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Topic C

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**TOPIC : [NCERT-I] Breathing and Exchange of Gases**

1. In which year was Alfonso Corti the Italian anatomist born :
  - (1) 1812
  - (2) 1842
  - (3) 1832
  - (4) 1822
2. What area of study did Corti first focus on in his scientific career:
  - (1) Human auditory system
  - (2) Cardiovascular systems of reptiles
  - (3) Brain and nervous system of mammals
  - (4) Digestive system of amphibians
3. What significant structure did Corti describe in 1851:
  - (1) Semicircular canals
  - (2) Organ of Corti
  - (3) Eustachian tube
  - (4) Cochlear nerve
4. What is the function of the organ of Corti:
  - (1) To pump blood in the cochlear vessels
  - (2) To convert sound vibrations into nerve impulses
  - (3) To regulate pressure in the middle ear
  - (4) To support the eardrum
5. What is the primary purpose of breathing in organisms:
  - (1) To supply oxygen for the breakdown of food molecules and remove carbon dioxide produced during catabolism
  - (2) To cool down the body during physical activity
  - (3) To circulate blood throughout the body
  - (4) To help in digestion of complex food molecules
6. Why do lower invertebrates like sponges and flatworms exchange gases directly through their body surface:
  - (1) They have highly developed lungs.
  - (2) Their small size and simple body organisation allow diffusion across the entire surface.
  - (3) They have a network of tracheal tubes.
  - (4) They use gills for gas exchange.
7. Which of the following structures is primarily used by insects to transport atmospheric air within the body:
  - (1) Lungs
  - (2) Gills
  - (3) Tracheal tubes
  - (4) Moist skin
8. Which statement correctly explains amphibian respiration:
  - (1) Amphibians respire only through gills.
  - (2) Amphibians respire through lungs and can also use their moist skin for gas exchange.
  - (3) Amphibians rely entirely on tracheal tubes.
  - (4) Amphibians have only pulmonary respiration and cannot perform cutaneous respiration.
9. Which structure prevents the entry of food into the larynx during swallowing:
  - (1) Glottis
  - (2) Vocal cords
  - (3) Pharynx
  - (4) Epiglottis
10. In the human respiratory system, the conducting part extends from:
  - (1) External nostrils to alveoli
  - (2) External nostrils to terminal bronchioles
  - (3) Pharynx to alveoli
  - (4) Trachea to secondary bronchi
11. The primary function of the conducting part of the respiratory system is:
  - (1) Exchange of gases
  - (2) Sound production
  - (3) Transport, filtration, humidification, and warming of air
  - (4) Storage of oxygen
12. The alveoli are specially adapted for gaseous exchange because they are:
  - (1) Thick-walled and muscular
  - (2) Thin-walled, irregular, vascularised bags
  - (3) Made of cartilage and lined with cilia
  - (4) Directly connected to the pharynx

13. The cartilaginous rings in trachea and bronchi are incomplete because:

- (1) They allow flexibility and prevent airway collapse
- (2) They help in gas exchange
- (3) They prevent entry of foreign particles
- (4) They produce sound

14. The pleural fluid present between the double-layered pleura mainly helps in:

- (1) Sound production
- (2) Storing air during breathing
- (3) Transporting oxygen into blood
- (4) Reducing friction on the lung surface

15. Assertion (A): Epiglottis prevents food from entering the larynx during swallowing.

Reason (R): Epiglottis is a thin elastic cartilaginous flap that covers the glottis while swallowing.

- (1) Both A and R are true, and R is the correct explanation of A
- (2) Both A and R are true, but R is not the correct explanation of A
- (3) A is true, but R is false
- (4) A is false, but R is true

16. Assertion (A): The alveoli are the main site of gaseous exchange.

Reason (R): Alveoli have thick walls supported by cartilage to facilitate diffusion.

- (1) Both A and R are true, and R is the correct explanation of A
- (2) Both A and R are true, but R is not the correct explanation of A
- (3) A is true, but R is false
- (4) A is false, but R is true

17. Assertion (A): The conducting part of the respiratory system includes bronchi, bronchioles, and alveoli.

Reason (R): The conducting part transports, filters, humidifies, and warms the air.

