

ER V

RESPIRATION



For each of the following questions, choose the one most appropriate answer.

619. The Hering-Breuer reflex originates from the:

- (A) Chemoreceptors in the lungs
- (B) Hypothalamus
- (C) Baroreceptors
- (D) Mechanoreceptors in the lungs
- (E) Carotid and aortic bodies

620. Which of the following statements is wrong?

- (A) At the start of inspiration, the intrapleural pressure is -2.5 mmHg.
- (B) The air remaining in the lungs after maximal expiration is the vital capacity.
- (C) The change in lung volume / unit change in the airway pressure is called compliance.
- (D) The surfactant is secreted by type II alveolar epithelial cells.
- (E) The primary cause of emphysema is increased elastase activity and inhibition of alpha<sub>1</sub>-antitrypsin activity in the lungs.

621. Which of the following statements is true?

- (A) The volume of alveolar ventilation = tidal volume  $\times$  respiratory rate.
- (B) Rapid shallow breathing produces the same alveolar ventilation as normal.
- (C) The pneumotaxic centre exerts an excitatory action on the inspiratory neurone.
- (D) The carotid and aortic bodies are maximally stimulated by a high arterial  $P_{O_2}$ .
- (E) The medullary chemoreceptors are largely influenced by  $PCO_2$  in the CSF.

622. In artificial mouth to mouth breathing:

- (A) The neck is extended.
- (B) It is performed 18 times / minute.
- (C) The nostrils are open.
- (D) Active expiration occurs.
- (E) The amount of air introduced each time is 5 times the tidal volume.

623. Among the effects of hypocapnia:

- (A) Decreased cardiac output.
- (B) Excitation of the vasomotor centre.
- (C) Generalized V.C. including the cerebral vessels.
- (D) Marked increase of the arterial B.P.
- (E) Decreased blood pH (acidosis)

624. The oxygen dissociation curve is shifted to the right by:

- (A) Shift of the blood pH towards the alkaline side.
- (B) Rise of the blood temperature.
- (C) Decreased concentration of 2,3 DPG in the red blood corpuscles.
- (D) CO poisoning.
- (E) Presence of fetal haemoglobin.

625. All the following statements are true except:

- (A) The vital capacity in healthy young women is near to 3.3 litres.
- (B) The maximal voluntary ventilation in healthy men averages 150 litres/minute.
- (C) Maximum ventilation can be attained by  $CO_2$  inhalation.
- (D) The total alveolar surface area is about 100 square meters.
- (E) The  $PO_2$  in dry atmospheric air is about 160 mmHg.



1. Which of the following is not a lung volume?

- Vital capacity
- Anatomical voluntary ventilation
- Expiratory reserve volume
- Respiratory minute volume
- Timed vital capacity in one second (FEV<sub>1</sub>)

2. The lung compliance is decreased in all the following conditions except:

- Emphysema and old age
- Pulmonary congestion and pulmonary edema
- Lung fibrosis
- Lung stiffness

3. About the bronchial tone, bronchoconstriction is produced by:

- Epinephrine
- Adrenaline
- A circadian rhythm at about 6 AM
- VIP (vasoactive intestinal polypeptide)

4. All the following statements are correct except:

- During inspiration, the phrenic muscles that contract are the abductors.
- In newly born infants, a transpulmonary pressure of + 60 mmHg is needed for the first breath.
- The low surface tension in the alveoli (due to surfactant) increases compliance.
- The low surface tension in the alveoli (due to surfactant) decreases compliance.
- The surfactant helps to keep the alveoli dry.

5. About the metabolic and endocrine functions of the lungs:

- The lungs partially remove the surfactant from the blood.
- The lungs contain active peptides specially VIP.
- Bradykinin is activated in the lungs.
- Angiotensin I is synthesized by the alveoli for local use.
- Serotonin is synthesized in the lungs then released into the blood.
- Kallikrein is partially removed from the blood by the lungs.

6. P.G. of the pulmonary arterioles is produced by all the following except:

- Epinephrine
- Angiotensin II
- Isoproterenol
- Thromboxane A<sub>2</sub>

7. All the following partial pressures of gases in air are true except:

- The PCO<sub>2</sub> in alveolar air is 40 mmHg.
- The PCO<sub>2</sub> in expired air is 28 mmHg.
- The PH<sub>2</sub>O in both alveolar and expired air is 47 mmHg.
- The PO<sub>2</sub> in alveolar air is 100 mmHg.
- The PO<sub>2</sub> in expired air is 80 mmHg.

8. Due to the effect of gravity on the lungs, all the following is true except:

- During rest, the intrapleural pressure (IPP) at the lung apex is - 10 cm water.
- During rest, the intrapleural pressure (IPP) at the lung base is - 2.5 cm water.
- At full expiration, the IPP in the lung apex is - 4 cm water.
- At full expiration, the IPP in the lung base is + 3.5-4 cm water.
- Ventilation is better in the lung base both at rest and at full expiration.

