

VI-MCQs

1- Regarding dead space one of the following is correct. **L1**

- A- It increases by vagal stimulation.
- B- Decreased with aging.
- C- Physiological dead space equals to alveolar dead space.
- D- The alveolar dead space always pathological.**

2- Concerning pulmonary surfactant which of the following is correct? **L1**

- A- It is formed by vascular endothelium of pulmonary capillaries.
- B- Secreted by type II alveolar epithelium.**
- C- It is composed of protein only.
- D- It increases the surface tension of alveolar fluid.

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*UNDERSTANDING
PHYSIOLOGY*

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3- Oxygen therapy is most beneficial in which of the following situations provided normal lung function?

- A- Cyanid poisoning.
- B- High altitude.
- C- Anemia.
- D- CO₂ retention.

4- Regarding lung compliance one of the following is correct. **L1**

- A- Increased with pulmonary fibrosis.
- B- Decreased in emphysema.
- C- Increased in pneumothorax.
- D- Decreased with pulmonary congestion.

5- Which of these statements about intrapulmonary pressure and intrapleural pressure is true? **L1**

- a. The intrapulmonary pressure is always subatmospheric.
- b. The intrapleural pressure is always greater than the intrapulmonary pressure.
- c. The intrapulmonary pressure is greater than the intrapleural pressure.
- d. The intrapleural pressure equals the atmospheric pressure.

6. Which of these would be most affected by a decrease in the affinity of hemoglobin for oxygen?

- a. Arterial P O₂
- b. Arterial percent oxyhemoglobin saturation
- c. Venous oxyhemoglobin saturation
- d. Arterial P CO₂

7. If a person with normal lung function were to hyperventilate for several seconds, there would be a significant

- a. increase in the arterial P O₂.
- b. decrease in the arterial P CO₂.
- c. increase in the arterial percent oxyhemoglobin saturation.
- d. decrease in the arterial pH.

8. If the transpulmonary pressure equals zero,

- a. a pneumothorax has probably occurred.
- b. the lungs cannot inflate.
- c. elastic recoil causes the lungs to collapse.
- d. all of these apply.

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9. The affinity of hemoglobin for oxygen is decreased under conditions of **L5**
- acidosis.
 - fever.
 - anemia.
 - acclimatization to a high altitude.
 - all of these.
10. The chemoreceptors in the medulla are directly stimulated by
- CO₂ from the blood.
 - H⁺ from the blood.
 - H⁺ in cerebrospinal fluid that is derived from blood CO₂.
 - decreased arterial P O₂.
11. Concerning expiration in normal quiet respiration which of the following is correct? **L1**
- Caused by contraction of external intercostal muscles.
 - Makes the intrapleural pressure more negative.
 - It is an active process.
 - Makes the intrapleural pressure less negative.
12. Regarding lung volumes and capacities one of the following is correct.
- Not all lung volumes can be measured by spirometers.
 - Tidal volume equal to 800 ml in adult man.
 - Vital capacity equals to tidal volume + residual volume.
 - Residual volume equals to 1200 ml.
13. Concerning hypoxia which of the following is correct? **L9**
- Carbon monoxide poisoning causes anemic hypoxia.
 - Oxygen therapy is very useful in histotoxic hypoxia.
 - The arterial O₂ content in anemic hypoxia is normal.
 - Heart failure can cause hypoxic hypoxia.
14. Regarding Orthopnoea one of the following is correct.
- Caused by decrease pulmonary blood flow.
 - Caused by right heart failure.
 - Caused by chronic obstructive lung disease.
 - Caused by left ventricular failure.
15. Concerning work of breathing which of the following is correct?
- Decreased in bronchial asthma.
 - Decreased in lung fibrosis.
 - Increased with increasing compliance.
 - Decreased with increasing surfactant.



16- Regarding Caisson's disease one of the following is correct.

- A- Results from sudden compression.
- B- Relived spontaneously without treatment.
- C- Causes pain in joint and muscles.
- D- Caused by excessive solubility of carbon dioxide.

17- Concerning regulation of arterial blood pressure which of the following is correct?

- A- CNS ischemic response concerned with long term mechanism.
- B- Respiratory reflexes concerned with short term mechanism.
- C- The arterial baroreceptors concerned with intermediate term mechanism.
- D- The rennin-angiotensin system concerned with intermediate and long term mechanism.