- (1) Both A and R are true, and R is the correct explanation of A
- (2) Both A and R are true, but R is not the correct explanation of A
- (3) A is true, but R is false
- (4) A is false, but R is true

18. Consider the following statements about the thoracic chamber:

- (i) It is formed dorsally by the vertebral column.
- (ii) It is formed ventrally by the sternum.
- (iii) It is formed laterally by the diaphragm.
- (iv) It is formed on the lower side by the diaphragm.

Which of the above are correct:

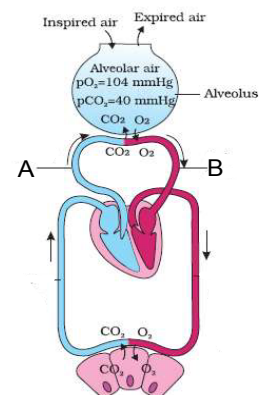
- (1) (i) and (iv) only
- (2) (ii) and (iii) only
- (3) (i), (ii), (iii) and (iv)
- (4) (i), (ii) and (iv) only

19. Which of the following statements regarding breathing are true:

- (i) Any change in thoracic volume is reflected in pulmonary volume.
- (ii) Humans can not directly alter the pulmonary volume without thoracic changes.
- (iii) The arrangement of lungs in thorax is essential for breathing.
- (iv) Lungs are anatomically situated in an airtight chamber.

- (1) (i), (iii) and (iv) only
- (2) (ii) and (iii) only
- (3) (i), (ii), (iii) and (iv)
- (4) (i) and (ii) only

20. Choose the correct option for A and B in given figure :



- (1) A – Pulmonary vein – Has impure blood  
B – Pulmonary artery – Has pure blood
- (2) A – Pulmonary artery – Has pure blood  
B – Pulmonary vein – Has impure blood
- (3) A – Pulmonary artery – Has impure blood  
B – Pulmonary vein – Has pure blood
- (4) A – Pulmonary vein – Has pure blood  
B – Pulmonary artery – Has impure blood

**21. During inspiration, air enters the lungs because:**

- (1) Intra-pulmonary pressure becomes greater than atmospheric pressure
- (2) Atmospheric pressure becomes greater than intra-pulmonary pressure
- (3) Pulmonary volume decreases causing suction
- (4) Expiration muscles contract strongly

**22. If the diaphragm is paralysed and fails to contract, what immediate effect will it have on breathing:**

- (1) Inspiration will become difficult as thoracic volume cannot increase efficiently
- (2) Expiration will stop as thoracic volume cannot decrease
- (3) Air will continue to flow in due to diffusion alone
- (4) Breathing rate will increase to compensate

**23. A boy accidentally inhales a foreign object that lodges in his trachea, preventing normal expansion of the lungs. Which of the following pressure differences will fail to occur:**

- (1) Atmospheric pressure > intra-pulmonary pressure
- (2) Intra-pulmonary pressure > atmospheric pressure
- (3) Intra-pulmonary pressure = alveolar pressure
- (4) Thoracic pressure = abdominal pressure

**24. External intercostal muscles are cut surgically in an experimental animal, while the diaphragm remains intact. What effect will this have on inspiration:**

- (1) Inspiration will be unaffected as diaphragm alone is sufficient
- (2) Inspiration will be partially impaired because dorso-ventral expansion is reduced
- (3) Inspiration will completely stop as rib movement is essential
- (4) Expiration will be more active

**25. Which of the following best explains why expiration is normally a passive process:**

- (1) It does not require contraction of any muscles
- (2) It occurs due to elastic recoil of lungs and relaxation of diaphragm/intercostals
- (3) It occurs only when intra-pulmonary pressure is lower than atmospheric pressure
- (4) It depends on abdominal muscles generating high thoracic pressure

**26. Consider the following statements about inspiration:**

- (i) Inspiration occurs when intra-pulmonary pressure is lower than atmospheric pressure.
- (ii) Contraction of the diaphragm increases thoracic volume in the antero-posterior axis.
- (iii) Contraction of internal intercostal muscles lifts ribs and sternum to increase thoracic volume in dorso-ventral axis.
- (iv) Inspiration is a passive process that requires no muscular activity.

