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Breathing and Exchange of Gases

Importance of Respiratory systems :

- Cellular respiration is a catabolic process, so energy can release.
- In cellular respiration oxidation of glucose takes place by glycolysis, Krebs cycle and oxidative phosphorylation.
- During the respiration process CO_2 is produced which toxic to cell. Hence it becomes a compulsion to cell remove it. Sameway for oxidative phosphorylation cell has necessity to get oxygen.
- In Respiratory system this process is possible. This system has two major paths : (1) Inspiration, by which O_2 is accepted. (2) Expiration by which CO_2 is released.
- In body for the supplies O_2 and removal of CO_2 circulatory system and respiratory system are these.
- The respiratory system consists of organs that exchange gases between atmosphere and blood.
- Blood transports gases between lung and cells.
- The overall exchange of gases between atmosphere, blood and cell is called respiration in general.

- (1) It is not proper for complete oxidation of glucose.
(A) TCA Cycle (B) ETS (C) Fermentation (D) Glycolysis
- (2) What is not true for human respiratory system ?
(A) CO_2 is removed by it and O_2 is obtained.
(B) It has two passage, Inspiration and expiration.
(C) It makes exchanges of gases possible at pulmonary level.
(D) It makes exchange of gases possible at cellular level.
- (3) In human for the exchange of CO_2 and O_2 which system is linked with respiratory system ?
(A) Nervous system (B) Circulatory system (C) Digestive system (D) Excretory system
- (4) Sequentially with which exchange of gases takes place, termed as breathing ?
(A) Atmosphere -blood -cells (B) Blood -Atmosphere -cells
(C) Atmosphere -cells- blood (D) Blood - cells - atmosphere
- (5) Role of blood in respiration in human
(A) Connects exchanges of gases at pulmonary and cellular level
(B) Connects exchange of gases at atmospheric and pulmonary level
(C) Connects exchange of gases at atmospheric and cellular level
(D) All of above

Answers : (1-C), (2-D), (3-B), (4-A), (5-A)

Respiratory system of human : The respiratory system of human consists organs like nose, pharynx, larynx, trachea, bronchi and lungs.

- (1) **Nose :** It has external portion jutting out from the face and an internal portion lying hidden inside the skull. It is divided into external noses, nasal chamber and internal nosed.
 - **External noses or Nostrils :** Two nostrils are seperated by septums
 - **Nosal chamber :** The internal region of nose is a large cavity within the skull. Anteriorly it opens through external noses and posteriorly it communicates with the pharynx through internal noses. Each noses chamber is divided into their regions lower vestibular, middle respiratory and upper olfactory. The two nosal chambers are also separated by the nosal septum.

- (2) **Pharynx** : It is a tube about 12.5cm long, serving as a passage way for air and food, Pharynx is divided into three parts.
- Nasopharynx : The upper most portion of the pharynx from which air passes.
 - Osopharynx : The second portion of the pharynx, lies behind the buccal cavity from which air and food passes.
 - Laryngo pharynx : The lowest portion of the pharynx. It extends downward and empties into oesophagus posteriorly and into the larynx (voice - box) anteriorly from which air and food passes.
- (3) **Larynx** : It is a passage that connects the pharynx with the trachea. The leaf shaped piece of cartilage called glottis is always remains open except during swallowing. The mucous membrane of the larynx contains vocal cords. It has ability to vibrate. This ability allows us to speech.
- (4) **Trachea** : It is about 12cm in length and 2.5cm in diameter. It extends from the larynx to the middle of the thoracic cavity, where it divides into right and left primary bronchi. It is a tubular passage way for air. The trachea is divided into right primary bronchus, which enters the right lung and left primary bronchus-which enters the left lung. The right primary bronchus is more vertical, shorter and wider than the left. Along the length in the trachea and bronchi at short distances 'C' shaped incomplete; cartilagenous rings occur. They keep the respiratory passage open and prevent it from blockage.
- When primary bronchi enter into lungs, divide as follows. (In each lobe of lungs)
 - Primary bronchi divide in each lung lobe into secondary bronchi → Tertiary bronchi or segmental bronchi divides further into bronchioles → Bhronchioles further divide into terminal bronchioles ended into alveoli → millions of alveoli in each lung, Each alveolus is sac like structure surrounded by pulmonary cell and enveloped by a net work of blodod capillaries.
 - Bronchial tree : It is arising by trachea and alveoli between network of tubules are present.
- (5) **Lungs** : The lungs are paired, cone shaped organs lying in the thoraecic cavity. Protected by rib-cage, The diaphragm is placed beneath them. Two layers collectively called the plural membrane covers each lung.
- The outer layer is attached with the wall of thoracic cavity.
 - The inner layer covers, the lungs themselves.
 - The space between two layers contains a lubricating fluid secreted by the membranes. This fluid protects lungs against shock.

Right lung	Left lung
(1) It is thickers, broader, longer and heavier.	(1) It is thinner, narrower, shorter and lighter.
(2) It has three lobes, (upper, lower and middle lobess which are demarkated by two fissures one ablique and one horizontal)	(2) It has two lobes.(upper and lower lobes, which are demarkated by one fissure (oblique)
(3) Cardiac notch in which the heart lies is not present.	(3) Cardiac notch is present.

- (6) How many organs included in respiratory system perform functions other than respiration ?
(A) 2 (B) 1 (C) 3 (D) 4
- (7) Large part of nose enclosed by bone of cranium
(A) External nares (B) Nasal chamber (C) Internal nares (D) A and C both
- (8) What is connected by internal nares ?
(A) Nasal chamber - pharynx (B) Nasal chamber - larynx
(C) Nasal chamber - trachea (D) Nasal chamber - oesophagus
- (9) Which region of nasal chamber is near to internal nares ?
(A) Pre olfactory region (B) Respiratory region (C) A and B (D) olfactory region
- (10) Number of vestibular region in nose.
(A) 2 (B) 4 (C) 6 (D) 1

- (11) Which region of pharynx, transport air and food ?
 (A) Nasopharynx (B) Buccopharynx (C) Larynx (D) B and C
- (12) Which part of pharynx opens posteriorly into oesophagus ?
 (A) Buccopharynx (B) Laryngo-pharynx (C) Nasopharynx (D) Larynx
- (13) Normally epiglottis remains closed in which condition ?
 (A) During Yawning (B) While drinking water (C) Speaking (D) A and B
- (14) What is length from larynx to the midregion of thoracic cavity ?
 (A) 12.5 cm (B) 2.5 cm (C) 12 cm (D) 24.5 cm
- (15) Length of respiratory passage, having 'C' shaped cartilagenous ring.
 (A) 12 cm (B) Less than 12 cm (C) 2.5 cm (D) More than 12 cm
- (16) Total number of secondary bronchioles.
 (A) 2 (B) 5 (C) 3 (D) 4
- (17) Bronchiole, totally located in pulmonary lobules
 (A) Secondary (B) Primary (C) Tertiary (D) A and B
- (18) Having same number as alveoli
 (A) Secondary bronchiole (B) Tertiary bronchiole
 (C) Terminal bronchiole (D) Primary bronchiole
- (19) It is improper for Bronchial tree.
 (A) Primary bronchiole (B) Tertiary bronchiole
 (C) Secondary bronchiole (D) Trachea
- (20) What is proper for lungs with median fissure ?
 (A) Small and light (B) Parallel fissure
 (C) Presence of cardiac notch (D) Thin and narrow
- (21) What is proper for both lungs ?
 (A) cardiac notch (B) Median fissure (C) Oblique fissure (D) All
- (22) Cartilagenous tissue in the structure-
 (A) Trachea (B) Bronchus (C) Primary bronchiole (D) A and C both
- (23) What is proper for left bronchus compared to right bronchus ?
 (A) Narrow (B) More straight (C) Short (D) (B) and (C)

Answers : (6-C), (7-B), (8-A), (9-D), (10-A), (11-D), (12-B), (13-B), (14-C), (15-D), (16-B), (17-C), (18-C), (19-D), (20-B), (21-C), (22-D), (23-A)

Mechanism of respiration, respiratory volumes and capacities, transportation of respiratory gases :

Respiration process : It is phenomenon of breathing.

