



## Breathing and Exchange of Gases Important Questions With Answers

### NEET Biology 2023

1. Incidence of Emphysema - a respiratory disorder is high in cigarette smokers. In such cases
- the bronchioles are found damaged
  - the alveolar walls are found damaged**
  - the plasma membrane is found damaged
  - the respiratory muscles are found damaged

**Solution : -**

Emphysema is a condition of short breath due to breakdown of alveolar wall and reduction of respiratory area due to smoking.

2. **Assertion:** Emphysema is the permanent abnormal inflation of airspace of terminal bronchioles or alveolar sacs.  
**Reason:** Destruction of pulmonary tissues specially alveolar septa and flattening of alveolar ducts occur in emphysema.
- If both assertion and reason are true and reason is the correct explanation of assertion.
  - If both assertion and reason are true but reason is not the correct explanation of assertion.**
  - If assertion is true but reason is false.
  - If both assertion and reason are false.

3. Which structure of man is similar to spiracle of cockroach?

- Nostril**
- Bronchiole
- Lung
- Alveolus

**Solution : -**

Spiracle in cockroach and nostril in man are the openings through which air enters the body.

4. The CO<sub>2</sub> content by volume, in the atmospheric air is about

- 3.34%
- 4%
- 0.0314%**
- 2.1%

5. In the tissues, high concentrations of carbon dioxide

- increases the affinity of haemoglobin to both oxygen and hydrogen
- increases the affinity of haemoglobin to oxygen but decreases its affinity to hydrogen
- decreases the affinity of haemoglobin to oxygen but increases its affinity to hydrogen**
- decreases the affinity of haemoglobin to both oxygen and hydrogen.

**Solution : -**

Increase in the CO<sub>2</sub> content of the blood decreases the pH of the blood. This decreases the affinity of O<sub>2</sub> with Hb. This is called Bohr effect and is closely related to the fact that deoxygenated Hb binds hydrogen ions more actively than does the Hb. This facilitates gaseous exchange because more O<sub>2</sub> is released in the tissues where the amount of CO<sub>2</sub> is more due to metabolic activity. At the same time, more O<sub>2</sub> is taken up by the lungs or gills when the amount of CO<sub>2</sub> is low.

6. In breathing movements, air volume can be estimated by

- stethoscope
- hygrometer
- sphygmomanometer
- spirometer**

**Solution : -**

Spirometry is the process of recording the changes in the volume and movement of air in and out of the lungs and the instrument used for this purpose is called spirometer or respirometer.

7. Pneumotaxic centre which can moderate the functions of the respiratory rhythm centre is present in  
**a) pons region of brain** b) thalamus c) spinal cord d) right cerebral hemisphere.

**Solution : -**

Pneumotaxic centre is present in the dorsal part of the pons varolii of the brain. Its function is primarily to limit inspiration.

8. **Assertion:** Inspiration occurs when there is a negative pressure in the lungs with respect to the atmospheric pressure.

**Reason:** During inspiration, a decrease in pulmonary volume increases the intra-pulmonary pressure than atmospheric pressure which forces the air from outside to move into the lungs.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
b) If both assertion and reason are true but reason is not the correct explanation of assertion.  
**c) If assertion is true but reason is false.** d) If both assertion and reason are false.

**Solution : -**

The movement of air into and out of the lungs is carried out by creating a pressure gradient between the lungs and the atmosphere. Inspiration occurs when the pressure within the lungs (intra-pulmonary pressure) is less than the atmospheric pressure, i.e., there is a negative pressure in the lungs with respect to atmospheric pressure.

9. Which one of the following is the incorrect statement for respiration in humans?

- a) Cigarette smoking may lead to inflammation of bronchi.**  
b) Neural signals from pneumotaxic centre in pons region of brain can increase the respiratory rate.  
c) Workers in grinding and stone-breaking industries may suffer from lung fibrosis. **d) None of these**

10. One haemoglobin carries how many molecules of  $O_2$ ?

- a) 4** b) 2 c) 6 d) 8

**Solution : -**

Hb contains a protein portion called globin and a pigment portion called haem. The haem portion consists of four atoms of iron, each capable of combining with a molecule of  $O_2$ . Thus, one Hb carries 4 molecules of  $O_2$ .

