

RESPIRATION

1) The primary functions of the respiratory system:

- a- To protect respiratory surfaces from dehydration and environmental variations.
- b- To provide an area for gas exchange between air and circulating blood.
- c- To move air to and from the exchange surfaces.
- d- All the above.
- e- None of the above.

2) The functions of the respiratory system include all of the following **EXCEPT**:

- a- Helping venous and lymph return.
- b- Secreting angiotensin II, which maintain normal ABP.
- c- Increasing heat loss.
- d- Regulating acid base balance.
- e- Metabolizing some substances as prostaglandins E and F.

3) The respiratory system consists of structures that:

- a- Permit vocalization and production of other sounds
- b- Provide defense from pathogenic invasion
- c- Regulate blood volume and pressure
- d- All the above
- e- None of the above

4) Dilation and relaxation of the bronchioles are possible because of the presence of:

- a- C-shaped cartilaginous rings.
- b- Bands of skeletal muscles in the submucosa.
- c- Bands of smooth muscle encircling the lumen.
- d- Cuboidal epithelial cells containing cilia.
- e- None of the above.

5) After passing through the trachea, the correct pathway a molecule of inspired air would take to reach an alveolus is:

- a- Primary bronchus → secondary bronchus → Bronchioles → terminal bronchioles → respiratory bronchioles → alveoli.
- b- Primary bronchus → secondary bronchus → bronchioles → respiratory bronchioles → terminal bronchioles → alveoli
- c- Bronchus → primary bronchioles → secondary bronchioles → terminal bronchioles → respiratory bronchioles → alveoli
- d- Primary bronchus → secondary bronchus → bronchioles → terminal bronchioles → alveoli
- e- None of the above

6) Gas exchange begins in the following part of the airways:

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

7) The main bulk of gas exchange occurs in the following part of the airways:

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

- 8) **The concentration of O_2 is highest in:**
- a- The anatomical dead space at the end of inspiration.
 - b- The anatomical dead space at the end of expiration.
 - c- The alveoli at the end of inspiration.
 - d- The alveoli at the end of expiration.
 - e- The blood in the pulmonary arteries.
- 9) **The in and out movement of air into the lung is defined as:**
- a- External respiration.
 - b- Pulmonary ventilation.
 - c- Tidal volume.
 - d- Respiratory minute volume.
 - e- Maximum breathing capacity.
- 10) **Air is moved in and out of the lung by the difference between the following pressures:**
- a- Intrapleural and intrathoracic pressures.
 - b- Intrapleural and intra-alveolar pressures.
 - c- Intra-alveolar and intrathoracic pressures.
 - d- Intra-alveolar and atmospheric pressures.
 - e- Atmospheric and intrathoracic pressures.
- 11) **The movement of air into and out of the lungs is primarily dependent on:**
- a- Pressure differences between the air in the atmosphere and individual cells
 - b- Pressure differences between the air in the atmosphere and the anatomic dead space
 - c- Pressure differences between the air in the atmosphere and air in the lungs
 - d- All the above
 - e- None of the above

12) The distending pressure of the lung is the:

- a- Intrapleural pressure.
- b- Intrathoracic pressure.
- c- Intra-alveolar pressure.
- d- Atmospheric pressure.
- e- Transmural pressure.

13) During rest, inspiration is a(n) ----- process, that involves -----:

- a- Active: contraction of the diaphragm and internal intercostal muscles.
- b- Active: contraction of the external intercostal muscles.
- c- Passive: relaxation of the diaphragm and internal intercostal muscles.
- d- Passive: relaxation of the internal intercostal muscles.
- e- None of the above.

14) During forced breathing, expiration is a(n) ----- process, that involves -----:

- a- Active: contraction of the diaphragm and external intercostal muscles.
- b- Active: contraction of the internal intercostal muscles.
- c- Passive: relaxation of the diaphragm and external intercostal muscles.
- d- Passive: relaxation of the internal intercostal muscles.
- e- None of the above.

15) During Inspiration there will be an increase in the volume of the thoracic cavity and a(n):

- a- Increasing intrapulmonary pressure, increasing the lung volume.
- b- Increasing intrapulmonary pressure, decreasing the lung volume.
- c- Decreasing intrapulmonary pressure, increasing the lung volume.
- d- Decreasing intrapulmonary pressure, decreasing the lung volume.
- e- None of the above.