Breathing :

- **Inhalation** : The process of drawn in air from the atmosphere toward lungs is called inhalation.
- **Exhalation** : The process of exporation of air from lungs into the atmosphere is called exhalation.
- **Inhalation + exhalation = Breathing**

- In this process diaphragm and ribs play important role.
- The diaphragm is dome shaped separates the thoracic cavity and abdominal cavity. It is attached anteriorly with sternum and at its posterior, it remains attached to the vertebral column.
- Inter costal muscles are associated with the ribs.

Inspiration process	Exhalation process
– Contraction of diaphragm muscles.	– Relaxation of diaphragm muscles.
– The diaphragm is pulled down wards.	– The diaphragm is more upwards.
– The size of thoracic cavity is increase.	– The size of thoracic cavity is decrease.
– The partial pressure of air in lungs is reduced.	– The partial pressure of air in lungs increases by the contraction of lungs.
– Air from atmosphere move into lungs.	– Under such pressure the air within the lungs goes out into the atmosphere.
– Exchanges of O_2 - CO_2 in alveoli	– CO_2 contain air removed from the alveoli.
– Ribcage moves upper and out side.	– Ribcage moves lower and interior side.
– In rapid inhalation process muscles of neck also plays in important role.	– In rapid exhalation process muscles of abdominal also plays important role.

Respiratory volumes and capacities : Many factors effect respiratory capacity viz : Person's age, size, sex and physical conditions.

- (1) **Tidal Volume (TV) :** Normal quiet breathing moves approximately 500 ml of air into and out of the lungs with each breath. This volume is referred as a tidal volume (TV).
- (2) **Inspiratory Reserve Volume (IRV) :** The amount of air that can be inhaled forcibly over the normal (tidal) volume is the IRV. Normally IRV is between 2500 ml to 3000 ml.
- (3) **Expiratory Reserve Volume (ERV) :** The amount of air that can be forcibly exhaled after a normal (tidal) expiration is known as ERV. The ERV is approximately 1000 ml to 1100 ml.
- (4) **Residual volume (RV) :** It is the amount of air remains in the lungs after a forcible expiration. The approximately RV is 1100 ml to 1200ml.
- (5) **Inspiratory Capacity (IC) :** It is the total volume of air which can be inhaled by a person after normal expiration i.e IC is a sum of TV and IRV. It is about 3000 ml to 3500 ml.
- (6) **Expiratory Capacity (EC) :** It is the total volume of air which can be exhaled by a person normal inspiration i.e. EC is a sum of TV and ERV. It is about 1500 ml to 1600 ml.
- (7) **Functional residual capacity (FRC) :** It is a volume of air that will remain in the lungs after normal expiration. FRC is the sum of ERV and RV. FRC is about 2100 ml to 2300 ml.
- (8) **Vital Capacity (VC) :** It is the total of air which can be breathe by a person. The VC is the sum of TV, RV and ERV, VC is about 4000 ml to 4600 ml.
- (9) **Total Lung Capacity (TLC) :** It is the amount of air in the lungs and respiratory passage after a maximum inspiration. The TLC is the sum of TV, IRV, ERV or VC + RV. TLC is about 5100 ml. to 5800 ml.

Transport of respiratory gases :

- The interstitial fluid makes possible exchanges between alveoli and blood.
- Here transport of O_2 and CO_2 by simple diffusion.
- The partial pressures (in mm Hg) of O_2 and CO_2 at different parts is compared with atmosphere as under.

Respiratory gas	Atmospheric Air	Alveoli	Blood (deoxygenated)	Blood (oxygenated)	Tissues
O ₂	159	104	40	95	40
CO ₂	0.3	40	45	40	45

- (24) Diaphragm is connected with on its dorsal side.
 (A) Ribs (B) Sternum (C) Vertebral column (D) Femur
- (25) Process associated with breathing.
 (A) Contraction of diaphragm muscle (B) Relaxation of diaphragm muscle
 (C) Partial pressure of air increases in lungs (D) Decreases size of thoracic cavity
- (26) When diaphragm is pushed up, process occurs is
 (A) Contraction of diaphragm muscles (B) Relaxation of diaphragm muscles
 (C) Diaphragm is pushed down (D) Increases size of thoracic cavity
- (27) Which situation is observed when diaphragm contracts ?
 (A) Decreases size of thoracic cavity, partial pressure of air increases in lungs.
 (B) Size of thoracic cavity decreases, partial pressure of air decreases in lungs.
 (C) Size of thoracic cavity increases, partial pressure of air increases in lungs.
 (D) Size of thoracic cavity increases, partial pressure of air decreases in lungs.
- (28) Contraction and relaxation of diaphragm is sequentially connected with which process ?
 (A) Exhalation - Inhalation (B) Inhalation - Inhalation
 (C) Inhalation - Exhalation (D) Exhalation - Exhalation
- (29) When breathing process is slow ?
 (A) Anger (B) Exercising (C) Excited condition (D) Sleeping
- (30) Phenomenon, which do not affect respiratory capacity.
 (A) Age (B) Size (C) Caste (D) Physical condition
- (31) Total volume of air, normally inhalation and forcefully taken is
 (A) ERV (B) IRV (C) RV (D) IC
- (32) What is obtained when TLC - FRC ?
 (A) EC (B) IC (C) VC (D) RV
- (33) What is obtained in EC-TV + RV ?
 (A) VC (B) TLC (C) FRC (D) IC
- (34) What is volume of air by VC - IC ?
 (A) 2500 to 3000 ml (B) 4000 to 4600 ml (C) 1000 to 1100 ml (D) 3000 to 3500 ml
- (35) Approximate volume of air, coming out during sneezing ?
 (A) 1500 to 1600 ml (B) 1000 to 1100 ml (C) 3000 to 3500 ml (D) 2100 to 2300 ml
- (36) Total volume of air taken by person during breathing is
 (A) EC (B) VC (C) IC (D) FRC