11. After taking a long deep breath we do not respire for some seconds due to

- a) more  $CO_2$  in blood b) more  $O_2$  in blood **c) less  $CO_2$  in blood** d) less  $O_2$  in blood

12. In alveoli of the lungs, the air at the site of gas exchange, is separated from the blood by\_\_\_\_\_.

- a) alveolar epithelium only** **b) alveolar epithelium and capillary endothelium**  
c) alveolar epithelium, capillary endothelium and tunica adventitia  
d) alveolar epithelium, capillary endothelium, a thin layer of tunica media and tunica adventitia

**Solution : -**

The wall of the capillaries consists of only tunica intemae which is made up of simple squamous endothelium. The wall of alveoli is also very thin, consisting of squamous epithelium.

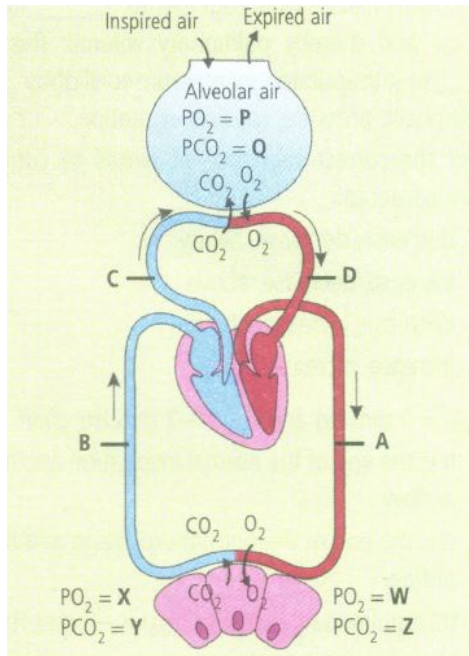
13. Carbon dioxide is transported from tissues to respiratory surface by only\_\_\_\_\_

- a) plasma and erythrocytes** b) plasma c) erythrocytes d) erythrocytes and leucocytes

**Solution : -**

Carbon dioxide is transported from tissues to respiratory surface by only plasma and erythrocytes. Carbon dioxide ( $CO_2$ ) transportation by blood is much easier than oxygen due to the high solubility of  $CO_2$  in water. During transport of  $CO_2$  70% of  $CO_2$  is dissolved in plasma, 23% as carbaminohaemoglobin and 7% transported as bicarbonates ( $HCO_3^-$ )

14. What is the value of W, X, Y and Z normally (in mmHg)?



a)

W	X	Y	Z
95	40	45	40

b)

W	X	Y	Z
95	40	40	45

c)

W	X	Y	Z
40	45	95	40

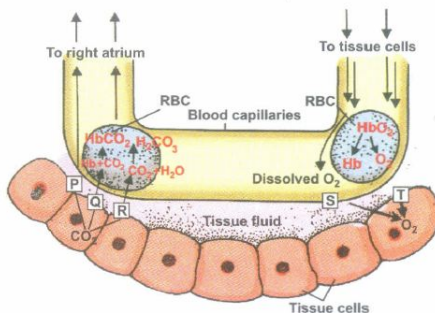
d)

W	X	Y	Z
95	45	40	40

**Solution : -**

In the tissues, exchange of gases occur between the blood and the tissue cells through tissue fluids that surround the tissue cells. Blood that reaches the tissues has more partial pressure of  $O_2$  ( $PO_2 = 95$  mm Hg), than that already in the tissues ( $PO_2 = 40$  mm Hg). Similarly partial pressure of  $CO_2$  is more in tissues (= 45 mm Hg) than in the blood (= 40 mm Hg). Due to these differences in partial pressure of gases,  $O_2$  from blood diffuses in the tissues and  $CO_2$  from tissues diffuses into the blood. This exchange of gases occurs simultaneously.