**Which of the above statements are correct:**

- (1) (i), (ii) and (iii) only
- (2) (i) and (ii) only
- (3) (i) and (iv) only
- (4) (i), (ii), (iii) and (iv)

**27. Regarding expiration in normal breathing, which of the following are true:**

- (i) Expiration occurs when intra-pulmonary pressure is higher than atmospheric pressure.
- (ii) It mainly results from relaxation of diaphragm and external intercostal muscles.
- (iii) Expiration always requires abdominal muscles.
- (iv) Elastic recoil of lungs helps in normal expiration.

- (1) (i), (iii) and (iv) only
- (2) (ii) and (iii) only
- (3) (i), (ii) and (iv) only
- (4) (i), (ii), (iii) and (iv)

28. **Statement I:** On an average, a healthy human breathes 12-16 times per minute.

**Statement II:** The volume of air involved in breathing movements is estimated by a spirometer which is used in clinical assessment of pulmonary functions.

- (1) Both Statement I and Statement II are true
- (2) Both Statement I and Statement II are false
- (3) Statement I is true, but Statement II is false
- (4) Statement I is false, but Statement II is true

29. Match the following respiratory volumes with their average values:

Column I (Volumes)	Column II (Values)
A. Tidal Volume (TV)	(i) 1000 - 1100 mL
B. Inspiratory Reserve Volume (IRV)	(ii) 1100 - 1200 mL
C. Expiratory Reserve Volume (ERV)	(iii) 500 mL
D. Residual Volume (RV)	(iv) 2500 - 3000 mL

- (1) A-iii, B-ii, C-iv, D-i
- (2) A-iv, B-iii, C-i, D-ii
- (3) A-iii, B-iv, C-i, D-ii
- (4) A-i, B-iv, C-iii, D-ii

30. Match the following respiratory volumes with their descriptions:

Column I (Volumes)	Column II (Descriptions)
A. Tidal Volume (TV)	(i) Air that remains in lungs after a forcible expiration
B. Inspiratory Reserve Volume (IRV)	(ii) A person can inspire by a forcible inspiration.
C. Expiratory Reserve Volume (ERV)	(iii) Volume of air inspired or expired in normal respiration
D. Residual Volume (RV)	(iv) A person can expire by a forcible expiration.

- (1) A-i, B-ii, C-iv, D-iii
- (2) A-ii, B-iii, C-i, D-iv
- (3) A-iii, B-iv, C-ii, D-i
- (4) A-iii, B-ii, C-iv, D-i

31. Match the pulmonary capacities with their components:

Column I (Capacities)	Column II (Components)
A. Inspiratory Capacity (IC)	(i) ERV + TV + IRV
B. Expiratory Capacity (EC)	(ii) TV + IRV
C. Functional Residual Capacity (FRC)	(iii) TV + ERV
D. Vital Capacity (VC)	(iv) ERV + RV

- (1) A-iii, B-ii, C-iv, D-i
- (2) A-ii, B-iii, C-iv, D-i
- (3) A-ii, B-iv, C-iii, D-i
- (4) A-i, B-ii, C-iv, D-iii

32. Match the pulmonary capacities with their correct descriptions:

Column I (Capacities)	Column II (Descriptions)
A. Total Lung Capacity (TLC)	(i) Volume of air accommodated the in lungs at the end of forced inspiration
B. Inspiratory Capacity (IC)	(ii) Maximum air a person can inspire after normal expiration
C. Expiratory Capacity (EC)	(iii) Maximum air a person can expire after normal inspiration
D. Vital Capacity (VC)	(iv) Maximum volume of air a person can breath in after force expiration

- (1) A-ii, B-i, C-iii, D-iv
- (2) A-iv, B-ii, C-iii, D-i
- (3) A-i, B-ii, C-iii, D-iv
- (4) A-iv, B-iii, C-ii, D-i