- (37) What has largest volume ?
 (A) EC (B) ERV (C) FRC (D) RV
- (38) Air entering during yawning in lungs has volume
 (A) EC (B) IC (C) VC (D) TLC
- (39) During excessive exercise air taken by person and given out, volume is
 (A) 3000 to 3500 ml (B) 1500 to 1600 ml (C) 5100 to 5800 ml (D) 4000 to 4600 ml
- (40) Exchange of O_2 and CO_2 between blood and tissue cells occurs by
 (A) Cerebro spinal fluid (B) Coelomic fluid (C) Inter cellular fluid (D) Lymph
- (41) Exchange of gases at respiratory surface occurs by which process ?
 (A) Simple diffusion (B) Facilitated diffusion (C) Active transport (D) All
- (42) How less mm Hg is partial pressure of O_2 in alveolus than atmosphere ?
 (A) 104 (B) 159 (C) 5 (D) 55
- (43) Blood Capillary having similar partial pressure of CO_2 as that of alveolus.
 (A) Pulmonary artery (B) Hepatic portal vein (C) Pulmonary vein (D) Renal vein
- (44) Partial pressure of O_2 in blood of left auricle
 (A) 40 (B) 95 (C) 45 (D) 104
- (45) Difference of partial pressure of CO_2 mm hg between pulmonary artery and renal artery is
 (1) Left ventricle (2) Right ventricle (3) Pulmonary artery (4) Pulmonary vein
 (5) Hepatic artery (6) Hepatic portal vein (7) Different vein (8) Renal vein
 (A) 1, 3, 5, 7, (B) 1, 3, 5, 6, 8 (C) 2, 3, 5, 6, 8 (D) 1, 4, 5, 7
- (46) What is difference of partial pressure of CO_2 mm Hg between pulmonary artery and Renal artery ?
 (A) 40 (B) 95 (C) 45 (D) 104

Answers : (24-C), (25-A), (26-B), (27-D), (28-C), (29-D), (30-C), (31-D), (32-B), (33-C), (34-C), (35-A), (36-B), (37-C), (38-B), (39-D), (40-C), (41-A), (42-D), (43-C), (44-B), (45-C), (46-D)

Transport of O_2 in the blood :

- Nearly 97% O_2 is transported through RBCs.
- Haemoglobin, a respiratory pigment, present in RBCs is responsible for transport of O_2 ; Each RBC transports around one billion molecules of O_2 .

Reactions at respiratory surface :

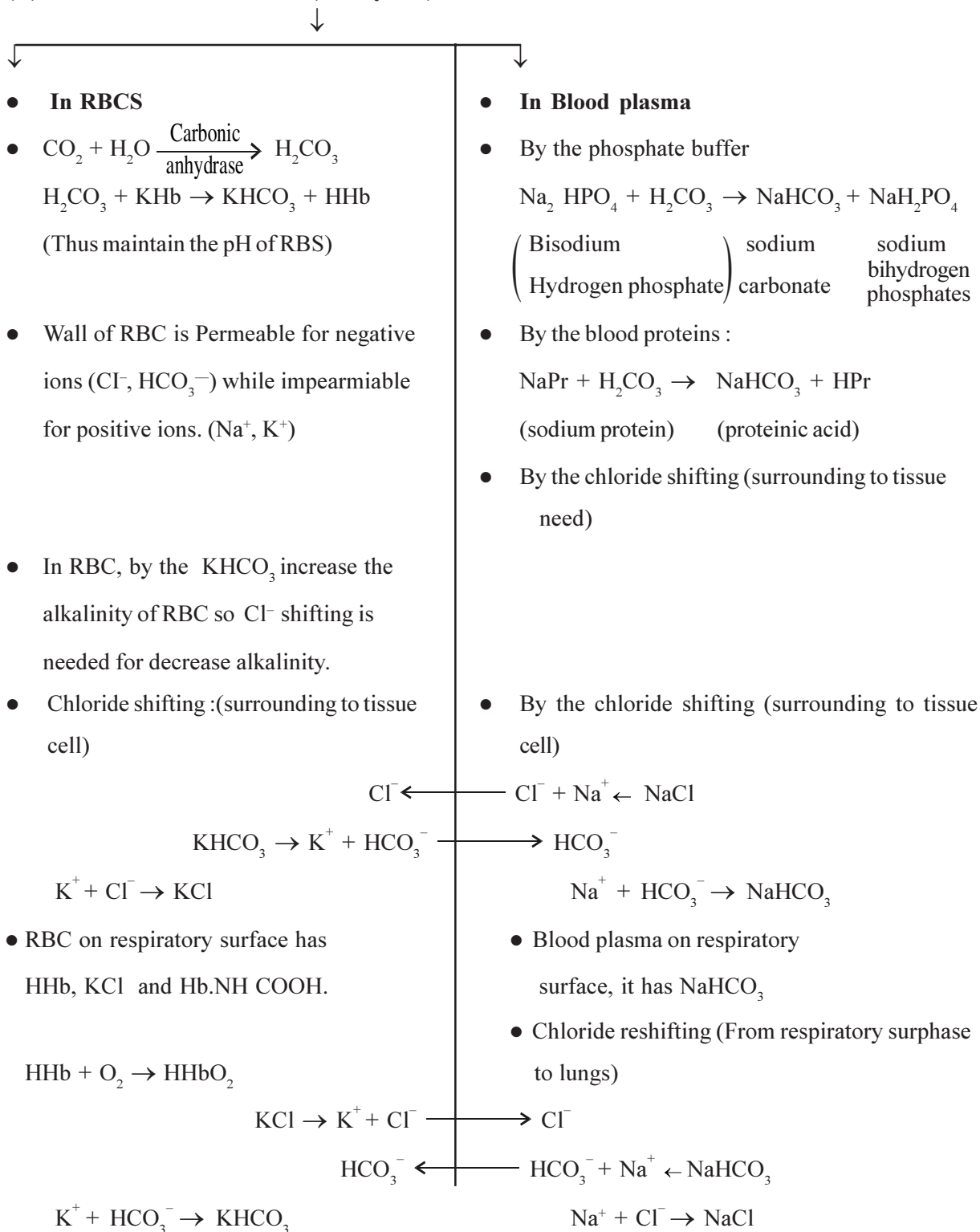
- $H + Hb \rightarrow H \cdot Hb$ (Haemoglobinic acid)
- $H \cdot Hb + O_2 \rightarrow H \cdot Hb O_2$ (Oxyhaemoglobinic acid)
- $H \cdot HbO_2 + KHCO_3 \rightarrow KHbO_2 + H_2CO_3$
- Thus, O_2 is transported in a form of potassium oxyhaemoglobin ($KHbO_2$) near tissue surface $KHbO_2$ splits to release Potassium haemoglobin and oxygen.
 $KHbO_2 \rightarrow KHb + O_2$ (Near tissue surface)

