plant body exchange gases with the environment?**

Ans: Gaseous exchange in plants:

Plants have no organs or systems for the exchange of gases with the environment. Every cell of the plant body exchanges gases with the environment by its own.

Gaseous exchange in stomata:

The leaves and young stems have **stomata** in their epidermis. The gaseous exchange occurs through these stomata. The inner cells of leaves (mesophyll) and stems also have air spaces among them, which help in the exchange of gases



Gaseous exchange in a leaf

Gaseous exchange in a leaf:

Leaf cells face two situations.

Gaseous exchange in a leaf during daytime:

During the daytime when the mesophyll cells of leaves are carrying out photosynthesis and respiration side by side, the oxygen produced in photosynthesis is utilized in cellular respiration. Similarly the carbon dioxide produced during cellular respiration is utilized in photosynthesis.

Gaseous exchange in a leaf during night:

However, during night when there is no photosynthesis occurring, the leaf cells get oxygen from the environment and release carbon dioxide through stomata.

Gaseous exchange in stems and roots:

Lenticels:

In woody stems and mature roots, the entire surface is covered by bark which is impervious to gases or water. However, there are certain pores in the layer of bark. These are called the lenticels

Note:

The lenticels are slightly more raised than the general surface of the stem

Gases diffuse in and out of the general surface of the young roots. The gases are found in the soil surrounding the roots.

Gaseous exchange in aquatic plants:

The aquatic plants get the oxygen dissolved in water and release carbon dioxide in the water.

2. Write down the steps of inhalation and exhalation.

Ans: The Mechanism of Breathing:

The physical movements associated with the gaseous exchange are called breathing. There are two phases of breathing i.e. inhalation and exhalation

Inhalation is a process where you intake oxygen through the nostrils and exhalation is breathing out carbon dioxide through the same airways.

i. Steps of Inspiration or Inhalation:

During inspiration, the rib muscles contract and ribs are raised. At the same time the dome-shaped diaphragm contracts and is lowered. These movements increase the area of the thoracic cavity, which reduces the pressure on lungs. As a result, the lungs expand and the air pressure within them also decreases. The air from outside rushes into the lungs to equalize the pressure on both sides

ii. Steps of Expiration or Exhalation:

After the gaseous exchange in the lungs, the impure air is expelled out in exhalation. The rib muscles relax bringing the ribs back to the original position. The diaphragm muscles also relax and it gets its raised dome shape. This reduces the space in the chest cavity and increases the pressure on lungs. The lungs contract and the air are expelled out of them.

Comparison between the inspired and the expired air

Feature	Inspired Air	Expired Air
Amount of oxygen	21%	16%
Amount of carbon dioxide	0.04%	4%
Amount of nitrogen	79%	79%
Amount of water vapours	Variable	Saturated
Amount of dust particles	Variable	Almost none
Temperature	Variable	Almost equal to body temperature

3. State the signs and symptoms, causes and treatments of bronchitis, emphysema and pneumonia.

Ans: i. Bronchitis:

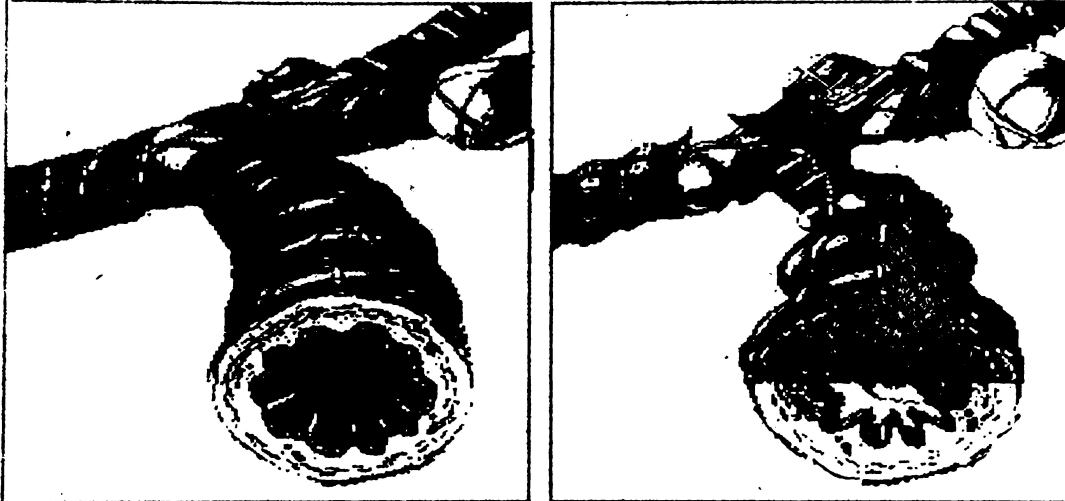
Bronchitis is the inflammation of the bronchi or bronchioles.