33. Regarding Vital Capacity (VC), which of the following statements are true:
- It is the maximum volume of air a person can inspire after a normal expiration.
  - It includes ERV + TV
  - It can also be defined as the maximum volume of air a person can expire after a forced inspiration.
  - It is the same as Functional Residual Capacity (FRC).
- (i), (ii) and (iii) only
  - (i) and (iv) only
  - Only (iii)
  - All (i), (ii), (iii) and (iv)
34. A patient's spirometry shows the following values:  
 TV = 500 mL                      IRV = 2500 mL  
 ERV = 1000 mL                      RV = 1200 mL
- Which of the following statements is correct:
- Inspiratory Capacity (IC) = 3500 mL
  - Functional Residual Capacity (FRC) = 1700 mL
  - Vital Capacity (VC) = 4000 mL
  - Total Lung Capacity (TLC) = 4500 mL
35. If the Residual Volume (RV) is absent, which pulmonary capacity would be directly affected the most:
- Inspiratory Capacity (IC)
  - Vital Capacity (VC)
  - Total Lung Capacity (TLC)
  - Expiratory Capacity (EC)
36. A mountaineer at high altitude has a significantly increased Inspiratory Reserve Volume (IRV) compared to sea level. This adaptation is most likely because:
- Decrease in Expiratory Reserve Volume allows more air in
  - Lower oxygen availability demands greater inspiration per breath
  - Residual Volume decreases, creating more space for inspiration
  - Functional Residual Capacity increases to store more oxygen

37. Assertion (A): Inspiratory Capacity (IC) represents the maximum volume of air a person can inspire after a normal expiration.  
 Reason (R): Inspiratory Capacity (IC) is equal to Tidal Volume (TV) plus Inspiratory Reserve Volume (IRV).
- Both A and R are true, and R is the correct explanation of A
  - Both A and R are true, but R is not the correct explanation of A
  - A is true, but R is false
  - A is false, but R is true
38. Statement I: Functional Residual Capacity (FRC) is the volume of air that remains in the lungs after a normal expiration.  
 Statement II: Residual Volume (RV) is the air that remains in the lungs after a forcible expiration, averaging 1100-1200 mL.
- Both Statement I and Statement II are true
  - Both Statement I and Statement II are false
  - Statement I is true, but Statement II is false
  - Statement I is false, but Statement II is true
39. What is the main driving force for the exchange of oxygen and carbon dioxide in the alveoli and tissues:
- Active transport by ATP hydrolysis
  - Simple diffusion based on partial pressure gradients
  - Osmosis through alveolar membranes
  - Facilitated transport by carrier proteins
40. Which factors can significantly influence the rate of diffusion of gases across the respiratory membrane:
- Solubility of the gases and thickness of the membrane
  - Muscle contractions during breathing
  - Blood pressure in pulmonary arteries
  - Presence of hemoglobin in red blood cells
41. The partial pressure of oxygen ( $pO_2$ ) in alveoli is about 104 mmHg, whereas in deoxygenated blood it is 40 mmHg. This gradient helps in:
- Movement of  $O_2$  from blood to alveoli
  - No net movement of  $O_2$
  - Movement of  $O_2$  from tissues to blood
  - Movement of  $O_2$  from alveoli to blood

42. The partial pressure of  $\text{CO}_2$  in tissues is about 45 mmHg, whereas in oxygenated blood it is 40 mmHg. What will be the direction of  $\text{CO}_2$  diffusion:

- (1) From blood to tissues
- (2) From atmospheric air to alveoli
- (3) From tissues to blood
- (4) From alveoli to blood

43. Why does  $\text{CO}_2$  diffuse more efficiently than  $\text{O}_2$  across the respiratory membrane despite having a smaller partial pressure gradient:

- (1) Because  $\text{CO}_2$  is 20-25 times more soluble than  $\text{O}_2$
- (2) Because  $\text{CO}_2$  has a higher partial pressure in alveoli
- (3) Because the respiratory membrane is impermeable to  $\text{O}_2$
- (4) Because  $\text{CO}_2$  is actively transported across membranes

44. Which of the following correctly represents the structure of the diffusion membrane in alveoli:

- (1) Alveolar epithelium → Thick connective tissue → Capillary endothelium
- (2) Thin squamous epithelium of alveoli → Basement membrane → Endothelium of capillaries
- (3) Capillary endothelium → Two layers of smooth muscle → Alveolar epithelium
- (4) Ciliated epithelium → Basement membrane → Muscle tissue