16) Contraction of the diaphragm results in a(n):

- a- Decrease in the volume of the thoracic cavity, and therefore a decrease in intra-alveolar pressure.
- b- Decrease in the volume of the thoracic cavity, and therefore an increase in intra-alveolar pressure.
- c- Increase in the volume of the thoracic cavity, and therefore a decrease in intra-alveolar pressure.
- d- Increase in the volume of the thoracic cavity, and therefore an increase in intra-alveolar pressure.
- e- Decrease in the volume of the thoracic cavity, and therefore an increase in intrapleural pressure.

17) At the beginning of normal inspiration, the intra-alveolar pressure:

- a- Equals the atmospheric pressure.
- b- Is higher than the atmospheric pressure.
- c- Is lower than the atmospheric pressure.
- d- Equals the intrapleural pressure.
- e- Is lower than the intrapleural pressure.

- 18) At the end of normal inspiration, the intra-alveolar pressure:
- a- Equals the atmospheric pressure.
 - b- Is higher than the atmospheric pressure.
 - c- Is lower than the atmospheric pressure.
 - d- Equals the intrapleural pressure.
 - e- Is lower than the intrapleural pressure.
- 19) At the beginning of normal expiration, the intra-alveolar pressure:
- a- Equals the atmospheric pressure.
 - b- Is higher than the atmospheric pressure.
 - c- Is lower than the atmospheric pressure.
 - d- Equals the intrapleural pressure.
 - e- Is lower than the intrapleural pressure.
- 20) At the end of normal expiration, the intra-alveolar pressure:
- a- Equals the atmospheric pressure.
 - b- Is higher than the atmospheric pressure.
 - c- Is lower than the atmospheric pressure.
 - d- Equals the intrapleural pressure.
 - e- Is lower than the intrapleural pressure.
- 21) The intrapleural pressure is negative in all of the following conditions EXCEPT:
- a- In the new born infant.
 - b- In mid thoracic position.
 - c- During forced inspiration with glottis closed.
 - d- At the beginning of forced expiration.
 - e- At the end of forced expiration.

22) The intrapleural pressure equals:
a- Zero mmHg in the mid thoracic position.
b- -3 mmHg at the end of normal inspiration.
c- -30 mmHg at the end of forced inspiration.
d- -6 mm Hg at the end of forced expiration.
e- +40 mm Hg at the end of forced expiration with glottis closed.

23) During expiration there is a(n):
a- Decrease in intrapulmonary pressure
b- Increase in atmospheric pressure
c- Increase in the volume of the lungs
d- Increase in intrapulmonary pressure
e- None of the above

24) During expiration the diaphragm:
a- Contracts and progresses inferiorly toward the stomach
b- Relaxes and progresses inferiorly toward the stomach
c- Contracts and the dome rises into the thoracic cage
d- Relaxes and the dome rises into the thoracic cage
e- None of the above

25) Which of the following muscles is not involved in inspiration:
a- Diaphragm.
b- Internal intercostal muscles.
c- External intercostal muscles.
d- Sternocleidomastoid.
e- None of the above.

- 26) Which of the following is NOT involved in active breathing:
- a- The external intercostal muscles.
 - b- The internal intercostal muscles.
 - c- The pleural sac.
 - d- The diaphragm.
 - e- The anterior abdominal wall muscles.
- 27) In the mid-thoracic position, the pressure within the lung alveoli equals:
- a- Intrapleural pressure.
 - b- Intrathoracic pressure.
 - c- Atmospheric pressure.
 - d- Transmural pressure.
 - e- Zero mm Hg.
- 28) When the intra-alveolar pressure drops below the atmospheric pressure:
- a- Air moves into the lung.
 - b- Air moves out of the lung.
 - c- The lung collapses.
 - d- The transmural pressure increases.
 - e- The residual volume increases.
- 29) The intrapleural pressure helps:
- a- Venous return from the lung to the left side of the heart.
 - b- Lymphatic return to the lower limbs.
 - c- Air flow in the respiratory passages.
 - d- Expansion of the chest wall.
 - e- None of the above.