- (47) Transport of O_2 takes place by
 (A) RBC (B) WBC (C) Blood plasma (D) A and C
- (48) How many O_2 molecules are carried by one RBC ?
 (A) 10^7 (B) 10^9 (C) 10^8 (D) 10^6
- (49) Where is HHb Present ?
 (A) At the respiratory surface in RBC of Blood.
 (B) Blood Surrounding tissue cells.
 (C) Respiratory surface blood plasma.
 (D) Blood plasma surrounding tissue.
- (50) Which component is formed in the blood by O_2 at respiratory surface ?
 (A) HHb (B) $KHCO_3$ (C) $KHbO_2$ (D) $HHbO_2$
- (51) Which part of the Hb accepts O_2 ?
 (A) R - Group (B) Fe^{+2} (C) NH_2 - Group (D) $COOH$ - Group
- (52) By which process potassium oxyhaemoglobin is formed in R.B.C ?
 (A) $HHbO_2 + H_2CO_3$ (B) $KHCO_3 + H_2CO_3$ (C) $HHbO_2 + KHCO_3$ (D) $HHbO_2 + KCl$
- (53) How much O_2 is transported in the form of $KHbO_2$?
 (A) 100 % (B) 3 % (C) 97 % (D) 70 %
- (54) Which is correct option for transport of O_2 from respiratory surface to tissue cells ?
 (A) $O_2 \rightarrow KHbO_2 \rightarrow HHbO_2 \rightarrow O_2$ (B) $O_2 \rightarrow HHbO_2 \rightarrow KHbO_2 \rightarrow O_2$
 (C) $O_2 \rightarrow KHCO_3 \rightarrow HHbO_2 \rightarrow O_2$ (D) $O_2 \rightarrow H_2CO_3 \rightarrow KHbO_2 \rightarrow O_2$
- (55) Reactant at respiratory surface for carbonic anhydrase :
 (A) CO_2 (B) H_2O (C) H_2CO_3 (D) A and B
- (56) Which is proper option for transport of O_2 ?
 (A) $KHbO_2$ (B) NH_2HPO_4 (c) NaH_2PO_4 (D) $HHbO_2$

Answers : (47-D), (48-B), (49-A), (50-D), (51-B), (52-C), (53-C), (54-B), (55-C), (56-A)

Transport of CO_2 in blood :

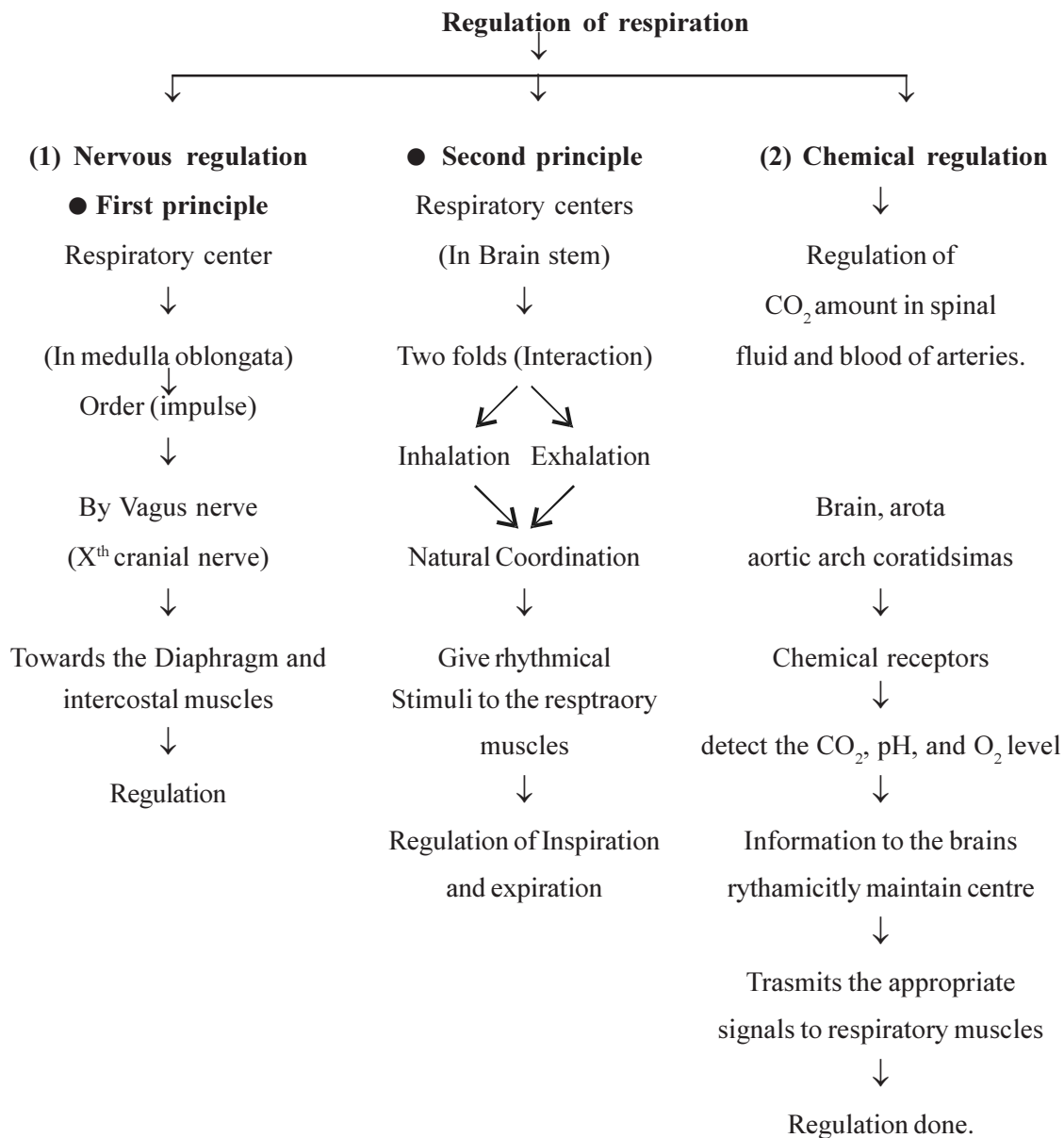
- CO_2 Produced through cellular respiration in cells diffuses into the blood within the capillaries. It is transported in two forms :
 - (1) Physical solution and
 - (2) Chemical compound
- (1) In a form of physical solution : About 10% of CO_2
- Combines chemically with water of **plasma** forming carbonic acid.
- (1) $CO_2 + H_2O \rightleftharpoons H_2CO_3$ (Carbonic acid) Any increase in its concentration causes the disassociation of H_2CO_3 into hydrogen ion and bicarbonate ion $H_2CO_3 \rightleftharpoons H^+ + HCO_3^-$
 If all amount of CO_2 is transported by blood streams. pH of blood would be lowered from its normal level. i.e. 7.4 about 4.5 This would be instantly fatal.
- (2) **In a form of chemical compound : (In RBCs)**
- (A) **Carbamino compounds : (20% Nearly)**
 $CO_2 + Hb.NH_2 \rightarrow Hb.NH.CO_2H$ (carbamino haemoglobin)

(B) As a bicarbonate form (Nearly 70%)**Released CO_2 on respiratory surface (lungs)**

- $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- $2\text{KHCO}_3 \rightarrow \text{K}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2 \uparrow$
- $\text{HbNHCOOH} \rightarrow \text{HbNH}_2 + \text{CO}_2 \uparrow$

