



Physiology of respiratory system

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- When the inspiratory muscles are relaxed, the lungs are at:
- a. vital capacity.
- b. residual volume.
- c. minimal volume.
- d. functional residual capacity.
- e. inspiratory capacity.
- Answer: d

- Place the following steps for normal inhalation in order. (1) decrease in intrapleural pressure to 754 mmHg (from -4 mmHg to -6 mmHg). (2) flow of air from higher to lower pressure (inhalation). (3) lung size increases. (4) decrease in intra-alveolar pressure to 759 mmHg (-1 mmHg). (5) contraction of the diaphragm + external intercostals muscles.
- a. 5, 2, 3, 4, 1.
- b. 1, 3, 4, 5, 2.
- c. 5, 4, 3, 2, 1.
- d. 5, 1, 3, 4, 2.
- e. 1, 2, 3, 4, 5.
- Answer: d

- In normal individual, regarding gas exchange across pulmonary capillaries during mild exercise, which of the following statements is TRUE:
- a. CO₂ crosses the membrane easier than O₂.
- b. Diffusing capacity of the lung for O₂ is more than for CO₂, the most important factor to play role is the molecular weight of both gases.
- c. The length of capillary required for gas equilibrium is shorter during exercise.
- d. ABGs become grossly abnormal.
- e. Equilibrium across the respiratory membrane is never achieved.
- Answer: a

- In diving, divers first hyperventilate before they go into water. This hyperventilation allows one to hold one's breath for a longer period of time, because hyperventilation:
 - a. Make alveolar air full of O₂ which divers can use while diving.
 - b. Decreases the pH of systemic arterial blood.
 - c. Increases brain blood flow.
 - d. Increases the oxygen reserve of systemic arterial blood.
 - e. Decreases the PCO₂ of systemic arterial blood.
- Answer: e

- The work of breathing is:
- a. More in pulmonary fibrosis.
- b. Directly proportional to lung compliance.
- c. Is less in emphysema.
- d. Remain constant during exercise.
- e. Not affected by airway resistance.
- Answer: a

- The work of breathing is:
- a. directly proportional to lung compliance.
- b. Remain constant during exercise.
- c. is directly proportional to the airway resistance.
- d. Is less in pulmonary fibrosis.
- e. Is less in IRDS.
- Answer: C (**don't confuse with the previous question**)

- Hypoventilation causes one of the following changes in arterial blood gases:
 - a. Increase in arterial PO₂, increase in arterial PCO₂, and decrease pH.
 - b. Increase in arterial PO₂, decrease in arterial PCO₂, and increase pH.
 - c. Decrease in arterial PO₂, decrease in arterial PCO₂, and increase pH.
 - d. Increase arterial PO₂, no change in arterial PCO₂, and increase pH.
 - e. Decrease in arterial PO₂, increase in arterial PCO₂, and decrease pH.
- Answer: e

- Normal standing individual, when compared to apical alveolar, the alveoli at the base of the lungs:
 - a. At RV, their alveoli reach their resting volume.
 - b. Less compliant.
 - c. They have a less volume change during inspiration starting from FRC.
 - d. higher PAO₂.
 - e. At FRC they are less inflated.
- Answer: e

- One of the followings is expected in idiopathic pulmonary fibrosis:
- a. lower than normal FRC.
- b. higher than normal tidal volume.
- c. lower than normal pulmonary vascular resistance.
- d. higher than normal TLC.
- e. higher than normal lung compliance.
- Answer: a

- In normal person at rest, which of the following decreases arterial PO₂:
- a. Polycythemia (high RBC count).
- b. CO poisoning.
- c. Breathing 50% oxygen.
- d. Anemia.
- e. Ascent to an altitude of 3500 m.
- Answer: e

- The least important factor in gas diffusion:
- a. molecular weight.
- b. concentration gradient.
- c. solubility.
- d. surface area.
- e. thickness.
- Answer: a

- Which of the following concerning average lung volumes and capacities of a person at rest, is True:
 - a. $TLC > VC > TV > FRC$.
 - b. $TLC > FRC > VC > TV$.
 - c. $VC > TLC > IC > FRC$.
 - d. $TLC > VC > FRC > TV$.
 - e. $TLC > FRC > TV > VC$.
 - Answer: d

- Increase ventilation during exercise, which of the following changes occur: “A=stands for alveolar”
- a. increase PAO₂, increase PAH₂O, increase arterial PCO₂.
- b. increase PAO₂, unchanged PAH₂O, increase arterial PCO₂.
- c. unchanged PAO₂, unchanged PAH₂O, unchanged arterial PCO₂.
- d. decrease PAO₂, unchanged PAH₂O, decrease arterial PCO₂.
- e. decrease PAO₂, unchanged PAH₂O, increase arterial PCO₂.
- Answer: C