30) Unilateral pneumothorax results in:

- a- Collapse of the lung on the opposite side.
- b- Collapse of the lungs on both sides.
- c- Expansion of the chest wall on the same side.
- d- Expansion of the chest wall on the opposite side.
- e- Shift of the mediastinum to the same side.

31) Airway resistance:

- a- Decreases in bronchial asthma.
- b- Increases in emphysema.
- c- Decreases in allergic conditions.
- d- Does not affect the work of breathing.
- e- None of the above.

32) Pulmonary surfactant is a phospholipid secretion produced by alveolar cells to:

- a- Reduce the attractive forces of O_2 molecules and increase surface tension
- b- Increase the cohesive force of air molecules and raise surface tension
- c- Reduce the cohesive force of H_2O molecules and lower surface tension
- d- Increase the surface area of the alveoli
- e- None of the above

33) Measurement of the lecithin-sphingomyelin (L-S) ratio in amniotic fluid assesses:

- a- The placenta's ability to oxygenate the fetus
- b- Fetal adrenal function
- c- Fetal kidney development
- d- Fetal brain development
- e- Fetal lung maturity

34) Surfactant:

- a- Is secreted by type I alveolar cells.
- b- Decreases surface tension of fluid lining the alveolus helping its collapse.
- c- Increases surface tension of fluid lining the alveolus helping its collapse.
- d- Facilitate fluid filtration from alveolar capillaries into the alveoli.
- e- None of the above.

35) Surfactant deficiency occurs in all of the following conditions EXCEPT:

- a- Hyaline membrane disease of the newborn.
- b- More common in premature than full term neonates.
- c- Pure oxygen inhalation for long time.
- d- Thyroid hormone deficiency.
- e- Oversecretion of cortisole.

36) Which one of the following statements characterizes pulmonary compliance?

- a- It decreases with advancing age
- b- It is inversely related to the elastic recoil properties of the lung
- c- It increases in patients with pulmonary edema
- d- It is equivalent to $\Delta P / \Delta V$
- e- It increases when there is a deficiency of surfactant

37) The work of breathing is increased in the following condition:

- a- Increased sympathetic tone to the airway passages.
- b- Decreased vagal discharge to the airway passages.
- c- Increased lung compliance.
- d- Decreased PCO₂ in alveolar air.
- e- All of the above.

38) The volume of the respiratory pathways that does not undergo gas exchange is called:

- a- Anatomical dead space.
- b- Physiological dead space.
- c- Pathological dead space.
- d- Residual volume.
- e- Functional residual capacity.

39) The volume of air inspired or expired during rest is known as:

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

40) When the respiratory muscles are relaxed, the volume of lungs is at:

- a- Residual volume (RV)
- b- Expiratory reserve volume (ERV)
- c- Functional residual capacity (FRC)
- d- Inspiratory reserve volume (IRV)
- e- Total lung capacity (TLC)

41) The sum of vital capacity and residual volume is called:

- a- Total lung capacity.
- b- Inspiratory capacity.
- c- Functional residual capacity.
- d- Maximum breathing capacity.
- e- Respiratory minute volume.

42) A spirometer can be used to measure directly:

- a- Functional residual capacity
- b- Inspiratory capacity
- c- Residual volume
- d- Total lung capacity
- e- Physiological dead space

43) Which of the following cannot be determined by the spirometer:

- a- Vital capacity.
- b- Total lung capacity.
- c- Tidal volume.
- d- Inspiratory reserve volume.
- e- Expiratory reserve volume.

44) Regarding vital capacity, all of the following are correct EXCEPT:

- a- It is comprised of tidal volume plus inspiratory reserve volume plus expiratory reserve volume.
- b- It is a measure for physical fitness.
- c- It is measured by peak flowmeter.
- d- It is higher in adults than children.
- e- It decreases in bronchial asthma.

45) In mild bronchial asthma:

- a- Total lung capacity is normal but vital capacity decreases.
- b- Vital capacity is normal but total lung capacity decreases.
- c- Vital capacity is normal but timed vital capacity decreases.
- d- Timed vital capacity is normal but vital capacity decreases.
- e- Timed vital capacity is normal but total lung capacity decreases.