- (57) How much CO_2 is brought at respiratory surface by blood plasma ?
 (A) 70 (B) 90 (C) 30 (D) 80
- (58) In which form CO_2 is not transported at respiratory surface ?
 (A) NaHCO_3 (B) KHCO_3
 (C) Physical Solution (D) Carbamino haemoglobin
- (59) Reactant for carbonic anhydrase in blood plasma surrounding tissue cells.
 (A) CO_2 (B) H_2CO_3 (C) CO_2 and H_2O (D) None
- (60) Which are sequential changes during chloride shift and reshift ?
 (A) $\text{NaCl} \rightarrow \text{Cl}^- \rightarrow \text{KCl} \rightarrow \text{Cl}^- \rightarrow \text{NaCl}$ (B) $\text{NaCl} \rightarrow \text{Cl}^- \rightarrow \text{NaCl} \rightarrow \text{Cl}^- \rightarrow \text{KCl}$
 (C) $\text{KCl} \rightarrow \text{Cl}^- \rightarrow \text{NaCl} \rightarrow \text{Cl}^- \rightarrow \text{KCl}$ (D) $\text{KCl} \rightarrow \text{Cl}^- \rightarrow \text{KCl} \rightarrow \text{Cl}^- \rightarrow \text{NaCl}$
- (61) Removal of CO_2 by blood plasma at respiratory surface.
 (A) $2\text{NaHCO}_3 \rightarrow \text{Na}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$ (B) $\text{Hb} \cdot \text{NH} \cdot \text{COOH} \rightarrow \text{Hb} \cdot \text{NH}_2 + \text{CO}_2$
 (C) $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$ (D) $2 \text{KHCO}_3 \rightarrow \text{K}_2\text{CO}_3 + \text{H}_2\text{O} + \text{CO}_2$
- (62) Which components are present in RBC flowing in blood from pulmonary artery ?
 (1) $\text{Hb} \cdot \text{NH} \cdot \text{COOH}$ (2) KCl (3) NaHCO_3 (4) KHCO_3 (5) HHb (6) KHbO_2 (7) H_2CO_3
 (A) 1, 2, 3, 6, (B) 1, 2, 5 (C) 1, 2, 4, 5, 7 (D) 1, 2, 4, 5, 6, 7
- (63) Buffer component present in blood plasma :
 (A) NaH_2PO_4 (B) NaHCO_3 (C) Na_2HPO_4 (D) KHCO_3
- (64) During transport of CO_2 in blood formation and dissociation of NaCl , Sequentially as -
 (A) tissue cell and respiratory surface
 (B) respiratory surface and cell
 (C) tissue cell and tissue cell
 (D) respiratory surface and respiratory surface
- (65) During backshift of chloride, Cl^- joins with which component in blood plasma ?
 (A) KCl (B) KHCO_3 (C) NaCl (D) NaHCO_3
- (66) Source of necessary Cl^- for chloride shift is
 (A) KCl (B) HCl (C) NaCl (D) NH_4Cl
- (67) Transport of CO_2 by blood plasma as chemical composition by
 (A) Na_2HPO_4 (B) Cl^- Shift (C) NaPr (D) $\text{Hb} \cdot \text{NH}_2$
- (68) If all CO_2 is transported in the form of physical solution, what will be pH of blood ?
 (A) 7.4 (B) 4.5 (C) 8.5 (D) 11.9
- (69) Cl^- from blood plasma, enters RBC, in exchange of which component ?
 (A) HCO_3^- (B) H^+ (C) K^+ (D) Na^+

Answers : (57-D), (58-B), (59-D), (60-C), (61-A), (62-B), (63-C), (64-B), (65-D), (66-C), (67-D), (68-B), (69-A)



- Respiratory center / (s) gets impulses from substances which lying on lungs.

Disorders of respiratory systems :

(1) Bronchitis :

- **Causes** : infection - smoking.
- **Symptoms** : regular coughing with thick and large amount of ● phlegm - Yellowish / greenish like cough
- burning sensation in trachea. ● **Prevention** - Away from the smoke, chemical and pollutants
- **Treatment** : By antibiotics.

(2) Asthma :

- **Causes** : Allergenes in air.

Symptoms : The muscles wall of tracheal branches remain constantly agitated undergo spasmic contraction - repeated coughing out of phlagm.

Difficulty in breathing - suffocation in trachea.

- **Prevention** : Avoiding the foreign substance or allergens.
- **Treatment** : With suitable antibiotic, antihistamine drugs.

- (3) ● **Emphysema : causes** : Smoking and chronic bronchitis.
 ● **Symptoms** : lost elasticity of alveoli - after inhalation alveoli are full - difficulty in breathing, suffocation
 ● **Side effect** : The heart and brain do not get enough O_2 .
 ● **Prevention** : Avoiding of smoking and pollutants.
 ● **Treatment** : Use of antibiotics and tracheal dilatory drugs. once it occurs, the obtained, there is no permanent treatment.
- (4) **Pneumonia-Causes** : Streptococcus Pneumonia
 ● **Symptoms** : An acute infection of the alveoli - alveoli of lungs becomes filled with fluid and dead I WBCs, become defunct.
 ● Children, old individuals and AIDS - patients are susceptible to this disease.
 ● Treatment : with antibiotics
- (5) **Occupational lung disease** :
 Causes : exposure of harmful gas and dust
 Examples : Silicosis and asbestosis
-
- (70) Respiratory centre of medulla oblongata sends message to
 (A) diaphragm muscle (B) Intercostal muscle (C) Pulmonary muscle (D) A and B both
- (71) Where is location of respiratory centre with two folds ?
 (A) cerebrum (B) Brain stem (C) cerebellum (D) Diencephalon
- (72) Chemical regulation of breathing is not regulated by amount of
 (A) CO_2 in artery (B) CO_2 into cerebro spinal fluid
 (C) A and B both (D) O_2 in cerebrospinal fluid
- (73) Chemical receptors checks amount of in blood
 (A) CO_2 , O_2 (B) CO_2 , O_2 and pH (C) CO_2 (D) O_2
- (74) In treatment of which disease antihistamine drugs are given ?
 (A) amphisema (B) Asthama (C) Asbestosis (D) Bronchitis
- (75) Due to which disease, functions of brain and heart is hampered ?
 (A) Asthama (B) Pneumonia (C) Amphysema (D) Bronchitis
- (76) Which disease do not occur due to infection of Bacteria or virus ?
 (A) Pneumonia (B) Asbestosis (C) Bronchitis (D) All of above
- (77) Alveolus loses elasticity and alvelous filled with liquid are symptoms of which disease ?
 (A) Amphysema - Asthama (B) Amphysema - Bronchitis
 (C) Pneumonia - Amphysema (D) Amphysema - Pneumonia
- (78) symptom of bronchitis.
 (A) Suffocation in Bronchus (B) Inflammation, irritation in bronchus
 (C) Destruction of alveoli (D) alveoli remain filled with air
- (79) Probability of which respiratory related disease possibly occur in HIV infected person ?
 (A) Bronchitis (B) Asthma (C) Pneumonia (D) Amphysema
- (80) Constant contraction of tracheal muscle is symptom of disease.
 (A) Asthma (B) Amphysema (C) Bronchitis (D) Asbestosis

(81) It is symptom of Bronchitis.

(A) Alveoli loses elasticity.

(B) Alveoli filled with liquid and WBC.

(C) Expulsion of thick, greenish yellow cough in large quantity.

(D) Mostly difficulty in exhalation.

