

Breathing and Exchange of Gases — NEET Biology PYQ (2006-2021)

Class 11 Biology · 29 real NEET & AIPMT questions, year-tagged · answers checked by RankUp

NEET 2021

1. Select the favourable conditions required for the formation of oxyhaemoglobin at the alveoli.

- (A) High pO_2 , low pCO_2 , less H^+ , lower temperature
- (B) Low pO_2 , high pCO_2 , more H^+ , higher temperature
- (C) High pO_2 , high pCO_2 , less H^+ , higher temperature
- (D) Low pO_2 , low pCO_2 , more H^+ , higher temperature

NEET 2021

2. The partial pressures (in mm Hg) of oxygen (O_2) and carbon dioxide (CO_2) at alveoli (the site of diffusion) are :

- (A) $pO_2 = 104$ and $pCO_2 = 40$
- (B) $pO_2 = 40$ and $pCO_2 = 45$
- (C) $pO_2 = 95$ and $pCO_2 = 40$
- (D) $pO_2 = 159$ and $pCO_2 = 0.3$

NEET 2020 · Q19

3. Identify the wrong statement with reference to transport of oxygen.

- (A) Binding of oxygen with haemoglobin is mainly related to partial pressure of O_2 .
- (B) Partial pressure of CO_2 can interfere with O_2 binding with haemoglobin.
- (C) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.
- (D) Low pCO_2 in alveoli favours the formation of oxyhaemoglobin.

NEET 2020 · Q24

4. 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) and (b)
- (B) (c) and (d)
- (C) (a), (b) and (d)
- (D) only (d)

NEET 2019 · Q120

5. Due to increasing air-borne allergens and pollutants, many people in urban areas are suffering from respiratory disorder causing wheezing due to :

- (A) benign growth on mucous lining of nasal cavity.
- (B) inflammation of bronchi and bronchioles.
- (C) proliferation of fibrous tissues and damage of the alveolar walls.
- (D) reduction in the secretion of surfactants by pneumocytes.

NEET 2019 · Q141

6. 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) 1700 mL
- (C) 2200 mL
- (D) 2700 mL

NEET 2018 · Q136

7. 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

NEET 2018 · Q138

8. Match the items given in Column I with those in Column II and select the correct option given below:

Column I: a. Tidal volume, b. Inspiratory Reserve volume, c. Expiratory Reserve volume, d. Residual volume

Column II: i. 2500 - 3000 mL, ii. 1100 - 1200 mL, iii. 500 - 550 mL, iv. 1000 - 1100 mL

- (A) a-i, b-iv, c-ii, d-iii
- (B) a-iii, b-i, c-iv, d-ii
- (C) a-iii, b-ii, c-i, d-iv
- (D) a-iv, b-iii, c-ii, d-i

NEET 2017 · Q52

9. Lungs are made up of air-filled sacs, the alveoli. They do not collapse even after forceful expiration, because of:

- (A) Residual Volume
- (B) Inspiratory Reserve Volume
- (C) Tidal Volume
- (D) Expiratory Reserve Volume

NEET 2017 (Gujarati paper) · Q66

10. Which of the following cannot be measured by spirometry?

- (A) Tidal volume
- (B) Inspiratory reserve volume
- (C) Residual volume
- (D) Vital capacity

NEET 2017 (Gujarati paper) · Q69

11. Air pollution can result in Emphysema, which is:

- (A) Chronic damage to air sacs or alveoli leading to abnormal reduction in respiratory surface area
- (B) Persistent inflammation and damage to the cells lining the bronchi and bronchioles
- (C) An allergic reaction causing muscle spasms in the bronchial walls
- (D) Damage to any Lung tissue causing increase in elasticity of the air sacs

NEET 2016 Phase 2 · Q148

12. The partial pressure of oxygen in the alveoli of the lungs is

- (A) equal to that in the blood
- (B) more than that in the blood
- (C) less than that in the blood
- (D) less than that of carbon dioxide

NEET 2016 Phase 2 · Q156

13. Lungs do not collapse between breaths and some air always remains 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

NEET 2016 Phase 1 · Q99

14. Name the chronic respiratory disorder caused mainly by cigarette smoking:

- (A) Emphysema
- (B) Asthma
- (C) Respiratory acidosis
- (D) Respiratory alkalosis

NEET 2016 Phase 1 · Q112

15. Asthma may be attributed to:

- (A) bacterial infection of the lungs
- (B) allergic reaction of the mast cells in the lungs
- (C) inflammation of the trachea
- (D) accumulation of fluid in the lungs

NEET 2016 Phase 1 · Q149

16. Reduction in pH of blood will:

- (A) reduce the rate of heart beat.
- (B) reduce the blood supply to the brain.
- (C) decrease the affinity of hemoglobin with oxygen.
- (D) release bicarbonate ions by the liver.

