

chapter-14	1	Respiration
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chapter No-14

Respiration

Q1 write short note on Respiration.

Answer : Respiration:

Meaning :- The word respiration is derived from a Latin word—Respirationem which means breathing.

Definition of cellular Respiration:

Respiration is oxidation—reduction process inside the cell, in which the organic food (Glucose) is oxidized to produce CO_2 , H_2O and energy, which used in the synthesis of ATP.

— OR —

“Respiration is the oxidation of food substances with the release of energy in living cells.”

Reaction :-

$$\text{C}_6\text{H}_{12}\text{O}_6 + 6\text{O}_2 \xrightarrow{\text{Enzyme}} 6\text{CO}_2 + 6\text{H}_2\text{O} + \text{Energy}$$

Importance :- In this process energy is produce according to the need of organism and wast-product (CO_2) is also released.

Types of cellular respiration :- Respiration of two types. i.e—

1: Aerobic Respiration :- Aerobic respiration is the breakdown of food substances in the presence of oxygen with the release of a large amount of energy.

2: Anaerobic Respiration :- Anaerobic respiration is the breakdown of food substances with the release of a —

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Comparatively small amount of energy in the absence of O_2. Other types of respiration: <Gaseous exchange>- <u>1: External Respiration :-</u> The exchange of gases between bodies <i.e- skin, lung, gills> and external environment is called external respiration. <u>2: Internal Respiration :-</u> The exchange of gases between body cells and body fluid <i.e- Blood, Lymph, hemolymph> is called internal respiration. <u>Respiratory system :-</u> In simple animals respiration occurs through general body surface, while in complex animals <i.e- Human> respiration occurs through specialized respiratory system.		
Q2 Write the properties of respiratory surfaces.		
<u>Answer: properties of respiratory surface:</u>		
<u>Definition :-</u> Respiratory surface is the surface of - respiratory organs through which gaseous exchange occurs.		
<u>properties: <characteristics>-</u>		
Respiratory surfaces are the sites where gaseous - exchange take place by simple diffusion process. For effective diffusion of respiratory gases, the respiratory surface must have the following properties.		
<u>1: Thin epithelium:-</u> The surface through which exchange of gases takes place must be very thin-walled, so that the		

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distance through which diffusion takes place may be minimum i.e. ~ 1mm or less.

2: More permeable :- The surface through which exchange of respiratory gases takes place must be permeable. So more gases will be diffused or pass through it.

3: Large surface area :
Respiratory surface should have large surface area. So that maximum air (O_2) is taken in and maximum CO_2 is given out.

4: Wet surface :- The respiratory surface should be kept moist. so that gaseous exchanges occur easily because gases can not pass through dry surface easily.

5: capillary network :-
The respiratory surface should possess extensive network of blood-capillaries through which blood can pass at an adequate speed. In this way complete diffusion gradient is maintained which helps in rapid diffusion of oxygen.

6: Ventilation :-
There should be a good ventilation mechanism to maintain a steep ($High$) diffusion gradient across the respiratory surface.

Q3 Describe the structure of human respiratory system.

Answer: Human respiratory System:

Definition:- A system of organs functioning in respiration

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is known as respiratory system.		
<u>Explanation :-</u> Gaseous exchange in human occur b/w human body and their environment. Humans have specialized respiratory system which help in exchange of gases.		
<u>Components : <parts> -</u>		
Human respiratory system consists of a pair of lungs and air passage <tube> which carry air to and from lungs. i.e. -		
<u>1: Air passage:</u>		
<u>Definition :-</u> The respiratory tract or tube in which gases are passed toward Lungs for exchange is called air passage.		
<u>Parts of air passage :-</u> It consists of the following parts.		
<u>i: Nose :</u>		
<u>External part :-</u> The nose is only external part of the — respiratory system which Links the respiratory system with the external environment for exchange of respiratory gases.		
<u>Location :-</u> Nose is present on the ventral anterior side of face.		
<u>Shape :-</u> It is conical shaped structure.		
<u>Structure :-</u> Nose is external visible part of respiratory system which is slightly different <external feature> in each individual depending upon the ethmoid bone and the cartilages present in nose. but each nose structure consists of bones, cartilage and fatty-tissue.		
<u>Nostrils :-</u> It is the openings of nose in which air —		

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enters to respiratory tract or tube.		
<u>Nasal cavities</u> :- Each nostril opens to cavities called nasal-cavity which then open into pharynx.		
<u>Nasal septum</u> :- In between two nasal cavities there is a hard cartilaginous wall called internasal septum.		
<u>Mucus and Hair</u> :- Each nasal cavity is lined by ciliated epithelial cells which secrete mucus and also bear hair - and cilia.		
<u>Function of Nose : <mucus and Hair>-</u>		
1- Through nose respiratory gases is enter to respiratory tube		
2- The hair of nose acts a filter to trap large dust particles.		
3- Nose hair also serve as a defense mechanism against the harmful pathogens and solid particles present in the air.		
4- The mucus and cilia filter the air and prevent the entry of foreign particles such as microorganisms, dust, etc.		
5- The mucus also helps in moistening the air to prevents the damage of respiratory surface by dry air.		
6- underneath the mucus-membrane, there are blood - capillaries that help to warm the air (about 30°C), according to internal temperature.		
<u>ii: pharynx</u> : <u>Size</u> :- pharynx is about 4.5 inches long tube.		
<u>Shape</u> :- The Nasal cavities opens to cone-shaped - muscular passage or tube called pharynx.		
<u>Location</u> : the upper end of pharynx is wider which located just below the lower surface of the skull while the lower end of pharynx is narrow which located at the level of the sixth cervical vertebra (C-6). CR - pharynx is located at the base of buccal cavity.		

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<u>Mucus membrane</u>: pharynx is also lined with mucus membrane which keep it moisturize. <u>Regions of pharynx</u>: pharynx has three main regions i.e. 1: <u>Nasopharynx</u>: it is found between the base of the skull and the soft palate. it connected to posterior nasal cavity and functions as air ways. (respiratory function) 2: <u>Oropharynx</u>: it is connected to the oral cavity and involved in swallowing. 3: <u>Laryngopharynx</u>: it is most inferior region of pharynx where the respiratory and digestive system diverge. <u>Functions of pharynx</u>: 1- The mucus of pharynx moisturized the air, warm the air, and trap dusts and solid particles. 2- It regulate the air and food to trachea and oesophagus. iii: <u>Larynx</u>: < sound box / voice box > - <u>Location</u> :- It is a cartilaginous structure - present on the base of pharynx or on the upper end of the trachea. It is also lined with mucus - membrane. <u>Cartilagenous</u> :- The larynx is composed of cartilagenous plates which prevent the collapse of the larynx. <u>Glottis and epiglottis</u> :- The opening of larynx is known as glottis which is gaurded by lid called epiglottis. The epiglottis prevents entry of food or liquid into larynx. <u>Vocal cord</u> : Inside the larynx there are two fibrous bands called - vocal-cords which help in voice production. As air passes through larynx the vocal-cords stretch and produce sound. then sound is changed into word by tongue and Lips.		

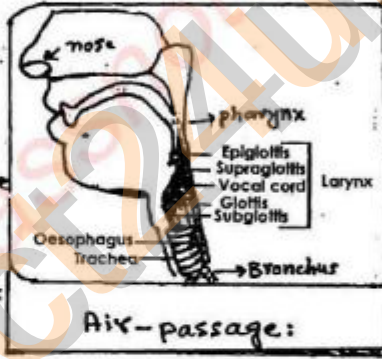
The interconnection of the oral and nasal regions is extremely beneficial in humans. It allows them to breathe through either the nose or the mouth and, when medically necessary, allows food to be passed to the esophagus by nasal tubes.

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Vocal pitch :- Men and women have different vocal cord sizes. This difference in vocal-cord size causes a — difference in vocal-pitch. For example adult males have larger vocal-cords and usually produce low pitched sound, while adult females have small vocal-cord and produce high pitched sound.

Functions of larynx :

- 1- Larynx is a small air-passage — which lined with mucus-membrane that helps in filtration of air.
- 2- Larynx is also called sound box because it produces sound.



