

## BREATHING AND EXCHANGE OF GAS

1. Find the incorrect statement:
  - (A) Contraction of external intercostals muscles in man causes expansion of lungs along the Antero-posterior axis.
  - (B) Contraction of diaphragm increases the volume of lungs along the supero inferior axis in human.
  - (C) Contraction of external inter costal muscles increases the volume of lungs along Antero-posterior axis in rabbit.
  - (D) Contraction of diaphragm increases the volume of lungs along the Antero- posterior axis in rabbit.
2. A person who has inhaled normally has been asked to shout loudly. What is the volume of air expected to be present in the lungs after this? (A) 1100-1200ml (C) 1500-2000ml  
(B) 1000-1100ml  
(D) 2500-3000ml
3. What is the partial pressure of oxygen in the blood flowing through pulmonary artery? (A) 40mm Hg (C) 45mm Hg  
(B) 95mm Hg  
(D) 104mm Hg

4. Match the columns:-

Column I	Column II
(A) Crustaceans	(p) Skin (q) Lungs (r)
Insects	(C) Gills (s) Trachea (B) A-
Amphibians	(D) p, B-r, C-q, D-s (D) A-r,
Mammals	(A) A-q, B-s, B-s, C-p, D-q
	(C) A-r, B-p,
	C-s, D-q

5. The diffusion membrane, through which gaseous exchange occur in the lungs comprises of:

- (A) Alveolar epithelium & capillary endothelium.
- (B) Alveolar epithelium & capillary endothelium and the basement membrane between them.
- (C) Only alveolar epithelium.
- (D) Alveolar epithelium and basement membrane of alveoli.

6. Read the given statement and fill in the blanks:

“Blood is the medium for transport of gases. About \_\_\_\_\_(A)\_\_\_\_\_ % of CO<sub>2</sub> is transported in dissolved form through plasma while around \_\_\_\_\_(B)\_\_\_\_\_ % is transported through RBC.”

- |            |        |
|------------|--------|
| (A)        | (B)    |
| (A) 7%     | 70%    |
| (B) 70%    | 20-25% |
| (C) 20-25% | 7%     |
| (D) 7%     | 20-25% |

7. Respiratory Rhythm centre is located in:
- (A) Pons (B) Medulla  
(C) Brain stem (D) Hypothalamus
8. Identify the correct sequence of air passage in man
- (A) External nares → larynx → Pharynx → Trachea → Bronchi → Bronchioles → Alveoli  
(B) External nares → Larynx → Nasopharynx → Trachea → Bronchi → Bronchioles → Alveoli  
(C) External nares → Nasopharynx → Larynx → Trachea → Bronchi → Bronchioles → Alveoli  
(D) External nares → Nasopharynx → Larynx → Trachea → Bronchioles → Bronchi → Alveoli
9. A person comes to a chest physician with a complain of difficulty in breathing mainly during expiration. On further investigation he is found to have a long history of smoking. Which disease he is likely to suffer?
- (A) Asthma (B) Bronchitis  
(C) Pneumonia (D) Emphysema

10. Find the incorrect statement:

- (A) Lower invertebrates respire with the help of general body surface
- (B) Sound producing organ of man is called larynx present at the junction of pharynx and trachea
- (C) Trachea divides to form 2 bronchi at the level of T6.
- (D) The process of exchange of O<sub>2</sub> from atmosphere with CO<sub>2</sub> produced by the cells is commonly called breathing.

11. Which among the following has no specialized respiratory organ?

- (A) Frog tadpole
- (B) Earthworm
- (C) Mosquito
- (D) Amphioxus

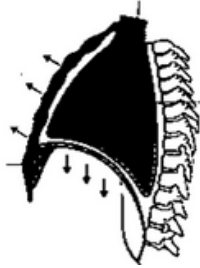
12. A man who is lying on a recliner and watching a football match is having around 19ml of O<sub>2</sub> in 100ml of blood in his arteries, what would be the volume of O<sub>2</sub> in 100ml of blood in his veins?

- (A) 14ml
- (B) 15ml
- (C) 10ml
- (D) 9ml

13. The nasal chamber opens into

- (A) Oropharynx
- (B) Nasopharynx
- (C) Laryngopharynx
- (D) Larynx

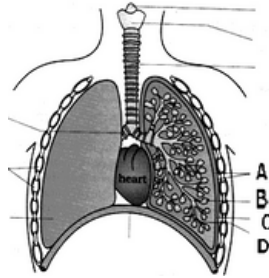
14. Refer to the diagram given below and find the position of diaphragm w.r.t the mechanism shown in the diagram.