AIPMT 2015

17. When you hold your breath, which of the following gas changes in blood would first lead to the urge to breathe?

- (A) rising CO_2 and falling O_2 concentration
- (B) falling O_2 concentration
- (C) rising CO_2 concentration
- (D) falling CO_2 concentration

AIPMT 2014

18. Approximately seventy percent of carbon-dioxide absorbed by the blood will be transported to the lungs:

- (A) in the form of dissolved gas molecules
- (B) by binding to R.B.C
- (C) as carbamino-haemoglobin
- (D) as bicarbonate ions

AIPMT 2011 Mains

19. Bulk of carbon dioxide (CO_2) released from body tissues into the blood is present as

- (A) 70% carbamino-haemoglobin and 30% as bicarbonate
- (B) Carbamino-haemoglobin in RBCs
- (C) Bicarbonate in blood plasma and RBCs
- (D) Free CO_2 in blood plasma

AIPMT 2011 Mains

20. Which one of the following is a possibility for most of us in regard to breathing, by making a conscious effort ?

- (A) One can consciously breathe in and breathe out by moving the diaphragm alone, without moving the ribs at all
- (B) The lungs can be made fully empty by forcefully breathing out all air from them
- (C) One can breathe out air totally without oxygen
- (D) One can breathe out air through eustachian tubes by closing both the nose and the mouth

21. A large proportion of oxygen is left unused in the human blood even after its uptake by the body tissues. This O_2

- (A) Helps in releasing more O_2 to the epithelial tissues
- (B) Acts as a reserve during muscular exercise
- (C) Raises the pCO_2 of blood to 75 mm of Hg
- (D) Is enough to keep oxyhaemoglobin saturation at 96%

22. Two friends are eating together at 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

23. Listed below are four respiratory capacities (a - c) and four jumbled respiratory volumes of a normal human adult

Respiratory capacities — Respiratory volumes

(a) Residual volume — 2500 mL

(b) Vital capacity — 3500 mL

(c) Inspiratory reserve volume — 1200 mL

(d) Inspiratory capacity — 4500 mL

Which one of the following is the correct matching of two capacities and volumes?

- (A) (a) 4500 mL, (b) 3500 mL
- (B) (b) 2500 mL, (c) 4500 mL
- (C) (c) 1200 mL, (d) 2500 mL
- (D) (d) 3500 mL, (a) 1200 mL

24. What is true about RBCs in humans?

- (A) They do not carry CO_2 at all
- (B) They carry about 20-25 percent of CO_2
- (C) They transport 99.5 percent of O_2
- (D) They transport about 80 percent oxygen only and the rest 20 percent of it is transported in dissolved state in blood plasma

25. What is vital capacity of our lungs?

- (A) Total lungs capacity minus residual volume
- (B) Inspiratory reserve volume plus tidal volume
- (C) Total lungs capacity minus expiratory reserve volume
- (D) Inspiratory reserve volume plus expiratory reserve volume

26. The haemoglobin of a human foetus

- (A) Has a higher affinity for oxygen than that of an adult
- (B) Has a lower affinity for oxygen than that of the adult
- (C) Its affinity for oxygen is the same as that of an adult
- (D) Has only 2 protein subunits instead of 4

27. People living at sea level have around 5 million RBC per cubic millimeter of their blood whereas those living at an altitude of 5400 metres have around 8 million. This is because at high altitude :

- (A) people get pollution-free air to breathe and more oxygen is available
- (B) atmospheric O_2 level is less and hence more RBCs are needed to absorb the required amount of O_2 to survive
- (C) there is more UV radiation which enhances RBC production
- (D) people eat more nutritive food, therefore more RBCs are formed

28. Which one of the following statements is incorrect ?

- (A) The residual air in lungs slightly decreases the efficiency of respiration in mammals
- (B) The presence of non-respiratory air sacs, increases the efficiency of respiration in birds
- (C) In insects, circulating body fluids serve to distribute oxygen to tissues
- (D) The principle of countercurrent flow facilitates efficient respiration in gills of fishes

29. The majority of carbon dioxide produced by our body cells is transported to the lungs :

- (A) dissolved in the blood
- (B) as bicarbonates
- (C) as carbonates
- (D) attached to haemoglobin

Answer key and explanations

1. Answer: (A) High pO_2 , low pCO_2 , less H^+ , lower temperature

At the alveoli, high pO_2 , low pCO_2 , fewer H^+ ions (higher pH) and lower temperature all favour binding of oxygen to haemoglobin. The opposite set of conditions, found in tissues, favours release of oxygen.