18- - The physiological dead space is: *L1*

- A. Sometimes measured using the arterial po_2 .
- B. Generally smaller than the anatomic dead space.
- C. Often increased in lung disease.
- D. Equal to alveolar dead space.

19 - Stagnant hypoxia is due to: *L9*

- A. Ascending to high altitude.
- B. CO poisoning
- C. An increase in blood flow.
- D. A decrease in blood flow.

20- Which of the following is NOT a function of the lungs?

- A. Metabolism
- B. Serves as a reservoir of blood for the left ventricle.
- C. It is a filter to protect the systemic vasculature
- D. Facilitates the exchange of O_2 and CO_2 between air and blood.
- E. All of the above are true.

21. Which of the following is the first branching of the bronchial tree that has gas exchanging capabilities? *L1*

- A. Terminal bronchioles.
- B. Respiratory bronchioles.
- C. Alveoli
- D. segmental bronchi



22. Which of the following represents the pressure difference that acts to distend the lungs?
- Alveolar pressure
 - Airway opening pressure
 - Transthoracic pressure
 - Transpulmonary pressure
 - Esophageal pressure.
23. If a patient had a progressive lung disease that required an ever increasing pressure to fill the same volume of lung, how would the lung's compliance be affected? *LI ?*
- It would increase it.
 - It would stay the same.
 - It would decrease it.
 - These variables do not affect lung compliance.
24. An asthma sufferer finds she has to breathe at twice her normal rate. How does that affect her dynamic compliance?
- It stays the same.
 - It decreases.
 - It increases.
 - Static compliance, not dynamic, is the variable affected by asthma.
25. According to the Law of Laplace, air should flow from the smaller alveoli to the larger, collapsing them. In the lungs, several factors counter that tendency, and stabilize the alveolar structures. Which of the following is NOT one of them?
- Surfactant lowers surface tension to a greater degree when it is on a smaller surface area, allowing the smaller alveoli to stay open.
 - Mechanical stability is given by surrounding alveoli.
 - Transpulmonary pressure is lower for smaller alveoli, allowing them to stabilize in comparison to the bigger ones.
 - Surface tension at the gas-liquid interface increases as alveolar surface area increases.
26. Which of the following is FALSE concerning the production and role of lung surfactant? *ما شئ حقا الدكتور LI*
- It is part of a lipoprotein called dipalmitoyl phosphatidyl-choline.
 - It is synthesized by alveolar type II cells.
 - As the alveolar surface area decreases during the compression curve, the surfactant decreases the surface tension at a constant rate.
 - When surfactant density is decreased during expansion, surface tension initially rises rapidly, then slows down until it reaches the starting point.



27. Which of the following is NOT true concerning respiratory distress syndrome in premature infants? **L1**

- A. Their ability to synthesize DPPC 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 overexpand and sometimes burst at the end of inspiration.

28-Features of mild carbon monoxide poisoning include: **L9**

- a) decreased arterial PO_2 .
- b) decreased hemoglobin-oxygen affinity.
- c) increased alveolar ventilation.
- d) decreased arterial O_2 concentration.

29-Stagnant hypoxia is due to: **L9**

- a) ascending to high altitude.
- b) CO poisoning
- c) an increase in blood flow.
- d) a decrease in blood flow.

30-In a patient with stable chronic lung disease elevated $PaCO_2$ and decreased PaO_2 :

- a) CSF pH is near the normal value (7.32).
- b) the ventilator response to CO_2 is reduced.
- c) changes in PaO_2 are more important in determining the level of ventilation than in normal people.
- d) arterial $[H^+]$ is slightly above normal.

31- Which of the following is the first branching of the bronchial tree that has gas exchanging capabilities? **L1**

- a) terminal bronchioles.
- b) respiratory bronchioles.
- c) trachea.
- d) two main bronchi.

32- Which of the following could NOT be part of respiratory zone? **L1**

- a) alveolar sacs.
- b) alveolar ducts.
- c) terminal bronchioles.
- d) respiratory bronchiole

33- 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) $TLC > VC > FRC > TV$.
- d) $TLC > FRC > TV > VC$.



34- Which of the following does NOT happen during inspiration? (1)

- a) The ribs move upward.
- b) The diaphragm lifts up.
- c) The antero-posterior dimensions of the chest are increased.
- d) The transverse dimensions of the thorax are increased.

35- During inspiration, how does alveolar pressure compare to atmospheric pressure? (1)

- a) Alveolar pressure is greater than atmospheric.
- b) Alveolar pressure is less than atmospheric.
- c) Alveolar pressure is the same as atmospheric.
- d) Alveolar pressure is one of the few pressures where the reference pressure is not atmospheric.

