13 Human Respiration

13.0 : Introduction :

Q.1. Define respiration. Give the equation to represent the process of respiration.

Ans: Respiration:

Respiration is the intracellular biochemical process of oxidation in which complex organic substances (foods) are broken down stepwise to release energy in small packets to synthesize ATP,releasing CO2 as by product.

Energy released during respiration is incorporated in the form of ATP (Adenosine Triphosphate). In ATP, energy is stored in the high energy phosphate bond.

Equation for the process of respiration:

$$C_6H_{12}O_6 + \xrightarrow{\text{Respiration}} 6CO_2 + 6H_2O + 38ATP$$

Q.2. How are respiratory organs, blood and the body cells involved in respiration?

Ans: i. In respiration, respiratory organs supply oxygen and remove water and carbon dioxide.

ii. Blood transports the gases from the respiratory organs to the tissue cells and vice versa.

iii. Body cells oxidize the food and produce energy.

13.1 : Respiration in animals :

Q.3. Name some organisms where cutaneous respiration takes place.

Ans: Earthworm,leeches and frog are the animals in whom cutaneous respiration takes place.

Q.4. Give an account of respiratory organs from lower organisms to higher organisms.

Ans: Unicellular organisms – These organisms exchange gases directly through cell membrane.

Sponges and jelly fishes exchange gases directly from surrounding water.

Flatworm and annelids – these organisms use their outer covering for respiration.

Some arthropods, annelids, fishes use their gills for respiration.

Amphibians use their skin for respiration.

Some terrestrial animals like cockroaches use trachea for respiration.

Sr. No.	List of organisms	Respiratory organs used
i.	Unicellular organisms	Cell membrane
ii.	Flatworm and annelids	Outer covering
iii.	Arthropods, fishes, annelids	Gills
iv.	Amphibians (Frogs)	Skin
v.	Reptiles, birds, mammals	Lungs

Q.5. Write a note on gills.

Ans: i. Gills are efficient organs for respiration. They are efficient in removing oxygen from water.

ii. Gills are organized into a series of plates.

iii. Gills can be internal (e.g. crabs and fishes) or external (e.g. some amphibians)

iv. Water flows over gills in one direction, while blood flows in opposite direction through gill capillaries.

v. This counter current allows maximum oxygen transfer.

13.2 : Human Respiratory System :

Q.6. Enlist various parts in human respiratory pathway.

Ans: Human respiratory pathway includes:

i. Nostrils ii. Nasal chambers iii. Nasopharynx
iv. Larynx v. Trachea vi. Bronchi and bronchiole
vii. Lungs

Q.7. Describe the human respiratory system.

Ans: Respiratory system of man consists of:

I. Respiratory pathway II. Respiratory organs

I. The respiratory pathway comprises of:

i. Nostrils and nasal chambers ii. Pharynx iii. Larynx
iv. Trachea v. Bronchi vi. Lungs

i. Nostrils and nasal cavities (chambers):

These are also called external nares.

a. Nostrils: Nose shows two external openings called nostrils or external nares through which oxygen rich air is taken inside the body and carbon dioxide rich air containing water vapour is expelled outside the body. There are a pair of internal openings, which open into pharynx and are known as the internal nares.

b. The space between the external and internal nares is known as nasal chamber/cavities. It is divided into right and left parts by a cartilage known as mesethmoid.

c. The cavities are internally lined by a mucous membrane and ciliated epithelium.
Each half of the nasal chamber is further divided into three regions:
Vestibule: This is the anteriormost part of the nasal chamber. It has hair to trap dust particles and prevent them from going inside.
Respiratory part: This is the part which is richly supplied with capillaries.
Sensory part: This is lined by sensory epithelium for detection of smell.

ii. Pharynx:

a. Nasal chamber opens into the pharynx. Pharynx is a 12 cm long, vertical tube.
b. The respiratory and the food passages cross each other in the pharynx.
c. Its upper part is known as naso-pharynx and the lower part is called oro-pharynx or the laryngo-pharynx. Naso-pharynx helps in air conduction and oropharynx or laryngopharynx helps in conduction of food to oesophagus.
d. In the pharynx, there are tonsils which are made up of lymphatic tissue.
e. They kill bacteria trapped in the mucous.
Function: It connects the internal nares to the larynx.

iii. Larynx:

a. It is the sound producing organ and is also known as voice box.
b. From the pharynx, air enters the larynx through an opening called glottis.
c. The glottis is guarded by a flap called epiglottis.
d. Along the sides of the glottis, there are two folds of elastic tissues called vocal chords.
e. The voice is produced due to vibration of the vocal chords.

Function:

a. Vibrations of vocal cords enable us to produce sounds (phonation).
b. Larynx conducts air from the pharynx to the trachea.
c. It prevents the entry of food particles into the respiratory passage.

iv. Trachea:

a. It is also known as wind pipe.
It is about 12 ems long and 2.5 cms wide.