Air-passage:

iv: Trachea : <wind pipe> - <ETEA-2007>

Location :- Trachea is a tubular-cartilagenous structure which is also called wind-pipe, lie below the larynx. It is internally lined by ciliated epithelial cells which — produce mucus.

Length :- Trachea is about 11 cm long and 2 to 2.5 cm wide.

Cartilagenous rings :- The trachea bear 16-20 'C' or horse shoe shaped cartilage rings which prevent the trachea from collapsing and keep it open.

Functions of Trachea :

- 1- The mucus of trachea moist and warmth the air.
- 2- Trachea provide a passage for air to move toward lungs.

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3- mucus and cilia of trachea filter the air and protects the respiratory surface from an accumulation of – foreign particles.		
<u>V: Bronchi :</u>		mucus is a viscous fluid composed of water, epithelial cells, dead WBCs, mucin and inorganic salts.
<u>two tubes :-</u> The trachea is divided into right and left bronchi which enters to each lung. Bronchi after entering lungs divide into secondary and tertiary bronchi.		
<u>Right and Left bronchi :-</u> The right bronchus has larger diameter and is shorter while the left bronchus has smaller diameter and is longer.		
<u>Cartilagenous :-</u> Bronchi are cartilagenous air-passage which lined with mucus-membrane.		
<u>Functions of bronchi :</u>		
1- Bronchi (left + right) divided the air for each lung .		
2- Bronchi is also lined with mucus-membrane which filter, moisturized and warmth the air.		
<u>vi: Bronchioles: <ETEA-2012></u>		
<u>location :-</u> The bronchi divided and redivide forming an air way network inside the lungs called bronchioles.		
<u>Non-cartilagenous :-</u> The bronchioles lack cartilage rings or plates but contain circular smooth-muscles and elastic fibres.		
<u>Diameter :-</u> The bronchioles are approximately 1mm or less in diameter.		

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<u>Function of bronchioles</u> :- The bronchioles are responsible for controlling air distribution in the lungs. <u>Vii : Alveoli</u> : (ETEA-2009,2019) <u>air sacs</u> :- The bronchioles divided and redivide and finally open into small collection of air-sac called Alveolar-sacs <u>Alveoli</u> :- Each air-sac contains large number of rounded structures called alveoli, where gases exchange occurs or called sites for gaseous exchange. Each alveolus is made of moist squamous-epithelium which is thin and flattened cells, help in diffusion of gases. <u>Number</u> :- There are over 700-million alveoli present in the lungs, representing a total surface area of 70-90 m. <u>Diameter</u> :- They are only one cell thick i.e - 0.1 μm. <u>Functional unit</u> :- The alveoli are the functional units of lungs because gases exchange occurs in alveoli. Alveoli are internally coated by watery layer thus facilitating the diffusion of gases. <u>Blood capillaries</u> :- on outside of alveoli there is dense network of blood capillaries which provides blood to alveoli for the exchange of gases. <u>Functions of alveoli</u> : 1- Alveoli form the gases exchange sites or surfaces where exchange of respiratory gases occur.		
		

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2- The collagen and elastic-fibres of alveoli allow the alveoli to expand and recoil easily during breathing. 3- Special cells in the alveolus wall secrete a detergent like chemical called surfactant which lowers the surface-tension of the fluid layer of alveoli, as a result reduce the amount of effort needed for breathing. 4- surfactants also help to kill any bacteria which may reach the alveoli. <u>2: A pair of Lung:</u> <u>Number and location :-</u> Human have two lungs (i.e. - one right and one left) which are located in the chest (Thoracic) cavity. In the chest cavity, base of the two lungs is present on diaphragm and the apexes of lungs is extended above the first rib. <u>Membrane : (pleural-membrane) -</u> Each lung is surrounded by two tough, flexible, transparent, thin-membrane called pleural-membrane. pleural - membranes have cavity called pleural-cavity containing pleural-fluid. <u>Function of pleural membrane :</u> 1- The pleural-membrane are filled with fluid which - reduces friction between the lungs and the wall of thorax. 2- It protects the lung from over extension or external - factors. 3- It stops the leakage of air from lungs to the - thoracic cavity.		

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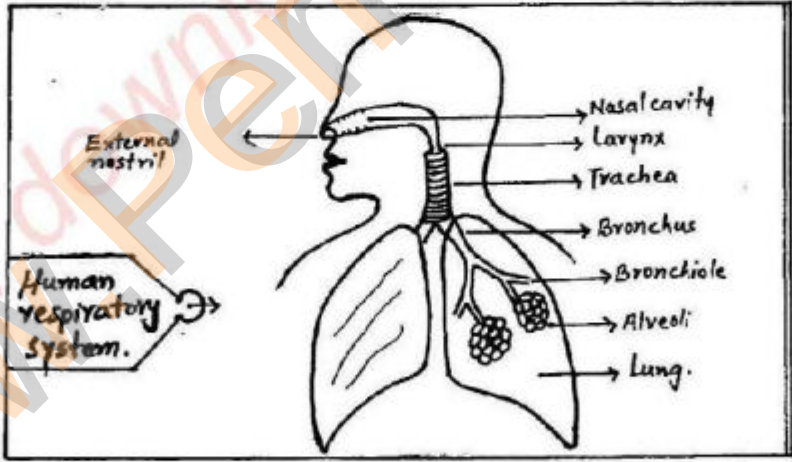
Spongy in nature :- The lungs are spongy because of the presence of millions of alveoli or air sacs.

Right and Left lung :- right and left lungs are slightly unequal in size. i.e. -

- 1- The right lung represents 56% of the total lung volume. The right lung is composed of 3-lobes or sections i.e. - superior, middle and inferior.
- 2- while the left lung is smaller in volume (i.e. - 44%) - because of the asymmetrical position of the heart. The left lung is composed of two lobes i.e. - superior and inferior.

pulmonary artery and vein :

Blood passes to lungs are brought by pulmonary artery and taken away from lungs by the pulmonary vein.



Q4 write a short note on lung volume and capacity.

Answer: Lung volume and Lung capacity :-

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<u>Definition</u> :- The total volume of air that can be taken into the lungs is called is called Lung capacity. —OR— “Lung volume and capacity means volume of air in the lungs at different phases of breathing.”		
<u>Lung capacity</u> :- Total capacity of lung is about 5-Liters in adult human.		
<u>Explanation</u> :- Lung capacity is the combination of following capacities		
<u>1: Tidal air</u> :-		
<u>Definition</u> :- The volume or amount of air that is taken in and given out during breathing at rest condition is called,		
<u>Capacity</u> :- Tidal air capacity is equal to 0.5 Liter. Tidal air.		
<u>2: Complemental air</u> :-		
<u>Definition</u> :- The volume or amount of air that is taken in and given out during severe exercise is called complemental air.		
<u>Capacity</u> :- Complemental air capacity is equal to 3-liter.		
<u>3: Vital capacity</u> :-		
<u>Definition</u> :- The sum of tidal air and complemental air is called vital capacity. —OR— “volume of air which one can accommodate in lungs at any time is called vital capacity.”		
→ vital capacity is different to age and sex of people.		
<u>Capacity</u> :- vital capacity is equal to $0.5 + 3 = 3.5$ liter.		
<u>4: Residual air</u> :-		
<u>Definition</u> :- The volume or amount of air that is left or		

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Remained in the lungs after forced exhalation is called residual air. <u>Capacity:-</u> Residual air capacity is equal to 1.5 Liter. <u>Total lung capacity:-</u> The sum of total of vital air capacity and residual air capacity is called total lung capacity. So, Total lung capacity = vital capacity + Residual air $= 3.5 + 1.5$ lung capacity = 5 Liter		
Q5 Explain the involuntary and voluntary control of breathing.		
<u>Answer: Involuntary and voluntary control of breathing:</u>		
<u>Introduction:-</u> Breathing is autonomic and involuntary process which is controlled by the respiratory centre located in medulla-oblongata. but sometime the involuntary breathing can be modified for a short period by voluntary effects.		
<u>Explanation:</u>		
<u>1: Involuntary control :-</u> Breathing is mainly involuntary process which is not in the will of individual because it occurs continuously during sleeping and unconsciousness.		
<u>controlling centre :-</u> The involuntary breathing centre located in the medulla oblongata of the brain. i.e-		
<u>i-Inspiratory centre :-</u> The Ventral portion of medulla — oblongata acts as inspiratory centre, which controls the		