Answers : (70-D), (71-B), (72-D), (73-B), (74-B), (75-C), (76-B), (77-D), (78-B), (79-C), (80-A), (81-C)

• **Column type questions - Select proper option.**

(82) **Column -I** **Column-II**

(1) Pre-olfactory region (P) upper region

(A) 1 - R, 2 - Q, 3 - P

(2) Olfactory region (Q) middle region

(B) 1 - P, 2 - R, 3 - Q

(3) Respiratory region (R) lower region

(C) 1 - R, 2 - P, 3 - Q,

(D) 1 - Q, 2 - P, 3 - R

(83) **Column -I** **Column-II**

(1) Pharynx (P) Opens in pharynx

(A) 1 - R, 2 - Q, 3 - S, 4 - P

(2) Larynx (Q) Connects pharynx with trachea

(B) 1 - R, 2 - Q, 3 - P, 4 - S

(3) Trachea (R) Opens in larynx and oesophagus

(C) 1 - R, 2 -P, 3 - S, 4 - Q

(4) Internal nares (S) Gives passage to air towards trachea

(D) 1 - R, 2 - S, 3 - Q, 4 - P

(84) **Column -I** **Column-II**

(1) Primary bronchiole (P) Branch entering in each lobules of lungs

(A) 1- Q, 2 - R, 3 - T, 4 - P

(2) Tertiary bronchiole (Q) Branch entering into lungs

(B) 1 - Q, 2 - S, 3 - P, 4 - T

(3) Secondary bronchiole (R) Branch forming trachea

(C) 1-Q, 2 - R, 3 - P, 4 - T

(4) Trachea (S) Branch forming terminal end

(D) 1- Q, 2 - R, 3 - P, 4 - S

(T) Branch ending in alveolus

(85) **Column -I** **Column-II**

(1) Right lung (P) Contraction of diaphragm muscles

(A) 1 - S, 2 - R, 3 - P, 4 - Q

(2) Left lung (Q) Relaxation of diaphragm muscles

(B) 1 - R, 2 - S, 3 - P, 4 - Q

(3) Inhalation (R) Two fissures

(C) 1 - R, 2 - S, 3 - Q, 4 - P

(4) Exhalation (S) One fissure

(D) 1 - S, 2 - R, 3 - Q, 4 - P

(86) **Column -I** **Column-II**

(1) Volume of air, entering into lungs and coming out, during normal breathing

(P) 500 ml

(Q) ERV

(2) Residual air after forceful exhalation, in lungs

(R) 2500 to 3500 ml

(3) Amount of air, expelled forcefully from lungs after normal exhalation

(S) RV

(4) Amount of air, taken by lungs after normal inhalation

(A) (1-P), (2-S), (3-R), (4-Q)

(B) (1-P), (2-Q), (3-S), (4-R)

(C) (1-P), (2-S), (3-Q), (4-R)

(D) (1-P), (2-R), (3-S), (4-Q)

- (87) **Column -I** **Column-II**
- (1) TLC - RV = (P) FRC (A) 1 - R, 2 - S, 3 - Q, 4 - P
- (2) TLC - FRC = (Q) EC (B) 1 - R, 2 - S, 3 - P, 4 - Q
- (3) TLC - IC = (R) VC (C) 1 - R, 2 - Q, 3 - P, 4 - S
- (4) TLC - (IRV - RV) = (S) IC (D) 1 - R, 2 - P, 3 - S, 4 - Q
- (88) **Column -I** **Column-II**
- (1) HHbO₂ (P) Haemoglobinic acid (A) 1 - R, 2 - U, 3 - T, 4 - S
- (2) KHbO₂ (Q) Disodium hydrogen phosphate (B) 1 - P, 2 - U, 3 - T, 4 - S
- (3) NaH₂PO₄ (R) Oxyhaemoglobinic acid (C) 1 - R, 2 - U, 3 - Q, 4 - S
- (4) H.Pr (S) Proteonic acid (D) 1 - S, 2 - U, 3 - T, 4 - R
- (T) Sodium hydrogen phosphate
- (U) Potassium oxyhaemoglobin
- (89) **Column -I** **Column-II**
- (1) Silicosis (P) Irritation, burning sensation in bronchus. (A) 1 - R, 2 - T, 3 - P, 4 - Q, 5 - S
- (2) Asthama (Q) Recurrence of bronchitis (B) 1 - R, 2 - T, 3 - P, 4 - S, 5 - Q
- (3) Pneumonia (R) Professional hazards (C) 1 - R, 2 - T, 3 - S, 4 - Q, 5 - P
- (4) Amphisema (S) Acute infection of aveoli (D) 1 - T, 2 - R, 3 - S, 4 - Q, 5 - P
- (5) Bronchitis (T) Allergic disease

Answers : (82-C), (83-A), (84-D), (85-B), (86-C), (87-B), (88-A), (89-C)

A - Statement, R - Reason type questions

Select answers for questions given below from the following options :

(A) A and R true and R is explanation of A.

(B) A and R true, but R is not explanation of A.

(C) A is true, R wrong.

(D) A is wrong, R true.

- (90) Statement A : During Asthmatic attack antihistamine drugs give relief.
Reason R : Asthma is allergic disease.
- (A) (B) (C) (D)
- (91) Statement A : Food does not enter into oesophagus while eating.
Reason R : Oesophagus always remain open.
- (A) (B) (C) (D)
- (92) Statement A : Alveoli of lungs are its respiratory surface.
Reason R : Exchange of O₂ and CO₂ takes place in lungs by alveoli.
- (A) (B) (C) (D)
- (93) Statement A : When muscles of diaphragm contracts, Size of thoracic cavity decreases.
Reason R : When diaphragm muscles contracts, diaphragm is pushed downwards.
- (A) (B) (C) (D)

- (94) Statement A : O_2 is transported only by RBC in blood.
Reason R : Hb is present in RBC.
(A) (B) (C) (D)
- (95) Statement A : Respiratory passage remains open and do not suffocate.
Reason R : Trachea possess 'C' shaped cartilagenous rings.
(A) (B) (C) (D)
- (96) Statement A : Lungs are prevented from jerks.
Reason R : Lungs are protected by rib-cage.
(A) (B) (C) (D)
- (97) Statement A : More O_2 is transported by RBC.
Reason R : HHbo₂ is formed at respiratory surface in RBC.
(A) (B) (C) (D)
- (98) Statement A : Cl^- Shifting occurs at respiratory surface.
Reason R : HHbo₂ is formed in RBC at respiratory surface.
(A) (B) (C) (D)
- (99) Statement A : Silica enters during inhalation, causes silicosis.
Reason R : Elasticity of alveolus is destroyed in silicosis.
(A) (B) (C) (D)
- (100) Statement A : pH of blood is maintaining 7.4.
Reason R : Na_2HPO_4 is present in blood plasma.
(A) (B) (C) (D)
- (101) Statement A : Blood emptying in left auricle has 95 mmHg partial pressure.
Reason R : Blood from lungs emptied into left auricle by pulmonary vein.
(A) (B) (C) (D)

Answer: (90-A), (91-B), (92-A), (93-D), (94-D), (95-C), (96-B), (97-B), (98-D), (99-C), (100-C), (101-A)

True - False type questions (T - F)

Select which option is correct for true or false in following sentences.