- (A) Inspiration: Contracted & Arched
  - (B) Inspiration: Contracted & Flat
  - (C) Expiration: Contracted and Arched
  - D) Expiration: Relaxed & Arched
15. What common feature between human trachea & cockroach trachea is observed?
- (A) Both are paired and unbranched
  - (B) Both are supported by cartilaginous rings
  - (C) Both are non-collapsible
  - (D) Both originate from Pharynx
16. Incomplete cartilaginous rings for support is found in
- (A) Trachea, primary, secondary & tertiary bronchi, initial bronchioles.
  - (B) Trachea, primary & secondary bronchi, respiratory bronchioles.
  - (C) Trachea, secondary & tertiary bronchi, terminal bronchioles.

(D) Primary, secondary & Tertiary bronchi, initial bronchioles, respiratory bronchioles.

17. Correctly identify the labels of the given diagram



- (A) A=Pleural membrane, B=Alveoli, C=Pleural fluid, D=Bronchiole
- (B) A=Pleural fluid, B=Alveoli, C=Pleural membrane, D=Bronchiole
- (C) A=Pleural membranes, B=Bronchioles, C=Pleural fluid, D=Alveoli
- (D) A=Pleural fluid, B=Bronchioles, C=Pleural membranes, D=Alveoli

18. Which is the incorrect statement?

- (A) Sponges use their body surface for simple diffusion of gases.
- (B) Larynx is a cartilaginous box which helps in sound production.
- (C) Epiglottis guards the entry of air in larynx.
- (D) Humans have a pair of external nostrils opening out above the upper lip.

19. The conducting part of the respiratory system comprises of the part starting from
- (A) External nostrils to respiratory bronchioles.
  - (B) External nostrils to terminal bronchioles.
  - (C) External nostrils to alveoli.
  - (D) External nostrils to bronchus.

20. Vital capacity can be defined as:
- (A) Total volume of air present in lungs.
  - (B) Amount of air present in lungs after normal inhalation.
  - (C) Maximum amount of air a person can inhale after forced expiration.
  - (D) None of these

21. Match the items in column I with column II and choose the correct option:

Column I	Column II
(A) Tidal volume	(p) (q) 2500-3000ml
(B) Residual volume	500ml
(C) IRV (D) ERV (A)	(r) 1100-1200ml
A=q, B=s, C=p, D=r (C)	(s) 1000-1100ml
A=s, B=p, C=r, D=q	(B)
	A=q, B=p, C=r, D=s
	(D)
	A=q, B=r, C=p, D=s

22. The respiratory part of the respiratory system
- (A) transports the atmospheric air to the alveoli.
  - (B) Clears atmospheric air from foreign particles.
  - (C) Site of actual diffusion of O<sub>2</sub> and CO<sub>2</sub> between blood and atmospheric air.
  - (D) brings the air to body temperature.

23. Pick the incorrect statement.

- (A) Lungs are situated in the thoracic chamber which is anatomically an air tight chamber.
- (B) We cannot directly alter the pulmonary volume.
- (C) Pulmonary ventilation involves diffusion of gases between blood and tissues.
- (D) Cellular respiration occurs mainly in the mitochondria of the cell.

24. Quiet breathing is often referred to as:

- (A) respiration
- (B) inspiration
- (C) thoracic breathing
- (D) abdominal breathing

25. Adam's apple represents

- (A) Cricoid cartilage
- (B) Thyroid cartilage
- (C) Arytenoid cartilage
- (D) Epiglottis



26. Which is true for partial pressure of CO<sub>2</sub>?

- (A) More in inspired air than in expired air
- (B) more in alveolar air than in expired air
- (C) more in expired air than in alveolar air
- (D) more in inspired air than in alveolar air

27. Bohr effect is the effect of:

- (A) CO<sub>2</sub> on RBCs
- (B) O<sub>2</sub> on haemoglobin
- (C) CO<sub>2</sub> on haemoglobin
- (D) CO<sub>2</sub> on oxyhaemoglobin

28. A spirometer can be used to measure directly

- (A) IC
- (B) RV
- (C) Total lung capacity
- (D) None of these

29. Functional residual volume of lungs is

- (A) TV+ERV
- (B) RV+ERV
- (C) RV+IRV
- (D) RV+ERV+IRV+TV

30. On an average, a healthy human breathes

- (A) 12-16 times/ minute
- (B) 10-20 times/ minute
- (C) 8-12 times/ minute
- (D) 6-14 times/ minute