45. The thickness of the diffusion membrane is usually:

- (1) About 1 millimetre
- (2) About 10 millimetres
- (3) 2-3 millimetres
- (4) Much less than 1 millimetre

46. What percentage of oxygen in the blood is transported in a dissolved state through plasma:

- |         |        |
|---------|--------|
| (1) 97% | (2) 7% |
| (3) 25% | (4) 3% |

47. In what form is the majority of carbon dioxide transported in the blood:

- (1) Dissolved in plasma
- (2) Bound to hemoglobin in RBCs
- (3) As bicarbonate ions
- (4) As carbonic acid

48. Which of the following correctly represents the proportion of  $\text{CO}_2$  transported by different means:

- (1) 20-25% by RBCs, 70% as bicarbonate, 7% dissolved in plasma
- (2) 97% by RBCs, 3% dissolved in plasma
- (3) 70% by RBCs, 20-25% as bicarbonate, 7% dissolved in plasma
- (4) 50% by RBCs, 30% as bicarbonate, 20% dissolved in plasma

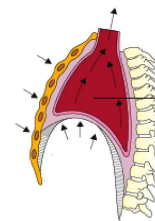
49. Consider the following statements about haemoglobin:

- a. Haemoglobin is an iron-containing pigment present in RBCs.
- b. Each haemoglobin molecule can bind up to 2 molecules of oxygen.
- c. Binding of oxygen with haemoglobin is reversible.
- d. Oxyhaemoglobin formation is favoured in alveoli.

Which of the above statements are correct:

- (1) a, b and c
- (2) a, c and d
- (3) b and d
- (4) Only d

50. Which of the following is correct for given figure :



- (1) Volume of throax increased
- (2) Volume of thorax decreased
- (3) Diaphragm contracted
- (4) (2) and (3) both

51. In tissues, which of the following conditions favour dissociation of oxygen from oxyhaemoglobin:

- a. Low  $pO_2$                       b. High  $pCO_2$   
c. High  $H^+$  concentration  
d. Higher temperature

- (1) a and b only  
(2) a, b and c only  
(3) a, b, c and d  
(4) b and d only

52. Select the correct statements:

- a. In alveoli, low  $pCO_2$  and lower temperature favour oxyhaemoglobin formation.  
b. In tissues, high  $pCO_2$  and low  $H^+$  concentration favour oxygen dissociation.  
c. Every 100 ml of oxygenated blood can deliver -5 ml of  $O_2$  to tissues under normal physiological conditions.  
d. The oxygen dissociation curve is linear, not sigmoid.

- (1) a, b and c                      (2) a and d  
(3) b and d                        (4) a and c

53. Assertion (A): Each haemoglobin molecule can carry a maximum of four molecules of oxygen.

**Reason (R):** Haemoglobin contains four iron atoms, each of which can bind one molecule of oxygen reversibly.

- (1) Both A and R are true, and R is the correct explanation of A  
(2) Both A and R are true, but R is not the correct explanation of A  
(3) A is true, but R is false  
(4) A is false, but R is true

54. Assertion (A): The oxygen dissociation curve is sigmoid in shape.

**Reason (R):** Binding of oxygen to haemoglobin is influenced by cooperative binding, where binding of one  $O_2$  molecule increases the affinity for the next.

- (1) Both A and R are true, and R is the correct explanation of A  
(2) Both A and R are true, but R is not the correct explanation of A  
(3) A is true, but R is false  
(4) A is false, but R is true

55. Assertion (A): In alveoli, oxyhaemoglobin formation is favoured.

**Reason (R):** High  $pO_2$ , low  $pCO_2$ , lesser  $H^+$  concentration, and lower temperature exist in alveoli.

- (1) Both A and R are true, and R is the correct explanation of A  
(2) Both A and R are true, but R is not the correct explanation of A  
(3) A is true, but R is false  
(4) A is false, but R is true