36- Which of the following represent the pressure difference that acts to distend the lungs? (1)

- a) Alveolar pressure.
- b) Airway opening pressure.
- c) Tran thoracic pressure.
- d) Tran pulmonary pressure.

37- Which of the following is NOT true concerning respiratory distress syndrome in premature infants? (1)

- a) Their ability to synthesize surfactant is limited.
- b) Higher pressures are required to ventilate the lungs.
- c) Lung compliance is low.
- d) Alveoli tend to overexpand and sometimes burst at the end of inspiration.

38- Which of the following is NOT a function of dead space? (1)

- a) Warms expired air to body temperature.
- b) Saturates inspired air with water vapor.
- c) Removes bacteria and other particulate matter.
- d) Conducts the warmed air to the respiratory membranes.

39- Which of the following definitions is FALSE?

- a) O₂ content of blood is the actual amount of O₂ in one deciliter of blood.
- b) O₂ saturation of blood is the ratio of O₂ content to its O₂ capacity.
- c) The O₂ uptake curve of blood is the functional relationship between O₂ content and PO₂.
- d) The O₂ content of blood depends completely on the amount of Hb in the blood.

40- Forced expiration requires contraction of: (1)

- a) The internal intercostals.
- b) The diaphragm.
- c) The abdominal muscles.
- d) All of c above.

41- The affinity of Hb for O₂ is influenced by: (5)

- a) PH.
- b) Temperature.
- c) Concentration of 2,3, DPG.
- d) All of the above.



42- Dyspnoea is usually present when the dyspnoic index is:

- a) Less than 90%.
- b) Less than 80%.
- c) Less than 70%.
- d) Less than 60%.

43- The solubility of CO₂ in the blood is about:

- a) 0.5 times that of O₂.
- b) 2 times that of O₂.
- c) 20 times that of O₂.
- d) 10 times that O₂.

44- Decompression sickness or Caisson's disease is due to bubbling of:

- a) Oxygen in the tissues.
- b) CO₂ in the tissue.
- c) Hydrogen in the tissues.
- d) Nitrogen in the tissues.

45-Compensatory mechanism due to acclimatization at high attitude involves: L9

- a) Increased alveolar ventilation.
- b) Increased production of red blood cells.
- c) Production of alkaline urine.
- d) All of the above.

46-In histotoxia hypoxia: L9

- a) O₂ tension in blood is low.
- b) O₂ content of blood is low.
- c) O₂ utilization by tissues is excessive.
- d) O₂ utilization by tissues is defective.

47- Chemical regulation of respiration is maximally affected by:

- a) O₂.
- b) CO₂.
- c) Bicarbonate.
- d) Lactic acid.

48-Respiration during exercise is regulated by:

- a) Cerebral cortex.
- b) Hypoxia in the muscles.
- c) Joint proprioceptors.
- d) All of the above.



49- The respiratory centre:

- a) Is situated in the reticular substance of lower part of pons.
- b) Is influenced by higher centers.
- c) Is inhibited during swallowing.
- d) All of the above statements are true.

50- Hering-Breuer reflex is activated during:

- a) Early inspiration.
- b) Maximal inspiration.
- c) Late expiration.
- d) None of the above.

51- Which of the following is FALSE concerning the airflow in the lungs?

- A. During inspiration and expiration, the flow in the trachea and larger bronchi is turbulent.
- B. Towards the middle of the bronchial tree, the flow is turbulent at the branches and laminar in between.
- C. Near the end of the bronchial tree, the flow is laminar.
- D. The acini have very small radii which significantly increases the total air flow resistance of the bronchial tree.

52- Which of the following is NOT true at 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 relaxation pressure of the lung and chest wall combined is at atmospheric pressure.

53- Which of the following is FALSE concerning airway resistance?

- A. Up to 50% is in the nose.
- B. The maximum resistance in the bronchial tree occurs at the fourth generation.
- C. In the later generations, the radii are smaller, increasing the total resistance at each successive generation.
- D. Airway resistance can be increased by loss of tissue elasticity and contraction of bronchial smooth muscles.

54- Which of the following is FALSE concerning the effect of effort on airflow and volume during inspiration and expiration?

- A. During inspiration, greater effort always results in greater flow.
- B. Peak expiratory flow occurs at the beginning of expiration.
- C. At low and moderate lung volumes, the greater the effort above threshold, the greater the airflow in expiration.
- D. Portions of the expiration curve are effort independent.