46) The functions of dead space include all of the following EXCEPT:

- a- Cooling of inspired hot air.
- b- Heating of inspired cold air.
- c- Humidifying inspired air.
- d- Filtering air from foreign particles.
- e- Maintain a constant composition of alveolar air.

47) Alveolar ventilation can be calculated by:

- a- Adding the expiratory reserve volume and the residual volume
- b- Subtracting the tidal volume from the inspiratory reserve
- c- Subtracting the dead space from the tidal volume
- d- Adding the tidal volume to the inspiratory reserve volume
- e- None of the above

Use the respiratory data below to answer the following question.

Tidal volume = 400 mL

Dead space volume = 100 mL

Breathing frequency = 10 breaths/min

Arterial PCO₂ = 50 mmHg

Inspired PO₂ = 150 mmHg

48) The patient's alveolar ventilation is:

- a- 3 L/min
- b- 4 L/min
- c- 5 L/min
- d- 6 L/min
- e- 7 L/min

49) During a normal inspiration, more air goes to the alveoli at the base of the lung than to the alveoli at the apex of the lung because:

- a- The alveoli at the base of the lung have more surfactant
- b- The alveoli at the base of the lung are more compliant
- c- The alveoli at the base of the lung have higher V/Q ratios
- d- There is a more negative intrapleural pressure at the base of the lung
- e- There is more blood flow to the base of the lung

50) Which one of the following is higher at the apex of the lung than at the base when a person is standing?

- a- V/Q ratio
- b- Blood flow
- c- Ventilation
- d- Alveolar PCO₂
- e- Lung compliance

51) Which one of the following will be greater than normal in a patient with a low V/Q ratio?

- a- Alveolar PCO₂
- b- Arterial PO₂
- c- Alveolar-arterial gradient
- d- Oxygen dissolved in blood
- e- Oxygen combined with hemoglobin

52) In areas of the lung with lower than normal V/Q ratios:

- a- Capillary CO₂ tension is lower than normal
- b- Pulmonary vascular resistance is higher than normal
- c- Alveolar O₂ tension is higher than normal
- d- Water vapor pressure is higher than normal
- e- Gas exchange ratio is higher than normal

53) Which one of the following contributes to the normal difference between the alveolar and arterial oxygen tension (A-a) gradient?

- a- The low PO₂ in the mixed venous blood
- b- The inability of pulmonary capillary blood to equilibrate with alveolar gas
- c- The low solubility of oxygen in blood
- d- The shape of the oxyhemoglobin saturation curve
- e- The high affinity of hemoglobin for oxygen in arterial blood

54) A patient with inadequate surfactant will have a relatively normal:

- a- FEV1
- b- FVC
- c- FEV1/FVC
- d- RMV
- e- V/Q ratio

55) Which of the following will increase as a result of stimulating parasympathetic nerves to the bronchial smooth muscle?

- a- Lung compliance
- b- Airway diameter
- c- Elastic (compliance) work of breathing
- d- Airway resistance work of breathing
- e- Anatomic dead space

56) Each molecule of hemoglobin has the capacity to carry molecules of O₂:

- a- 2
- b- 8
- c- 4
- d- 6
- e- None of the above

57) What percentage of total oxygen (O₂) is carried within red blood cells chemically bound to hemoglobin?

- a- 100%
- b- 5%
- c- 68%
- d- 98%
- e- None of the above

- 58) The affinity of hemoglobin for oxygen is increased by:
- a- Metabolic acidosis
 - b- Exercise
 - c- Hypoxemia
 - d- Anemia
 - e- Carbon monoxide poisoning
- 59) Which of the following conditions causes a decrease in arterial O₂ saturation without a decrease in O₂ tension?
- a- Anemia
 - b- Carbon monoxide poisoning
 - c- A low V/Q ratio
 - d- Hypoventilation
 - e- Right-to-left shunt
- 60) A shift in the oxygen-haemoglobin dissociation curve to the right occurs in:
- a- Hypothermia.
 - b- Carboxyhaemoglobin
 - c- Alkalosis
 - d- Fetal haemoglobin
 - e- None of the above.
- 61) The oxygen dissociation curve is shifted to the left with:
- a- Anemia.
 - b- Pyrexia.
 - c- Respiratory acidosis.
 - d- Sickle cell anemia.
 - e- Decreased concentration of 2,3-DPG in the erythrocytes.

