

(c) tidal volume

(d) vital volume

14. Pulmonary emphysema:

(a) characterised by loss of elasticity of the alveolar walls

(b) results from bacterial infection

(c) results from bronchial constriction

(d) is uncommon in cigarette smokers

Answer

1	(b)	2	(d)	3	(c)	4	(d)	5	(b)
6	(c)	7	(a)	8	(c)	9	(c)	10	(a)
11	(d)	12	(d)	13	(c)	14	(d)		

SECTION II: Short Questions

Give short answers of the following questions.

Q1. List any two properties of respiratory tract that help to trap dust particles and microbes in inhaled air.

Answer

- Hairs:** present inside the nostrils
- Mucous membrane:** Inside the nose secretes a sticky substance called mucus.
- Cilia:** Originate from internal lining of nasal cavity filter the air and prevent the entry of foreign particles such as micro-organisms, dust and particulate matter inside the respiratory system.

Q2. List the properties of respiratory surface.

Answer

Properties of Respiratory Surfaces

The area where gaseous exchange with the environment actually takes place is called the respiratory surface. Gaseous exchange takes place in all organisms by the physical process of diffusion. For effective diffusion the respiratory surface must have the following properties.

- It must be permeable, so that gases can pass through it.
- It must be thin for efficient diffusion, because diffusion is only efficient over distance of 1 mm or less.
- It should possess a large surface area so that sufficient amounts of gases are able to be exchanged according to the organism's need.
- It should possess a good blood supply.
- There should be a good ventilation mechanism to maintain a steep diffusion gradient across the respiratory surface.

Q3. What organs constitute the respiratory system?

Answer

Respiratory system provides fundamental ability to breath. This system consists of:

- | | | | |
|------------|------------------|-------------------|-------------|
| i) Nose | ii) Nasal cavity | iii) pharynx | iv) larynx |
| v) trachea | vi) bronchi | viii) bronchioles | ix) Alveoli |
| x) Lungs | | | |

Q4. How nose and nasal cavity function in filtering incoming air?

Answer

Nose

The nose is only externally visible part of the respiratory system. The structure of a human nose is composed of bones, cartilage and fibro fatty tissues. The external feature of a nose depends upon the ethmoid bone and the cartilages.

Hairs are present inside the nostrils that help in the filtration of air. Hence, nose hair serve as a defense mechanism against the harmful pathogens and solid particulate matter present in the air. Both the nostrils and nasal cavities are lined by mucous membranes along with cilia. The mucous membrane secretes a sticky substance called mucus. The mucus and cilia filter the air and prevent the entry of foreign particles such as microorganisms, dust and particulate matter inside the respiratory system. The mucus also helps in moistening the air. Cilia move the trapped substances to the pharynx for their removal.

Q5. How lungs contract and relax?

Answer

Humans have two lungs, a right and left, which are located in the thoracic cavity.

The lungs neither draw in air nor push it out the diaphragm, abdominal muscles and the intercostal muscles provide help in contraction and relaxation of lungs.

Q6. Differentiate between haemoglobin and myoglobin.

Answer

Haemoglobin		Myoglobin	
1	It consists of four polypeptide chain.	1	Consists of one polypeptide chain.
2	Each molecule possesses four iron containing haem groups.	2	Each molecule possesses one iron containing haem group.
3	Four oxygen molecules can bind to each haemoglobin molecule.	3	Only one oxygen molecule can bind to each myoglobin molecule.
4	It is found in RBCs.	4	It is found in muscles.
5	It transports oxygen.	5	It stores oxygen.
6	It has less affinity with oxygen.	6	It has more affinity with oxygen.
7	It loses oxygen at PO_2 60 mmHg.	7	It loses oxygen at PO_2 20 mmHg.

Q7. What is the role of respiratory pigments?

Answer

A respiratory pigments molecule that involves in transport or storage of respiratory gases. In humans, haemoglobin that increases the oxygen carrying capacity of blood and myoglobin that stores oxygen in muscles are referred as respiratory pigments.

Q8. Define oxygen carrying capacity and list the factors that affect upon it.

Answer

The ability of haemoglobin to bind with oxygen is called oxygen carrying capacity of blood.

Factors

Following are the factors which affect oxygen carrying capacity of haemoglobin:

- i) Partial pressure of oxygen PO_2 and carbon dioxide PCO_2
- ii) Amount of haemoglobin
- iii) Body temperature fluctuations
- iv) Drop in pH of blood

Q9. Differentiate between sinusitis and otitis media.

Answer

Sinusitis

Sinusitis is an inflammation of the nasal sinuses that may be acute (symptoms last 2 – 8 weeks) or chronic (symptoms last much longer). The sinuses are holes in the skull between the facial bones.

Otitis media

Otitis media is an inflammation of middle ear (a cavity between the ear drum and the inner ear). Inflammation of the middle ear causes the Eustachian tubes to close causing the fluid to become trapped. Bacteria from the back of nose travel through the Eustachian tube directly into the middle ear cavity and multiply in the fluid. Otitis media that fails to clear up after three months or more is called chronic otitis media.

Q10. What is chloride shifts or Hamburgers phenomenon?

Answer

The phenomenon of balancing of ions in two opposite directions by the help of proteins, which result in maintenance of balance of ions on either side is called shifts or Hamburgers phenomenon.