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rate and depth of inspiration.		
<u>ii- Expiration centre :-</u> The dorsal and lateral portion of medulla oblongata acts as expiratory centre, which — inhibits inspiration and stimulate expiration.		
<u>Mechanism of involuntary control:</u>		
1- Breathing movement occurs due to contraction and — relaxation of intercostal muscles and diaphragm.		
2- First breathing centre (medulla oblongata) sends nerve impulse to intercostal muscles by intercostal — Nerve and diaphragm by phrenic — nerve.		
3- As a result the intercostal muscles and diaphragm contract or relaxe.		
4- Due to movement of intercostal and diaphragm, inspiration or expiration occurs.		
<u>2: Voluntary control :-</u> Normally breathing process is involuntary process, but within limits, the rate and — depth of breathing can be controlled depending on training for it and the physical condition of the person i.e — holding or catching of breath.		
<u>Controlling centre :-</u> The breathing centre for voluntary breathing is cerebral — hemispheres in the brain.		
<u>Mechanism of voluntary control:</u>		
1- There is no specific controlling centre for voluntary breath		
2- But specific impulses originated from cerebral —		

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hemispheres during voluntary breathing. 3- such impulses from cerebral- hemispheres then passed to the breathing centre (medulla-oblongata) for controlling involuntary breathing. 4- But such cerebral hemisphere impulses after short - time diffuse (ended) as a result again involuntary breathing start. Note:- oxygen concentration also effect the breathing rate. For example, if the oxygen concentration is 20% - decrease the rate of breathing also become double. Mcq		
Q6 Describe the mechanism of breathing in man. Answer: Mechanism of Breathing: Beathing definition:- The Inhalation and exhalation of air for intake of oxygen and giving out of CO_2 is - called breathing. (ETEA-2011) Breathing rate :- The rate of breathing rangs b/w 15 to 20 time per-minute during rest conditions, while during exercise breathing rate may be 30 to 40 time/min Breathing control centre :- Breathing is involuntary proces which is controlled by medulla - oblongata of the brain. Mechanism of breathing: < suction - pump mechanism >. Breathing muscles :- The proper breathing involves all the muscles of the head,		

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neck, thorax and abdomen. In addition to the involuntary musculature of the larynx, Trachea and bronchi. But the main muscles of respiration in normal quite-breathing are the intercostal muscles and diaphragm. <u>phases of breathing:</u> The cycle of respiration consists of two phases. i.e - <u>1: Inspiration : <inhalation>- (ETEA-2005)</u> <u>Definition :-</u> The active process in which human taking air (O_2) from their surrounding is called inspiration. <u>Controlling centre :-</u> Inspiration is controlled by inspiratory centre located in the ventral portion of medulla-oblongata. <u>Stimulus :-</u> stimulus for inspiration is the high concentration of carbon-dioxide (CO_2) in blood. <u>Mechanism of inspiration :</u> The following events occurs during inspiration. <u>i- contraction of intercostal muscles :-</u> During inspiration the nerve impulses are sent from inspiratory centre to intercostal muscles through intercostal-nerve. As a result the intercostal muscles of ribs contract, resulting ribs and sternum (chest cavity) move upwards and outwards <u>ii- contraction of diaphragm :</u> During inspiration the nerve impulses are sent from - inspiratory centre to diaphragm muscles through phrenic nerves. As a result the diaphragm-muscles also -		

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contrat, resulting diaphragm move downward and - become less dome shaped $\langle \curvearrowright \rangle$.

iii- Increase lungs volume :- Due the movements of ribs and diaphragm the volume and capacity of thoracic cavity increases in size and the pressure of air inside the chest cavity decreases than the external atmospheric pressure.

iv- Sucking of air :-

Due to increase in the volume of the chest cavity and the decrease of air pressure of the lungs, the air rushes - $\langle$ sucked $\rangle$ from atmosphere into lungs, on the basis of suction-pump-mechanism or diffusion process.

2: Expiration: $\langle$ Exhalation $\rangle$ - (ETEA-2018)

Definition:- The passive process in which human release air (CO_2) to their surrounding is called expiration.

Controlling centre :- Expiration is controlled by - expiratory centre located in the dorsal and lateral portions of medulla-oblongata.

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<u>Stimulus :-</u> Stimulus for expiration is high concentration of carbon-dioxide (CO_2) in blood.		
<u>Mechanism of expiration:</u>		
The following events occurs during expiration.		
<u>i-Relaxation of intercostal muscles:-</u> When the — concentration of CO_2 rises in the blood, expiratory centre of the brain will activated and send nerve impulses to intercostal-muscles. As a result the intercostal muscles of ribs relax, resulting the ribs and sternum (chest-cavity) move downwards and inwards.		
<u>ii-Relaxation of diaphragm :-</u> Due to high concentration of CO_2 in blood, the expiratory centre of the brain also — send nerve impulses to diaphragm-muscles. As a result the diaphragm muscles also relax, resulting the diaphragm move upward and becomes more dome shaped. ($\cap$).		
<u>iii- Decrease Lungs volume :</u> Due to relaxation of ribs and diaphragm, the volume of chest cavity decreases in size and the air pressure inside the chest cavity increases than external atmospheric pressure		
<u>iv-Exhale of air:</u> Due to decrease in the volume of chest-cavity and the increase of air pressure of the lungs, the air (CO_2) is rushes from lungs to atmosphere by diffusion process.		

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Q7 Explain transport mechanism of respiratory gases.		
Answer: Mechanism of transport of gases:		
Introduction:- In human the respiratory gases (O_2 , CO_2) are transported through blood from the lungs to the body tissues and from the body tissues to the lungs. i.e.		
1: Transport of oxygen:		
After breathing process, oxygen is transport from lungs to tissues for cellular respiration in two ways i.e. — through RBC (haemoglobin) and through blood plasma.		
%age of oxygen transport by blood components: (ETEA-2015)		
1: About 97% of oxygen is carried by the red blood — cells in the form of oxyhaemoglobin. The haemoglobin acts as respiratory pigment present in human red blood cells, which has a great affinit for oxygen.		
2: while 3% of oxygen is carried by the plasma of blood in dissolved form. because oxygen is relatively less soluble in the blood, therefore a small amount of oxygen (about 3%) is transported in dissolve state.		
Explanation:		
Oxygen is transported in the following two ways.		
1: Transport of O_2 in the form oxyhaemoglobin:-		
Haemoglobin combine with oxygen to form oxyhaemoglobin. This binding is a reversible reaction which occurs in the alveoli of the lungs in the presence of enzyme called		

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"carbonic-anhydrase". Each molecule of haemoglobin - can bind with four molecules of oxygen.		
<u>Reaction :-</u> $\text{Hb} + 4\text{O}_2 \xrightarrow{\text{Enzyme}} \text{Hb} \cdot 4\text{O}_2$		
<u>Haemoglobin saturation :-</u> Each haemoglobin molecule contains iron-containing four Heme molecules. when all four heme sites are occupied with oxygen, the haemoglobin is said to be saturated. when one to three heme sites are occupied with oxygen, the haemoglobin is said to be partially saturated. So haemoglobin saturation of 100% means that every - heme-unit in all the RBCs (Erythrocytes) of the body is bound to oxygen.		
<u>For example :-</u> In a healthy person with normal haemoglobin-levels, haemoglobin saturation generally ranges from 95-99%.		
<u>Oxygen carrying capacity of blood <Hb> :- (ETEA-2014)</u>		
<u>Definition :-</u> The ability of haemoglobin to bind with O_2 is called oxygen carrying capacity of blood or Hb.		
<u>Explanation :-</u> Oxygen carrying capacity of blood - means how much oxygen can be carried out by - Haemoglobin. The oxygen carrying capacity of blood is directly proportional to the partial pressure of O_2 (PO_2).		
<u>Maximum oxygen carrying capacity:-</u>		
Maximum oxygen carrying capacity of arterial blood is 20 mL / 100 mL of blood (100% saturated) which is -		