9. In the following statements, all are false except:

- The curve transects the atmospheric (zero) pressure at the functional residual capacity (FRC).
- The relaxation volume of the total respiratory system corresponds to the residual volume.
- At the relaxation volume, the recoil of both the lungs & chest wall exactly balances.
- The airway pressure is +ve at volumes greater than the relaxation volume.
- The airway pressure is -ve at volumes smaller than the relaxation volume.

10. Which of the following statements is true?

- The physiological dead space can be measured by the single breath N<sub>2</sub> test.
- The anatomical dead space can be measured by using the Bohr's equation.
- Because of the dead space, the alveolar ventilation is much decreased in shallow rapid breathing.
- Either the diaphragm or external intercostal muscles alone can maintain adequate ventilation during muscular exercise.
- The diaphragm accounts for about 50% of the change in the intrathoracic volume during quiet inspiration.

11. Which of the following statements is true?

- Transection of the spinal cord above the 3<sup>rd</sup> cervical segment is fatal without artificial respiration.
- Transection of the spinal cord below the 5<sup>th</sup> cervical segment is not fatal.
- All lung volumes are measured by the respirometer except the residual volume.
- When the diaphragm contracts it moves upwards.
- The air volume remaining in the lungs at the resting expiratory level is the FRC (functional residual capacity).

12. The anterior abdominal wall muscles are expiratory muscles because:

- They pull the rib cage downward and inward on contracting.
- They push the diaphragm upward.
- They increase the intra-abdominal pressure.
- All of the above.
- None of the above.

13. Concerning the mechanics and muscles of respiration:

- Expiration is normally an active process.
- The expiratory muscles act during rest.
- The internal intercostal muscles are important inspiratory muscles.
- The diaphragm is the only inspiratory muscle.
- The external intercostal muscles elevate the lower ribs and push the sternum forward, so increasing the anteroposterior diameter of the chest.

14. About the lung volumes and capacities, all the following is true except:

- The residual volume is the volume of air remaining in the lungs after maximal expiration.
- All lung capacities can be measured by the respirometer.
- The residual volume can be measured by using the dilution principle.
- The vital capacity equals the total lung capacity minus the residual volume.
- The vital capacity is formed of 3 lung volumes.



640. From the following, showing the various lung volumes and capacities:

- (A) The inspiratory capacity = tidal volume + expiratory reserve volume (ERV).
- (B) The ERV is the maximal volume of air which can be expired from the resting end-inspiratory position.
- (C) The IRV (inspiratory reserve volume) is the maximal volume of air which can be inspired from the resting end-expiratory position.
- (D) The volume of air breathed in and out during quiet respiration is the tidal volume.
- (E) The volume of air remaining in the lungs after maximal expiration is the F.R.C.

641. Which of the following statements is wrong?

- (A) The determination of  $FEV_1$  is important in the diagnosis of obstructive lung diseases and it is normally about 70 %.
- (B) The vital capacity is greater in the standing position.
- (C) The breathing reserve = maximal breathing capacity (MBC) minus the respiratory minute volume (RMV).
- (D) The dyspnoeic index (breathing reserve / MBC) must normally exceed 20 %.
- (E) The dyspnoeic index is decreased when the MBC is decreased and dyspnoea occurs if it drops to about 70 %.

642. Concerning the work of breathing, all the following is true except:

- (A) It is performed normally during the inspiratory phase only.
- (B) It is expended in stretching the elastic tissues of the chest wall and lungs and for moving the inelastic tissues and moving air in the respiratory passages.
- (C) The elastic work required to inflate the lungs alone is equal to the work required to inflate the whole respiratory system.
- (D) It is increased in emphysema, asthma and congestive heart failure.
- (E) It can be calculated from the relaxation pressure curve.

643. In the  $O_2$  dissociation curve, all the following is true except:

- (A) Its characteristic sigmoid shape is due to progressive increased affinity of Hb to combine with  $O_2$ .
- (B) At  $PO_2$  of 100 mmHg, Hb is about 97 % saturated.
- (C) At  $PO_2$  of 40 mmHg, Hb is about 75 % saturated.
- (D) It is shifted to the left in case of fetal blood and with decreased temperature.
- (E) It is shifted to the right with increased 2,3 DPG content and blood pH.
- (F) A decrease in  $PO_2$  from 100 to 60 mmHg has a little effect on the %  $O_2$  saturation.

644. About myoglobin, all the following is true except:

- (A) Its  $O_2$  dissociation curve has the shape of a rectangular hyperbola.
- (B) It is shifted to the left of the Hb  $O_2$  dissociation curve.
- (C) It has a higher affinity to  $O_2$  than blood Hb.
- (D) It is more concentrated in skeletal muscles specialized for sustained contraction.
- (E) It has a low affinity to  $O_2$  at low  $PO_2$ .

## CHAPTER V

645. About the carotid chemoreceptors, all the following is true except:

- (A) They contain islands of types I and II cells surrounded by fenestrated capillaries.
- (B) The impulses originating in them ascend to the CNS (medulla) through afferent fibres in the glossopharyngeal nerve.
- (C) They are most sensitive to hypoxia and less sensitive to increased  $PCO_2$ .
- (D) The type I cells contain adrenaline which stimulates the discharges from the receptors.
- (E) The blood flow in them / 100 gm tissue is much more than that detected in an equal weight of brain tissue.
- (F) They are stimulated in cyanide poisoning but not when the combined amount of  $O_2$  in the blood is decreased (e.g. in anaemia and CO poisoning).