56. Assertion (A): In tissues, oxyhaemoglobin dissociates to release oxygen.

**Reason (R):** Tissues have low  $pO_2$ , high  $pCO_2$ , high  $H^+$  concentration, and lower temperature.

- (1) Both A and R are true, and R is the correct explanation of A  
(2) Both A and R are true, but R is not the correct explanation of A  
(3) A is true, but R is false  
(4) A is false, but R is true

57. Assertion (A): Every 100 ml of oxygenated blood delivers about 5 ml of  $O_2$  to tissues under normal conditions.

**Reason (R):** This is because complete dissociation of haemoglobin occurs in tissues during oxygen delivery.

- (1) Both A and R are true, and R is the correct explanation of A  
(2) Both A and R are true, but R is not the correct explanation of A  
(3) A is true, but R is false  
(4) A is false, but R is true

58. In what form is about 20-25% of carbon dioxide transported in blood:

- (1) As dissolved  $CO_2$  in plasma  
(2) As carbamino-haemoglobin bound to haemoglobin  
(3) As bicarbonate ions only  
(4) As carbonic acid

59. Which condition favours binding of  $CO_2$  with haemoglobin to form carbamino-haemoglobin:

- (1) High  $pO_2$  and low  $pCO_2$  (alveoli)  
(2) Low  $pO_2$  and high  $pCO_2$  (tissues)  
(3) Low  $pO_2$  and low  $pCO_2$  (alveoli)  
(4) High  $pO_2$  and high  $pCO_2$  (arteries)

**60. What is the role of the enzyme carbonic anhydrase in RBCs:**

- (1) It binds CO<sub>2</sub> directly to haemoglobin
- (2) It converts CO<sub>2</sub> and H<sub>2</sub>O into carbonic acid, which dissociates into bicarbonate and hydrogen ions
- (3) It transports bicarbonate ions across the plasma membrane
- (4) It increases the solubility of CO<sub>2</sub> in plasma

**61. At the alveolar site where pCO<sub>2</sub> is low, the reaction catalyzed by carbonic anhydrase leads to:**

- (1) Conversion of CO<sub>2</sub> to bicarbonate ions
- (2) Conversion of bicarbonate ions into CO<sub>2</sub> and H<sub>2</sub>O
- (3) Storage of CO<sub>2</sub> in plasma
- (4) Irreversible binding of CO<sub>2</sub> to haemoglobin

**62. Every 100 ml of deoxygenated blood delivers approximately how much CO<sub>2</sub> to the alveoli:**

- (1) 5 ml
- (2) 25 ml
- (3) 7 ml
- (4) 4 ml

**63. Match the following regarding transport of gases in blood:**

Column I	Column II
<b>A. Oxygen transport in RBCs</b>	<b>(i) 70%</b>
<b>B. Oxygen dissolved in plasma</b>	<b>(ii) 97%</b>
<b>C. CO<sub>2</sub> transported as bicarbonate</b>	<b>(iii) 3%</b>
<b>D. CO<sub>2</sub> dissolved in plasma</b>	<b>(iv) 7%</b>

- (1) A-iii, B-ii, C-iv, D-i
- (2) A-i, B-ii, C-iii, D-iv
- (3) A-ii, B-iv, C-i, D-iii
- (4) A-ii, B-iii, C-i, D-iv

**64. Match the respiratory sites with approximate partial pressure of CO<sub>2</sub> (pCO<sub>2</sub> in mmHg):**

Column I	Column II
<b>A. Atmospheric air</b>	<b>(i) 45 mmHg</b>
<b>B. Alveoli</b>	<b>(ii) 0.3 mmHg</b>
<b>C. Deoxygenated blood</b>	<b>(iii) 40 mmHg</b>
<b>D. Tissues</b>	<b>(iv) 45 mmHg</b>

- (1) A-ii, B-iii, C-i, D-iv
- (2) A-i, B-ii, C-iii, D-iv
- (3) A-ii, B-iv, C-i, D-iii
- (4) A-iii, B-ii, C-iv, D-i

**65. Which centre in the brain is primarily responsible for maintaining the respiratory rhythm in humans:**

- (1) Pneumotaxic centre in the pons
- (2) Respiratory rhythm centre in the medulla
- (3) Cerebellum
- (4) Hypothalamus