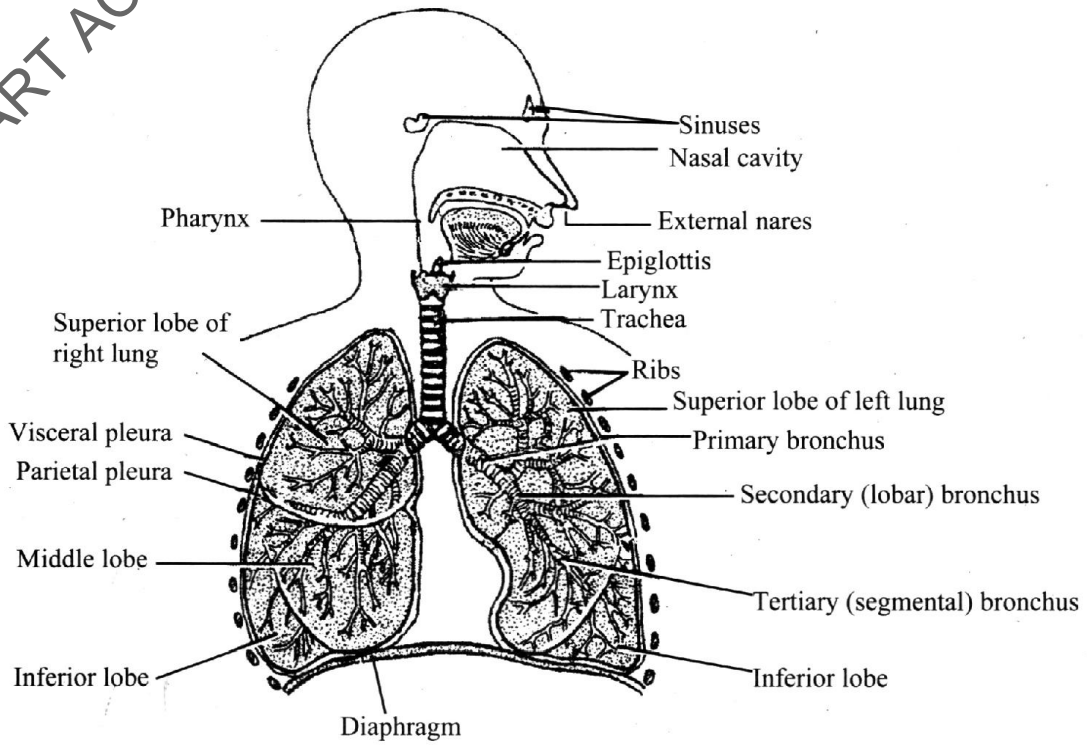
b. It lies in front of the oesophagus and extends downward into the neck.
c. The wall of the trachea is made up of fibrous muscular tissue, supported by 'C' -shaped cartilage rings which are 16-20 in number. They make the trachea rigid.
d. The trachea is internally lined with ciliated epithelium and mucous glands.

Function:

a. The dust and mucus is carried towards the mouth, from where it is either swallowed or spat out through trachea.
b. The inner lining of trachea prevent the entry of dust particles into the lungs.
c. Ciliary movement sweeps foreign particles back to the pharynx and finally they enter the oesophagus.

v. Bronchi:

a. The trachea after entering the thorax, divides into two branches behind sternum called bronchi.
b. Each bronchus is supported by a complete ring of cartilage.
c. It enters into the lung of its respective side.
d. On entering the lung, each bronchus further divides into secondary and then tertiary bronchus.
e. Tertiary bronchi divides into many minute bronchioles.
f. Wall of each bronchiole does not have cartilage rings.
g. Each bronchiole ends into a balloon-like alveolus.
h. These alveoli make the lungs spongy and elastic.



Human Respiratory System

II. Respiratory Organs:

vi. Lungs:

Lungs are the principal organs of respiration and the respiration performed by it is called pulmonary respiration.

Location: A pair of lungs is situated on either sides of the heart in thoracic or pleural cavity.

Structure:

a. Lungs are externally covered by double layered serous membrane called pleural membrane.

b. The outer membrane is called parietal pleura, while inner one is called visceral pleura.
c. The space between the two pleura is called pleural cavity.
d. The right lung is larger than the left lung.
e. Right lung shows two fissures which divides it into three lobes, namely upper lobe, middle lobe and lower lobe.
f. The left lung shows one fissure which divides it into two lobes, namely an upper and lower lobe.
g. Each lung consists of bronchioles.
h. Bronchioles end into a thin walled air sac. Each sac has about twenty alveoli. Alveoli are the structural and functional units of lungs.

Q.8. Differentiate between pharynx and larynx.
Ans:

No.	Pharynx	Larynx
i.	It is a short, vertical tube.	Larynx is sound producing organ located at the end of pharynx.
ii.	Mouth leads to the pharynx.	Pharynx leads to the larynx.
iii.	Vocal cords are absent.	Vocal cords are present.
iv.	Pharynx does not show Adam's apple.	Larynx shows Adam's apple in adult males.
v.	It does not increase in size at the time of puberty.	In males larynx increases in size at the time of puberty.

Q.9. What is epiglottis?
Ans: Epiglottis is the structure situated in the larynx, the function of which is to close the open trachea during food swallowing, so that food particles should not enter the respiratory tract.

Q.10. Write short notes on - a. Alveoli b. Trachea c. Larynx
Ans: a. Alveoli:
i. Each bronchiole ends into a thin walled air sac provided with large number of pouch-like structure called alveoli.
ii. Alveoli are thin-walled structures.
iii. A capillary network of pulmonary arterioles is situated on the surface of alveoli.
iv. The gaseous exchange takes place between alveolar air and the blood of capillary network surrounding the alveoli.
v. Each alveolus is lined by thin, highly permeable membranous wall of simple non-ciliated squamous epithelium.
vi. Human lungs has about 750 million alveoli, which increase surface area for exchange of gases.

b. Trachea:
i. It is also known as wind pipe. It is about 12 cmslong and 2.5 ems wide.
ii. It is situated in front of the oesophagus and extends downward into the neck.
iii. The wall of the trachea is made up of fibrous muscular tissue supported by 'C' - shaped cartilagenous rings.
iv. Cartilagenous rings are 16 - 20 in number. They make the trachea rigid.
v. The trachea is internally lined with ciliated epithelium and mucous glands.