646. About the ventral (medullary) chemoreceptors, all the following is true except:

- (A) They mediate hyperventilation produced by increased arterial  $PCO_2$  after denervation of the carotid and aortic bodies.
- (B) They are placed within the respiratory centre.
- (C) They are located on the ventral surface of the brain stem.
- (D) They monitor the  $H^+$  of the cerebrospinal fluid (CSF).
- (E) The increased  $H^+$  that activates them is the result of increased  $PCO_2$  in the blood which readily penetrates the blood brain barrier.

647. Which of the following statements is wrong?

- (A) The breaking point following breath holding is due to increased  $PCO_2$  and decreased  $PO_2$  in the arterial blood.
- (B) The breaking point can be delayed by hyperventilation or breathing 100 %  $O_2$ .
- (C) The breaking point is not affected by psychic factors.
- (D) Hypercapnia develops when the  $CO_2$  concentration in inspired air exceeds 7 %.
- (E) Hypercapnia decreases the activity of the respiratory centre.
- (F) Hypercapnia leads to headache, confusion and may be narcosis.

648. All the following exert non-chemical influence on respiration except:

- (A) Hypocapnia.
- (B) Pain sensation through the hypothalamus.
- (C) Proprioceptors.
- (D) Irritation of the air passages in coughing.
- (E) Afferents from the higher centres through the corticospinal tract.

649. Anaemic hypoxia is characterized by all the following except:

- (A) A lowered Hb content or increased amount of altered Hb.
- (B) It is a prominent symptom in CO poisoning.
- (C) A normal  $PO_2$  but lowered  $O_2$  content in the arterial blood.
- (D) An increased amount of 2,3 DPG.
- (E) A lowered P50.

650. All the following about the pulmonary chemoreflex is true except:

- (A) It is initiated by stimulation of chemoreceptors in the pulmonary blood vessels.
- (B) Its receptors can be stimulated by injection of veratridine or serotonin into the pulmonary circulation.
- (C) It results in bradycardia, hypotension and brief apnea.
- (D) Its effects on respiration are significant and clear in physiologic situations.



There is only hypercapnia.  
 There is combined hypercapnia and hypoxia.  
 During it, catecholamines are released and the arterial blood pressure rises.  
 The respiratory centre is depressed before the vasomotor centre.  
 It may be caused by a large pneumothorax or morphine poisoning.

#### Concerning the Cheyne-Stokes respiration :

During hyperventilation, the  $PO_2$  is lowered and  $PCO_2$  is elevated.  
 It never occurs normally.  
 It is a type of periodic (interrupted) breathing.  
 During apnea, the  $PCO_2$  is decreased and  $PO_2$  is elevated.  
 The hypoxia resulting from apnea stimulates the central chemoreceptors.

#### During exposure to increased barometric pressure, all the following is true except :

The condition often occurs in deep-sea divers and caisson workers.  
 Decompression sickness may occur on sudden decrease of the pressure.  
 Using 100 %  $O_2$  is avoided (to prevent  $O_2$  toxicity) and 20 %  $O_2$  is preferred.  
 The  $PN_2$  does not increase with the increased ambient pressure.  
 The intellectual functions are impaired and narcosis usually occurs.

#### The accumulation of ketone bodies in diabetic patients' blood is associated with :

- Increased respiration.
- Excretion of ketone bodies in the urine.
- Decreased alveolar  $PCO_2$ .
- A compensatory fall in the blood  $H^+$  (if the condition is not severe).
- All of the above.

#### Concerning the ventilation responses to oxygen lack :

- Oxygen lack stimulates the respiratory centre via the central chemoreceptors.
- A decreased  $PO_2$  in the inspired air decreases the respiratory minute volume.
- A decreased arterial  $PO_2$  below 100 mmHg increases the discharge from the carotid and aortic chemoreceptors.
- When the alveolar  $PCO_2$  increases 2-3 mmHg and the  $PO_2$  is below 100 mmHg, ventilation is not affected.
- When the alveolar  $PCO_2$  is lower than normal and the  $PO_2$  is below 60 mmHg, there is no respiratory response.

#### As a consequence of severe exercise, all the following occurs except :

- The  $O_2$  consumption increases to a maximum of about 4-5 litres/minute.
- The  $CO_2$  production increases up to about 8 litres/minute.
- The mean  $PCO_2$  in the alveolar air may decrease.
- The mean  $PO_2$  in the alveolar air falls.
- More than 90 % of Hb is oxygenated in spite of the rapid passage of blood through the lungs.

#### RESPIRATION

657. Along  $O_2$  pathway by the blood, all the following is true except :
- (A)  $O_2$  flows downhill from air to the alveoli then to the arterial blood then to the intracellular fluid.
  - (B) In the blood,  $O_2$  is present only in chemical combination with Hb.
  - (C) The  $PO_2$  at the arterial ends of pulmonary capillaries is 40 mmHg.
  - (D) The  $PO_2$  at the venous ends of pulmonary capillaries is 100 mmHg.
  - (E)  $O_2$  diffuses in the pulmonary capillaries at a gradient of 60 mmHg.