- 55- Which of the following does NOT apply to the alveoli at the base of the lungs?
- They are less elastic than the alveoli at the apex.
 - The pleural pressure is lower.
 - At FRC they are less inflated than the alveoli at the apex.
 - They are closed at RV.
 - They have a greater volume change than alveoli at the apex during inspiration from FRC.
56. Which of the following is TRUE if a patient breathes slower than normal with increased tidal volumes?
- More resistive work is done.
 - More elastic work is done.
 - The total work done decreases.
 - Compliance is decreased.
- 57- A 140 lb woman would have approximately how much dead space in her lungs?
- 140 ml.
 - 280 ml.
 - 70 ml.
 - 35 ml.
- 58- If a patient's blood carries 10 grams of Hb per deciliter, what is the O₂ carrying capacity of his blood?
- 18 milliliters per deciliter.
 - 20 milliliters per deciliter.
 - 10 milliliters per deciliter.
 - 13 milliliters per deciliter.
- 59- Which of the following definitions is FALSE?
- O₂ content of blood is the actual amount of O₂ in one deciliter of blood.
 - O₂ saturation of blood is the ratio of O₂ content to its O₂ capacity.
 - The O₂ dissociation curve of blood is the functional relationship between O₂ content and PO₂.
 - The O₂ content of blood depends completely on the amount of Hb in the blood.
- 60- The partial pressure of O₂ in arterial blood is:
- 46 mm Hg.
 - 40 mm Hg.
 - 95 mm Hg.
 - 130 mm Hg.
- 61- Acute hypoxia has all these effects, EXCEPT:
- Hyperventilation.
 - Bone marrow stimulation.
 - Vasoconstriction in tissues.
 - Cardiac stimulation.



62- Normal arterial PCO₂ (PaCO₂) is.:

- a) 38 mmHg.
- b) 46mmHg.
- c) 52 mmHg.
- d) 40 mmHg.

63-In cheyne-stokes breathing apnoea results from: L7

- a) Hypoxia.
- b) Hypercapnia.
- c) Acidosis.
- d) Hypocapnia.

64- Valsalva manouever is:

- a) Forced expiration against closed glottis.
- b) Deep inspiration with closed glottis.
- c) Both.
- d) Neither.

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65-In airway obstruction, which of these occurs:

- a) The FEV1 is prolonged.
- b)The residual volume is increased.
- c) Both.
- d) Neither.

66- Haldane effect relates:

- a) CO₂ uptake on O₂ dissociation.
- b) O₂ dissociation on CO₂ uptake.
- c) O₂ uptake and 2,3 DPG.
- d) O₂ delivery and (H⁺).

67-Peripheral chemoreceptors are located in:

- a) Carotid sinus.
- b) Aortic sinus.
- c) Aortic body.
- d) A and C.

68- Which of the following has the greatest effect on the ability of blood to transport oxygen? L5

- a) capacity of the blood to dissolve oxygen.
- b) amount of hemoglobin in the blood.
- c) pH of plasma.
- d) CO₂ content of red blood cells.

69-An increase in which of the following increases the O₂ affinity of hemoglobin? L5

- a) Temperature.
- b) Carbon monoxide added to the blood.
- b) H⁺ concentration.
- d) 2,3-DPG.



70-The physiological dead space is: **L₁**

- a) Sometimes measured using the arterial PO₂.
- b) Generally smaller than the anatomic dead space.
- c) Often increased in lung disease.
- d) Equal to alveolar dead space.

d) A decrease in pH increases P50.

71-Which of the following is NOT a form by which CO₂ can be transported in the blood?

- a) As bicarbonate.
- b) Dissolved in plasma.
- c) Bound to the amino end groups in proteins.
- d) Bound to globulin.

72- It is correct to say:

- a) the peripheral chemoreceptors are mainly stimulated by hypoxia.
- b) the intrapleural pressure is positive during inspiration.
- c) CO₂ is transported mainly as carbonic acid.
- d) compliance of the lung is greater when the breath near the residual volume.

73- Which of the following is the primary regulating variable of the central chemoreceptors?

- a) PaO₂.
- b) PaCO₂.
- c) arterial pH.
- d) Input from stretch receptors.

74-Which of the following pairs is NOT a pulmonary mechanoreceptor paired to a possible stimulus?