Function:
i. The dust and mucus is carried towards the mouth, from where it is either swallowed or spat out.
ii. The inner lining of trachea prevent the entry of dust particles into the lungs.
iii. If any foreign particle enters, it is immediately expelled out by coughing action.
iv. Dust particles get trapped by the mucous.
v. Ciliary movement sweeps foreign particles back to the pharynx and finally, they enter the oesophagus.

c. Larynx:

i. Larynx is also known as voice box as it produces sound.
ii. In males, the larynx increases in size at the time of puberty. Hence, it is called Adam's apple. It is clearly seen in the neck region.
iii. Air enters the larynx through an opening called glottis from the pharynx.
iv. The glottis is guarded by a flap called epiglottis. ,
v. Along the sides of the glottis, there are two folds of elastic tissues called vocal chords.

Function:

i. Vibrations of vocal cords enable us to produce sounds (phonation).'
ii. Larynx conducts air from the pharynx to the trachea.
iii. It prevents the entry of food particles into the respiratory passage.
iv. The voice is produced due to vibration of the vocal cords.

Q.11. Name the peritoneal covering of the lungs.
Ans: Pleura is the peritoneal covering of the lungs.

Q.12. Name the respiratory surface in the human lung.
Ans: Alveoli is the respiratory surface in the human lung.

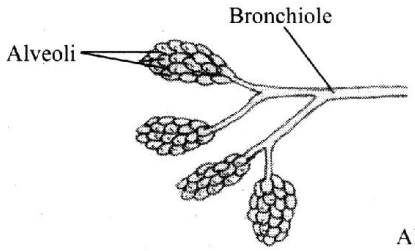
Q.13.Name the sound producing organ of human being.
Ans: Larynx is the sound producing organ of human being.

Q.14.What prevents collapsing of our trachea during breathing?
Ans: Tracheal cartilagenous rings prevents collapsing of our trachea during breathing.

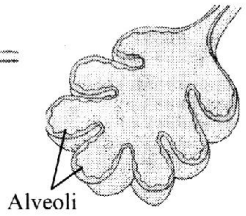
Q.15.Name the structural and functional unit of lungs.
Ans: Alveolus is the structural and functional unit of lungs.

Q.16. Name the artery which supplies blood to the alveolar capillaries.
Ans: Pulmonary artery supplies blood to the alveolar capillaries.

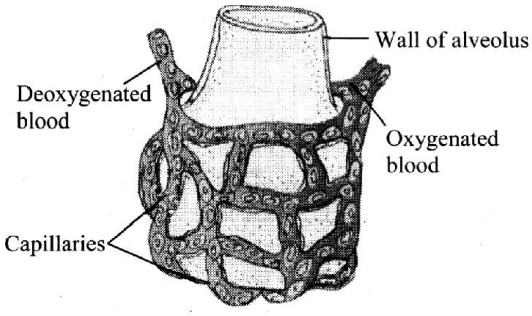
Q.17. Draw a neat labelled diagram of the structure of alveoli.
Ans:



Respiratory bronchiole



Air sac



Alveolus associated with capillaries

Q.18. Diffusion of gases occurs in the alveolar region only and not in other parts of respiratory system. Why?

Ans: i. Only alveoli are lined by thin, moist, vascular and permeable respiratory membrane.
ii. This membrane allows pulmonary gaseous exchange between oxygen of alveolar air and CO_2 of blood. But, other parts are lined by thick lining which does not allow exchange of gases.

Q.19. Describe the histological structure of lungs.

OR

Write a note on the histology of lungs.

Ans: Histology of lungs:

i. Lung is enclosed in pleural sac.

ii. Pleural sac is made up of two membranes:
   a. parietal
   b. visceral
iii. Space between two layers is filled with pleural fluid.
iv. Right lung is made up of three lobes, whereas left lung is made up of two lobes.
v. Each lobe has bronchioles which leads to air sacs called alveolar sacs.
vi. Each sac has about twenty alveoli.
vii. Each alveolus is covered with network of capillaries from pulmonary artery and vein.
viii. There are about 750 million alveoli in lungs.

Q.20. Distinguish between right and left lungs.
Ans:

No.	Right lung	Left lung
i.	Right lung is three lobed.	Left lung is two lobed.
ii.	It is heavier.	It is lighter.
iii.	It is longer and broader.	It is smaller and narrower.

13.3 : Mechanism of respiration :

Q.21. Describe the process of respiration in human being.
Ans: The term 'respiration' includes a complete process of taking in oxygen and giving out carbon dioxide.
It includes breathing, external respiration, internal respiration and cellular respiration.

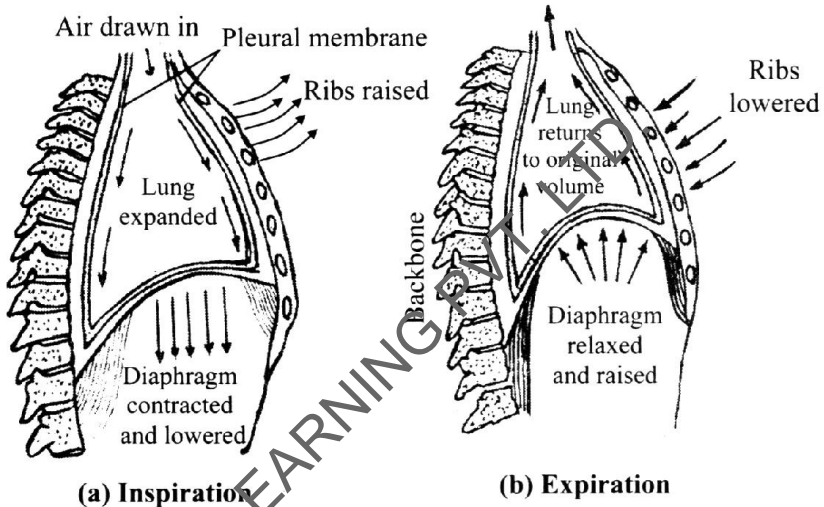
Breathing:
The process by which air comes in and goes out of the lungs is called breathing.
It is the process that speeds up the rate of gaseous exchange.
Breathing includes inspiration and expiration.