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achieved at 100 mm Hg pO_2. This is because the amount of haemoglobin is 15 gms / 100 mL of blood. 1 gm Haemoglobin can bind with 1.34 mL of oxygen. so 15 gms haemoglobin can bind with 20 mL of oxygen. i.e. - $\frac{1.34}{100} \times 15 = 20.10 \text{ or } 20 \text{ mL}$		
<u>2: Transport of oxygen in dissolve form:</u> As compare to CO_2, oxygen is relatively insoluble in the blood, therefore a small amount of oxygen is transported in dissolved state in the blood plasma, from lungs to tissues. <u>Oxygen carrying capacity in dissolve form:</u> maximum oxygen carrying capacity in dissolved form in plasma is 0.3 mL / 100 mL blood, which is achieved at 100 mmHg partial pressure of oxygen : $\langle pO_2 \rangle$ <u>Definition :-</u> Its the individual pressure exerted independ- -ently by a particular gas (e.g- oxygen) within a mixture of gases (air). <u>Explanation :-</u> partial pressure is an important aspect of the binding of oxygen to and disassociation from heme. i.e. when pO_2 increases, a proportionately greater number of oxygen molecules are bound by heme. while the lower the pO_2, the fewer oxygen molecules are bound to heme. Gases travel from an area of higher partial pressure to area of lower		

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partial pressure. partial pressure of oxygen (p_{O_2}) is - different in different parts of the body i.e -		
i: <u>p_{O_2} in lungs</u> :- partial pressure of oxygen (p_{O_2}) in lungs (Alveoli) is 100 mm Hg, which provides highest affinity for oxygen to bind with haemoglobin in lungs as a result oxyhaemoglobin is formed.		
ii: <u>p_{O_2} in tissue</u> :- partial pressure of oxygen (p_{O_2}) in tissues is 40 mm Hg, which provides less affinity for oxygen to bind with Haemoglobin, as a result oxygen releases from haemoglobin at tissue level.		
For example :- (Importance of p_{O_2})		
1- <u>At highly active tissue</u> :- At highly active tissues (such as Muscles) use of oxygen is more for energy production so there is lower partial pressure of oxygen (i.e. 20 mm Hg) while the partial pressure inside the blood-capillaries is about 100 mm Hg which make pressure difference between active tissue and capillaries, as a result a - greater number of oxygen molecules dissociate from - Haemoglobin or blood-capillaries and enter the active tissue.		
2- <u>At lower metabolic tissue</u> :-		
In low metabolic tissues (such as adipose) the p_{O_2} is high due to less use of oxygen. as a result the few oxygen molecules is dissociate from haemoglobin or blood capillaries and enter the tissue interstitial fluid.		

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Lung level: (P_{O_2} - 100 mmHg)

RBC

$\rightarrow$

O_2 combin with Hb form oxy-Hb

tissue level: (P_{O_2} - 40 mmHg)

O_2 - released to tissue-cells.

2: Transport of CO_2 :

Transport ways:- CO_2 is produced as wast-product in metabolism at cells or tissues level. For the removal of such excess of CO_2 from the body, CO_2 is transported in the blood from tissues towards lungs in serval ways or form. i.e -

i: As bicarbonate ions: (ETEA-2014)

% age of CO_2 transport:- about 70% of CO_2 is carried by Sodium (Na^+) of the blood in the form of bicarbonate-ion.

Explanation:

Formation of carbonic-acid (H_2CO_3):

As in tissues CO_2 is constantly produced by metabolism so concentration of carbon-dioxide in cells increases due to which CO_2 diffuses into blood. in the cytoplasm of RBC, CO_2 react with H_2O and form H_2CO_3 in the - presence of an enzyme carbonic-anhydrase. ie -

$$CO_2 + H_2O \xrightarrow{\text{Enzyme}} H_2CO_3$$

Splitting of carbonic-acid:- carbonic acid (H_2CO_3) is unstable compound which quickly split into hydrogen -

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ions $\langle H^+ \rangle$ and bicarbonate ions $\langle HCO_3^- \rangle$ in the presence of enzyme carbonic-anhydrase. i.e.-

$$H_2CO_3 \xrightarrow{\text{Enzyme}} H^+ + HCO_3^-$$

Increase acidity of blood :- after splitting of carbonic-acid the H^+ ions are accumulated in the blood, as a result the pH of blood decrease and acidity increases. Similarly the H^+ -ions combines with haemoglobin to form haemoglobinic-acid which also increases acidity of blood and helps in oxygen releasing from Hb at tissue level. i.e-

$$Hb \cdot 4O_2 + H^+ \xrightarrow{\text{Enzyme}} H^+Hb + 4O_2$$

chloride shifts -or- Hamburger's phenomenon:

Definition :- The phenomenon in which bicarbonates $\langle HCO_3^- \rangle$ move outside and chloride $\langle Cl^- \rangle$ move inside in RBC through special carrier proteins is called chloride shift or Hamburger's phenomenon.

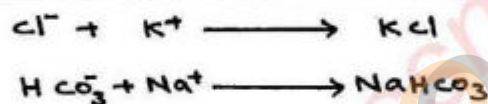
Explanation :-

RBC-membrane has a special bicarbonate-chloride carries proteins which moves the two ions in opposite directions and maintaining the balance of ions on either side of membrane called chloride shifts.

due to chloride shifts the HCO_3^- ions diffuses to the plasma from RBC and Cl^- ions diffuses into RBC

from plasma in opposite direction.

Formation of KCl and NaHCO₃ :- The chloride ions that enters the RBCs combine with potassium (K⁺) to form potassium-chloride (KCl), while bicarbonate-ions in the plasma combines with sodium (Na⁺) to form sodium-bicarbonates (NaHCO₃).



Reverse reaction in lungs :- on reaching the lungs a reverse reaction takes place i.e- bicarbonate (HCO₃⁻) from plasma again enters the RBC and combines with H⁺ ions to form carbonic-acid (H₂CO₃), while chloride ions from RBCs again enters the plasma. i.e -



Then the carbonic-acid in lungs splits into water and CO₂. Such CO₂ then passes out from blood and diffuses into the alveoli of lungs, from where CO₂ is exhaled.

partial pressure of CO₂ (pCO₂) :-

Transport of CO₂ depends on the partial pressure of CO₂ i.e-

1: The partial pressure of CO₂ (pCO₂) is highest at tissue level which helps of the blood in drawing of CO₂ from tissues.

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2: While the partial pressure of CO_2 (pCO_2) in lungs is low which helps in releasing of CO_2 from blood into lungs

ii: As carboxyhaemoglobin:

%age of CO_2 transport :- about 23% of CO_2 is transported in the form of carboxyhaemoglobin from the tissues to - lungs, where the carboxyhaemoglobin dissociates into CO_2 and haemoglobin in the presence of high oxygen - tension or concentration.

Formation of carboxyhaemoglobin :- CO_2 combines with haemoglobin, as a result carboxyhaemoglobin is - formed. This reaction depends on the partial pressure of CO_2 i.e. -

1- pCO_2 in tissues :- The partial pressure of CO_2 is higher in the tissues (i.e. 45 mm Hg) which helps in combination of CO_2 and haemoglobin, as a result - carboxyhaemoglobin is formed.

2- pCO_2 in lungs :- The partial pressure of CO_2 is low in the lungs (i.e. 40 mm Hg) which helps in dissociation of CO_2 from haemoglobin, as a result carboxy-Hb release CO_2 in lungs, from where CO_2 is exhaled.

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iii: <u>As dissolved CO_2 in plasma:-</u> (ETEA-2016) <u>Introduction:-</u> A small amount or %age of CO_2 is — dissolved in blood-plasma which is then transported from tissues to lungs for exhalation. This process is an inefficient way to carry CO_2, however this also occurs. <u>%age of CO_2 dissolved in plasma:</u> about 7% of CO_2 is carried from tissues to lungs in dissolved form in plasma.		
Q8 Describe the role of respiratory pigments in transport and storage of respiratory gases.		
<u>Answer: Respiratory pigments:</u>		
<u>Definition:-</u> Those protein-molecules which are — involved in the transport or storage of respiratory gases are known as respiratory pigments.		
<u>Types of respiratory pigments:-</u> In human there are two types of respiratory pigments. i.e.—		
<u>1: Haemoglobin:-</u> (ETEA-2010, 2013)		
<u>Meaning:-</u> The name haemoglobin is derived from the words — “Hemo and Globin” which means that each subunit of haemoglobin is a globular-protein with an embedded heme group (iron containing porphyrin).		
<u>Definition.-</u> Haemoglobin is a red protein responsible for transporting oxygen in the blood of vertebrates.		