31. Find the correctly matched pair w.r.t. the O<sub>2</sub> dissociation curve of a normal adult human.

pO <sub>2</sub> (in mm Hg)	Percentage saturation of Hb with O <sub>2</sub>
(A) 40mm Hg	60%
(B) 25mm Hg	50%
(C) 70mm Hg	70%
(D) 65mm Hg	65%

32. A concentration gradient is established for CO<sub>2</sub> during exchange of gases

- (A) from tissues to blood and alveoli to blood.
- (B) from alveoli to blood and blood to tissue.
- (C) from tissue to blood and blood to alveoli.
- (D) from alveoli to blood and tissues to blood.

33. The total thickness of diffusion membrane in lungs is

- (A) >1mm
- (B) <1mm
- (C) =1mm
- (D) <0.1mm

34. Which among the following is an unfavourable condition for formation of oxyhaemoglobin?

- (A) Lesser H<sup>+</sup> concentration
- (B) higher temperature
- (C) High pO<sub>2</sub>
- (D) Low pCO<sub>2</sub>

35. The amount of CO<sub>2</sub> that can diffuse through the diffusion membrane per unit difference in partial pressure
- (A) is much higher compared to that of O<sub>2</sub>
  - (B) is much lower compared to that of O<sub>2</sub>
  - (C) is equal compared to that of O<sub>2</sub>
  - (D) is negligible compared to that of O<sub>2</sub>
36. The chemical formula of oxyhaemoglobin is:
- (A) Hb<sub>4</sub>(O<sub>2</sub>)<sub>4</sub>
  - (B) Hb(O<sub>2</sub>)<sub>4</sub>
  - (C) Hb(O)<sub>4</sub>
  - (D) Hb<sub>2</sub>(O<sub>2</sub>)<sub>4</sub>
37. The enzyme carbonic anhydrase is
- (A) Present in high concentration inside RBCs and plasma
  - (B) Present in high concentration in plasma and in minute quantities in RBCs
  - (C) Present in high concentration in RBCs and in minute quantities in plasma
  - (D) Present in high concentration in RBCs only
38. Which statement correctly defines Bohr effect?
- (A) Fall in P<sub>50</sub> with a decrease in pH.
  - (B) Rise in P<sub>50</sub> with a decrease in CO<sub>2</sub> concentration.
  - (C) Rise in P<sub>50</sub> with an increase in CO<sub>2</sub> concentration.
  - (D) Rise in P<sub>50</sub> with an increase in pH and decrease in pCO<sub>2</sub>.

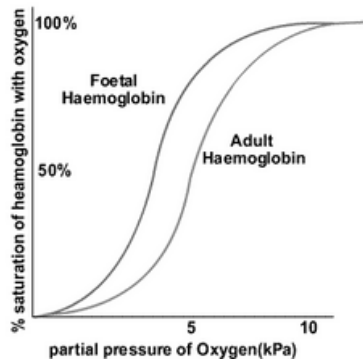
39. The centre which can moderate the function of the respiratory rhythm centre is

- (A) Pneumotaxic centre
- (B) Sensory centre
- (C) Medulla
- (D) Cerebrum

40. CO is more toxic than CO<sub>2</sub> because it

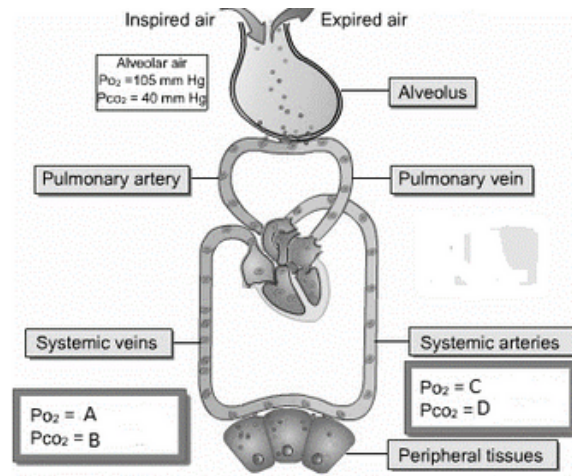
- (A) damages lungs
- (B) forms acid with water
- (C) affects the nervous system
- (D) reduces the oxygen carrying capacity of haemoglobin

41. Refer to the diagram given below & find the correct statement:



- (A) Haemoglobin of adult has higher affinity for oxygen.
- (B) Haemoglobin of foetus has higher affinity for oxygen.
- (C) Adult haemoglobin gets saturated early.
- (D) Both (A) & (C) are correct.