15. Refer to the given diagrammatic representation of the transportation of oxygen and carbon dioxide in the blood. P, Q, R, S and T represent percentage of both gases in different forms. Select the correct option for P-T.



a)

P	Q	R	S	T
23%	70%	7%	93%	75

b)

P	Q	R	S	T
7%	23%	70%	3%	97%

c)

P	Q	R	S	T
7%	23%	70%	97%	3%

d)

P	Q	R	S	T
70%	7%	23%	97%	3%

**Solution : -**

Blood is the medium of transport for  $O_2$  and  $CO_2$ . About 97% of  $O_2$  is transported by RBCs in the blood. The remaining 3% of  $O_2$  is carried in a dissolved state through the plasma. Nearly 20-25% of  $CO_2$  is transported by RBCs whereas 70% of it is carried as bicarbonate. About 7% of  $CO_2$  is carried in a dissolved state through plasma.

16. **Assertion:** The role of oxygen in the regulation of respiratory rhythm is quite insignificant.

**Reason:** Increased  $PCO_2$  and  $H^+$  concentration inputs from chemoreceptors can activate respiratory rhythm centre to make necessary adjustments.

a) If both assertion and reason are true and reason is the correct explanation of assertion.

b) If both assertion and reason are true but reason is not the correct explanation of assertion.

c) If assertion is true but reason is false d) If both assertion and reason are false.

17. A person breathing normally at rest, takes in and expels approximately half a litre of air during each respiratory cycle. This is called

a) inspiratory reserve volume **b) tidal volume** c) expiratory reserve volume d) vital capacity

**Solution : -**

The volume of air inspired or expired during normal breath is called tidal volume. It is about 500 mL of air in average young adult man.

18. Two friends are eating together on a dining table. One of them suddenly starts coughing while swallowing some food. This coughing would have been due to improper movement of

a) Tongue **b) Epiglottis** c) Diaphragm d) Neck

**Solution : -**

The epiglottis protects respiratory system from food particles.

19. Human beings have a significant ability to maintain and moderate the respiratory rhythm to suit demands of the body. For it we have

Respiratory rhythm centre in medulla - R

Pneumotaxic centre in pons - PT

Chemosensitive area in medulla - C1

Peripheral chemoreceptors in aortic arch and carotid artery- C2

Find out the correct path for regulation of respiration.

a)  $C_2 \rightarrow R \rightarrow PT \rightarrow C_1$  **b)  $PT \rightarrow R \leftarrow C_2$**  c)  $C_1 \rightarrow PT \rightarrow C_2$  d)  $PT \rightarrow C_2 \leftarrow C_1$

$\uparrow$   
C<sub>1</sub>

$\uparrow$   
R

$\uparrow$   
R

20. Which of the following options correctly represents the lung conditions in asthma and emphysema, respectively?

a) Increased respiratory surface; Inflammation of bronchioles

b) Increased number of bronchioles; Increased respiratory surface

**c) Inflammation of bronchioles; Decreased respiratory surface**

d) Decreased respiratory surface; Inflammation of bronchioles

**Solution : -**

Asthma is due to inflammation of bronchi and bronchioles. Emphysema is a chronic disorder in which alveolar walls are damaged due to which respiratory surface is decreased.

21. During winter a person died during sleep, the room was closed and a container with burnt charcoal was found in the room. What may be the possible reason of his death?

a) Non-availability of oxygen **b) Hb has more affinity to combine with carbon monoxide**

c) Hb has more affinity to combine with carbon dioxide d) Combined effect of both (a) and (b)

**Solution : -**

Charcoal on burning produces carbon monoxide (CO). CO has about 200 times more affinity for Hb than O<sub>2</sub>. On combining with Hb, it forms a stable compound carboxyhaemoglobin. Because of this compound, Hb cannot carry sufficient O<sub>2</sub> to the tissues ultimately leading to death.

22. The urge to inhale in humans results from:

**a) rising PCO<sub>2</sub>** b) rising PO<sub>2</sub> c) falling PCO<sub>2</sub> d) falling PO<sub>2</sub>.

**Solution : -**

Excess  $\text{CO}_2$  mainly stimulates the respiratory centre of the brain and increase the inspiratory and expiratory signals to the respiratory muscles.  $\text{O}_2$  does not have a significant direct effect on the respiratory centre of the brain in controlling respiration.