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<u>Occurance :-</u> The haemoglobin is present in the RBCs in almost all vertebrates. In the invertebrates, they are found in the plasma, coelomic fluid and haemoglobin - containing cells. <u>Amount of Haemoglobin in blood :-</u> The amount of Hb is 15 gms per 100 ml of blood. a single RBC contains as many as 200-million molecules of haemoglobin. <u>Structure of Hb: (ETEA-2018)</u> 1- Haemoglobin is a quaternary protein structure, made up of four protein-molecules or globulin-chains (containing 574-amino acids), that are connected together by hydrogen bonds. 2- The normal adult haemoglobin-molecule contains two Alpha-globulin-chains (each of 141-amino acids) and two Beta-globulin-chains (each of 146-amino acids). 3- Each globulin chain contains an important central structure called the heme-molecule (prophyrin ring). 4- ^{one} Iron is embedded with each heme-molecule which has a vital role in transporting of O_2 and CO_2 in our body. <u>Functions of Haemoglobin :</u> 1- Haemoglobin is the protein molecule in RBCs which carries oxygen from lungs to the body-tissues. 2- Similarly on return, haemoglobin carries CO_2 from the tissues back to the lungs.		

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3- Haemoglobin also plays an important role in maintaining the shape of the red blood cells (Hb make 96% body of RBC).

4- The iron present in haemoglobin is also responsible for the red colour of blood or RBCs.

2: Myoglobin : (ETEA- 2009, 2012, 2013)

Definition :- myoglobin is a red protein containing iron, which carries and stores oxygen in muscle-cells.

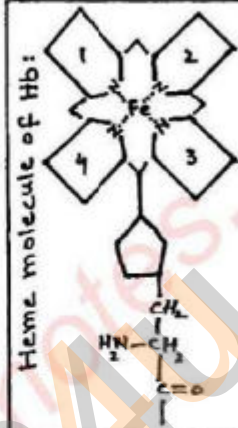
Occurance :- myoglobin is found in abundance in the skeleton-muscles of vertebrates and is responsible for the characteristics red-colour of muscle-tissues.

Structure of myoglobin :

- 1- myoglobin is single chain globular protein structure, consists of - 153 - amino acids.
- 2- myoglobin contains heme group at the centre, surrounded by globulin folds (apoprotein)
- 3- It has 8- α helices and a hydrophobic core or - insoluble core.
- 4- It has a molecular weight of 16700 daltons.

Functions of myoglobin :-

- 1: myoglobin is the primary oxygen-carrying pigment



Heme molecule of Hb:

1- myoglobin is single chain globular protein structure, consists of - 153 - amino acids.

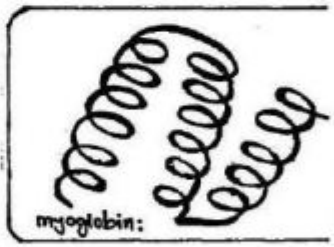
2- myoglobin contains heme group at the centre, surrounded by globulin folds (apoprotein)

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4- It has a molecular weight of 16700 daltons.

Functions of myoglobin :-

- 1: myoglobin is the primary oxygen-carrying pigment



myoglobin:

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of muscle-tissues, receives oxygen from the red - Blood cells (Hb) and transports it to the mitochondria of muscle cells. 2: It is also known as oxygen storage pigment because myoglobin stores oxygen and transports them called intracellular oxygen storage site. 3- It is also responsible for red-colour of muscular tissues		
Note :- MCQs 1: Haemoglobin is respiratory pigment of all vertebrates. 2: while invertebrates have diff; respiratory pigments. For example :- Haemocyanin is a respiratory pigment in molluscs, Haemoerythrin in some marine-animals and chlorocruvin in annelids, act as respiratory pigments.		
Q 9 state the causes, symptoms and treatment of upper respiratory disorders.		
Answer : upper respiratory disorders :		
Definition :- The problems or diseases of upper portion of respiratory-tract are known as upper Resp; disorders.		
Example of upper respiratory diseases :		
1: Sinusitis :-		
meaning :- "sinus" mean cavity or hollow, "itis" mean inflammation.		
Definition :- Sinusitis is an inflammation or swelling of the tissue lining (membranes) the sinuses.		
Sinuses :- A sinuses is holes (air filled spaces) in the		

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Skull (blw facial bones) which are connected with nasal air way. The sinuses are lined with mucus-membrane which protects the respiratory tract from microbes or infections, because such membrane secrete mucus which contains antibodies.		
<u>Type of sinuses</u>:- Human have 4-pair of sinuses. i.e.-		
1- <u>Frontal sinus</u>:- It is present in forehead.		
2- <u>Maxillary sinus</u>:- It is present behind cheeks.		
3- <u>Ethmoid sinus</u>:- It is present between the eyes.		
4- <u>Sphenoid sinus</u>:- It is present in deep behind the ethmoids		
<u>Types of sinusitis</u>:- sinusitis have the following two types.		
i: <u>Acute sinusitis</u>:- In acute sinusitis the symptoms are present for short time (i.e- 2 to 8 weeks) and mostly caused by bacteria.		
ii: <u>Chronic sinusitis</u>:- In chronic sinusitis the swelling and inflammation of sinuses present for long time and may be cause by bacteria or fungi.		
<u>Causes of sinusitis</u>:-		
1- Sinusitis is usually caused by bacteria, viruses or fungi.		
2- When sinuses are blocked and filled with fluid, germs can grow and cause an infection.		
3- It may also be caused by allergic reaction, dust, pollen.		
<u>Risk factors of sinusitis</u>:		
1: Blockage of drainage ducts.		

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2: Nasal mucus-membrane swelling as from a common cold. 3: Immune deficiencies or taking medication that — suppress the immune system. 4: In children, common environmental factors which — contribute to sinusitis include — Allergies, illness from other children, bottle drinking while lying on one's back, smoke, excessive dryness in homes. 5: In adults the contributing factors are most frequently infections and smoking or excessive dryness.												
<u>Symptoms of sinusitis</u> :- symptoms of sinusitis includes —												
<table border="0"><tr><td>1- Headache and Fever.</td><td>2- Facial pain and coughing.</td></tr><tr><td>3- Irritation in nasal cavity.</td><td>4- Nasal obstruction.</td></tr><tr><td>5- Nasal discharge.</td><td>6- loss of smell.</td></tr><tr><td>7- pus like nasal discharge.</td><td>8- Bad breath, Fatigue.</td></tr><tr><td colspan="2">9- Entering of nasal fluid in throat which cause sore throat.</td></tr></table>			1- Headache and Fever.	2- Facial pain and coughing.	3- Irritation in nasal cavity.	4- Nasal obstruction.	5- Nasal discharge.	6- loss of smell.	7- pus like nasal discharge.	8- Bad breath, Fatigue.	9- Entering of nasal fluid in throat which cause sore throat.	
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9- Entering of nasal fluid in throat which cause sore throat.												
<u>Treatment of Sinusitis</u> :-												
<u>1: Self care</u> :- i: inhale steam 2 to 4 time per day. ii- Apply a warm, moist, wash cloth to face several times — a day. iii- Spray with nasal-saline several time per day.												
<u>2: Medication</u> :- i- Bacterial sinusitis is usually treated with antibiotic-therapy. e.g- Sulfonamide antibiotics or sulfa drugs. ii- Early treatment of allergic- sinusitis may prevent Secondary sinus-infections.												