#### 658. Oxygen delivery to the tissues depends on the :

- (A) Amount of  $O_2$  entering the lungs.
- (B) Adequacy of pulmonary gas exchange.
- (C) Blood flow rate to the tissues.
- (D) Capacity of the blood to carry  $O_2$ .
- (E) All of the above.

#### 659. Which of the following statements is wrong ?

- (A) Lack of 2,3 DPG shifts the  $O_2$  dissociation curve to the right.
- (B) If a blood sample having a normal amount of Hb contains 2 ml  $O_2$  %, the % Hb saturation with  $O_2$  is 10 %.
- (C) The Hb  $O_2$  dissociation curve is most steep at a  $PO_2$  range of 40-20 mmHg.
- (D) The  $O_2$  dissociation curve for fetal blood lies to the left of the standard curve.
- (E) Myoglobin acts as a store of  $O_2$  in skeletal muscles to be available during anaerobic conditions.

#### 660. All the following statements are true except :

- (A) Almost all buffering is intracellular in case of respiratory acidosis.
- (B) In each 100 ml arterial blood there are 49 ml  $CO_2$  present as 2.6 ml dissolved, 13 ml as  $HCO_3^-$  and 2.6 ml as carbamino compounds.
- (C) The chloride shift phenomenon involves exchange of  $Cl^-$  for  $HCO_3^-$ .
- (D) The  $CO_2$  dissociation curve shows the relation between  $PCO_2$  and the % saturation of Hb with  $CO_2$ .
- (E) The shift of the oxygenated blood  $CO_2$  dissociation curve to the right of the deoxygenated blood curve is called Haldane shift.

#### 661. Which of the following statements is true ?

- (A) Breathing stops if the spinal cord is cut below the origin of the phrenic nerve.
- (B) The inspiratory drive can be inhibited by impulses from the apneustic centre.
- (C) The medullary respiratory centres are capable of spontaneous discharge.
- (D) During normal quiet breathing, the expiratory centre is active.
- (E) Quiet expiration occurs only by relaxation of the chest wall to the resting position.

#### 662. All the following statements are true except :

- (A) According to Boyle's law, if the pressure of a gas is doubled, its volume is halved.
- (B) Hypocapnia due to decrease of the alveolar  $PCO_2$  to 15 mmHg may produce tetany due to development of respiratory alkalosis.
- (C)  $O_2$  toxicity occurs due to production of superoxide and among its manifestations are V.C. of the cerebral vessels and acidosis.
- (D) Exposure to hyperbaric  $O_2$  should be less than 5 hours.
- (E)  $O_2$  therapy is of great value in the treatment of all types of hypoxia.
- (F) The symptoms of  $O_2$  toxicity develop within 30 minutes when using hyperbaric oxygen at 4 atmospheric pressure.



- (A) Muscular incoordination (B) Hyperpnea (C) Lassitude (weakness)  
(D) Euphoria (E) Headache

664. If the vagi nerves are cut, the respiratory rate :

- (A) Is increased (B) Is decreased (C) Remains constant  
(D) Ceases (= stops) (E) Becomes unresponsive to alterations in blood gases

665. The hyperpnea resulting from a moderate exercise is due to the :

- (A) Increased body temperature (B) Joint movements  
(C) Lowered serum pH (D) Elevated serum  $PCO_2$  (E) All of the above

666. All the following statements are true except :

- (A) There is about 21 ml  $O_2$  in every 100 ml of atmospheric air.  
(B) About 250 ml  $O_2$  are utilized in the body per minute at rest  
(C) The water vapour pressure in the alveolar air is about 47 mmHg  
(D) When fully saturated, each gm of Hb can combine with 5 ml of  $O_2$   
(E) There is about 19 ml  $O_2$  in every 100 ml of arterial blood

667. About the respiratory centres, all the following is true except :

- (A) The apneustic centre has an inherent activity.  
(B) The pneumotaxic centre has a role similar to that exerted by vagal afferents.  
(C) Both the apneustic and pneumotaxic centres are present in the medulla.  
(D) Both the apneustic and inspiratory centres are stimulated by a high serum  $PCO_2$ .  
(E) Deep and slow breathing occurs after bilateral vagotomy, and ablation of the pneumotaxic centre in this case results in apneustic breathing

668. Which of the following statements is true ?

- (A) The carotid body contains mechanoreceptors that affect respiration & arterial B.P.  
(B) The carotid sinus contains chemoreceptors that affect respiration & arterial B.P.  
(C) CO poisoning causes anemic hypoxia  
(D) The venous  $PO_2$  is lower than normal in histotoxic hypoxia.  
(E) Drowning causes stagnant hypoxia while excessive blood loss causes hypoxic hypoxia

669. Metabolic acidosis may be caused by :

- (A) Loss of  $CO_2$  by increased ventilation  
(B)  $CO_2$  retention due to respiratory obstruction  
(C) Persistent vomiting  
(D) Absorption of excessive amounts of  $NaHCO_3$  from the GIT.  
(E) None of the above