i. Inspiration:
The process in which au is taken inside the lungs is called inspiration.
Inspiration is an active process and it takes place with the help of ribs, intercostal muscles, sternum and diaphragm. It occurs in the following steps:

a. The intercostal muscles contract, pulling the ribs outward and increase the space in the thoracic cavity. The lower part of the sternum is also raised.
b. The diaphragm contracts and becomes almost flat. Volume of the thoracic cavity is increased.
c. The lungs expand and their volume increases.
d. Thus, pressure on the lungs decreases.
e. Atmospheric air rushes into the lungs through the respiratory passage to make the pressure equal. Thus, the air enters the lungs.

ii. Expiration:
The process of expelling air from the lungs into the atmosphere is called expiration.
During expiration, air containing carbon-dioxide and water vapour is expelled out of the lungs.
Expiration is a passive process. It takes place in the following steps:

a. The inter-costal muscles relax and pulls the ribs inwards.
b. The diaphragm relaxes and again becomes dome shaped. This reduces the volume of the thoracic cavity from the bottom.
c. The pressure on the lungs increases. The lungs get compressed and the air in the lungs, rushes out through the air passage.
d. Alternate inspiration and expiration together form the respiratory cycle. It occurs 16-20 times per minute in man.



(a) Inspiration **(b) Expiration**

Overall process of respiration can be classified into the following:

i. External respiration

The process of external respiration includes processes that take place in lungs. Oxygen from lungs diffuses into the blood capillaries and CO_2 from the lung capillaries into lungs.

ii. Internal respiration

Internal respiration takes place in the cells of the body. Oxygen brought by the blood is given to the cells and tissues during internal respiration. Similarly, carbon dioxide passes into the blood cells from cells and tissues.

iii. Cellular respiration

It takes place in the mitochondria of the cell. Energy is released in this process in the form of ATP.

Q.22. Name the respiratory muscles of man.

Ans: Intercostal muscles and diaphragm are the respiratory muscles of man.

Q.23. Differentiate between inspiration and expiration.

Ans: Inspiration and expiration:

No.	Inspiration	Expiration
i.	It is an active process.	It is a passive process.
ii.	During inspiration,intercostal muscles contract.	During expiration, intercostal muscles relax.
iii.	During inspiration, ribs are pulled outwards.	During expiration, ribs are pulled inwards.
iv.	Thoracic cavity space increases.	Thoracic cavity space decreases.
v.	Volume of the lungs increases in inspiration.	Volume of the lungs decreases in expiration.
vi.	Pressure on the lungs decreases.	Pressure on the lungs increases.
vii.	Atmospheric air comes inside the body in inspiration.	Air rushes out in expiration through external nares.

Q.24. Which part of our brain controls breathing?

Ans: Medulla oblongata of our brain controls breathing.

Q.25. How is breathing regulated?

Ans: i. Medulla oblongata regulates the contraction of diaphragm and intercostal muscles.
ii. Breathing is controlled by rhythm centre of medulla and pneumotaxic centre of pons.
iii. Changes in CO_2 and H^+ concentration are detected by receptor cells in aorta and carotid artery.
iv. Increase in concentration of ions stimulates pneumotaxic centres of pons and activates rhythm centre.
v. It brings about required changes in breathing.

13.4 : Transport of Gases :

Q.26. Name the various events involved in the transport of respiratory gases.

Ans: Various events involved in the transport of respiratory gases are as follows:

i. External respiration
ii. Internal respiration
iii. Cellular respiration

Q.27. How does transport of O_2 and CO_2 take place in man?

Ans: Transport of respiratory gases takes place through the following events:

i. External respiration
ii. Internal respiration .
iii. Cellular respiration

External respiration:

i. External respiration includes the respiratory processes which take place in the lungs.
ii. Oxygen from lungs diffuses in the lung capillaries and similarly CO_2 from the lung capillaries diffuses into lungs.

External respiration includes three events:

i. Exchange of gases:

a. Concentration of oxygen is higher in the inspired air ($PO_2 = 10^4$ mm Hg) as compared to that of alveolar blood ($PP_2 = 40$mm Hg).
b. Concentration of carbon dioxide is higher in the alveolar blood ($PCO_2 = 45$mm Hg) than in the inspired air ($PCO_2 = 40$mm Hg)
c. This results in the exchange of oxygen from the air into the blood and carbon dioxide from blood into the air which is exhaled out.

ii. Formation of oxyhaemoglobin:

a. The absorbed oxygen combines with haemoglobin of RBCs.

$$Hb + 4O_2 \longrightarrow Hb(4O_2)$$

Haemoglobin Oxygen (Oxy haemoglobin)

iii. Release of carbon di-oxide:

a. Carbon dioxide from the blood is releasedin the air.
b. CO_2 is majorly extracted in the form of sodium or potassium bicarbonates in blood plasma. Some amount of CO_2 is also expelled out in the form of carbamino - haemoglobin.
c. CO_2 in all forms is released as follows:
Bicarbonates break down to liberate carbonic acid.

$$NaHCO_3 \xrightarrow{H^+} Na^+ + H_2CO_3$$

Sodium bicarbonate Sodium ion Carbonic acid

$$KHCO_3 \xrightarrow{H^+} K^+ + H_2CO_3$$

Potassium bicarbonate Potassium ion Carbonic acid

Carbonic acid further breaks down to form CO_2 and water vapour.

$$H_2CO_3 \longrightarrow H_2O + CO_2$$

Carbamino haemoglobin diffuses and releases CO_2.

$$HbCO_2 \longrightarrow Hb + CO_2$$

Internal respiration:

i. Internal respiration takes place in the tissue cells.
ii. During internal respiration, oxygen brought by blood is given to tissue cells ($PO_2 = 95$ mm Hg) and CO_2 from the tissues ($PCO_2 = 40$mm Hg) is passed into the blood.

iii. When blood reaches the tissue cells, the unstable oxyhaemoglobin breaks down to form haemoglobin and oxygen.

iv. Carbon dioxide dissolves in the cellular fluid and passes into the plasma. CO_2 combines with water to form carbonic acid. .