23. Which of the following statements is true about RBCs in humans?

a) They carry about 20-25 percent of  $\text{CO}_2$ .    b) They transport 99.5 percent of  $\text{O}_2$ .

c)

They transport about 80 percent oxygen only and the rest 20 percent of it is transported in dissolved state in blood plasma.

d) They do not carry  $\text{CO}_2$  at all

**Solution : -**

Nearly 20-25% of  $\text{CO}_2$  is transported by RBCs whereas 70% of it is carried as bicarbonate. About 7% of  $\text{CO}_2$  is carried in a dissolved state through plasma. About 97% of  $\text{O}_2$  is carried by RBCs in the blood. About 3% of  $\text{O}_2$  is transported in a dissolved state through the plasma.

24. Select the correct events that occur during inspiration.

(a) Contraction of diaphragm

(b) Contraction of external inter costal muscles

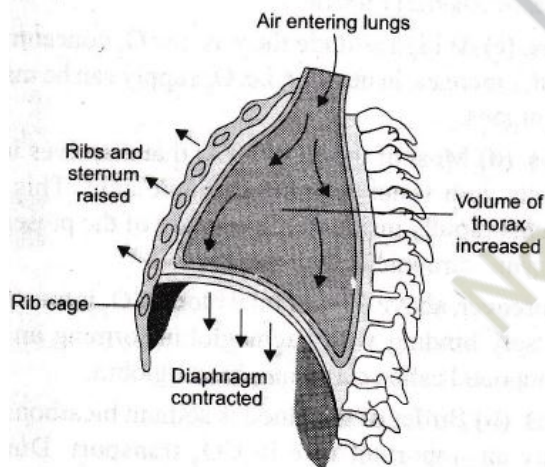
(c) Pulmonary volume decreases

(d) Intra pulmonary pressure increases

a) (a), (b) and (d)    b) only (d)    c) (a) and (b)    d) (c) and (d)

**Solution : -**

Inspiration is initiated by contraction of diaphragm which increases volume of thoracic chamber in anteriorposterior axis and contraction of external inter-costal muscles which lifts up the ribs and sternum causing increases in volume of thoracic chamber in dorsoventral axis.



25. Which of the following is true for  $\text{CO}_2$  concentration?

a) More in alveolar air than in expired air    b) More in expired air than in alveolar air

c) More in inspired air than in alveolar air    d) More in inspired air than in expired air

**Solution : -**

Concentration or partial pressure of  $\text{CO}_2$  ( $\text{PCO}_2$ ) is 40 mm Hg in alveolar air and 32 mm Hg in expired air.

26. Lungs are enclosed in

a) perichondrium    b) pericardium    c) pleural membrane    d) peritoneum.

**Solution : -**

The lungs are covered in a membrane called pleural membrane. The outer covering is called parietal pleura and the inner covering is called visceral pleura.



27. Lungs do not collapse between breathe and some air always remain in the lungs which can never be expelled because:

- a) There is a negative pressure in the lungs
- b) There is a negative intrapleural pressure pulling at the lung walls**
- c) There is a positive intrapleural pressure
- d) Pressure in the lungs is higher than the atmospheric pressure

**Solution : -**

Fact

28. Bulk of oxygen diffuses from the plasma into the red blood corpuscles where it joins loosely with  $Fe^{2+}$  ions of haemoglobin (Hb) to form bright red oxyhaemoglobin ( $HbO_2$ ). The process is called

- a) oxidation
- b) oxygenation**
- c) hydration**
- d) dehydrogenation

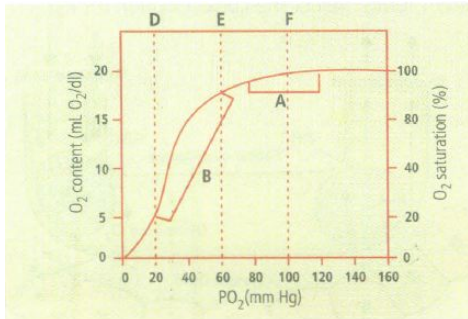
29. During expiration, the diaphragm becomes

- a) dome-shaped**
- b) oblique
- c) concave
- d) flattened.

**Solution : -**

Refer to answer 20.