670. The air volume that can be expelled following maximal inspiration is called the :

- (A) Maximal breathing capacity (B) Vital capacity (C) Tidal volume  
(D) Total lung capacity (E) Functional residual capacity

671. The oxygen dissociation curve is shifted to the right by :

- (A) Increased  $CO_2$  tension (B) Increased  $N_2$  tension  
(C) Increased blood pH (D) Decreased body temperature (E) CO poisoning

## CHAPTER 1

## RESPIRATION

672. The diffusion of  $CO_2$  across the alveolar membrane is much faster than  $O_2$  because :

- (A) An active transport of  $CO_2$   
(B) A larger alveolar area available for  $CO_2$   
(C) A larger  $CO_2$  pressure gradient  
(D) More solubility of  $CO_2$  in water.  
(E) All of the above

673. Most of the venous  $CO_2$  is in the form of :

- (A) Carbonate (B) Carbonic acid  
(C) Bicarbonate (D) Dissolved  $CO_2$

674. The most potent stimulant of respiration would be :

- (A) A 2-fold increase in the  $PCO_2$  of inspired air  
(B) A 2-fold increase in the  $PO_2$  of inspired air.  
(C) A 50 % decrease in the  $PCO_2$  of inspired air.  
(D) A 50 % decrease in the  $PO_2$  of inspired air.  
(E) Both A and D are equally potent stimuli

675. Which of the following statements is true ?

- (A) The surfactant is secreted by the bronchial epithelium.  
(B) Excessive surfactant causes the respiratory distress syndrome (RDS)  
(C) The alveolar air is completely replaced by atmospheric air with each breath  
(D) During inspiration the intrapulmonary pressure becomes slightly positive.  
(E) About 97 % of the  $O_2$  transported from the lungs to the tissues is carried by Hb

676. Which of the following statements is wrong ?

- (A) The Hering-Breuer reflexes regulate inflation and deflation of the lungs.  
(B) Under normal conditions, about 5 ml  $O_2$  are delivered to the tissues by each 100 ml blood.  
(C) The Cl content of the venous RBC's is greater than that of the arterial RBC's  
(D) The inspiratory reserve volume equals the vital capacity.  
(E) Cyanosis occurs due to increased amount of deoxygenated Hb

677. All the following statements are true except :

- (A) The central chemoreceptors are stimulated mainly by increased  $PCO_2$   
(B) An increase in the haematocrit always increases the  $O_2$  transport.  
(C) During normal expiration, the intraalveolar pressure becomes slightly positive.  
(D) About 3 % of  $O_2$  in the arterial blood is carried in the dissolved state.  
(E) The normal  $PCO_2$  in the arterial blood is 40 mmHg.

678. Which of the following statements is true :

- (A) Slow breathing is called tachypnea.  
(B) Hypoventilation increases the blood  $O_2$  content.  
(C) The air that fills the respiratory passages is called the dead space air.  
(D) The venous blood pH is higher than that of the arterial blood  
(E) The haematocrit value in both the arterial and venous blood is equal.



- (A) Normally, respiratory stimulation via the carotid body is minimal because the serum  $PO_2$  is too high to stimulate it.
- (B) The lung compliance is more than the compliance of the lungs and thorax together.
- (C)  $O_2$  therapy is most useful in hypoxic hypoxia.
- (D) The formation of  $H_2CO_3$  is catalyzed by a serum carbonic anhydrase enzyme.
- (E) Symptoms of Caisson's disease may include paralysis.

680. Concerning the various lung volumes and capacities :

- (A) The vital capacity is increased in emphysema & pulmonary edema.
- (B) The breathing reserve = maximal breathing capacity - tidal volume.
- (C) The % ratio of tidal volume/vital capacity is normally 2 %.
- (D) The % of total lung capacity that is never emptied of air is 60 %.
- (E) Direct readings from a spirometer cannot measure the total lung capacity.
- (F) The largest of the lung volumes is the expiratory reserve volume.

681. All the following statements are true except :

- (A) During exercise the amount of blood in the lungs and the diffusing capacity for oxygen are increased.
- (B) If the atmospheric  $O_2$  pressure is raised to 500 mmHg, the alveolar  $O_2$  pressure would rise proportionately.
- (C) The  $Cl^-$  that enters the RBCs at tissues replaces  $HCO_3^-$  that leaves the RBCs.
- (D) The anatomic dead space may be less than the physiologic dead space.
- (E) The normal dead space is about 50 % of the tidal volume.

682. Which of the following statements is wrong ?

- (A) Stimulation of the apneustic centre causes forceful inspiration.
- (B) Cyanosis is caused by an increased concentration of deoxygenated (= reduced) Hb more than 5 gm %.
- (C) The surface tension of the fluid lining the alveoli helps to maintain the lungs in an expanded position.
- (D) Both the residual volume and functional residual capacity can be measured by application of the dilution principle using helium.
- (E) The  $PO_2$  and  $PCO_2$  in the arterial blood would be markedly changed if there were no residual volume.