$CO_2 + H_2O \longrightarrow H_2CO_3$

Carbonic acid combines with sodium and potassium and convert it into sodium and potassium bicarbonates.

Cellular respiration:

i. Cellular respiration is an important process.

ii. Cellular respiration releases energy in the form of ATP molecules.

iii. This energy is used to carry out vital life processes.

iv. Cellular respiration takes place mainly in mitochondria of cells.

v. Main byproducts are CO_2 and water vapour which are transported by the blood to the lungs.

Q.28. Differentiate between transport of O_2 and transport of CO_2.

Ans: Transport of O_2 and transport of CO_2.

No.	Transport of O_2	Transport of CO_2
i.	Takes place through two modes as oxyhaemoglobin and as solution in plasma.	Takes place through three modes as bicarbonates, carbamino haemoglobin and as solution in plasma.
ii.	In this process, oxyhaemoglobin is formed.	In this process, carbaminohaemoglobin is formed.
iii.	Oxygen combines with haemoglobin to form oxyhaemoglobin.	CO_2 combines with haemoglobin to form carbaminohaemoglobin.
iv.	Transport of O_2 occurs from lungs to tissue cells	Transport of CO_2 occurs from tissue cells to lungs.

Q.29. In which form, major part of CO_2 is transported in the blood?

Ans: CO_2 is transported by blood from body tissue to the lungs in the forms of bicarbonates of Na^+ and K^+.

Q.30. Write a note on internal respiration.

Ans: The respiratory processes which take place in the tissue cells are included under internal respiration. Oxygen brought by the blood is given to the tissue cells and carbon-dioxide from the tissues, is passed into the blood. When the blood reaches tissue cells, the unstable oxy-haemoglobin breaks down to form haemoglobin and oxygen.

i. Carbon-dioxide dissolves in the cellular fluid and passes into the plasma. CO_2 dissolves in the water to form carbonic acid as,

$CO_2 + H_2O \longrightarrow H_2CO_3$

Carbonic acid is converted into sodium and potassium bicarbonates after reacting with sodium and potassium.

About 80% to 85% carbon-dioxide is carried by the blood in the form of bicarbonates.

ii. A small amount of carbon-dioxide combines with haemoglobin to form carbamino-haemoglobin.

iii. Some carbon-dioxide dissolves in the plasma and is carried to the lungs.

Q.31. Write a note on cellular respiration.

Ans: Cellular respiration:

Cellular respiration involves the release of energy which is carried out in the cells by oxidation of food.

This process is called as oxidative phosphorylation.

It results in the formation of ATP molecules.

Energy is stored in the form of ATP.

This energy is used to carry out vital life processes.

Cellular respiration takes place mainly in the mitochondria of cells.

ATP is formed as the main product, while byproducts are CO_2 and water which are transported by the blood to the lungs. Energy released as heat is used to maintain the body temperature.

Q.32. Name the energy currency of cell.
Ans: ATP is the energy currency of the cell.

Q.33. Differentiate external and internal respiration.
Ans: External respiration and internal respiration:

No.	External Respiration	Internal Respiration
i.	It includes respiration occuring in lungs.	It includes respiration occuring in tissues.
ii.	In this process, CO_2 from lung capillaries diffuse into the lungs.	In this process, CO_2 from tissue enters into blood.
iii.	In this process, O_2 from lungs enters in the lung capillaries.	In this process, O_2 from blood enters the tissue cells.
iv.	The exchange of gases takes place between the blood and surrounding medium.	The exchange of gases takes place between blood and tissues of the body.

Q.34. Give reasons:

i. Breathing by mouth is harmful.

OR

It is desirable to breath only through nose.

Ans: Mouth is internally not lined by hair, so air is neither filtered nor warmed.
Inhaled air will have dust, microbes and other impurities which may harm the lungs.
Therefore, breathing by mouth is harmful.
Blood capillaries warm the air.
The hairs in the nose and mucus traps dust particles and bacteria, and helps in filtering incoming air.
Hence, it is desirable to breath only through nose.

ii. The lungs are covered by a double layered membrane.

Ans: The lungs are covered by a double' layered membrane called pleura to protect them from mechanical shock. It allows the free movement of lungs in thoracic cavity. .

Q.35. How is respiration regulated?

OR

Explain the role of neural system in regulation of respiration.

Ans: i. There is a chemosensitive area adjacent to respiratory rhythm centre in medulla oblongata.
ii. This area in medulla oblongata is sensitive to CO_2 and H^+.
iii. Changes in concentration of H^+ and CO_2 sends signal to the rhythmic centre.
iv. Besides that, chemoreceptors like carotid bodies and aortic bodies are present.
v. These receptors detect decrease in CO_2 and trigger increase in rate and depth of respiration.