- a) Stretch receptor: inflation.
- b) Irritant receptor: inhaled dust.
- c) Juxtacapillary receptors: decreases interstitial fluid volume in alveolar walls.
- d) Bronchial C receptors: large inflations.

75-Carbon dioxide carriage:

- a) 25% dissolved.
- b) 10% carbamino.
- c) 65% bicarbonate.
- d) 100% bicarbonate.

76-Factors that favour formation of carbamino-haemoglobin include:

- a) carbonic anhydrase.
- b) a decrease in oxygen tension.
- c) an increase in oxygen tension.
- d) none of the above.



77-In a normal healthy individual, the physiological dead space is: **61**

- a) More than anatomic dead space.
- b) Less than anatomic dead space.
- c) Equal to anatomic dead space.
- d) None of the above.

78- Total lung capacity:

- a) Tidal volume + residual volume.
- b) Residual volume + Vital capacity.
- c) Inspiratory capacity + residual volume.
- d) Expiratory reserve volume + residual volume.

79-CO₂ is transported in blood:

- a) In dissolved form in plasma as bicarbonate.
- b) In combination with plasma proteins.
- c) In combination with Hb.
- d) All of the above forms.

80-Which of the following statements about Hb is FALSE? **15**

- A. A higher P₅₀ than normal means that the O₂ binds less tightly to Hb.
- B. An increase in 2,3-DPG shifts the O₂ uptake curve to the left.
- C. An increase in PCO₂ causes a right shift of the O₂ uptake curve.
- D. An decrease in pH increases P₅₀.
- E. An increase in temperature shifts the O₂ uptake curve to the right.

81-The affinity of hemoglobin for oxygen is decreased under conditions of **15**

- a) acidosis.
- b) fever.
- c) acclimatization to a high altitude.
- d) all of the above.

82-Most of the carbon dioxide in the blood is carried in the form of

- a) dissolved CO₂.
- b) carbaminohemoglobin.
- c) bicarbonate.
- d) carboxyhemoglobin.

83-The chemoreceptor in the medulla are directly stimulated by

- a) CO₂ from the blood.
- b) H⁺ from the blood.
- c) H⁺ in cerebrospinal fluid that is derived from blood CO₂.
- d) decreased arterial PO₂.



84-The rhythmic control of breathing is produced by the activity of inspiratory and expiratory neurons in

- a) the medulla oblongata.
- b) the apneustic center of the pons.
- c) the pneumotaxic center of the pons.
- d) the cerebral cortex.

85-Which of these occur(s) during hypoxemia? L5

- a) increased ventilation.
- b) increased production of 2,3-DPG.
- c) increased production of erythropoietin.
- d) all of the above.

86-All of these can bond with hemoglobin EXCEPT:

- a) HCO_3^- .
- b) O_2 .
- c) H^+ .
- d) CO_2 .

87- Suppose a person's arterial PO_2 and PCO_2 are normal ($\text{PO}_2 = 100 \text{ mm Hg}$; $\text{PCO}_2 = 40 \text{ mm Hg}$). Which of the following would most likely stimulate an increase in ventilation?

- a) A decrease in PO_2 to 90 mm Hg
- b) A decrease in PCO_2 to 35 mm Hg
- c) An increase in PO_2 to 110 mm Hg
- d) An increase in PCO_2 to 45 mm Hg

88- A rise in arterial PCO_2 triggers an increase in ventilation by stimulating both central and peripheral chemoreceptors. The response of central chemoreceptors is due to

- a) Diffusion of carbon dioxide into brain extracellular fluid, which stimulates chemoreceptors directly.
- b) Diffusion of hydrogen ions into brain extracellular fluid, which stimulates chemoreceptors directly.
- c) Diffusion of carbon dioxide into brain extracellular fluid, which reacts with water to form hydrogen ions, which stimulate chemoreceptors directly.
- d) Diffusion of carbon dioxide into brain extracellular fluid, which reacts with water to form bicarbonate ions, which stimulate chemoreceptors directly.
- e) Direct stimulation by hydrogen ions in arterial blood.

89- Which of the following decreases with emphysema?

- A- Cardiac output.
- B- Alveolar Pco_2 .
- C- Diffusion area.
- D- Pulmonary artery pressure.



90- Which of the following can hemoglobin bind and transport in blood?

- a) Oxygen
- b) Carbon dioxide
- c) Hydrogen ions
- d) Both a and c
- e) All of the above

91- Which of the following can cause stagnant hypoxia? (C)

- A. Bronchial asthma
- B. Heart failure.
- C. Cyanide poisoning.
- D. Carbon monoxide poisoning.