- When you climb the top of Everest, what changes will happen:
- a. respiratory minute ventilation is less.
- b. percent of O₂ in the outside air is more.
- c. percent of O₂ in the outside air is less.
- d. percent of O₂ in the outside air remains the same.
- Answer: d

- Spirometry can be used to measure one of the following:
- a. RV (Residual volume).
- b. FRC (functional residual capacity).
- c. TLC (total lung capacity).
- d. VC (Vital capacity).
- e. physiologic dead space volume.
- Answer: d

- Which statement is FALSE about anatomical dead space:
- a. Anatomical dead space varies with age.
- b. No gas exchange occurs at the level of anatomical dead space.
- c. has no physiological importance.
- d. its measurement needs special instrument (not spirometer).
- e. Estimated at around 150 ml in a 75kg man with TV 500ml.
- Answer: C

- compared to resting state, which of the following sets of differences best describes the hemodynamics of the pulmonary circulation during exercise:

	Flow (lit/min)	Resistance	Pulmonary Arterial Pressure
A.	Higher	Lower	Higher
B.	Higher	Lower	Lower
C.	Same	Higher	Lower
D.	Lower	Lower	Lower
E.	Same	Lower	Lower

- Answer: A

- In normal individual, identify the inconsistent value at sea level
- A. Alveolar $PCO_2 = 40$ mmHg.
- B. pulmonary arterial $PO_2 = 100$ mmHg.
- C. Alveolar $P_{H_2O} = 47$ mmHg.
- D. interstitial $PO_2 = 40$ mmHg.
- E. pulmonary venous $PCO_2 = 40$ mmHg.
- Answer: b

- The inspiratory reserve volume measures the _____:
- a. amount of air remaining in the lung after a maximal exhalation.
- b. amount of air that the lung holds.
- c. amount of air that can be further exhaled after a normal breath.
- d. amount of air that can be further inhaled after a normal breath.
- e. none of the above are correct.
- Answer: d

- According to the Law of Laplace, small alveoli don't coexist with large alveoli at the same region. **In the lungs**, several factors counter that tendency, and stabilize the alveolar structures. Which of the following is NOT one of them:
 - a. Mechanical stability is given by surrounding alveoli (alveoli support each others =alveolar interdependency).
 - b. Surface tension increases as alveolar surface area increases.
 - c. Surfactant lowers surface tension to a greater degree when it is on a smaller surface area, allowing the smaller alveoli to stay open.
 - d. Intrapleural pressure is lower (more negative) for smaller alveoli, allowing them to stabilize in comparison to the bigger ones.
 - e. surfactant makes surface tension volume-dependent.
- Answer: d

- a normal person, what is the PO₂ (in mm Hg) of moist inspired air (humidified atmospheric air) in the anatomic dead space in a person breathing room air at sea level:
 - a. 100.
 - b. 150.
 - c. 160.
 - d. 760.
 - e. cannot be predicted from the above data.
- Answer: b

- At the end of inspiration at rest in normal individual at sea level:
- A. Intrapleural pressure becomes subatmospheric (below atmospheric) and intrapulmonary pressure becomes above atmospheric.
- B. Intrapleural pressure becomes equal to intrapulmonary pressure.
- C. Intrapleural pressure remains subatmospheric and intrapulmonary pressure becomes atmospheric.
- D. Intrapleural pressure becomes above pressure atmospheric and intrapulmonary pressure becomes above atmospheric.
- E. Intrapleural pressure becomes above atmospheric and intrapulmonary pressure becomes subatmospheric.
- Answer: C

- Which of the following is true regarding TLC(total lung capacity):
- a. it is the resting volume of the thorax.
- b. it is the resting volume of the lung.
- c. at total lung capacity inspiratory muscles are maximally contracted.
- d. is less in chronic pulmonary lung disease.
- e. at total lung capacity intra pleural pressure is more than atmospheric pressure.
- Answer: c

- An individual with normal lung compliance and increased airway resistance would face problem mainly during:
- a. Expiration but only during exercise.
- b. Inspiration but at night only.
- c. Both inspiration and expiration but more in inspiration.
- d. Inspiration.
- e. Expiration.
- Answer: maybe e

- The total lung capacity is calculated using which of the following formulas:
- a. residual volume + tidal volume + inspiratory reserve volume.
- b. residual volume + expiratory reserve volume + inspiratory reserve volume.
- c. expiratory reserve volume + tidal volume + inspiratory reserve volume.
- d. residual volume + expiratory reserve volume + tidal volume + inspiratory reserve volume.
- Answer: d