683. About the respiratory centre, all the following is true except :

- (A) It is situated in the brain stem.
- (B) It stops rhythmical activity if both vagi nerves are cut.
- (C) It is regulated by afferent vagal nerve impulses.
- (D) It responds to impulses from the cerebral cortex.
- (E) It is sensitive to pH alterations in the blood.

684. About the resistance of airways and work of breathing :

- (A) The resistance is increased by adrenaline and decreased by parasymp. stimulation.
- (B) The resistance is greater during inspiration than during expiration.
- (C) The normal work of breathing is about 3-8 kg.m /minute.
- (D) The work of breathing is made less as a result of the surfactant.
- (E) 10-15 % of the work of breathing is due to elastic work.

685. All the following statements are true except :
- (A) The pulmonary irritant receptors initiate the cough reflex.
- (B)  $O_2$  at high pressures may cause nausea, muscular twitching and brain damage.
- (C) The lung compliance decreases in both emphysema and pulmonary fibrosis.
- (D) Inhalation of 5 %  $CO_2$  increases  $H^+$  in the CSP and augments alveolar ventilation.
- (E) The work of breathing increases if the lung elastic recoil is increased.

686. Which of the following statements is true ?

- (A) Voluntary hyperventilation is associated with an arterial pH 7.3 and increased cerebral blood flow.
- (B) Cheyne-Stokes respiration may follow hyperventilation or ascent to high altitudes.
- (C) The functional residual capacity is approximately 1200 ml.
- (D) The pulmonary surfactant does not appear until birth.
- (E) The  $O_2$  affinity of Hb is decreased with a fall in temperature and rise in pH.

687. The arterial oxygen tension decreases when :

- (A) Ascending to high altitudes.
- (B) The ventilation perfusion ratio (V/P) is normal.
- (C) The Hb concentration is decreased.
- (D) The airway resistance is decreased.
- (E) There is CO poisoning.

688. About carbon dioxide transport, all the following is true except :

- (A) It is transported largely in the form of bicarbonate.
- (B) Some is transported as a carbamino compound with Hb.
- (C) Its partial pressure in the arterial blood is about 46 mmHg.
- (D) A little amount is physically dissolved in the blood.
- (E) Some is transported in association with the plasma proteins.

689. About the  $PO_2$  and  $PCO_2$  in air and blood :

- (A) The  $PCO_2$  in alveolar air is about twice that in the room (atmospheric) air.
- (B) Due to the dead space, the  $PCO_2$  in expired air is greater than that in alveolar air.
- (C) The  $PCO_2$  in arterial blood is greater than the  $PO_2$ .
- (D) As a result of the physiologic shunts, the  $PO_2$  is greater in the pulmonary capillaries than in the systemic arterial blood.
- (E) The  $PCO_2$  in the venous blood is less than the  $PO_2$ .

690. Which of the following statements is wrong ?

- (A) At tissues, the blood pH falls and the  $O_2$  dissociation curve is shifted to the right.
- (B) The respiratory centre is inhibited during swallowing and vomiting.
- (C) The carotid bodies are more affected by the arterial  $PO_2$  than by its  $O_2$  content.
- (D) The pulmonary surfactant increases the lung compliance.
- (E)  $CO_2$  is carried by Hb in the form of carboxyhaemoglobin.
- (F) The total amount of  $O_2$  in the arterial blood is less than that of  $CO_2$ .



- all the following do not occur except :
- (A) In the erect posture the V/P ratio increases from base to apex.
- (B) During initial inspiration, the intrapulmonary, intrapleural and intra-abdominal pressures increase.
- (C) During inspiration, the  $PO_2$  in the dead space falls.
- (D) Ventilation is doubled on inhaling air containing 17%  $O_2$  and 83%  $N_2$ .
- (E) Bronchoconstriction occurs by drugs that stimulate the beta adrenergic receptors.
692. All the following statements are true except :
- (A) The diaphragm is not essential to maintain life.
- (B) At high altitudes, the arterial pH rises and cerebral blood flow decreases.
- (C) The diffusing capacity in the lungs is greater for  $O_2$  than for  $CO_2$ .
- (D) Inspiration increases the venous return to the heart.
- (E) The tidal volume has a reciprocal relationship with the respiratory rate.
693. If the peripheral chemoreceptor function is lost :
- (A) A 75% fall in the arterial  $PO_2$  has no influence on respiration.
- (B) A 10% rise in  $PCO_2$  will not stimulate respiration.
- (C) Ventilation will not increase in exercise.
- (D) The adaptability to life at high altitudes (acclimatization) is decreased.
- (E) The intrapleural pressure becomes positive.
694. All the following statements are true except :
- (A) The pulmonary vascular resistance is 1/6 that in the systemic circulation.
- (B) The  $O_2$  dissociation curve is shifted to the right when the fetal blood is replaced by adult blood.
- (C) The work of breathing increases during exercise and in the recumbent position, and it is inversely related to the lung compliance.
- (D) The dead space saturates the air with water vapour and filters out large particles before reaching the alveoli.
- (E) The lung and chest compliance as well as the vital capacity increase gradually with age.
- (F) In the lungs, a low  $PO_2$  in a certain area causes V.C. in this area.
695. Which of the following statements is true ?
- (A) Bronchial asthma is relieved by a beta adrenergic receptor antagonist.
- (B) In case of pneumothorax, the vital capacity is reduced.
- (C) In case of emphysema, the  $FEV_1$  is increased.
- (D) V.D. occurs in the alveoli supplied by an obstructed bronchus.
- (E) A diver breathing air under high pressure may develop Caission's disease if decompression occurs gradually.
696. Which of the following statements is wrong ?
- (A) The total V/P ratio is a good indicator of the severity of a lung disease.
- (B) In deep anaesthesia, a fall in blood pH is likely to occur.
- (C) In peripheral cyanosis, only the finger tips (but not the tongue) are bluish.
- (D) During coughing, unlike during sneezing, the glottis is closed at the start of the expiratory act.
- (E) In chronic emphysema, the residual volume is likely to increase.