- (102) (1) Middle region of nasal cavity is called respiratory passage.
(2) Pharynx acts as passage for air in human.
(3) Lungs of human are situated in thoracic cavity.
(4) 'C' Shaped cartilagenous rings present in the trachea.
(A) T T F F (B) T F F F (C) T T T F (D) T F T F
- (103) (1) Alveoli tubule is smallest diameter tube in bronchiole tree.
(2) Diaphragm have striated muscles.
(3) Volume of ERV is 1100 to 1200 ml.
(4) Left lung, has two lobes and two fissures.
(A) T F T T (B) T T T T (C) F T T T (D) T F F F

- (104) In comparison with exhalation which statements are right or wrong ?
- (1) diaphragm is pulled up.
 - (2) Size of thoracic cavity increases.
 - (3) Partial pressure of air increases in lungs.
 - (4) Diaphragm muscles relaxed.
- (A) T F T F (B) T F T T (C) F F T T (D) T T T T
- (105) (1) Value of IRV is more than FRC.
- (2) Value of IC is less than IRV.
 - (3) Value of VC is 5100 to 5800 ml.
 - (4) Value of TV is less than RV.
- (A) T F F T (B) T F T T (C) T T F T (D) T T F F
- (106) (1) 3% of CO_2 is transported by blood plasma.
- (2) 97% of CO_2 is transported by RBC.
 - (3) 20% of CO_2 is transported as carbamino components.
 - (4) O_2 in the form of KHbO_2 and CO_2 in the form of NaHCO_3 , is transported maximum.
- (A) F T T T (B) F F F F (C) F F T T (D) F F T F
- (107) (1) Message of respiratory centre of medulla oblongata is transported by 10th cranial nerve.
- (2) Respiratory centers of medulla oblongata has two folds.
 - (3) Chemical receptors are present in lungs.
 - (4) Chemical receptors check percentage of CO_2 , pH and O_2 in blood.
- (A) T F F T (B) T T F T (C) F F T T (D) F F F T
- (108) (1) Antihistamine is useful in the treatment of Asthama.
- (2) As a side effect of asthma brain and heart do not receive enough blood.
 - (3) Alveoli are filled with liquid and dead RBC.
 - (4) Muscles of trachea remains excited in bronchitis.
- (A) T T T F (B) T F F F (C) T T F F (D) T T F T

Answers : (102-B), (103-D), (104-B), (105-A), (106-C), (107-D), (108-B)

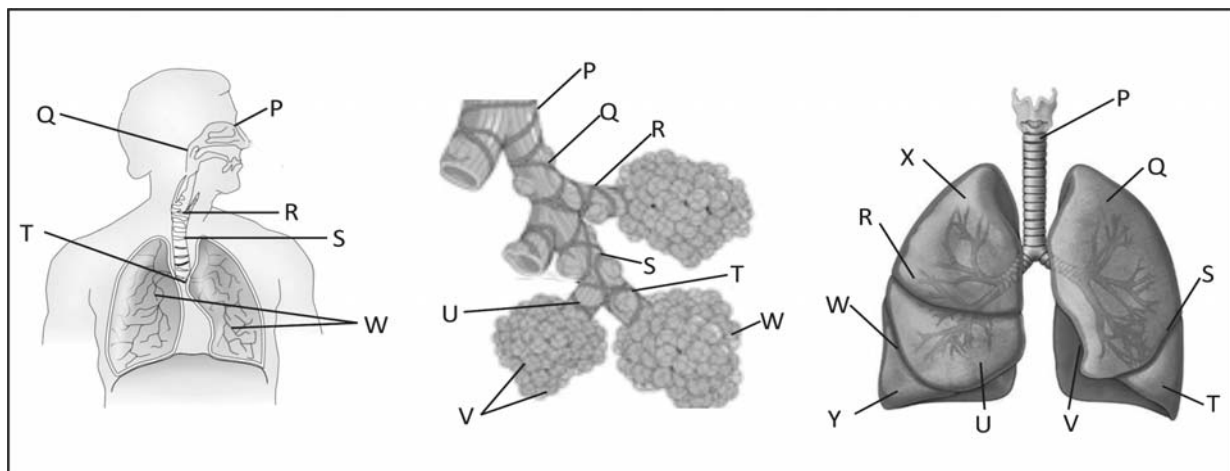
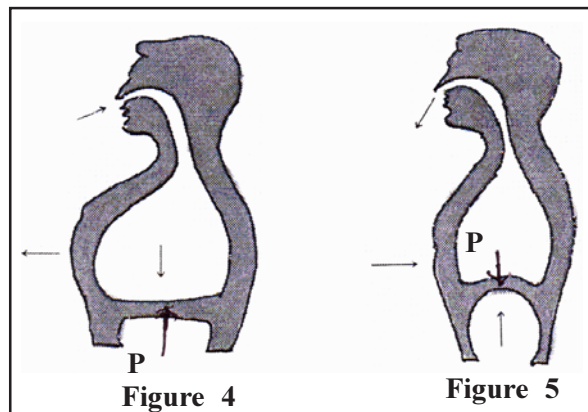


Figure 1

Figure 2

Figure 3

- (109) In which structure of Fig. 1 'C' Shaped cartilagenous ring is observed ?
 (A) Q and R (B) Q and T (C) R and S (D) R and P
- (110) What is indicated by 'R' in Fig. -1 ?
 (A) Pharynx (B) Larynx (C) Trachea (D) Bronchus
- (111) Which structure of Fig -2 is not included in broncheal tree ?
 (A) P (B) V (C) Q (D) P and V
- (112) What is indicated by 'S' in Fig. 2 ?
 (A) Secondary bronchiole (B) quartnary bronchiole (C) Tertiary bronchiole (D) Primary bronchiole
- (113) What is indicated by 'W' in Fig. 3 ?
 (A) Oblique fissure of right lung. (B) Oblique fissure of left lung.
 (C) Transverse fissure of right lung. (D) Transverse fissure of left lung.
- (114) What is indicated by upper lobe in Fig -3 ?
 (A) Y and T (B) X and U (C) Q and T (D) X and Q
- (115) What is indicated by 'U' in Fig. - 3 ?
 (A) upper lobe (B) middle lobe (C) lower lobe (D) lateral lobe
- (116) Which process is indicated by Fig. 4 ?
 (A) Exhalation (B) Breathing (C) Inhalation (D) Peristalsis
- (117) What is not proper for Fig. 5 ?
 (A) Relaxation of diaphragm muscle.
 (B) Partial pressure increases in lungs.
 (C) Size of thoracic cavity reduces.
 (D) Contraction of diaphragm muscles.



Answers : (109-C), (110-B), (111-A), (112-C), (113-A), (114-D), (115-B), (116-C), (117-D)

Nasal cavity dividing accordingly function

- (i) Vastibular - Skin, hair, sebacious gland.
- (ii) Respiratory passage - Globlet cells, pseudo columnar epithelial cells, glandular epithelial.
- (iii) Oltaetory region : nerve sensory epithelial.

Activity of respiratory center :

- Increases the concentration of CO_2 in blood, decreases the PH so acidity can occur that why respiratory centers become active.
- Respiratory rate in human 12-18 per minute.
- One molecule of haemoglobin attached with four molecules of CO_2 .
- Hb as four units : Each unit react with O_2 .
- 1gm Hb transport 1.34 ml of O_2
- 100 ml blood transport 20 ml of O_2 .