Q.36. Define the following:

i. Tidal Volume (TV) **ii. Inspiratory Reserve Volume (IRV)**
iii. Expiratory Reserve Volume (ERV) **iv. Residual Volume (RV)**
v. Vital Capacity (VC)

Ans: i. Tidal Volume (TV)
The volume of air breathed in and out during effortless breathing is called tidal volume.
It is about 500 ml in a normal adult.

ii. Inspiratory Reserve Volume (IRV)
Volume of air during forced inspiration is called inspiratory reserve volume.
It is abou(2500 to 3000 ml.

iii. Expiratory Reserve Volume (ERV)
Volume of air during a forced expiration is called expiratory reserve volume.
It is about 1000 ml.

iv. Residual volume (RV)

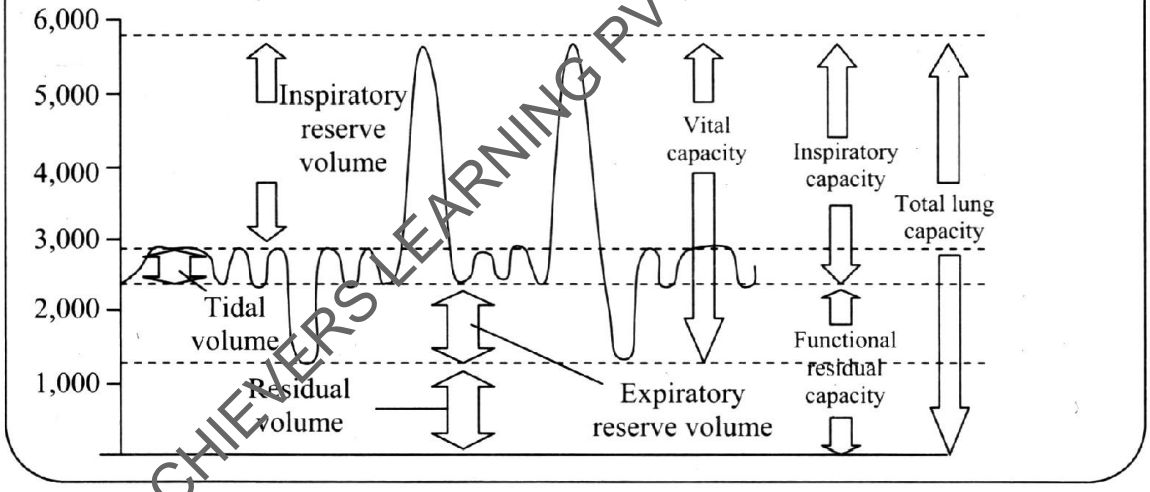
The volume of air left behind in lungs and respiratory passage after a forced expiration is called residual volume. It is about 1000 ml.

v. Vital capacity (VC)

It is the total volume of air expired after a maximum inspiration.

VC = ERV + TV + IRV

Additional information: TV, IRV, ERV, RV, VC can be graphically represented as



Q.37. What is tidal volume? Find out the tidal volume (approximate value) for a healthy human in an hour time.

Ans: i. It is called as TV.

ii. It is the volume of air inspired or expired during normal breathing. Its value is app. 500 ml in a normal healthy human.

iii. Amount of total volume (in one hour or 60 minutes) = Respiratory rate × tidal volume × 60
= 16 × 500 × 60 = 480000 ml or 480 kg.

Q.38. State the volume of air remaining in the lungs after normal breathing.

Ans: Volume of air that remains in the lungs after a normal expiration is called functional residual volume. It is the sum of expiratory reserve volume and residual volume. It is about 2.5 litres.

Q.39. Deime vital capacity. What is its significance?

Ans: Vital capacity is the amount of air which can be exhaled from the lungs after first filling the lungs to the maximum.

Significance of V.C:

Greater the vital capacity, more is the alveolar ventilation which increases the pulmonary gas exchange.

Q.40. Distingtiish between IRV and ERV.

Ans:

No.	IRV	ERV
i.	Amount of air which can be inspired by forced inhalation after the normal tidal volume.	Amount of air which can be expelled out by forceful expiration after the normal tidal expiration.
ii.	It is about 2500-3000 ml.	It is about 1000 ml.

Q.41. Write a note on carbon monoxide poisoning.

Ans: i. Carbon monoxide poisoning occurs due to presence of excess carbon monoxide in air.

ii. Haemoglobin has about 250 times more affinity for carbon monoxide than for oxygen.

iii. In the presence of carbon monoxide, haemoglobin readily combines to form a stable compound called

carboxyhaemoglobin.

iv. The oxygen combining power of haemoglobin decreases and as a result, tissues suffer from oxygen starvation.

v. This leads to asphyxia and in extreme cases to death.

vi. The patient needs to be administered with pure oxygen - carbon dioxide mixture to have a very high PO_2 level to dissociate carbon monoxide from haemoglobin.

vii. Carbon monoxide poisoning often occurs in closed rooms with open stove burner or furnaces or in garages having running automobile engines.

Q.42. Describe the respiratory disorders.

Ans: Respiratory disorders:

Respiratory disorders are the various disorders related to the respiratory system. These are as follows:

i. Asthma:

a. Asthma is an inflammatory disease of the airways associated with episodes of reversible overreactivity of the airway smooth muscle.

b. During an asthmatic attack, the spasmodic contraction of bronchial muscles, constricts the airways along with secretion of thick mucus, further adding to the narrowing of the air passages.

c. Inspiration is normal but only partial expiration is achieved.

d. Lungs become hyperinflated. Hyperinflation causes severe dyspnoea and wheezing.

e. Asthmatic attack may last from few minutes to hours.

ii. Occupational lung disorders: Occupational lung diseases are caused by inhaling atmospheric pollutants at work place. Small particles are carried in inspired air to the level of the respiratory bronchioles and alveoli, where they are cleared by phagocytosis.

Larger particles are trapped by mucus in upper part of the respiratory tract. They are expelled by ciliary action and coughing.

Silicosis: Silicosis can be caused by long-term exposure to dust containing silicon compounds. Inhaled silica particles accumulate in the alveoli.

Silicosis leads to destruction of lung tissue. Destruction of tissue can ultimately lead to pulmonary hypertension and heart failure.