697. About the mechanics of respiration, all the following are true except :
- (A) In forced inspiration, the upper 2 ribs are elevated by contraction of the sternocleidomastoid muscles.
- (B) In forced expiration, the ribs are lowered by contraction of the internal intercostal muscles.
- (C) At the end of a quiet inspiration, the intrapleural pressure reaches +6 mmHg.
- (D) During normal expiration, the intra-alveolar pressure reaches +1 mmHg.
- (E) The volume of air flowing through the respiratory passages is directly proportional to the pressure difference between the mouth and alveoli.
698. Which of the following statements is true ?
- (A) The surfactant is a glycoprotein secreted by the pulmonary capillary endothelium.
- (B) The hyaline membrane disease is due to a hole in the thoracic wall.
- (C) The compliance of normal lungs is 5 litres/cm water pressure.
- (D) The main cause of the lung's recoil tendency is the intermolecular attraction between the molecules of the fluid lining the alveoli.
- (E) The work of breathing decreases in restrictive lung diseases.
699. Concerning the various lung capacities :
- (A) In a dead-born child, the residual volume contributes to the total air in the lungs.
- (B) The ratio : residual volume / total lung capacity normally exceeds 35%.
- (C) In orthopnea, the vital capacity is normal.
- (D) At the functional residual capacity, the relaxation volume of the chest wall is reached.
- (E) At the functional residual capacity, the chest wall and lung recoil forces are equal.
700. When the tidal volume is 500 ml and the  $CO_2$  % in the expired air 0.07% and in the alveolar air 0.05%, the dead space would be :
- (A) 200 ml.
- (B) 150 ml.
- (C) 250 ml.
- (D) 50 ml.
- (E) 100 ml.
701. About the alveolar ventilation and pulmonary membrane diffusion capacity :
- (A) The alveolar ventilation increases with shallow rapid breathing.
- (B) The alveolar ventilation may be normal when the total pulmonary ventilation is decreased.
- (C) The alveolar ventilation is normally about 4.2 litres / minute.
- (D) The pulmonary diffusing capacity is normally much higher for  $O_2$  than for  $CO_2$ .
- (E) The normal pulmonary diffusing capacity for  $O_2$  is 2 ml/min./mmHg. at rest and 20 ml/min./mmHg during muscular exercise.
702. About the V/P ratio, all the following are true except :
- (A) Its average value is normally 0.8.
- (B) It is uniform throughout the lung.
- (C) It increases in case of pulmonary embolism.
- (D) When it increases the  $PO_2$  in the alveolar air and arterial blood increases.
- (E) When it decreases the  $PCO_2$  in the alveolar air and arterial blood increases.



### 1. Which of the following is correct?

- (A) Lung inflation leads to activation of the pneumotaxic centre.
- (B) Inhibition of the apneustic centre by the pneumotaxic centre is faster than vagal inhibition.
- (C) A transection between the pons and medulla oblongata stops respiration.
- (D) The apneustic centre sends tonic discharges to the inspiratory centre.
- (E) Section of both vagi renders respiration to be more shallow and rapid.

### 2. Which of the following statements is true?

- (A) The respiratory centre is stimulated by afferent impulses from the lung's inflation receptors, the arterial baroreceptors and the pharynx during swallowing.
- (B) Inhaling air containing 20% CO<sub>2</sub> markedly increases the ventilation.
- (C) The peripheral chemoreceptors respond better to an increased H<sup>+</sup> or PCO<sub>2</sub> than to a decreased PO<sub>2</sub>.
- (D) Shunting of venous blood into the arterial blood causes anemic hypoxia.
- (E) Cyanosis is absent in anemic and hemotoxic hypoxia.
- (F) CO poisoning produces stagnant hypoxia and cyanosis is a prominent symptom.

### 3. Which of the following statements is correct?

- (A) When the barometric pressure is 740 mmHg, the PO<sub>2</sub> becomes about 50 mmHg.
- (B) When the compliance is 50 ml/cm water, a tidal volume of 500 ml would increase the airway pressure 10 cm water.
- (C) In the lungs, O<sub>2</sub> is transported from the alveoli to the blood in the pulmonary capillaries by facilitated diffusion.
- (D) When breathing through a tube having a diameter 1 cm and its length is 100 cm, the physiologic dead space will be about 230-250 ml.
- (E) The main factor that affects the ability of blood to transport O<sub>2</sub> is the amount of haemoglobin.