92-The volume of air respired normally is called:

- a) The tidal volume.
- b) Vital capacity.
- c) Residual volume.
- d) Total lung capacity.

93-Residual volume is about:

- a) 2200 ml.
- b) 1200 ml.
- c) 1000 ml.
- d) 4500ml.

94-Hypoxia may be due to: (C)

- a) Anemia.
- b) Histamine release.
- c) Hypertension.
- d) Diabetes.

95-During normal inspiration:

- a) PO₂ in dead space rises.
- b) Intra-abdominal pressure falls.
- c) Intra-alveolar pressure falls.
- d) All of the above.

96-Cyanosis occurs when reduced hemoglobin in blood is more than: (C)

- a) 5 gm %.
- b) 10gm %.
- c) 15gm%.
- d) 20 gm%.



97-Spirometer cannot measure the followings EXCEPT: Lab

- a) Total lung capacity.
- b) Residual volume.
- c) Functional residual capacity.
- d) Expiratory reserve volume.

98-The volume of the vital capacity is about:

- a) 500 ml.
- b) 1500 ml.
- c) 4500 ml.
- d) 6000 ml.

99-The following are static lung volumes and capacities EXCEPT:

- a) The vital capacity.
- b) Expiratory reserve volume.
- c) The residual volume.
- d) The maximum breathing capacity.

100-The following lung volumes and capacities can be directly measured by spirometry EXCEPT:

- a) The vital capacity.
- b) The inspiratory reserve volume.
- c) The total lung capacity.
- d) The expiratory reserve volume.

101- Which of the following is *not* a function of the conducting zone of the respiratory system? L1

- a) Humidifying the air
- b) Adjusting the air to body temperature
- c) Exchanging gases between the respiratory system and the blood
- d) Secreting mucus
- e) Protecting the lungs from inhaled particles

102- The smallest airways in the conducting zone are L1

- a) Terminal bronchioles.
- b) Respiratory bronchioles.
- c) Alveolar ducts.
- d) Alveolar sacs.
- e) Bronchi.

103. Which of the following muscles contract(s) during quiet expiration? L1

- a) Diaphragm
- b) Internal intercostals
- c) External intercostals
- d) None of the above
- e) All of the above



104- Which of the following factors decreases airway resistance?

- a) Activation of the parasympathetic nervous system
- b) Epinephrine
- c) Histamine
- d) Both a and c.

105-The product of tidal volume and breathing rate gives

- a) Respiration rate.
- b) Total lung capacity.
- c) Alveolar ventilation.
- d) Minute ventilation.
- e) Dead space volume.

106- When all muscles of respiration are relaxed and alveolar pressure is zero, lung volume is equal to

- a) Residual volume.
- b) Vital capacity.
- c) Functional residual capacity.
- d) Tidal volume.
- e) Total lung capacity.

107-In obstructive lung diseases (e.g. bronchial asthma) the following is true:

- a) The dead space is increased.
- b) The total lung capacity is decreased.
- c) The functional residual capacity is decreased.
- d) None of the above.

108-On the summit of Mt. Everest, where the barometric pressure is about 250 mm Hg, and the partial pressure of O₂ is about

- a) 0.1 mm Hg.
- b) 0.5 mm Hg.
- c) 5 mm Hg.
- d) 50 mm Hg.
- e) 100 mm Hg.

109-The forced vital capacity is

- a) the amount of air that normally moves into (or out of) the lung with each respiration.
- b) the amount of air that enters the lung but does not participate in gas exchange.
- c) the largest amount of air expired after maximal expiratory effort.
- d) the largest amount of gas that can be moved into and out of the lungs in 1 min.

110-The tidal volume is

- a) the amount of air that normally moves into (or out of) the lung with each respiration.
- b) the amount of air that enters the lung but does not participate in gas exchange.
- c) the largest amount of air expired after maximal expiratory effort.
- d) the largest amount of gas that can be moved into and out of the lung in 1 min.



111. At the normal resting PO_2 of mixed venous blood, hemoglobin is **19**

- a) Nearly 100% saturated.
- b) Nearly 97% saturated.
- c) Nearly 75% saturated.
- d) Nearly 50% saturated.

112-Which of the following is responsible for the movement of O_2 from the alveoli into the blood?

- a) active transport.
- b) passive diffusion.
- c) secondary active transport.
- d) facilitated diffusion.