Asbestosis: Asbestosis is caused by inhaling asbestos fibres.

Blue asbestos is associated with the most serious disease.

Asbestos miners suffer from this disease.

iii. Emphysema:

It is a long term disease oflungs. It causes shortness of breath due to over-inflation of the alveoli.

In this disease, airways get collapsed and alveoli gets damaged.

Due to this, air gets trapped in alveoli and it becomes difficult to empty the air from the lungs.

Q.43. What is asthma?

Ans: Asthma:

i. Asthma is an inflammatory disease of the airways.

ii. Due to inflammed condition, the airways become swollen and very sensitive. They tend to react strongly to certain inhaled substances.

iii. It may be caused by non-specific factors like cold air, cigarette smoke, air pollution, pollen, upper respiratory tract infections, emotional stress and even strenuous exercise.

iv. The mucous membrane and muscle layer of the bronchi become thickened and the mucous glands enlarges reducing airflow to the lower respiratory tract.

v. During an asthmatic attack, the spasmodic contraction of the bronchial muscles (Bronchospasm) constricts the airways along with secretion of thick mucus, further adding to the narrowing of the air passages.

vi. As a result, inspiration is normal, but the inflammed airways act as a valve, thus only partial expiration is achieved causing lungs to retain more air than usual, i.e. they become hyperinflated. The usual flow

of the air is disrupted causing severe dysponea and wheezing.

vii. The duration of the attack varies from a few minutes to hours (status asthmaticus). In severe attacks, thick mucus plugs obstruct the bronchi, leading to acute respiratory failure, hypoxia and possibly death.

Q.44. Name any two disorders of respiratory system.

Ans: Asthma and emphysema are the two disorders of respiratory system.

Q.45. What are occupational lung diseases? Give a few examples of occupational lung diseases.

Ans: Occupational lung diseases:

A group of lung diseases caused by inhaling atmospheric pollutants at work place is collectively termed as occupational lung diseases.

The particles causing these diseases are usually superfine. They are carried to the bronchioles and alveoli where they can possibly be cleared only by phagocytosis.

Larger particles generally trigger the cough reflex and are thrown out.

The morbid effects of these lung diseases have led to legislation that limit workers exposure to these pollutants.

Few examples of occupational lung diseases can be as follows:'

i. Silicosis:

It is caused by clay, sand and sand stone grinding.

This may be caused due to long term exposure to dust containing silicon compounds.

Inhaled silica particles accumulate in the alveoli. These particles are then ingested by the macrophages, and are actively toxic for these cells. The inflammatory reaction is triggered when the macrophages destroy the particles which results in significant fibrosis.

Silicosis appears to predispose the development of pulmonary tuberculosis, which rapidly progresses to tubercular bronchopneumonia and possibly military tuberculosis (diffuse widespread tuberculosis)

Gradual destruction of lung tissue leads to progressive reduction in pulmonary function, pulmonary hypertension and heart failure.

ii. Asbestosis:

Asbestosis is caused by inhalation of asbestos fibres and usually develops after 10 to 20 years of exposure, but it can be as low as 2 years.

Asbestos miners and workers involved in making and using some products containing asbestos, are at risk.

There are different types of asbestos, but blue asbestos is associated with the most serious disease.

Q.46. Write a note on emphysema.

Ans: i. It is a long-term disease of the lungs that causes shortness of breath.

ii. It is caused due to over-inflation of alveoli. People suffering from emphysema have impaired or destroyed alveoli.

iii. In this disease, air flow to lungs is reduced or stopped, hence it is called as obstructive lung disease.

iv. In this disease, alveoli are damaged, hence patient experiences difficulty in breathing.

v. This disease is included in a group of disease called chronic obstructive pulmonary disease (COPD).

Additional Theory Questions :

Q.1. Draw a neat labelled diagram of human respiratory system. Refer Q.7.

Q.2. Explain the process of inspiration under normal conditions. Refer Q.21. (i)

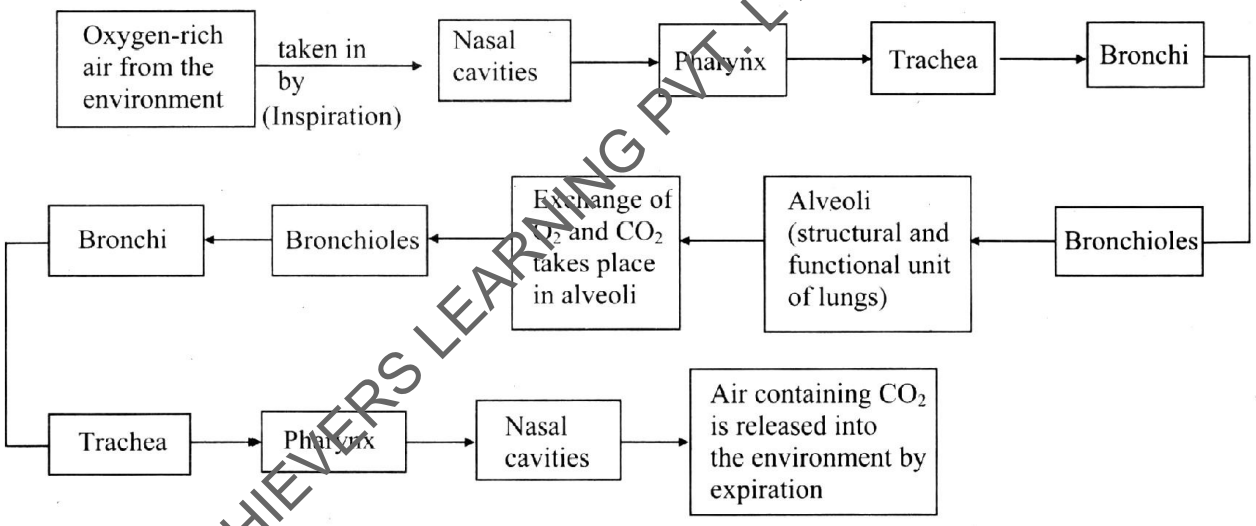
Q.3. Explain the transport of respiratory gases O2 and CO2 through external respiration. Refer Q.27.