30. Blood can combine with almost \_\_\_\_\_ of oxygen if the haemoglobin is 100 per cent saturated.



- a) 18 mL
- b) 15 mL
- c) 20 mL**
- d) 10 mL

31. In humans, which of the following is not a step in respiration?

- a) Alveolar diffusion of  $O_2$  and  $CO_2$
- b) Transport of gases by blood
- c) Diffusion of  $O_2$  and  $CO_2$  between blood and tissues
- d) Utilisation of  $CO_2$  by cells for catabolic reactions**

32. Which one of the following organs in the human body is most affected due to shortage of oxygen?

- a) Intestine
- b) Skin
- c) Kidney
- d) Brain**

**Solution : -**

The brain cells are highly specialised. They cannot regenerate and respire without  $O_2$ . Therefore, the shortage of  $O_2$  leads to death of brain cells.

33. Read the given statements characterising certain types of animals. Select the option which correctly exemplifies each of these types.

- (i) Animal having external gills
- (ii) Animal having internal gills
- (iii) Animal showing tracheal respiration
- (iv) Animal revealing buccopharyngeal respiration

a)

(i)	(ii)	(iii)	(iv)
Prawn	Arenicola	Unio	Fish

b)

(i)	(ii)	(iii)	(iv)
Necturus	Unio	Prawn	Frog

c)

(i)	(ii)	(iii)	(iv)
Pila	Arenicola	Unio	Toad

d)

(i)	(ii)	(iii)	(iv)
Necturus	Pila	Millipede	Toad

**Solution : -**

Necturus (Mud puppy, Amphibia) possesses three pairs of external gills. Pila (Apple snail, Mollusca) respire by means of gills (ctenidium) in water and by a pulmonary sac on land. Millipedes (Arthropoda) respire by tracheae (tracheal respiration) and toads (Amphibia) exhibit buccopharyngeal respiration.

34. Emphysema is a condition resulting from  
a) **cigarette smoking**   b) liquor consumption   c) drug addiction  
d) reduced oxygen carrying capacity of blood

**Solution : -**

Emphysema is a respiratory disorder which occurs due to the inflation or abnormal distension of the bronchioles or alveolar sacs resulting in the loss of their elasticity. Cigarette smoking and chronic bronchitis are the causes of this disease.

35. Vital capacity of lungs is  
a) IRV + ERV   b) IRV + ERV + TV - RV   c) IRV + ERV + TV + RV   **d) IRV + ERV + TV.**

**Solution : -**

Vital capacity is the maximum volume of air a person can breathe in after a forced expiration or the maximum volume of air a person can breathe out after a forced inspiration. This equals the inspiratory reserve volume (IRV) + expiratory reserve volume (ERV) + tidal volume (TV). Its value is 3400 mL- 4800 mL.

36. A person suffers punctures in his chest cavity in an accident, without any damage to the lungs, its effect could be  
a) reduced breathing rate   b) rapid increase in breathing rate   c) no change in respiration  
**d) cessation of breathing.**

**Solution : -**

Punctures in a person's chest may lead to loss of pressure gradient.

37. **Assertion:** If two men, expire the same volume of air after normal inspiration, they have the same expiratory capacity.

**Reason:** Expiratory capacity includes tidal volume and inspiratory reserve volume

- a) If both assertion and reason are true and reason is the correct explanation of assertion.**  
b) If both assertion and reason are true but reason is not the correct explanation of assertion.  
c) If assertion is true but reason is false.   d) If both assertion and reason are false

**Solution : -**

Expiratory capacity is the total volume of air a person can expire after a normal inspiration. This includes tidal volume and expiratory reserve volume (TV + ERV).

38. **Assertion:** The abdominal muscles are primarily involved in generating pressure gradient between the lungs and the atmosphere.

**Reason:** The strength of inspiration and expiration can be increased by additional muscles in diaphragm and intercostal muscles.

- a) If both assertion and reason are true and reason is the correct explanation of assertion.  
b) If both assertion and reason are true but reason is not the correct explanation of assertion.  
c) If assertion is true but reason is false.   **d) If both assertion and reason are false**

**Solution : -**

The diaphragm and a specialised set of muscles external and internal intercostals between the ribs, help in generating pressure gradient. Besides this we can increase the strength of inspiration and expiration with the help of additional muscles in the abdomen.

39. Thoracic chamber is formed dorsally by the \_\_\_\_\_(i)\_\_\_\_\_, ventrally by the \_\_\_\_\_(ii)\_\_\_\_\_, laterally by the \_\_\_\_\_(iii)\_\_\_\_\_ and on lower side by the dome shaped \_\_\_\_\_(iv)\_\_\_\_\_.

