

## Topic :-Breathing and Exchange of Gases

1 (d)

If a person respire in air containing normal amount of oxygen (21%) and small amount of carbon monoxide, he suffers from suffocation because haemoglobin combines with carbon monoxide to form a stable compound. The affinity of haemoglobin to carbon monoxide is about 250 times more than for oxygen. 0.1% of carbon monoxide blocks 50% Hb of the body due to which the oxygen carrying capacity of blood is decreased. This is called hypoxia.

2 (b)

- I. Residual volume
- II. Tidal volume
- III. Total lung capacity

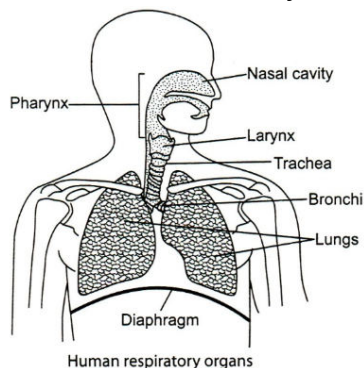
3 (c)

A healthy man can inspire or expire approximately 6000 to 8000 mL of air per minute

5 (d)

A-Epiglottis, B-Trachea, C-Bronchus, D-Diaphragm, E-Bronchiole.

Pair of external nostrils opens above the upper lips, which leads to nasal passage. It opens into the nasopharynx. Nasopharynx opens through the glottis of the larynx region into the trachea. Trachea is a straight tube extending upto mid-thoracic cavity, which divides at the right and left bronchi. Each bronchi undergoes repeated division to form secondary and tertiary bronchi and bronchioles ending up in very thin terminal bronchioles, which gives rise to a number of very thin, irregular walled, vascularized bag like structure called alveoli

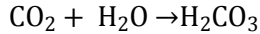


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(b)

Transportation of oxygen from lungs to body tissues and of CO<sub>2</sub> from tissues to the lungs is vital role of blood.

**Transport of carbon dioxide :** Most of the CO<sub>2</sub> that dissolves in blood plasma reacts with water to form carbonic acid :



An enzyme carbonic anhydrase present in RBCs, which accelerates the carbonic acid formation about 5000 times. About 70% of the CO<sub>2</sub> received by blood from the tissue immediately enter into RBCs and hydrated to carbonic acid. All carbonic acid of RBCs dissociates into hydrogen and bicarbonate ions (H<sup>+</sup> and HCO<sub>3</sub><sup>-</sup>). The H<sup>+</sup> mostly combine with haemoglobin for keeping the pH of blood (7.4) in steady state, whereas the bicarbonate ion diffuse from RBCs into the plasma. To maintain electrostatic neutrality of plasma many chloride ions in turn diffuse from plasma into RBCs. This is termed **chloride** or **Hamburger shift**.

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(c)

**Ketoacidosis** is a type of metabolic acidosis, which is caused by high concentrations of ketone bodies, formed by the breakdown of fatty acids and the deamination of amino acids.

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(b)

Oxygen (O<sub>2</sub>) is utilised by the living entities to indirectly break down the nutrients like glucose, to derive energy for performing various activities, etc.

CO<sub>2</sub> (carbon dioxide) which is a harmful gas, releases during the catabolic reactions. It is therefore, evident that O<sub>2</sub> has to be continuously provided to the cells and CO<sub>2</sub> produced by the cells have to be released out

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(d)

*Correct statements are*

- I. Diffusion membrane is made-up of the three layers
- II. Solubility of CO<sub>2</sub> in blood is higher than O<sub>2</sub> by 25 times
- III. Breathing volumes are estimated by spirometer
- IV. High H<sup>+</sup> in blood favours oxygen dissociation

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(c)

**Vital capacity** is the largest possible expiration after largest possible inspiration.

$$\begin{aligned}\text{Vital Capacity (VC)} &= \text{IRV} + \text{TV} + \text{ERV} \\ &= 3000 + 500 + 1100 \\ &= 4600\text{mL}\end{aligned}$$

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(a)

**Vital capacity** is the amount of air, which one can inhale and exhale with maximum effort.

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(c)

Partial pressure of O<sub>2</sub> in alveoli and oxygenated blood are almost same. Alveoli has 104 mm of Hg, whereas oxygenated blood has 95 mm of Hg.

**Percentage of gases in different parts of body**

Air	Oxygen%	Carbon dioxide %	Nitrogen %	Water vapours
Inhaled				
Air	20.84	0.03-0.04	79	Variable
Alveolar				
Air	13.1	5.3	79	Saturated
Exhaled				
Air	15.7	4.0	79.7	Saturated

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(a)

Carbon monoxide has higher affinity to combine with haemoglobin of blood than oxygen. Tobacco smoke also contains carbon monoxide, so it reduces the oxygen carrying capacity of blood.

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(a)

**Occupational Respiratory Disorders** In certain industries, especially those involving grinding or stone breaking, so much dust is produced. In that condition, the respiratory diseases like, silicosis, fibrosis and asbestoses occurs. Long exposure can give rise to inflammation leading to fibrosis and thus, causing serious lung damage

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(d)

All of these.

Alveoli are the primary site of exchange of gases. Exchange of gases also occur between the blood and tissue.  $O_2$  and  $CO_2$  are exchanged in these sites by simple diffusion, mainly based on pressure concentration gradient

Pressure/Concentration gradient, solubility of gases as well as the thickness of the membranes involved in diffusion are some important factors that affects the rate of diffusion

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(a)

Haemoglobinic acid is a very weak acid formed inside the red blood cells when hydrogen ions produced by the dissociation of carbonic acid combine with the haemoglobin.

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(d)

A - Epiglottis

B - Thyroid gland

C - Tracheal cartilage

D - Trachea

19

(c)

We can voluntarily take deep breath by an effort. In the process of deep inspiration, chest distention is brought about by the external intercostal muscles and the abdominal muscles

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(a)

Given diagram A clearly indicates that

(i) ribs going downward

(ii) diaphragm contract or going upward

These two sign indicates that the diagram A depicts the process of expiration

zANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	B	C	D	D	B	C	B	D	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	C	C		A	D	A	D	C	A

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