**66. What is the role of the pneumotaxic centre located in the pons:**

- (1) It initiates respiration
- (2) It reduces the duration of inspiration and modifies the respiratory rate
- (3) It monitors oxygen levels in blood
- (4) It prevents accumulation of surfactant in alveoli

**67. Which of the following stimuli play the major role in regulation of respiratory rhythm:**

- (1) Partial pressure of O<sub>2</sub>
- (2) Hormones secreted by adrenal glands
- (3) Neural inputs from cerebrum
- (4) Levels of CO<sub>2</sub> and H<sup>+</sup> concentration

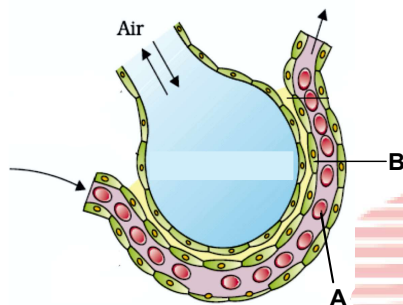
**68. Which of the following respiratory disorders is characterized by difficulty in breathing and wheezing due to inflammation of bronchi and bronchioles:**

- (1) Emphysema
- (2) Tuberculosis
- (3) Bronchitis
- (4) Asthma

69. In emphysema, the major damage occurs in:

- (1) Bronchi
- (2) Trachea
- (3) Alveolar walls
- (4) Pleural cavity

70. Identify A and B in given diagram :



- (1) A – Endothellum of blood capillary, B– Basement substance
- (2) A – Red blood cell, B– Endothellum of blood capillary,
- (3) A– Basement substance, B – Red blood cell
- (4) A– Endothellum of blood capillary, B – Red blood cell

71. Occupational respiratory disorders are commonly caused due to:

- (1) Exposure to very low oxygen levels
- (2) Excess production of carbon dioxide
- (3) Long-term inhalation of dust particles in industries
- (4) Deficiency of surfactant in alveoli

72. Inflammation and fibrosis of lungs due to occupational exposure to dust is best prevented by:

- (1) Taking antibiotics regularly
- (2) Vaccination
- (3) Wearing protective masks during work
- (4) Consuming vitamin supplements

73. Statement 1:

**Flagellated protozoans possess flagella and may be free-living or parasitic.**

**Statement 2:**

**Parasitic flagellated protozoans like Trypanosoma cause sleeping sickness in humans.**

- (1) Both statements I and II are correct.
- (2) Statement I is correct but Statement II is incorrect.
- (3) Statement I is incorrect but Statement II is correct.
- (4) Both statements I and II are incorrect.

74. Which enzyme plays a crucial role in conversion of  $\text{CO}_2$  into bicarbonate for transport:

- (1) Hemocyanin
- (2) Catalase
- (3) Peroxidase
- (4) Carbonic anhydrase

75. Respiration involves the following processes:

- (i) Diffusion of gases ( $\text{O}_2$  and  $\text{CO}_2$ ) across alveolar membrane.
- (ii) Transport of gases by the blood.
- (iii) Utilisation of  $\text{O}_2$  by cells with release of  $\text{CO}_2$ .
- (iv) Direct pumping of  $\text{O}_2$  by lungs into blood without diffusion.

Which statements are correct:

- (1) (i), (ii) and (iii) only
- (2) (ii) and (iv) only
- (3) (i), (iii) and (iv) only
- (4) All (i), (ii), (iii) and (iv)

76. Oxygen dissociation curve shows:

- a. Relationship between percentage saturation of Hb and partial pressure of  $\text{O}_2$ .
- b. A sigmoid shape.
- c. A straight line passing through the origin.
- d. The effect of  $\text{pCO}_2$ ,  $\text{H}^+$  concentration and temperature on oxygen binding.