113-Surfactant lining the alveoli **L1**

- a) prevents alveolar collapse.
- b) is produced in alveolar type I cells and secreted into the alveolus.
- c) is increased in the lungs of heavy smokers.
- d) is a glycolipid complex.

114-Most of the CO_2 transported in the blood is

- a) dissolved in plasma.
- b) in carbamino compounds formed from plasma proteins.
- c) in carbamino compounds formed from hemoglobin.
- d) bound to Cl^- .
- e) in HCO_3^- .

115-Inspiration occurs when: **L1**

- a) the alveolar pressure increases.
- b) the intrapleural pressure increases.
- c) the diaphragm relaxes.
- d) the alveolar pressure decreases.

116-The maximum amount of air that can be expired after a maximum inspiration is

- a) the vital capacity.
- b) the forced expiratory volume.
- c) the tidal volume.
- d) the maximum expiratory flow rate.

117-In order to measure alveolar ventilation we need to know the value of tidal volume, respiratory rate, and:

- a) lung compliance.
- b) oxygen consumption.
- c) CO_2 production.
- d) dead space volume.



V-TRUE OR FALSE

- 1- The trachea, bronchi and bronchioles are called the trachobronchial tree.
- 2- The wall of the respiratory part is thick, so it does not allow gas exchange L1
- 3- Air present in respiratory part is called alveolar air.
- 4- Elastic fiber in the lung responsible only for 70% of elastic recoil of the lung.
- 5- When the lung is inflated, it tends to recoil is called compliance.
- 6- Insulin hormone increases the surfactant formation.
- 7- Smoking increases the surfactant formation.
- 8- Respiratory distress syndrome (RDS) is common in premature babies.
- 9- Compliance of both lungs together is less than lung thoracic compliance.
- 10- Bronchial asthma is the disease characterized by difficult expiration due to bronchospasm.
- 11- Total lung capacity has medico- legal importance to know the newly-born baby was born dead or died after labor.
- 12- Inspiratory capacity is the volume of air expired by deep expiration after deep inspiration.
- 13- Breathing Reserve (BR) is 90% or more.
- 14- The diaphragm (30%) of inspiratory muscle action.
- 15- Muller's maneuver, forced expiration with glottis closed.
- 16- Artificial pneumothorax is by injection of air into the pleura to produce collapse of one lung.
- 17- Voluntary respiration controls by the cerebral cortex such as breath holding and during speech.
- 18- CO₂ is the major stimulant to the central chemoreceptors but it cannot diffuse through blood brain barrier
- 19- The O₂ tension can be reduced to about 60 mmHg while the O₂ saturation is decreased to 90%.
- 20- No release of CO or O₂ from Hb in CO poisoning.
- 21- CO₂ Dissociation Curve is the relationship between CO₂ tension and CO₂ saturation in the blood.
- 22- Inhibition of respiratory centers causes anemic hypoxia.
- 23- Orthopnea is the difficulty breathing in standing or sitting positions.
- 24- Cheyne-Stokes breathing is present in everyone however under normal conditions this mechanism is highly damped.

VII-CASES

1. A 50-year-old man with a persistent cough and difficulty breathing is referred by his family physician for pulmonary function tests. The test results show that the forced vital capacity (FVC), forced expired volume in 1st (FEV1), and functional residual capacity (FRC) are all significantly below normal. Which of the following diagnosis is consistent with these pulmonary function test results?

- A. Asthma
- B. Chronic bronchitis
- C. Emphysema
- D. Pulmonary fibrosis

2. A 19-year-old man is taken to the emergency department after being stabbed in the right side of the chest. The entry of air through the wound resulted in pneumothorax on the right side of his chest. What difference between the right and left sides of the chest would be apparent on a plain chest x-ray?

- A. The lung volume on the right would be larger
- B. The position of the diaphragm on the right would be higher
- C. The thoracic volume on the right would be larger
- D. There would be no differences in thoracic geometry

3. A 40-year-old woman presented with dyspnea, hematuria, and right flank pain. CT scans revealed a renal tumor, with an extensive venous thrombus that had invaded the inferior vena cava. Fragments of the thrombus had entered the lungs and were blocking several major branches of the pulmonary arteries. Assuming that there was no change in VT or respiratory rate, what effect would these pulmonary emboli have on arterial blood gases within the first few minutes of their occurrence?