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iii- Nasal corticosteroid spray and anti-histamines are used to decrease swelling. iv. Nasal decongestants for opening the blocked spaces. <u>3: Surgery</u> :- most fungal sinus-infection need surgery. <u>2: Otitis Media</u> : (ETEA-2017) <u>Other Name</u> :- otitis media is also called middle ear infection <u>Definition</u> :- The inflammation of middle ear cavity is called otitis media or middle ear infection. <u>victim</u> :- Ear infections are more common in children than adults, because the eustachian-tube in children is narrow, small in size and horizontal-position. <u>Eustachian tube</u> :- The eustachian-tubes are a pair of narrow tubes — which run from each ear toward high in the back of the throat, behind the nasal-passage. <u>Function</u> :- The eustachian tubes in throat open and close to regulate — air pressure in middle ear, refresh air in the ear and drain normal secretion from the middle ear. <u>Causes of otitis media</u> : 1- Ear infection is usually caused by — Bacteria or viruses which enter into the body through nose & mouth 2- Blockage of the eustachian tube may also cause it. 3- Nutritional deficiency is also cause this infection.		

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4- Some time middle ear is filled with fluid if you have a viral-infection (e.g- cold), as a result — eustachian tube gets swollen or blocked and fluid cannot drain away.

Risk factors of otitis media :-

- 1- children between the age of 6-months and 2-years are more susceptible to ear infection.
- 2- Respiratory infection or allergies may also increase the risk of such disease.
- 3- Some time the babies ear and throat anatomy is not fully developed which increases the risk of such infection.
- 4- air-pollution. 5- crowded environment.

Symptoms of otitis media:

1: Symptoms in children :- Symptoms common in children are-

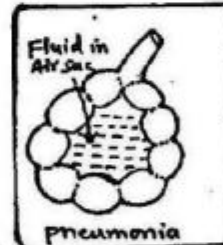
i- pulling at an ear.	ii- Difficulty in sleeping.
iii- headache.	iv- Fever of 100°f or higher.
v- Loss of balance.	vi- loss of appetite.
vii- Ear pain, especially when lying down.	
viii- Acting more irritable than usual.	
ix- Drainage of fluid from the ear.	

2: Symptoms in adults :- common symptoms in adults include-

i- Ear pain.	ii- Drainage of fluid from the ear.
iii- Diminished (loss) hearing (deafness).	
iv- difficulty in speaking. v- ringing in the ear.	

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vi- occasionally, the eardrum bursts, releasing pus and relief of pain. <u>Treatment of otitis media :-</u> most of otitis-media <around 80%> resolve within 3 or 4-days without - treatment. The perforated eardrum heals on its own with no need of treatment. But in chronic-infection the following treatment options are advised -. <u>1: Medications.:</u> i- Antibiotics may be used in chronic infections. ii- To reduce pain, painkillers should be used. iii- prescription eardrops may provide additional pain relief for those whose eardrums are intact or perforated. <u>2: Surgery: < Myringotomy >-</u> A myringotomy is a surgical procedure where the - Surgeon makes a tiny cut or hole into the eardrum. This can help to relieve pressure on the middle ear and allows the surgeon to drain away excessive fluid inside the middle ear. <u>Q10</u> State the causes, symptoms and treatment of lower respiratory tract disorders. <u>Answer: Disorder of lower respiratory tract:</u> <u>Definition :-</u> The problems or diseases associated with lower tract of respiratory system is called disorder of lower Resp; tract.		

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Example : 1: pneumonia : Meaning :- 'pneumon' mean lung, 'onia' mean Fever. Definition :- pneumonia is an Infection that inflames the air-sacs in one or both lungs due to pus or fluid accumulation. Causes of pneumonia :- 1- There are about 30-different causes of pneumonia but usually the pneumonia is caused by bacteric. (e.g. - streptococcus, mycoplasma) , viruses (e.g. - influenza, Rsv, corona) or fungal-infections. 2- These microbes enter into body through nose, mouth and eyes. if immune system is not strong enough then such microbes spread into lungs. The alveoli become filled with fluid and pus due to infections. Such person feels difficulty in breathing and become sick. Risk factors of pneumonia: 1: pneumonia can affect anyone. But the two age groups at highest risk are — infants and children younger than 2-years, because their immune-systems are still developing and people older than age-65. 2: other risk factors include — certain chronic diseases (such as — asthma, heart diseases) , weakend or supressed immune-system.		



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<u>Transmission</u> - The pneumonia-infection spread by - droplet mode i.e- coughing and sneezing.		
<u>Symptoms of pneumonia</u> :		
The symptoms vary, depending on the type of pneumonia and the individual. The general symptoms are -		
1- chills, headache, sharp chest and difficulty in - breathing occurs in the start of disease.		
2- Fever upto 103°F - 105°F in start of infection.		
3- initially dry cough, which later on becomes tenacious <adhering> with rusty coloured sputum.		
4- consolidation of lung takes place. <hardening of lungs>.		
5- accumulation of blood and fluid in lungs at later stage.		
6- Bluish colour of Lips and nail beds.		
7- Sometimes nausea or vomiting due to rise in temperature.		
8- Rapid pulse rate. 9- muscle-pain, sweating. etc.		
<u>Complications</u> :-		
if pneumonia is not treated timely, some complications may arise that include -		
1: <u>pleural effusion</u> :- in which fluid accumulated around the lungs.		
2: <u>Empyema</u> : in which pus is accumulated in the - pleural-cavity.		
3: <u>Hyponatremia</u> :- in which sodium level become low in blood.		
4: <u>Abscess</u> :- A painful area of inflamed tissue that is filled with pus is called abscess.		

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<u>Treatment of pneumonia :</u>		
<u>1- self care :-</u>		
i- Take entire course of any prescribed medicines.		
ii- Stay at home from school or work until after temperature returns to normal and stop coughing up mucus.		
iii- Drink plenty fluids , especially water.		
iv- complete bed rest.		
<u>2- Medication :-</u>		
i- To treat bacterial pneumonia, related antibiotic should be used.		
ii- To treat viral pneumonia, antiviral drugs should be used.		
iii- Fever reducers are given to normalize the temperature.		
iv- anti cough syrups are used to reduce the cough.		
<u>Prevention :-</u>		
i- get proper pneumonia vaccination.		
ii- maintain proper hygienic conditions.		
<u>2: Tuberculosis : (T.B)</u>		
<u>meaning :-</u> 'Tuberculum' mean swelling, 'Osis' mean condition		
<u>Definition :-</u> Tuberculosis is an infectious pulmonary condition in which the formation of tubercles in the lungs takes place with coughing and difficulty in breathing.		
<u>Causes of T.B :</u>		
Tuberculosis is caused by bacteria known as — mycobacterium—Tuberculosis. T.B infection begins when these bacteria reach the alveoli of lungs. They attack and replicate within the phagosome (vacuole) of —		

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alveolar-macrophage (WBC). when such macrophages (WBC) cannot digest these bacteria, as a result they destroy the phagosome and now macrophages are - unable to defend alveoli and thus T.B is caused i.e. - the lungs cells produce tubercles (swellings).		
<u>Risk factors of T.B:</u> Any one can get T.B. you are at higher risk if you- 1- Have Lived, worked or travelled in countries where T.B is common. 2- close contact with some one with T.B. 3- have AIDS or weak immune system. 4- Living in crowded housing or environment. 5- had T.B in the past, but did not get proper treatment for it.		
<u>Transmission of T.B:</u> - The T.B infection easily transmitted through droplet mode i.e. - coughing, sneezing.		
<u>Symptoms of T.B</u> :- signs usually don't appear until the disease get severe. 1- cough due to infection in lungs. 2- Evening rise of body temperature is the specific sign. 3- Night sweats is also a specific sign of T.B. 4- initially the cough is dry in nature, later on it becomes productive with rusty sputum. 5- poor appetite and loss of energy. 6- chest pain is present in most cases.		

Tidbit
About 15 percent of TB patients may develop the disease in an organ other than the lung, such as the lymph nodes, GI tract, bones and joints.