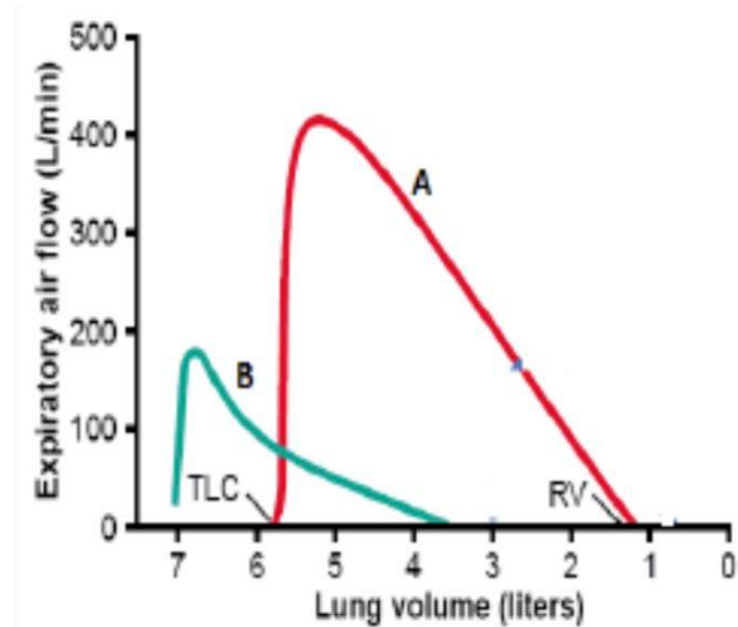
- In normal person, breathing room air at sea level at rest In standing position. Which of the following statements is true:
- a. Mixed Venous O_2 is equal or more than 20ml/dl blood.
- b. Compliance is greatest at lung apex.
- c. Ventilation at the base is more than ventilation at the apex.
- Answer: c

- In a normal person breathing 42% oxygen at rest for 10 minutes:
- a. Pulmonary vascular resistance is more at rest compared to exercise.
- b. This person's mixed expired P_{CO_2} decreases.
- c. The entire lung becomes zone (1)
- d. Mixed venous $[O_2]$ increases significantly.
- e. O_2 extraction ratio is about 42%.
- Answer: b

- In the lung, when O₂ diffuses from the alveoli to the capillaries, most of it:
 - a. Remains in solution as O₂.
 - b. Converted to oxyhemoglobin.
 - c. Converted to bicarbonate ions in RBC.
 - d. Combines with plasma proteins.
 - e. Combines with H₂O in plasma to form carbonic acid.
- Answer: B

- The maximum expiratory flow- volume curves in the diagram above were obtained from a healthy individual (curve A) and a 57 year old man who complains of shortness of breath (curve B). Which of the following disorders does the man most likely have:

- a. Asbestosis.
- b. Emphysema.
- c. Fibrosis.
- d. Acute asthmatic attack.
- e. ARDS.
- Answer: B (maybe not included)



- Which of the following is not correct about FRC:
- a. It is about 75% TLC.
- b. The elastic recoil of the chest wall is outward.
- c. The elastic recoil of the lung is inward.
- d. The lung-thorax system is at rest.
- e. pulmonary vascular resistance is the lowest.
- Answer: a

- How do we calculate alveolar minute ventilation, MV:
- a. subtract the alveolar and anatomical dead space from VT.
- b. multiply the VT with the respiratory rate.
- c. subtract anatomical dead space from VT and then multiply with respiratory rate.
- d. subtract the anatomical dead space from VT.
- e. none of the above are correct.
- Answer: c

- Which of the following is NOT true concerning respiratory distress syndrome in premature infants:
 - a. Their ability to synthesize surfactant is limited.
 - b. Higher pressures are required to ventilate the lungs.
 - c. Lung compliance is low.
 - d. Positive pressure respirators are often used to assist them in breathing.
 - e. Alveoli tend to over expand and sometimes burst at the end of inspiration.
- Answer: e

- TB Bacilli bacteria (Oxygen-loving Bacteria) would prefer to live and build their nests in the apex of the lung. The reason for that is:
- a. the apical alveoli are more ventilated when compared to basal alveoli.
- b. apical alveoli are surrounded with less negative intrapleural pressure.
- c. V/Q ratio is more than 1.
- d. apical alveoli are more compliant when compared to basal alveoli.
- e. apical alveoli are more perfused when compared to basal alveoli.
- Answer: C

- The forces governing the diffusion of a gas through a biological membrane are listed below. Which of the following changes increase the diffusion of a gas through a biological membrane: ↓=decrease, and ↑=increase.

	ΔP	A	S	d	MW
A.	↓	↓	↓	↓	↓
B.	↓	↓	↓	↑	↑
C.	↓	↓	↑	↓	↓
D.	↑	↑	↑	↓	↓
E.	↑	↑	↑	↑	↑

- Answer: d

V1

سُبْحَانَ اللَّهِ وَبِحَمْدِهِ عَدَدَ خَلْقِهِ وَرِضَا
نَفْسِهِ وَزِنَةَ عَرْشِهِ وَمَدَادَ كَلِمَاتِهِ

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