Q.4. Write short note on i. Silicosis and ii. Asbestosis. Refer Q.45. (i) and (ii)

Quick Review :

1. Respiration is the energy releasing and supplying process in all living organisms.

2. It converts food energy into metabolically usable form of chemical energy.
3. Respiration releases energy in a controlled and step-wise manner, as a result of which most of the energy is properly utilized for cellular activities.
4. The human respiratory system consists of several parts. The steps involved in respiration and the parts of the respiratory system are represented below:



RESPIRATORY CYCLE

5. The mechanism of respiration involves breathing, internal respiration, external respiration and transport of gases.
6. Several disorders and diseases are associated with the respiratory system. Some of them are Asthma, Emphysema, Silicosis, Asbestosis.

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Multipal Choice Question's

1. The correct sequence of conduction of air in respiratory system is
a) nasal cavity, pharynx, larynx and bronchi
b) larynx, trachea, bronchi and nasal cavity
c) nasal cavity, pharynx, larynx, trachea
d) nasal cavity, larynx, pharynx, trachea

2. Nasal chamber is divided into two parts by
a) Sphenoid b) Palatine
c) Mesethmoid d) Zygomatic

3. A dual organ is
a) trachea b) bronchus
c) pharynx d) larynx

4. Adam's apple is the name given to
a) pharynx b) larynx
c) trachea d) bronchus

5. Glottis is the opening present in between
a) pharynx and larynx
b) trachea and larynx
c) laryngopharynx and larynx
d) nasal passage and pharynx

6. The tracheal lining is ciliated. Cilia help in
a) inspiration b) expiration
c) pushing mucus out d) pushing mucus in

7. On dorsal side, cartilagenous rings of trachea are
a) incomplete b) complete
c) calcified d) extra thick

8. In the tertiary bronchioles, the covering does not have
a) tracheal rings b) connective tissue
c) epithelial tissue d) both a) and b)

9. Cartilage is absent in
a) trachea b) bronchus
c) bronchioles d) pharynx

10. Through which of these parts air never passes during respiration in man?
a) Bronchi b) Diaphragm
c) Trachea d) Larynx

11. Diaphragm in mammals is a
a) cartilaginous structure
b) bony structure
c) membranous structure
d) muscular structure

12. In human being, the chief respiratory organs are
a) Skin b) Gills

c) Lungs d) Nostrils

13. Coverings of the lungs are called
a) menmges b) pleura
c) ciliary lining d) peritoneum

14. The left lung is divided into
a) 3 lobes b) 2 lobes
c) 4 lobes d) 6 lobes

15. The right lung of man is divided into
a) 2 lobes b) 3 lobes
c) 4 lobes d) 5 lobes

16. Alveoli in lungs are internally lined by
a) cuboidal epithelium
b) ciliated epithelium
c) squamous epithelium
d) glandular epithelium

17. The steps in breathing are
a) inspiration and expiration
b) contraction and relaxation
c) inhalation and inspiration
d) none of these

18. The rate of respiration is controlled in
a) brain b) heart
c) both a) and b) d) none of these

19. Respiration taking place in the lungs is called
a) Internal respiration
b) External respiration
c) Cellular respiration
d) Tissue respiration

20. Transport of O_2 is done by
a) plasma b) RBC
c) lungs d) nostrils

21. The mechanism of exchange of O_2 is by
a) diffusion b) chloride shift
c) both a) and b) d) none of these

22. In human beings, oxygen carrying respiratory pigment is
a) haemocyanin b) haemoglobin
c) chloroquinin d) haemoerythrin

23. Most of the O_2 is carried in man
a) in solution form in plasma
b) as bicarbonates
c) as bound form to haemoglobin
d) as carbamino-haemoglobin

24. Transport of CO_2 is in the form of
a) sulphates b) phosphates
c) carbonates d) chlorides

25. Cellular respiration occurs in
a) RBCs b) alveoli
c) cells of the body d) blood vessels

26. Respiration takes place in
a) Golgi body
b) endoplasmic reticulum
c) mitochondria
d) nucleus

27. Respiration involves
a) oxidation b) reduction
c) both a) and b) d) none of these

28. Volume of air inspired and expired during normal breathing is called as
a) respiration
b) vital capacity
c) tidal volume
d) residual volume

29. In asthma, what causes respiratory distress?
a) Spasm of bronchial muscles
b) Excessive, thick mucous secretions in the air ways
c) Inflammation of the mucosa of the respiratory tract
d) All of the above

30. In asthma, the main difficulty is experienced in which phase of respiration?
a) Inspiration b) Expiration
c) Both a) and b) d) None of these

31. The factor, not DIRECTLY associated with Asthma is
a) emotional stress
b) strenuous exercises
c) air pollution
d) low oxygen pressure as in high altitudes

32. In occupational lung diseases, the pollutants are characterised by
a) very small size
b) cause acute inflammation (allergens)
c) large particle size so as to block the lower airways
d) can infect by person to person route

33. Silicosis is seen in all industries except
a) pottery work
b) road construction
c) glass industry
d) stone mining

34. The minimum exposure for development of Asbestosis is
a) 10 to 20 years
b) 20 to 30 years
c) 30 to 40 years
d) 40 to 50 years

35. The most common type of asbestos associated with asbestosis is
a) pink asbestos b) blue asbestos
c) white asbestos d) none

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