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7- loss of weight takes place day by day. 8- Blood sputum can be seen in develop cases. 9- Tubercles in the lungs are formed in later stage. 10- As the disease advances, lung is destroyed. <u>Treatment of T.B:</u> <u>1: self care:</u> i- make sure that the patient completes its course of treatment. ii- provide nutritious food and pleasant environment. <u>2: Medication :-</u> i- Anti-tuberculosis drugs are used to combat the - infection effectively e.g-isoniazid, Rifampicin, etc. ii- Fever reducers should be given to reduce body temp; iii- Anti-cough syrups are given for rest. <u>prevention :-</u> 1- BCG-vaccines (anti-T.B-vaccines) must be - administered in child-hood. 2- use pasteurized and properly boiled milk. 3- Isolation of the T.B-patient is necessary. 4- Improving hygienic conditions and housing.		
<u>Q11</u> write the different disorders of lungs.		
<u>Answer: Disorders of lungs:</u>		
<u>Definition :-</u> The problems or diseases associated with lungs is known as lungs-disorders or diseases.		

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Example : 1- Emphysema :

Meaning :- "Emphysis" mean dilation, "Ema" mean sac.

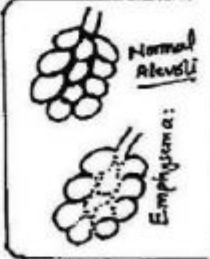
Definition :- It is respiratory disorder in which air-sac (alveoli) become enlarged and lack flexibility due to the damaged or break-down of alveoli-walls.

Causes and risk factors :

- 1- The main cause of emphysema is long term exposure to airborne irritants including-Tobacco smoke, air-pollution, marijuana smoke, etc.
- 2- Some time due to bronchitis disease the airway become narrow, result the person inhale the air with great force which leads to accumulation of air-particles or antigens around the internal wall of alveoli. These antigens are detected by immune system and - produce antibodies, which digest elastic-fiber in alveoli; Leading to loss of elasticity of alveoli, As a resulting the person starts forceful Inhalation which causes bursting of alveoli.
- 3- Rarely, emphysema is caused by an inherited deficiency of a protein that protects the elastic - Structures in the lungs.

Symptoms of emphysema:

- 1- main symptom of emphysem is shortness of breath with exertion (effort).



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2- coughing is also common sign during emphysema. 3- Lips or finger-nails turn blue (cyanosis) due to lack of O_2. 4- Due to breakdown of alveoli wall, large cavities or - surfaces are formed which reduce the gases - exchanging surface area. 5- Fatigue, weakness, chest tightness and wheezing. 6- increase in mucus production. <u>Treatment of Emphysema:</u> 1- Bronchodilators - drugs can help to relieve coughing, shortness of breath. 2- corticosteroid drugs inhaled as aerosol spray may help to relieve shortness of breath. 3- In case of bacterial infection, antibiotics are given. 4- nutrition therapy should be advised to gain weight. 5- Supplemental oxygen, if you have low oxygen level. <u>prevention :-</u> The effects of emphysema are permanent and irreversible, however if a person stop smoking soon, the further damage might be reduced. <u>2: Lung cancer:</u> <u>Definition :-</u> It is a respiratory disease characterized by uncontrolled cell-growth in tissues of the lungs. <u>Explanation :-</u> During smoking different carcinogenic - chemicals and tar penetrate into epithelium of airways		

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or lungs and finally reach to nucleus (DNA) which - cause mutation in genes, resulting the mutant-cells of lungs continue to divide without any control and form tumors (mass of abnormal cells). If it spread from its starting area then it is called as cancer.

Causes and risk factors:

The most causes of lung cancer are-

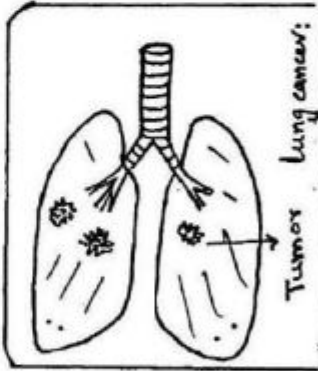
- 1- cigarette smoking. (about 90% cause).
- 2- industrial carcinogens.
- 3- air pollution.
- 4- Radiation
- 5- Viral infections.
- 6- Exposure to radon gas. (produce by natural breakdown of uranium in soil, rock and water).
- 7- Family history of lung cancer.

Symptoms of lung cancer:

In it early stages the lung-cancer does not show any symptoms. However in the advance stage when it has - fully spread, it is very painful and show the following symptoms.

- 1- A new cough that doesn't go away
- 2- changes in a chronic cough or smoker's cough
- 3- constant chest pain.
- 4- shortness of breath.
- 5- coughing with sputum or blood.
- 6- Repeated problems with pneumonia or bronchitis.

Lung cancer is one of the most common causes of the world. The most prone region for lung cancer are bronchi.



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7- Swelling of the neck and Face. 8- loss of appetite, weight loss, Fatigue and bone pain. 9- pain in shoulder and arms are the symptoms of lung cancer. <u>Treatment of lung cancer:</u> Treatment of lung cancer depends upon the type and - stage of cancer but usually treatment includes- <u>1- surgery :-</u> There is no specific treatment of lung - cancer, however the infected area can be removed surgically. <u>2- chemotherapy :-</u> Treatment of cancer through diff; anti-cancer drugs is called chemotherapy. <u>3- Radiation-therapy :-</u> destruction of cancer cells by means of radiation or rays is called radiotherapy. <u>prevention :</u> There is no sure way to prevent lung cancer but you can reduce your risk if you - 1- Don't smoke. 2- Avoid carcinogens at work. 3- Regular exercise. 4- Eat a diet full of fruits and vegetable.		
Q12 write the different effects of smoking on the - respiratory system.		
<u>Answer: Effects of smoking on the respiratory system:</u>		
<u>Introduction :-</u> Smoking can have major biological effects on the human body. Tobacco smoke contains over 400- different chemicals, out of which at least 69- chemicals		

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are carcinogenic (cancer causing agent) and many are pois- -onous.		
<u>Negative effects of Smoking :</u>		
1: Smoke from cigarettes contain tar which sticks to the cilia in our respiratory tract, as a result the cilia cannot work properly.		
2: with the very first inhalation of smoke, the beating of the cilia slows. with time, the cilia becomes paralyzed.		
3: The loss of cilia function leads to the development of smoker's -cough.		
4: Smoker's cough Lead to chronic bronchitis.		
5: mucus production increases and the lining of the bronchioles thicken, causing breathing difficultly.		
6: The bronchioles lose elasticity and are no longer able to absorb the pressure within the alveoli, enough to rupture the delicate alveolar walls, as a result Emphysema develops.		
7: The burst alveoli causes -cough, fatigue, shortness of breath.		
8: Simultaneously with the structural changes in lungs, as a result the lung cancer is developed.		
9: Due to smoking, irritation may develop in trachea & larynx.		
10: Smokers get seriously ill more easily than non-smoker.		
Some of these sickness are - Bronchitis, Emphysem, lung-cancer. etc.		
End		

Exercise

Exercise MCQs

A. Multiple Choice Questions (MCQs).

1. The distribution of air into lungs is controlled by
 - a. Bronchi
 - b. Bronchioles
 - c. Air sacs
 - d. All of these
2. Presence of cartilaginous ring in respiratory tract act as
 - a. Support
 - b. Keep passage open
 - c. Prevent collapsing
 - d. All of the above
3. Major contribution in inhalation by
 - a. Diaphragm
 - b. Intercostal muscles
 - c. Sternum
 - d. None of these
4. When the human blood leaves the capillary bed of the tissue, most of the carbon dioxide is in the form of:
 - a. carbonic acid
 - b. bicarbonate ions
 - c. carboxylic acid
 - d. carbon monodioxide
5. BCG vaccine is used for
 - a. Lung cancer
 - b. Tuberculosis.
 - c. Pneumonia
 - d. emphysema
6. The permanent and irreversible destruction of alveoli is
 - a. Emphysema
 - b. Tuberculosis.
 - c. Pneumonia
 - d. otitis media
7. Isoniazid and rifampicin are used for the treatment of
 - a. Tuberculosis.
 - b. Pneumonia
 - c. Emphysema
 - d. Otitis media
8. One of the following event is not associated with the activity of expiration:
 - a. contraction of diaphragm
 - b. more dome like shape of diaphragm
 - c. back ward & down ward movement of rib cage
 - d. relaxation of intercostal muscles
9. Oxygen carrying capacity of blood does not depend upon:
 - a. partial pressure of CO₂
 - b. partial pressure of O₂
 - c. height from sea level
 - d. quantity of blood
10. When haemoglobin of the blood is fully saturated with oxygen, the 100cc of blood contains.