- A. Decreased PCO₂ and decreased PO₂
- B. Decreased PCO₂ and increased PO₂
- C. Increased PCO₂ and decreased PO₂
- D. Increased PCO₂ and increased PO₂
- E. No change in PCO₂ or PO₂

4. A 9-year-old boy decided to find out for how long he could continue to breathe into and out of a paper bag. After approximately 2 minutes, his friends noticed that he was breathing very rapidly so they forced him to stop the experiment. What change in arterial blood gas composition was the most potent stimulus for this boy's hyperventilation?

- | | |
|-------------------------------|-------------------------------|
| A. Decreased PCO ₂ | B. Decreased PO ₂ |
| C. Decreased Ph | D. Increased PCO ₂ |
| E. Increased PO ₂ | F. Increased pH |



5-A group of medical students is experimenting with a peak flow meter in the respiratory physiology laboratory. Two students decide to compete to see which of them can blow the hardest into the device. Which of the following muscles is most effective at producing a maximal expiratory effort such as this?

- A. Diaphragm
- B. External intercostal muscles
- C. Internal intercostal muscles
- D. Rectus abdominus
- E. Sternocleidomastoid

6-24 years old male was transported to the emergency department in acute respiratory distress after being stabbed in the left lateral chest. Air can be heard entering the thorax through stab wound during inspiration and bubbles from the stab wound during exhalation. The patient has 3cm puncture wound on the left lateral chest between the third and fourth rib. He is conscious, able to speak and complain of chest pain associated with difficult breathing. At the end of inspiration what is the pressure in the left intrapleural space?

- A) - 3 mmHg.
- B) - 7 mmHg.
- C) 0 mmHg.
- D) + 30 mmHg.



V-TRUE OR FALSE

True (1, 3, 8, 9, 10, 13, 16, 17, 18, 19, 20, 24) & False (2, 4, 5, 6, 7, 11, 12, 14, 15, 21, 22, 23)

VI-MCQs

1-D	11-D	21-B	31-B	41-D	51-D	61-C	71-D	81-D	91-B	101-C	111-C
2-B	12-A	22-D	32-C	42-D	52-A	62-D	72-A	82-B	92-A	102-A	112-B
3-B	13-A	23-C	33-C	43-C	53-C	63-D	73-B	83-C	93-A	103-D	113-A
4-D	14-D	24-B	34-B	44-D	54-C	64-A	74-C	84-A	94-A	104-B	114-E
5-C	15-D	25-C	35-B	45-D	55-A	65-B	75-C	85-D	95-C	105-D	115-D
6-C	16-A	26-C	36-D	46-D	56-C	66-B	76-B	86-A	96-A	106-C	116-A
7-B	17-D	27-E	37-D	47-B	57-A	67-C	77-C	87-D	97-D	107-C	117-D
8-D	18-C	28-D	38-A	48-D	58-D	68-B	78-C	88-C	98-C	108-D	
9-E	19-D	29-D	39-D	49-D	59-D	69-B	79-D	89-C	99-D	109-C	
10-C	20-E	30-D	40-C	50-B	60-C	70-C	80-B	90-B	100-C	110-A	

VII-CASES

1—D. FVC and FEV1 are expected to be reduced in all these conditions. The coexistence of low FRC indicates reduced resting lung volume and is consistent with the low static lung compliance found in patients with pulmonary fibrosis.

2—C. A pneumothorax interrupts the pleural fluid between the lung and chest wall, allowing each structure to assume its equilibrium position. Therefore, the lung collapses to a small volume and the chest wall expands; the diaphragm is part of the chest wall and also moves outward (i.e., flattens to a lower position compared to the unaffected side).

3—C. Pulmonary emboli create areas of the lung that are ventilated but not perfused, thereby increasing dead space, reducing alveolar ventilation, and decreasing CO₂ excretion. Blood is forced to flow to other areas of the lung, some of which are not ventilated, creating a degree of intrapulmonary shunt, which decreases oxygenation.

4—D. Breathing into and out of a paper bag will result in accumulation of CO₂ and depletion of O₂ in the bag. The same changes will, therefore, be reflected in alveolar air and in arterial blood. Accumulation of CO₂ will also result in a decrease in the blood pH. However, in normal subjects, the most potent drive to breathe is the arterial PCO₂, acting through central chemoreceptors.

5—D. The abdominal muscles are the most powerful expiratory muscles; the internal intercostal muscles are weak expiratory muscles. The diaphragm is the primary inspiratory muscle, supported by the external intercostals muscles; the sternocleidomastoid is an accessory muscle of inspiration.

6-C