62) Which of the following conditions is most likely to shift the oxyhemoglobin dissociation curve to the left?

- a- Increased temperature
- b- Exercise
- c- Acclimatization to high altitude
- d- Hyperventilation
- e- Metabolic acidosis

63) The percentage of hemoglobin saturated with oxygen will increase if:

- a- The arterial PCO_2 is increased
- b- The hemoglobin concentration is increased
- c- The temperature is increased
- d- The arterial PO_2 is increased
- e- The arterial pH is decreased

64) With regard to the transport of carbon dioxide in blood:

- a- 25% of carbon dioxide is dissolved in blood
- b- Carbonic anhydrase is found in plasma
- c- 50% of carbon dioxide is carried as bicarbonate
- d- Oxygenated haemoglobin facilitates the transport of carbon dioxide
- e- Carbamino compounds are formed from the reaction between carbon dioxide reacts with haemoglobin

65) Carbon dioxide in blood:

- a- Is more soluble than oxygen
- b- Its amount in the arterial blood is less than oxygen.
- c- Is carried mainly as carbamino compounds.
- d- Is hydrated mainly in the plasma
- e- Is transported mainly in the red blood cells

66) The bulk of CO₂ is transported in arterial blood as:

- a- Dissolved CO₂
- b- Carbonic acid
- c- Carbaminohemoglobin
- d- Bicarbonate
- e- Carboxyhemoglobin

67) A patient with reduced VC, FRC, and RV is found to have a normal pH. A tentative diagnosis of diffuse interstitial fibrosis is made. Which of the following characteristics are consistent with this disease?

- a- An increase in lung compliance
- b- A decrease in respiratory rate
- c- An increase in the V/Q ratio
- d- A decrease in PaCO₂
- e- An increase in the FEV₁/FVC ratio

68) Airway resistance is lowest:

- a- During a forced expiration
- b- At the total lung capacity
- c- At the residual volume
- d- During vagal stimulation
- e- When breathing gas with low oxygen

69) Hyperventilation:

- a- Increases cerebral blood flow
- b- Increases ionized calcium concentration in the serum
- c- Causes hypocapnia
- d- Causes metabolic alkalosis
- e- Decreases cardiac output

70) Hyperventilation normally occurs during:

- a- Pregnancy
- b- Sleep
- c- Morphine administration
- d- Exercise
- e- Metabolic alkalosis

71) Hyperventilation in response to a stressful situation leads to:

- a- A decrease in the blood flow to the brain
- b- An increase in the activity of the central chemoreceptors
- c- A decrease in pH of the arterial blood
- d- An increase in the resistance of the pulmonary blood vessels
- e- A decrease in the excitability of nerve and muscle cells

72) The basic respiratory rhythm is generated by the:

- a- Dorsal respiratory group.
- b- Ventral respiratory group.
- c- pneumotaxic center.
- d- apneustic center.
- e- voluntary control.

73) Peripheral and central chemoreceptors may both contribute to the increased ventilation that occurs as a result of:

- a- A decrease in arterial oxygen content
- b- A decrease in arterial blood pressure
- c- An increase in arterial carbon dioxide tension
- d- A decrease in arterial oxygen tension
- e- An increase in arterial pH

74) Central chemoreceptors can contribute to the increased ventilation that occurs as a result of:

- a- A decrease in arterial oxygen content.
- b- An increase in arterial carbon dioxide tension.
- c- A decrease in arterial pH.
- d- A decrease in arterial blood pressure.
- e- All of the above.

75) Complete transection of the brainstem above the pons would:

- a- Result in cessation of all breathing movements
- b- Prevent any voluntary holding of breath
- c- Prevent the central chemoreceptors from exerting any control over ventilation
- d- Prevent the peripheral chemoreceptors from exerting any control over ventilation
- e- Abolish the Hering-Breuer reflex

76) Which one of the following is the most likely cause of a high arterial PCO₂?