Reasons:

It results in excessive secretions of mucus into the tubes, leading to the swelling of tubular walls and narrowing of tubes.

Causes:

It is caused by viruses, bacteria or exposure to chemical irritants (e.g. tobacco smoke).



Bronchi, normal (left) and inflamed (right)

Types of bronchitis:

There are two major types of bronchitis i.e. acute and chronic.

Acute bronchitis:

The acute bronchitis usually lasts about two weeks and patients recover with no permanent damage to the bronchi or bronchioles.

Chronic bronchitis:

In chronic bronchitis, the bronchi develop chronic inflammation. It usually lasts for three months to two years.

Sign and Symptoms:

Symptoms of bronchitis include a cough, mild wheezing, fever, chills and shortness of breath (especially when doing hard job).

Treatments and drugs:

In most cases, bronchitis requires only self-care treatments such as:

Getting more rest

Taking over-the-counter pain medications

Drinking fluids

Breathing in warm, moist air

Medications:

In some circumstances, doctor may prescribe medications, including:

i. Antibiotics

ii. Cough medicine

Note:

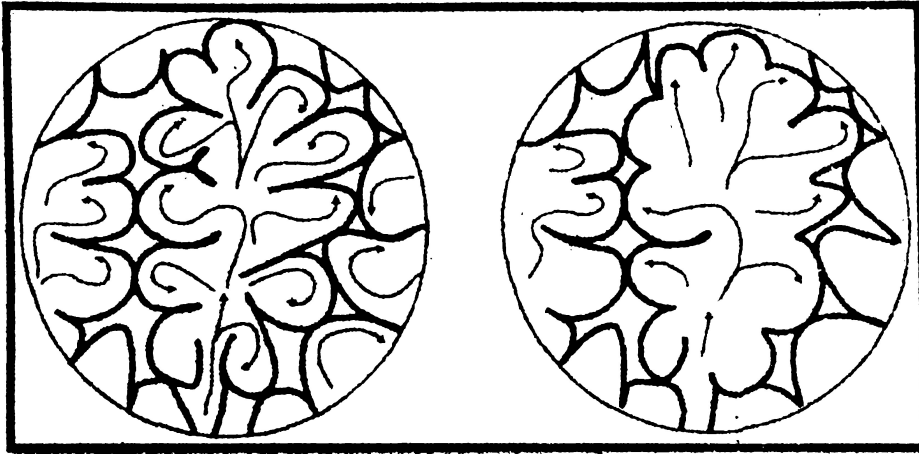
The majority of people diagnosed with chronic bronchitis are 45 years of age or older

ii. Emphysema:

Emphysema is the destruction of the walls of the alveoli.

Causes:

It results in larger sacs but with less surface area for gaseous exchange. As lung tissue breaks down, the lungs do not come back to their original shape after exhalation. So air cannot be pushed out and is trapped in the lungs.



The Alveoli; normal (left) and emphysema (right)

Sign and symptoms:

The symptoms of emphysema include shortness of breath, fatigue, recurrent respiratory infections and weight loss. By the time the symptoms of emphysema appear, the patient has usually lost 50% to 70% of his / her lung tissue. The level of oxygen in blood may get so low that it causes serious complications.

Treatment and drugs:**Inhaled steroids:**

Corticosteroid drugs inhaled as aerosol sprays may help relieve shortness of breath.