Select the correct option to complete the above paragraph.

a)

(i)	(ii)	(iii)	(iv)
vertebral column	sternum	ribs	diaphragm

b)

(i)	(ii)	(iii)	(iv)
sternum	vertebral column	diaphragm	ribs

c)

(i)	(ii)	(iii)	(iv)
diaphragm	ribs	vertebral column	sternum

d)

(i)	(ii)	(iii)	(iv)
ribs	diaphragm	vertebral column	sternum

40. Match column I with column II and select the correct option from the codes given below.

Column I	Column II
A. Tracheoles	(i) Yeast
B. Carbonic anhydrase	(ii) Fish
C. Lactic acid	(iii) Inspiration
D. Fermentation	(iv) Vital capacity
E. Gill filaments	(v) Fast muscle
F. Cutaneous respiration	(vi) Insect
G. Diaphragm	(vii) Bicarbonates
	(viii) Earthworm

a) A-(viii), B-(vii), C-(i), D-(iv), E-(ii), F-(vi), G-(v)    **b) A-(vi), B-(vii), C-(v), D-(i), E-(ii), F-(viii), G-(iii)**

c) A-(viii), B-(iv), C-(vii), D-(i), E-(iii), F-(ii), G-(v)    d) A-(vi), B-(i), C-(ii), D-(v), E-(iv), F-(viii), G-(iii)

41. It is known that exposure to carbon monoxide is harmful to animals because

- a) it reduces CO<sub>2</sub> transport    **b) it reduces O<sub>2</sub> transport**    c) it increases CO<sub>2</sub> transport  
 d) it increases O<sub>2</sub> transport.

**Solution : -**

Carbon monoxide poisoning occurs after enough inhalation of carbon monoxide (CO). Carbon monoxide binds with haemoglobin to form carboxyhaemoglobin because of which oxygen is not released to the tissues

42. Tidal Volume and Expiratory Reserve Volume of an athlete is 500 mL and 1000 mL, respectively. What will be his Expiratory Capacity if the Residual Volume is 1200 mL?

- a) 1500 mL**    b) 1700mL    c) 2200 mL    d) 2700 mL

**Solution : -**

Tidal Volume = 500 mL

Expiratory Reserve Volume = 1000 mL

Expiratory Capacity = TV + ERV

= 500 + 1000

= 1500 mL

43. Inspiration occurs when there is a negative pressure in the lungs with respect to atmospheric pressure. This negative pressure is achieved when

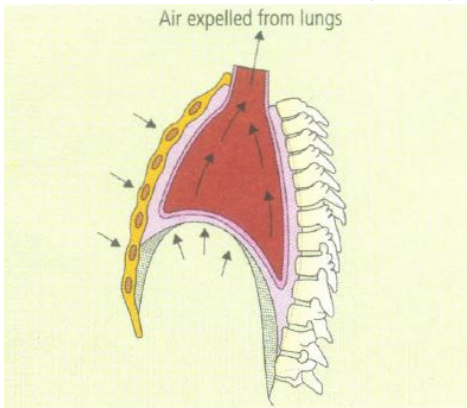
- a) intrapulmonary pressure is less than the atmospheric pressure**  
 b) intrapulmonary pressure is greater than the atmospheric pressure  
 c) intrapulmonary pressure is equal to the atmospheric pressure  
 d) intrapleural pressure becomes more than the intraalveolar pressure.

**Solution : -**



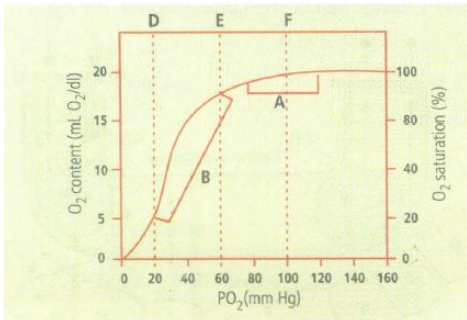
Because of the pressure gradient between the lungs and the atmosphere, the air moves into and out of the lungs. Inspiration occurs if the pressure within the lungs (intrapulmonary pressure) is less than the atmospheric pressure i.e. there is a negative pressure in the lungs with respect to atmospheric pressure.