- a- Increased metabolic activity
- b- Increased alveolar dead space
- c- Depressed medullary respiratory centers
- d- Alveolar capillary block
- e- Increased alveolar ventilation

77) An increase in pulmonary blood flow during exercise:

- a- Causes alveolar oxygen tension to decrease
- b- Causes the V/Q ratio at the top of the lung to increase
- c- Causes pulmonary arterial resistance to decrease
- d- Causes diffusion capacity to decrease
- e- Causes arterial oxygen saturation to decrease

78) During moderate aerobic exercise:

- a- PaO₂ increases
- b- PaCO₂ decreases
- c- Arterial pH decreases
- d- Alveolar ventilation increases
- e- Blood lactate level increases

79) A person ascends to the top of a mountain where the atmospheric pressure is below normal. Which one of the following blood gases (PO₂/PCO₂) was drawn from the person at the top of the mountain?

- a- 50/30
- b- 60/40
- c- 80/50
- d- 100/40
- e- 120/30

80) In an acclimatized person at high altitudes, oxygen delivery to the tissues may be adequate at rest because of:

- a- An increase in hemoglobin concentration
- b- The presence of an acidosis
- c- A decrease in the number of tissue capillaries
- d- The presence of a normal arterial PO₂
- e- The presence of a lower-than-normal arterial PCO₂

81) When a person ascends to a high altitude, alveolar ventilation increases. Alveolar ventilation continues to increase over the next several days because:

- a- The central chemoreceptors become more sensitive to low oxygen tensions
- b- The peripheral chemoreceptors increase their firing rate
- c- The plasma concentration of 2,3-DPG increases
- d- The pH of the cerebrospinal fluid decreases
- e- The oxygen-carrying capacity of hemoglobin increases

82) Which of the following will return toward normal first during acclimatization to high altitude?

- a- Arterial hydrogen ion concentration
- b- Arterial carbon dioxide tension
- c- Arterial bicarbonate ion concentration
- d- Arterial hemoglobin concentration
- e- Alveolar ventilation

83) The partial pressure of oxygen inhaled from a tank containing 21% O₂ by divers at a depth of 100 ft below sea level (4 atmospheres) is approximately:

- a- 40 mmHg
- b- 100 mmHg
- c- 200 mmHg
- d- 600 mmHg
- e- 1200 mmHg

84) Reduction of functional hemoglobin associated with anemia, methemoglobinemia, or carbon monoxide poisoning does not produce hyperpnea because the:

- a- Blood flow to the carotid body is decreased
- b- Total arterial oxygen content is maintained within the normal range
- c- Carotid body chemoreceptors are stimulated
- d- Central chemoreceptors are stimulated
- e- PO₂ of arterial blood is normal

85) Patients with chronic lung disease are often divided into "blue bloaters" (those who are cyanotic) and "pink puffers" (those who are not cyanotic). The presence of cyanosis in blue bloaters but not in pink puffers results from difference in their:

- a- V/Q ratios
- b- Vital capacities
- c- Airway resistances
- d- Total lung capacities
- e- Expiratory flow rates

86) The clinical sign of cyanosis is caused by:

- a- An increase in the affinity of hemoglobin for oxygen
- b- A decrease in the percent of red blood cells (hematocrit)
- c- An increase in the concentration of carbon monoxide in the venous blood
- d- A decrease in the concentration of iron in the red blood cells
- e- An increase in the concentration of deoxygenated hemoglobin

RESPIRATION

1	D	2	B	3	D	4	C	5	A
6	B	7	D	8	A	9	B	10	D
11	C	12	E	13	B	14	B	15	C
16	C	17	C	18	A	19	B	20	A
21	A	22	E	23	D	24	D	25	B
26	C	27	C	28	A	29	E	30	C
31	E	32	C	33	E	34	E	35	E
36	B	37	D	38	B	39	A	40	C
41	A	42	B	43	B	44	C	45	C
46	D	47	E	48	A	49	B	50	A
51	C	52	B	53	D	54	C	55	D
56	C	57	D	58	E	59	B	60	E
61	E	62	D	63	D	64	E	65	A
66	D	67	E	68	B	69	C	70	D
71	A	72	A	73	C	74	B	75	B
76	C	77	C	78	D	79	A	80	A
81	D	82	A	83	D	84	E	85	A
86	E								