Antibiotics are also used for the treatment of emphysema.

iii. Pneumonia:

Pneumonia is an infection of lungs. If this infection affects both lungs, it is called double pneumonia.

Causes:

The most common cause of pneumonia is a bacterium, *Streptococcus pneumoniae*. Some viral (influenza virus) and fungal infections may also lead to pneumonia.

Sign and symptoms:

When the causative organisms enter the alveoli, they settle there and grow in number. They break the lung tissues and the area becomes filled with fluid and pus. The symptoms of pneumonia include a cold that is followed by a high fever, shivering, and a cough with sputum production. Patient may become short of breath.

The patient's skin colour may change and become dusky or purplish. It is due to poor oxygenation of blood

Treatment and drugs:

Vaccines are available to prevent pneumonia caused by *S. pneumoniae*. Antibiotics are used in the treatment of this type of pneumonia

4. How does the tobacco smoke damage the respiratory system?

Ans. Bad Effects of Smoking:

i. Chemicals cigarettes:

Smoking is harmful due to the chemicals cigarettes and smoke. Tobacco smoke contains over 4 000 different chemicals, out of which at least 50 are carcinogens and many are poisonous. Many people think that lung cancer is the only smoking-related disease and it is the number one cause of death among smokers. But it is not right. Cigarette smoke affects the body from head to toe. Smokers have a much higher risk of developing a number of life threatening diseases

Smoking lead to the cancers:

Smoking may also lead to the cancers in kidneys, oral cavity, larynx, breast, bladder and pancreas etc. Many chemicals in tobacco smoke damage the air passageway, which leads to emphysema and other respiratory disorders.

Effects on the circulatory system:

Smoking also has effects on the circulatory system. The carbon monoxide present in tobacco smoke lessens the oxygen-carrying capacity of haemoglobin. Many other chemicals in smoke increase the production of blood platelets. When platelets are more than the normal numbers, they make the blood viscous and it can lead to arteriosclerosis

Effects on lungs:

Smokers are at greater risk of developing infections, particularly in the lungs. For example, smoking increases the risk of tuberculosis by two to four times, and of pneumonia by four times. Smoking is also responsible for weakening smoke, and staining the teeth. Tooth loss is 2 to 3 times higher in smokers than in non-smokers.

THE TERMS TO KNOW

● **Alveolar duct:**

The bronchioles progressively lose the cartilages as they become narrower, The bronchioles end as fine tubules called the **alveolar ducts**.

● **Alveolus:**

A sac-like structure present next to the alveolar duct in lungs.

● **Asthma:**

An inflammation of the bronchi that causes swelling and narrowing of the airways

● **Breathing:**

The process through which animals take air in their bodies to get oxygen and then give out the air for getting rid of carbon dioxide.

● **Bronchioles:**

Fine tubules formed by the division of the bronchi.

- **Bronchitis:**

Inflammation in the bronchi or bronchioles.

- **Bronchus:**

The part of air passageway formed by the division of the trachea.

- **Diaphragm:**

The muscular structure that forms the floor of the chest cavity present below lungs

- **Emphysema:**

A disease in which the walls of the alveoli are destroyed.

- **Exhalation:**

The phase of breathing in which air is expelled from the lungs.

- **Gaseous exchange:**

Taking in and giving out of gas (oxygen and carbon dioxide) by organism.

- **Inhalation:**

The phase of breathing in which air is drawn into the lungs.

- **Larynx:**

The part of the air passageway between pharynx and the trachea

- **Lenticels:**

Pores in the bark of woody stems and mature roots.

- **Nasal cavity:**

Hollow space in the nose. opens to the outside through nostrils, divided into two portions by a wall.

- **Nostril:**

The openings of the nasal cavity called nostrils.

- **Pneumonia:**

The infection of one or both lungs, caused by specific bacteria, viruses or fungi. the infected part of the lung becomes filled with fluid and pus.

- **Trachea:**

Windpipe Part of the air passageway between larynx and bronchi

- **Vocal cords:**

Two pairs of fibrous bands in the larynx, vibrate when the air passes through them and produce sounds.