QUESTIONS FOR NEET :

- (118) When amount of CO_2 increases in blood, breathing becomes
 (A) Shallow and slow (B) No effect on breathing
 (C) Slow and deep (D) Fast and deep
- (119) When analysis of patient's blood shows high amount of carboxyhaemoglobin than which of the following summary may mostly correct ?
 patient may be breathing more amount of polluted air with high amount of
 (A) carbon disulphide (B) chloroform
 (C) carbon dioxide (D) carbon monoxide
- (120) Which of the following cells of mammals are not able to metabolize glucose by aerobic respiration ?
 (A) Non - Striated muscle cells (B) Hepati cells
 (C) RBC (D) WBC
- (121) What is essential capacity of our lungs ?
 (A) Reserve volume of air - Tidal volume
 (B) Total lung capacity - Reserve volume of exhalation
 (C) Reserve volume of air - Reserve volume of exhalation
 (D) Total lung capacity - Remaining Volume
- (122) Given below is four respiration capacity and four irregular breathing volume in normal human.
 Which of the two from the given capacity is correct ?
- | Capacity of breathing | Volume of air |
|------------------------------|----------------------|
| (i) Remaining volume | (p) 2500 ml |
| (ii) Most essential capacity | (q) 3500 ml |
| (iii) Reserve volume of air | (r) 1200 ml |
| (iv) Capacity of inhalation | (s) 4500 ml |
- (A) (ii-p) and (iii-s) (B) (iii-r) and (iv-p) (C) (iv-q) and (i-r) (D) (i-s) and (ii-q)
- (123) Respiratory centre located in the brain is stimulated by
 (A) Concentration of O_2 in venous blood (B) Concentration of CO_2 in arterial blood
 (C) Concentration of O_2 in artery (A) Concentration of CO_2 in venous blood
- (124) How, is common cold, differ from pneumonia ?
 (A) Pneumonia is spreading disease where as common cold is disease of deficiency of nutritive substances.
 (B) Pneumonia can be prevented by live, less, weakened bacterial vaccine where as no effective vaccine for common cold.
 (C) Pneumonia is caused by virus, where as common cold is due to bacterium haemophils, influenzal.
 (D) Microorganisms of bacteria affects alveoli, where as effect of common cold is at nose and respiratory passage, lungs are not affected.
- (125) Normal amount of O_2 and CO_2 present in air when inhaled by man, he feels suffocated because
 (A) Haemoglobin unites with CO instead of O_2 to form carboxyhaemoglobin.
 (B) CO affects nerves of lungs.
 (C) CO and O_2 reacts together to decrease their amount.
 (D) CO affects diaphragm and intercostal muscles.

- (126) Breathing is regulated by
(A) Hypothalamus (B) Cerebrum (C) Cerebellum (D) medulla oblongata
- (127) Alveolar epidermis of lungs is formed of
(A) non- ciliated columnar (B) non-ciliated squamous
(C) ciliated columnar (D) ciliated squamous
- (128) Transport of CO_2 from tissue to respiratory surface is by
(A) blood plasma and RBC (B) blood plasma
(C) RBC (D) RBC and WBC
- (129) How is air passed into respiratory passage ?
(A) trachea \rightarrow lungs \rightarrow larynx \rightarrow pharynx \rightarrow alveoli
(B) Nose \rightarrow larynx \rightarrow pharynx \rightarrow trachea \rightarrow alveoli \rightarrow micro bronchioles
(C) Nasal aperture \rightarrow pharynx \rightarrow larynx \rightarrow trachea \rightarrow bronchioles \rightarrow microbronchiole \rightarrow alveoli
(D) Nose \rightarrow mouth \rightarrow lungs
- (130) Normally carbonic anhydrase is active in
(A) RBC (B) WBC (C) blood plasma (D) blood corpuscles
- (131) Presence of more number of alveoli surrounding alveolar tubule, opening in micro bronechioles in lungs indicates
(A) Non-functional system for, transport of residual air in less quantity
(B) Non-functional system for transport of residual air in more quantity
(C) In absence of residual air, functioning system for transportation
(D) Functional system for transport of residual air in less amount
- (132) During transport of CO_2 why blood does not become acidic ?
(A) due to neutralization of H_2CO_3 By Na_2CO_3 . (B) Due to absorption of leucocytes.
(C) Due to presence of blood buffer. (D) None of above.
- (133) If 1500 ml air increases in air, it is called.....
(A) Tidal volume (B) Inspiratory reserve volume
(C) Residual volume (D) Vital capacity
- (134) What protects lungs ?
(A) Ribs (B) Vertebral column
(C) sternum (D) All of above
- (135) What is haemoglobin ?
(A) vitamin (B) Pigments of skin (C) Blood carrier (D) Respiratory pigment
- (136) CO_2 reacts with water in RBC to form carbonic acid. What is responsible for it ?
(A) Carbonic anhydrase (B) Carboxy peptidase (C) Hydrolase (D) Oxido reductase
- (137) What is conditon of diaphragm at the time of exhalation ?
(A) Oblique (B) Normal (C) Flat (D) Dome shape
- (138) What is called exchange of bicarbonate and chloride between RBC and blood plasma ?
(A) Chloride shift (B) Effect of Bohr (C) Halden Effect (D) Intracellular respirtion

- (139) If CO_2 concentration increases in blood, then respiration
(A) increases (B) decreases (C) stops (D) no change occurs
- (140) What is vital capacity of our lungs ?
(A) $\text{RV} + \text{ERV}$ (B) $\text{TLC} + \text{TV}$ (C) $\text{RV} + \text{TV}$ (D) $\text{TLC} - \text{ERV}$
- (141) CO_2 liberated from tissues into blood is in which form ?
(A) Carbamino haemoglobin in RBC
(B) Bicarbonate in blood plasma and RBC
(C) Free CO_2 in blood plasma
(D) 70% carbamino haemoglobin and 30 % bicarbonate
- (142) Two friends are taking lunch, one of them has hiccups while swallowing food. It is due to improper movement of
(A) epiglottis (B) diaphragm (C) neck (D) tongue
- (143) Arrange it in ascending order.
(1) TV (2) RV (3) IRV (4) VC
(A) $1 < 2 < 3 < 4$ (B) $1 < 3 < 2 < 4$ (C) $1 < 4 < 3 < 2$ (D) $1 < 4 < 2 < 3$
- (144) What is symptoms of amphysema ?
(A) Haemorrhage of bronchieles
(B) Increase in number of alveoli
(C) Infection of microbacterium tubeculi
(D) Inflammation of alveoli
- (145) Center for Regulation of rhythemacity in breathing are
(A) pons (B) aortic arch (C) medulla (D) carotid artery

Answers : (118-D), (119-D), (120-C), (121-D), (122-C), (123-C), (124-D), (125-A), (126-D), (127-B), (128-A), (129-C), (130-A), (131-B), (132-C), (133-C), (134-D), (135-D), (136-A), (137-D), (138-A), (139-A), (140-B), (141-B), (142-A), (143-A), (144-D), (145-B)