42. Refer to the diagram given below & find the correct partial pressure at A, B, C & D.



	A	B	C	D	
(A)	95	40	45	40	(B)
	45	40	95	40	(C)
	45	95	40	(D)	40 45
	40	95			

43. Find the correct statement:

- (A) contraction of external intercostals muscles moves the ribs forward & upward.
- (B) contraction of external intercostals muscles moves the ribs inward.
- (C) contraction of internal intercostals muscles moves the ribs forward & upward.
- (D) All are correct.

44. Find the correct match:

(A)  $IC = TV + ERV$

(B)  $EC = ERV + TV$

(C)  $FRC = TV + ERV$

(D)  $VC = TLC - RV$

45. As the solubility of CO<sub>2</sub> is 20-25 times \_\_\_A\_\_\_ than that of O<sub>2</sub>, the amount of CO<sub>2</sub> that can diffuse through the diffusion membrane per unit difference in partial pressure is much \_\_\_B\_\_\_ compared to that of O<sub>2</sub>. Fill the blank A & B.

- | A          | B      |
|------------|--------|
| (A) Higher | higher |
| (B) Lower  | higher |
| (C) Higher | lower  |
| (D) Lower  | lower  |

## ANSWERS

- |       |       |       |       |
|-------|-------|-------|-------|
| 1. C  | 2. A  | 3. A  | 4. D  |
| 5. B  | 6. D  | 7. B  | 8. C  |
| 9. D  | 10. C | 11. B | 12. A |
| 13. B | 14. B | 15. C | 16. A |
| 17. A | 18. C | 19. B | 20. C |
| 21. D | 22. C | 23. C | 24. D |
| 25. B | 26. B | 27. D | 28. A |
| 29. B | 30. A | 31. B | 32. C |
| 33. B | 34. B | 35. A | 36. B |
| 37. C | 38. C | 39. A | 40. D |
| 41. B | 42. C | 43. A | 44. B |
| 45. A |       |       |       |

## SOLUTIONS

1. Rabbit is quadrupedal so external intercostals muscle will expand the lung in supero-inferior axis while diaphragm will act along antero – posterior axis.
2. On shouting loud, the ERV will be released and only RV will be left.
3. Pulmonary artery carries deoxygenated blood.
4. Crustaceans are aquatic arthropods and amphibians have moist skin.
9. Emphysema involves damage to alveolar walls to decrease respiratory surface
10. Trachea divides into Bronchi at T5level.

11. Earthworm respire through its moist skin.
12. Under normal physiological conditions, every 100ml of oxygenated blood delivers around 5ml of  $O_2$  to the tissues.
13. Pharynx comprises of Nasopharynx, Oropharynx and Laryngopharynx
14. During inspiration, diaphragm contracts & becomes flat.
15. Human trachea is lined by cartilaginous rings and cockroach trachea is internally lined by cuticle i.e intima to prevent them from collapsing.
16. Cartilaginous rings are found in the conducting part of respiratory system except terminal bronchioles
18. Epiglottis guards entry of food in larynx.
22. Respiratory part comprises of respiratory bronchioles and alveoli.
23. Pulmonary ventilation means breathing, in which  $O_2$  taken in &  $CO_2$  is given out.
25. Thyroid cartilage from a subcutaneous projection, prominent in male.
26.  $pCO_2$  in alveolar air is 40mm Hg and in expired air is 32mm Hg.
27. Bohr effect is displacement of  $O_2$  in oxyhaemoglobin due to increase in partial pressure of carbon dioxide.
28. Spirometer can measure volume of air inspired or expired and not volume of air still present in lungs i.e RV.



31.  $pO_2$  when 50% of Hb is saturated is calculated to be 25mm Hg.
32.  $CO_2$  moves in body from tissue to blood to alveoli to outside.
33. Thickness of diffusion membrane is approx 0.2mm.
34. Lower temperature is favourable for formation of oxyhaemoglobin.
36.  $Hb + 4O_2 \rightarrow Hb(O_2)_4$  oxyhaemoglobin.
38. Bohr effect means dissociation of oxyhaemoglobin with increase in  $pCO_2$ .
40. Hb shows maximum affinity for CO.
41.  $p_{50}$  value of foetal Hb is lower than  $p_{50}$  value of adult Hb.
42. A and B indicates partial pressure of oxygen and carbon dioxide resp. in deoxygenated blood and C and D means in oxygenated blood.