For example from inside the erythrocytes (RBC) negatively charged HCO_3^- ions diffuse to plasma. This is balanced by the diffusion of the chloride ions (Cl^-), in opposite direction. This is achieved by special bi-carbonate-chloride carrier proteins that are present in RBC membrane.

Q11. What is the amount of oxygen contained by each 100 ml of arterial and venous blood?

Answer

Maximum oxygen carrying capacity of arterial blood is 20 ml / 100 ml of blood (100% saturation) which is achieved at 100 ml mmHg PO_2 . This is because the amount of haemoglobin is 15 gms/100 ml of blood but in our body each 100 ml of arterial blood contains 19.4 ml of oxygen (97% saturated so PO_2 is 97 mmHg).

While 100 ml of venous blood contains 14.4 ml O_2 (75% saturated) So PO_2 is 40 mmHg.

Q12. What is spirometry?

Answer

Spirometry is the process of measuring volumes of the air that moves into and out of the respiratory system and a spirometer is a device to measure these pulmonary volumes.

Q13. Define pneumonectomy and resuscitation.

Answer

Pneumonectomy

To avoid spreading of lung cancer in healthy part of lungs and operation is done to remove a lobe or the lung completely before secondary growths have time to form. This operation is called pneumonectomy.

Resuscitation

Mouth to mouth artificial respiration is called resuscitation.

Q14. How can we prevent the spread of tuberculosis?

Answer

The spread of TB can be controlled by some preventive measures like:

- 1) Living room should be well ventilated and bright.
- 2) Always cover the mouth with cloth during coughing and sneezing.
- 3) Avoid spitting openly.
- 4) Always bury or burn the sputum of patient.
- 5) The patients should spit in a utensil with lime powder to prevent the spread of disease.
- 6) The use of masks and other respiratory isolation procedures to prevent spread to medical personal is also important.

Q15. What are the causes of lung cancer?

Answer

Smoke is a main cause of lung cancer because tobacco smoke contains many carcinogens (Cancer causing substance). In addition to this, asbestos, arsenic radiation such as gamma and x-ray, the sun and compounds in car exhaust fumes are all examples of carcinogens.

Q16. What are the advantages of having millions of alveoli rather than a pair of simple balloon like lungs?

Answer

- i) The alveoli form the gas exchange surface.
- ii) The wall of each alveolus is only 0.1 μm thick.
- iii) On outside the alveoli there is a dense network of blood capillaries.
- iv) Living of each alveolus is moist which increase the absorption ability of alveolus.

It is estimated that there are over 700 million alveoli present in the lungs, representing a total surface area of 70-90 m.

Q17. Why does the smoker's lungs look black?

Answer

In between alveoli gaps/spaces are present called alveolar spaces, which contain special W.B.C called scavenger cells. These macrophages engulf the foreign material which enters in lungs through the airways. When smoke with many impurities is inhaled, the alveolar spaces of smokers containing scavenger cells that are filled with engulfed particles of impurities and debris, become gray/black.

SECTION III: Extensive Questions

Q1. Describe the main structural features and functions of the components of human respiratory system.

Answer

Respiratory System of Man

The body system which is responsible for the exchange of gases between body fluid and outer environment is called **respiratory system**. The human respiratory system can be divided into two regions, upper respiratory tract and lower respiratory tract.

Upper Respiratory Tract

The upper respiratory tract includes nostrils, nasal cavity and pharynx.

Nose

The nose is only externally visible part of the respiratory system. Human nose is composed of bones, cartilage and fatty tissues. The external openings of nose are called nostrils and the inner hollow spaces are called nasal cavities. There are two nasal cavities which are partitioned by means of nasal septum (the part of nasal bone). The anterior parts of nasal cavities near the nostrils are called vestibules which contain a network of hairs. Both the nostrils and nasal cavities are lined by mucous membrane alongwith cilia.

Nose hairs, mucus and cilia serve as a defence mechanism against the harmful pathogens and solid particulate (relating to particles) matter present in the air. The mucus and cilia filter the air and prevent the entry of foreign particles such as microorganisms, dust and particulate matter inside the respiratory system. The mucus also helps in moistening the air. Cilia move the trapped substances to the pharynx for their removal. Underneath the mucous membrane, there are blood capillaries that help to warm the air to about 30°C , depending upon the external temperature.

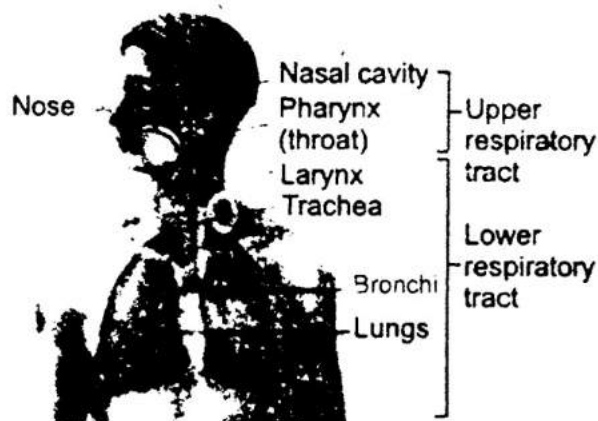


Fig. Human respiratory tract