2. Answer: (A) $pO_2 = 104$ and $pCO_2 = 40$

Alveolar air has pO_2 of 104 mm Hg and pCO_2 of 40 mm Hg. The values 159 and 0.3 are for atmospheric air, and 40 and 45 are for deoxygenated blood.

3. Answer: (C) Higher H^+ conc. in alveoli favours the formation of oxyhaemoglobin.

In the alveoli the conditions that favour oxyhaemoglobin formation are high pO_2 , low pCO_2 , lower H^+ concentration and lower temperature. A higher H^+ concentration favours release of oxygen (as in the tissues), so that statement is wrong.

4. Answer: (A) (a) and (b)

Inspiration starts when the diaphragm and the external intercostal muscles contract, which increases the volume of the thoracic cavity and the lungs. The larger pulmonary volume lowers intra-pulmonary pressure below atmospheric, so a decrease in volume and an increase in pressure belong to expiration.

5. Answer: (B) inflammation of bronchi and bronchioles.

Asthma, triggered by allergens and pollutants, is difficulty in breathing with wheezing due to inflammation of bronchi and bronchioles. Fibrosis and alveolar wall damage describe occupational lung disease and emphysema respectively.

6. Answer: (A) 1500 mL

Expiratory capacity = tidal volume + expiratory reserve volume = 500 + 1000 = 1500 mL. Residual volume is not part of it; adding it gives 2700 mL, which is the trap (that sum would be functional residual capacity plus tidal volume).

7. Answer: (C) Inflammation of bronchioles; Decreased respiratory surface

Asthma is difficulty in breathing caused by inflammation of the bronchi and bronchioles. Emphysema is a chronic disorder in which alveolar walls are damaged, so the respiratory surface decreases. The reversed pairing is the main trap.

8. Answer: (B) a-iii, b-i, c-iv, d-ii

NCERT gives tidal volume about 500 mL, inspiratory reserve volume 2500–3000 mL, expiratory reserve volume 1000–1100 mL and residual volume 1100–1200 mL. The close values of ERV and RV are the trap; residual volume is the slightly larger one.

9. Answer: (A) Residual Volume

Residual volume (about 1100–1200 mL) is the air that remains in the lungs even after the most forceful expiration, and it keeps the alveoli from collapsing. Expiratory reserve volume is the extra air that can be breathed out forcibly, so it is exactly the air that is removed.

10. Answer: (C) Residual volume

Residual volume is the air that always remains in the lungs after forced expiration, so it never passes through the spirometer and cannot be measured by it. Tidal volume, inspiratory reserve volume and vital capacity are all exhaled or inhaled volumes that a spirometer records.

11. Answer: (A) Chronic damage to air sacs or alveoli leading to abnormal reduction in respiratory surface area

Emphysema is a chronic disorder in which alveolar walls are damaged, so the respiratory surface area decreases; smoking and air pollution are major causes. Persistent inflammation of the bronchi describes bronchitis, allergic bronchial spasms describe asthma, and emphysema reduces rather than increases lung elasticity.

12. Answer: (B) more than that in the blood

Alveolar pO_2 is about 104 mm Hg, higher than the 40 mm Hg of deoxygenated blood and the 95 mm Hg of oxygenated blood, so oxygen diffuses from the alveoli into the blood. Alveolar pCO_2 is only about 40 mm Hg, so pO_2 is not less than pCO_2 .

13. Answer: (B) there is a negative intrapleural pressure pulling at the lung walls

The pleural space is kept below the pressure inside the lungs, and this negative intrapleural pressure pulls on the lung walls and keeps the alveoli from collapsing, so a residual volume always stays. Intrapulmonary pressure itself swings either side of atmospheric during breathing and is not permanently negative or higher.

14. Answer: (A) Emphysema

Emphysema is a chronic disorder in which alveolar walls are damaged and the respiratory surface is reduced; cigarette smoking is its major cause. Asthma is an allergic inflammation of bronchi, and acidosis/alkalosis are acid-base disturbances, not respiratory diseases caused by smoking.