44. Which of these is incorrect regarding the given mechanism of breathing?



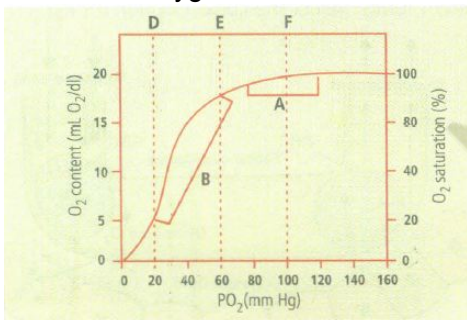
- a) Volume of thorax decreases    **b) Ribs and sternum are raised**  
 c) Diaphragm relaxes and arches upwards    d) All of these

45. Which of these is incorrect regarding A and B in the given graph?



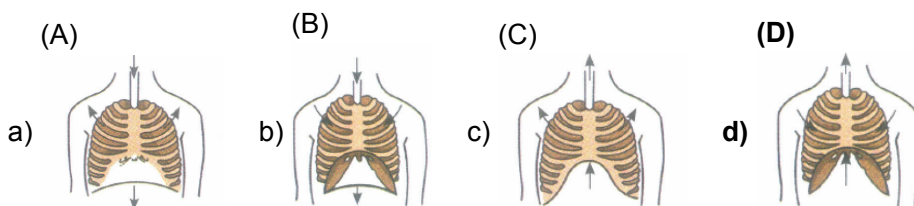
- a) A is deoxygenated blood leaving the tissues**    b) B is reduced blood returning from tissues.  
 c) A is oxygenated blood leaving the lungs    d) B is deoxygenated blood in the systemic veins.

46. How much oxygen will be released to the tissues by blood on passing from lungs to tissues?



- a) 15 mL of O<sub>2</sub>/100 mL of blood    b) 70 mL of O<sub>2</sub>/100 mL of blood    **c) 5 mL of O<sub>2</sub>/ 100 mL of blood**  
 d) 20 mL of O<sub>2</sub>/ 100 mL of blood

47. Exhalation is the process of expulsion of air through the respiratory tract. Which figure illustrates the process of exhalation?



**Solution : -**

Refer to answer 20.

48. Which of the following statements is correct?

- a) The contraction of internal intercostal muscles lifts up the ribs and sternum.
- b) The RBCs transport oxygen only.    **c) The thoracic cavity is anatomically an air tight chamber.**
- d) Healthy man can inspire approximately 500 mL of air per minute.

**Solution : -**

The thoracic cavity is anatomically an air tight chamber as it consists of lungs that further consist of air sacs in which the air remains trapped. The contraction of the external intercostal muscles lifts up the ribs and sternum. RBCs transport both O<sub>2</sub> and CO<sub>2</sub>. Healthy man can inspire or expire 6000 to 8000 mL of air per minute.

49. Air is breathed through \_\_\_\_\_ .

- a) trachea - lungs - larynx - pharynx - alveoli    b) nose - larynx - pharynx - bronchus - alveoli - bronchioles
- c) nostrils - pharynx - larynx - trachea - bronchi - bronchioles - alveoli**    d) nose - mouth - lungs

**Solution : -**

In mammalian respiratory system, air is breathed through nostrils, from nostrils air passes through pharynx (common passage for food and air) → larynx (voice box) → trachea (wind pipe) → bronchi (2 for each side lungs) → bronchioles → alveoli (small sacs or pouches for exchange of gases).

50. If alveolar ventilation is 4200 mL/min, respiratory frequency is 12 breaths per minute, and tidal volume is 500 mL, what is the anatomical-dead-space ventilation?

- a) 1800 mL/min**    b) 6000 mL/min    c) 350 mL/min    d) 1200 mL/min

**Solution : -**

Total minute ventilation is comprised of dead space plus alveolar ventilation. Minute ventilation is respiratory frequency (12 breaths per minute) multiplied by tidal volume (500 mL/breath) = 6000 mL/min. Subtract alveolar ventilation (4200 mL/min) from that i.e., 6000 - 4200 = 1800 mL/min.