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a. 15cc of oxygen b. 20cc of oxygen c. 25cc of oxygen d. 10cc of oxygen																				
11. The wall of the trachea (windpipe) and bronchi of man is furnished with a series of incomplete: a. cartilaginous plates b. chitinous rings c. cartilaginous rings d. muscular rings																				
12. What does not happen during inspiration. a. intercostal muscles contract b. ribs are elevated c. diaphragm becomes dome-shaped d. ribs move forwards																				
13. The lateral walls of the chest cavity of man are composed of the: a. ribs and trachea. b. intercostal muscles c. ribs & intercostal muscles d. ribs, intercostal muscles & diaphragm																				
14. When the human blood leaves the capillary bed of the tissue, most of the carbon dioxide is in the form of: a. carbonic acid b. bicarbonate ions c. carboxylic acid d. carbon monodioxide																				
15. Which sequence of organs is correct in air passageway of man? a. nasal cavities, larynx, pharynx, trachea, bronchi b. nasal cavities, pharynx, trachea, larynx, bronchi c. nasal cavities, pharynx, larynx, bronchi, trachea d. nasal cavities, pharynx, larynx, trachea, bronchi																				
16. Which part of the air passage way possesses cartilage plates in its wall? a. bronchioles b. distal region of bronchi c. proximal region of bronchi d. trachea																				
17. Human lungs are spongy due to the presence of millions of: a. bronchi b. alveoli c. bronchioles d. trachea																				
18. Which event is not associated with the activity of expiration? a. contraction of diaphragm b. more dome like shape of diaphragm c. back ward & down ward movement of rib cage d. relaxation of intercostal muscles																				
Answer:(key) <table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tbody> <tr> <td>1-b</td> <td>2-d</td> <td>3-b</td> <td>4-b</td> <td>5-b</td> <td>6-a</td> </tr> <tr> <td>7-a</td> <td>8-a</td> <td>9-d</td> <td>10-b</td> <td>11-c</td> <td>12-c</td> </tr> <tr> <td>13-c</td> <td>14-b</td> <td>15-d</td> <td>16-b</td> <td>17-b</td> <td>18-a</td> </tr> </tbody> </table>			1-b	2-d	3-b	4-b	5-b	6-a	7-a	8-a	9-d	10-b	11-c	12-c	13-c	14-b	15-d	16-b	17-b	18-a
1-b	2-d	3-b	4-b	5-b	6-a															
7-a	8-a	9-d	10-b	11-c	12-c															
13-c	14-b	15-d	16-b	17-b	18-a															

chapter-14	48	Respiration
Short Questions		
Q1:	- what are the risk factors and causes of Tuberculosis	
	<u>Answer:-</u> See Question No-10 (write only cause + risk Factors of T.B)	
Q2:	- state the signs and symptoms of otitis media.	
	<u>Answer:-</u> See Question No-9. (write only symptoms of part-2: otitis media).	
Q3:	- Describe the role of respiratory pigments in human.	
	<u>Answer:-</u> see Question No-8. (write only-definition, occurrence and function of Haemoglobin and myoglobin).	
Q4:	- Give any two factors that affect the oxygen - carrying capacity of blood.	
	<u>Answer: Factors that affect the O_2 carrying capacity:</u>	
	<u>1: concentration of oxygen (PO_2):</u>	
	The concentration of oxygen helps its combination to haemoglobin. At the lung-level the oxygen concentration is more, so more oxygen will bind to haemoglobin, while at tissue-level the oxygen concentration is less so oxygen is dissociated from haemoglobin.	
	<u>2: concentration of CO_2 (PCO_2):</u>	
	Increased CO_2 -concentration, decreases the oxygen - carrying capacity of haemoglobin. so, at the tissue level the concentration of CO_2 is more which helps in the releasing of oxygen from haemoglobin.	

Chapter-14	49	Respiration
Q5:	- To what extent human body can have the involuntary control of breathing?	
	<u>Answer</u> :- see Question No-5. (write only involuntary control -	
Long Questions		
Q1:	- Describe the structure of human respiratory system.	
	<u>Answer</u> :- see Question No-3.	
Q2:	- Describe the mechanism of breathing in man.	
	<u>Answer</u> :- see Question No-6.	
Q3:	- Describe the role of respiratory pigments in transport and storage of respiratory gases.	
	<u>Answer</u> :- See Question No-8.	
Q4:	- State the causes, symptoms, and treatment of any one disorder of lower respiratory tract.	
	<u>Answer</u> :- See Question No-10. (write only one - disease or example of low respiratory disorder).	
End		

chapter-14	50	ETEA- MCQs
Previous Entry Test MCQ's of Biology Chapter No -14: (Respiration)		a) More the rate of respiration b) Less the rate of respiration c) Rate of respiration as nothing to do with size of animal d) None of these
2005 ETEA		2011 ETEA
1. During inspiration the: a) Chest wall is raised and diaphragm is lowered b) Chest wall is raised and diaphragm is also raised c) Chest wall is lowered and diaphragm is raised d) Chest wall is lowered and diaphragm is also raised		8. The rate of breathing of a child of 5- year is about: a) 44 times/minute b) 40 times/minute c) 25 times/minute d) 20 times/minute
2007 ETEA		2012 ETEA
2. The cartilage present in trachea is: a) Fibrous b) Hyaline c) Elastic d) Neurotic		9. Myoglobin combines with: (a) Four oxygen molecules (b) Three oxygen molecules (c) Two oxygen molecules (d) One oxygen molecule
2009 ETEA		10. Following nasal passages are composed of cartilage except: a) Trachea b) Bronchus c) Bronchioles d) Tracheoles
3. Alveoli are absent in: a) Fishes b) Amphibian c) Birds d) Mammals		2013 ETEA
4. A coiled hemoglobin is called: a) Haemocyanine b) Hemoprotein c) Myoglobin d) Hemorrhoids		11. A single molecule of hemoglobin is composed of: (a) Three polypeptide chains (b) Four polypeptide chains (c) Five polypeptide chains (d) Six polypeptide chains
2010 ETEA		12. Myoglobin is found in: a) Bone b) Connective tissue c) Muscles d) Cartilage
5. The center of porphyrine in the head region of hemoglobin is occupied by: a) Iron b) Magnesium c) Sodium d) Potassium		2014 ETEA
6. Rhythmicity of respiration is maintained by: a) The cardiac center b) Pons c) Ventilation center d) Carotid sinus		13. The oxygen carrying capacity of hemoglobin in human when blood is 100% oxygenated is:
7. Smaller the animal:		

Chapter-14

51

ETEA-MCQs

a) 19.4ml b) 19.6ml
c) 20ml d) 22ml

14. Which of the following ions play important role in the transport of carbon dioxide?

a) Sodium b) Potassium
c) Bicarbonate d) Chloride

2015 ETEA

15. Amount of O_2 carried by red blood cells is:

a). 77% b).90%
c). 87% d). 97%

2016 ETEA

16. Percentage of CO_2 carried by plasma is.

a) 5% b) 6%
c) 7% d) 8%

2017 ETEA

17. Otitis media is an inflammation of which part of the body?

(a) Brain (b) Middle ear
(c) Lungs (d) Urinary tract

18. Of 100ml of Arterial blood, oxygen provided to the tissues is:

(a) 2ml (b) 3ml
(c) 4ml (d) 5ml

2018 ETEA

19. Expiratory centre in medulla is:

(a) Dorsal (b) Ventral
(c) Lower part (d) All of them

20. The centre of porphyrin in the head region of haemoglobin is occupied by:

(a) Potassium (b) Sodium
(c) Magnesium (d) Iron

2019 ETEA

21. The alveoli represent the total surface area of:

(a) 10-30m (b) 30-60m
(c) 70-90m (d) 90-110m

Key: -

1. a	2. b	3. c	4. c	5. a	6. b
7. a	8. c	9. a	10. c	11. b	12. c
13. c	14. c	15. d	16. c	17. b	18. d
19. a	20. d	21. c			

Note:

In Entry Test (NMDCAT) 2020, no single MCQs included from chapter no- 14 (respiration).

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