15. Answer: (B) allergic reaction of the mast cells in the lungs

Asthma is an allergic response: allergens trigger mast cells to release histamine and other mediators, causing inflammation and spasm of bronchi and bronchioles and wheezing. It is not a bacterial infection (as in pneumonia) or fluid accumulation.

16. Answer: (C) decrease the affinity of hemoglobin with oxygen.

A fall in pH (higher H^+) shifts the oxygen-haemoglobin dissociation curve to the right (Bohr effect), lowering haemoglobin's affinity for O_2 so more oxygen is released to tissues. It does not cause the liver to release bicarbonate.

17. Answer: (C) rising CO_2 concentration

The chemosensitive area of the medulla responds to rising CO_2 and H^+ in the blood, and this is the strongest drive to breathe. The fall in O_2 during breath-holding is small and has little effect at first, so it is not what first causes the urge.

18. Answer: (D) as bicarbonate ions

About 70% of CO_2 is carried as bicarbonate ions formed by carbonic anhydrase in RBCs, about 20–25% as carbamino-haemoglobin and about 7% dissolved in plasma. So the bicarbonate route, not carbamino-haemoglobin, accounts for the seventy percent.

19. Answer: (C) Bicarbonate in blood plasma and RBCs

About 70% of CO_2 is carried as bicarbonate, formed mainly in RBCs by carbonic anhydrase and carried largely in plasma; about 20–25% travels as carbamino-haemoglobin and about 7% as dissolved CO_2 . The trap reverses the percentages: carbamino-haemoglobin is the minor form, not 70%.

20. Answer: (A) One can consciously breathe in and breathe out by moving the diaphragm alone, without moving the ribs at all

With conscious effort one can breathe by moving the diaphragm alone (abdominal breathing) while keeping the ribs still. The lungs can never be emptied completely because the residual volume always remains, and expired air still contains about 16% oxygen.

21. Answer: (B) Acts as a reserve during muscular exercise

Each 100 mL of oxygenated blood delivers only about 5 mL of O_2 to the tissues at rest, so venous blood remains largely saturated. This unused oxygen acts as a reserve that can be released when muscular activity increases the demand.

22. Answer: (B) Epiglottis

During swallowing, the epiglottis closes the glottis so that food passes into the oesophagus and not the larynx. If it does not close properly, food enters the air passage and triggers a coughing reflex.

23. Answer: (D) (d) 3500 mL, (a) 1200 mL

Inspiratory capacity = tidal volume (about 500 mL) + IRV (2500–3000 mL), which is about 3500 mL.

Residual volume is about 1100–1200 mL. Vital capacity (about 4500 mL) and IRV (about 2500 mL) do not match the other options as given.

24. Answer: (B) They carry about 20-25 percent of CO₂

About 20–25% of CO₂ is carried by RBCs as carbamino-haemoglobin, about 70% as bicarbonate, and about 7% dissolved in plasma. For oxygen, about 97% travels bound to haemoglobin in RBCs and 3% dissolved, so the 99.5% and 80% figures are wrong.

25. Answer: (A) Total lungs capacity minus residual volume

Vital capacity is ERV + TV + IRV, the most air that can be breathed out after a forced inspiration. Total lung capacity is VC + RV, so VC = TLC – RV. IRV + ERV leaves out the tidal volume, and IRV + TV is the inspiratory capacity.

26. Answer: (A) Has a higher affinity for oxygen than that of an adult

Foetal haemoglobin ($\alpha_2\gamma_2$) binds O₂ more strongly than adult HbA, so it can take oxygen from maternal blood across the placenta. It is still a tetramer of four globin chains, not two.

27. Answer: (B) atmospheric O₂ level is less and hence more RBCs are needed to absorb the required amount of O₂ to survive

At high altitude the partial pressure of oxygen is low, so the body makes more RBCs to carry enough oxygen to the tissues. The air there actually has less available oxygen, not more.

28. Answer: (C) In insects, circulating body fluids serve to distribute oxygen to tissues

Insects carry oxygen directly to tissues through tracheal tubes, and their blood (haemolymph) plays little part in oxygen transport, so this statement is the incorrect one. Residual air does slightly lower efficiency because fresh air is mixed with stale air.

29. Answer: (B) as bicarbonates

About 70% of CO₂ is carried in plasma as bicarbonate ions, formed with carbonic anhydrase in RBCs.

About 20–25% travels bound to haemoglobin and around 7% dissolved.

Questions as set in the AIPMT/NEET papers conducted by CBSE and NTA. Answers checked and explanations written by the RankUp team. RankUp is not affiliated with CBSE or NTA.