Which statements are correct:

- (1) a, b and d
- (2) a and c
- (3) b and c
- (4) Only d

77. Which of the following is a major cause of emphysema:

- (1) Viral infection
- (2) Bacterial infection
- (3) Dust inhalation
- (4) Cigarette smoking

78. Which of the following best describes Ernst Mayr's major contribution to evolutionary biology:

- (1) Discovery of the structure of DNA
- (2) Introduction of genetic engineering techniques
- (3) Establishing the currently accepted definition of a biological species
- (4) Discovery of photosynthesis pathway in plants

79. Why was the Two Kingdom system of classification (Plantae and Animalia) found to be inadequate:

- (1) It did not include organisms like viruses.
- (2) It failed to distinguish prokaryotes from eukaryotes, unicellular from multicellular, and photosynthetic from non-photosynthetic organisms.
- (3) It completely ignored morphology of organisms.
- (4) It classified fungi and algae correctly into separate kingdoms.

80. The present phylogenetic classification system is mainly based on:

- (1) Similarity in external morphology
- (2) Evolutionary relationships and common ancestry
- (3) Similarity in habitat and habit
- (4) Utility of organisms for humans

81. An unknown animal is found in the ocean. It shows the following features:

- i. Body can be divided into identical halves by more than one plane passing through the central axis.
- ii. Its body has tentacles and a gastrovascular cavity.
- iii. Based on these observations, the animal most likely belongs to which phylum:

- (1) Porifera
- (2) Coelenterata (Cnidaria)
- (3) Annelida
- (4) Arthropoda

82. Which of the following statements about venation is correct:

- (1) Reticulate venation is generally found in monocotyledonous plants.
- (2) Parallel venation is a characteristic feature of dicotyledonous plants.
- (3) Reticulate venation is commonly seen in dicots, while parallel venation is seen in most monocots.
- (4) Both monocots and dicots exclusively show only one type of venation without exceptions.

83. The epidermis in plants is usually:

- (1) Multilayered and made of collenchyma
- (2) Single-layered and made of parenchyma
- (3) Double-layered and made of sclerenchyma
- (4) Multilayered and lignified

84. The blood vascular system of frog is:

- (1) Open type
- (2) Closed type
- (3) Absent
- (4) Incomplete type

85. Which of the following statements about bacterial cell envelopes or Gram staining is correct:

- (1) Gram positive bacteria do not retain the Gram stain and appear pink.
- (2) Gram negative bacteria have a thick peptidoglycan layer and retain crystal violet stain.
- (3) The bacterial cell envelope consists of glycocalyx, cell wall, and plasma membrane acting together as a protective unit.
- (4) The glycocalyx is only present in Gram positive bacteria.

86. Which of the following is true:

- (1) Plant cell walls are made of chitin.
- (2) Cotton and paper are made of cellulose.
- (3) Chitin is found in animal cell walls.
- (4) All polysaccharides are proteins.

87. A human cell completes one cell cycle in approximately 24 hours, while a yeast cell completes its cycle in 90 minutes. If both start dividing at the same time, how many times will a yeast cell divide in the time it takes a human cell to complete one cycle:

- (1) 12
- (2) 16
- (3) 18
- (4) 24

88. Assertion (A):

Deuteromycetes are called Imperfect Fungi because only their asexual or vegetative phases are known.

Reason (R):

Their sexual forms, when discovered, are placed in proper groups like ascomycetes, phycmycetes.

- (1) Both A and R are true, and R is the correct explanation of A.
- (2) Both A and R are true, but R is not the correct explanation of A.
- (3) A is true, but R is false.
- (4) A is false, but R is true.

89. If a carbohydrate is completely oxidized during respiration, the RQ will be:

- (1) 0.7
- (2) 0.8
- (3) 1.0
- (4) 1.2

90. Heterophylly in plants like cotton, coriander, and buttercup refers to:

- (1) Difference in leaf shapes due to juvenile vs mature stages or environmental conditions
- (2) Difference in root shapes in water and soil
- (3) Change in flower colour due to environment
- (4) Formation of thorns on stems



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10. Bijnor
11. Bhilai
12. Bulandshah
13. Ghazipur
14. Ghatampur
15. Gorakhpur
16. Etawah
17. Jaunpur
18. Jhansi
19. Kannauj
20. Lakhimpur K
21. Mainpuri
22. Mau
23. Muzaffarpur
24. Hazratganj I
25. Aliganj Luck
26. Orai
27. Pilibhit
28. Prayagraj
29. Sultanpur
30. Mahmoorg



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