### 4. All the following statements are true EXCEPT:

- (A) The most important buffer in the interstitial fluid is the bicarbonate system.
- (B) Lactic acid increases the ventilation by stimulating the carotid bodies.
- (C) Respiration stops only after transection of the brain stem at the lower part of the medulla oblongata.
- (D) CO<sub>2</sub> retention is most likely to occur in CO poisoning.
- (E) Variations in the arterial Hb<sup>+</sup> concentration do not affect respiration.

Answer the following questions by using this key:

- (A) If 1, 2 and 3 are correct (B) If 1 & 3 are correct (C) If 2 & 4 are correct
- (D) If only 4 is correct (E) If all four are correct

### 5. The surfactant lining the lung alveoli:

- (1) Is a lipoprotein material produced by type II alveolar cells.
- (2) Helps to prevent alveolar collapse.
- (3) Its deficiency causes the hyaline membrane disease (= respiratory distress syndrome).
- (4) Is decreased in the lungs of heavy smokers.

### 6. During inspiration:

- (1) The thoracic cavity increases in all characters.
- (2) The intrapleural pressure becomes more negative.
- (3) The intra-abdominal pressure increases.
- (4) The venous return decreases.

### 7. Reduction of the pulmonary ventilation occurs as a result of:

- (1) Transection of both phrenic nerves.
- (2) Transection of the spinal cord at the first thoracic level.
- (3) Pulmonary fibrosis.
- (4) Metabolic acidosis.

### 8. Collapse of the pulmonary alveoli (atelectasis) may occur in:

- (1) The respiratory distress syndrome.
- (2) Emphysema.
- (3) Open pneumothorax.
- (4) Decompression sickness.

### 9. The pulmonary diffusing capacity for O<sub>2</sub> depends mainly on the:

- (1) Amount of Hb and its % saturation in the blood of pulmonary capillaries.
- (2) Thickness of the alveolar capillary membrane.
- (3) Volume of the dead space.
- (4) Total surface area of the pulmonary alveoli.

### 10. The airway resistance:

- (1) Is increased if adrenaline is injected.
- (2) Does not affect the work of breathing.
- (3) Is increased in muscular exercise.
- (4) Is increased in bronchial asthma.

### 11. The flow of O<sub>2</sub> from the blood to tissues increases by an increase in the:

- (1) 2,3 DPG content of the blood.
- (2) Blood PCO<sub>2</sub>.
- (3) Blood temperature.
- (4) Plasma sodium concentration.

### 12. The concentration of 2,3 DPG in the RBCs:

- (1) Increases in chronic hypoxia.
- (2) Is unaffected by muscular exercise.
- (3) If increased, it shifts the O<sub>2</sub> dissociation curve to the right.
- (4) Is decreased in fresh blood.

### 13. Stimulation of the carotid bodies is presumed to occur in the presence of:

- (1) A decrease in the pH.
- (2) An increase in the HCO<sub>3</sub><sup>-</sup> concentration.
- (3) A decrease in the PO<sub>2</sub>.
- (4) A decrease in the H<sup>+</sup> ion concentration.

### 14. Stimulation of the central end of a vagus nerve causes:

- (1) No effect on respiration.
- (2) Inhibition of respiration.
- (3) An increase in the heart rate.
- (4) A decrease in the arterial blood pressure.

### 15. The medullary chemoreceptors:

- (1) Is located in the medulla oblongata.
- (2) Discharges spontaneously in the inspiratory muscles during respiration.
- (3) Is affected by impulses from the muscles and joints.
- (4) Is unaffected by stimulation of the hypothalamus.



718. The respiratory stimulation by a moderate  $O_2$  lack is weak because :
- (1) There is a slight increase in the blood pH which tends to inhibit respiration.
  - (2) Of inhibition of the respiratory neurons in the brain.
  - (3) There is a decrease in the alveolar  $PCO_2$ .
  - (4) There is a compensatory increase in the alveolar  $PO_2$ .

719. The delivery of  $O_2$  to exercising muscles is facilitated by :
- (1) An increase in the 2, 3 DPG concentration in the red blood cells.
  - (2) An increase in the tissue temperature.
  - (3) A decrease of the tissue pH.
  - (4) A decrease in the tissue  $PO_2$ .

720. Pulmonary fibrosis is expected to produce :
- (1) Histotoxic hypoxia.
  - (2) Hypoxic hypoxia.
  - (3) Increased compliance.
  - (4) Cyanosis.

721. The manifestations of oxygen toxicity include :
- (1) Irritation of the respiratory tract.
  - (2) Cyanosis.
  - (3) Difficulty in seeing due to retrolental fibroplasia.
  - (4) An increase of the blood pH.

722. Which of the following would occur if the pressurization of the cabin of an airplane flying at 12500 m suddenly fails ?
- (1) A marked decrease in the arterial  $PO_2$ .
  - (2) Air embolism.
  - (3) Formation of bubbles of gas in the blood.
  - (4) Nitrogen narcosis.

723. As one ascends to higher altitudes, the atmosphere changes as follows :
- (1) The total barometric pressure decreases proportionately.
  - (2) The proportion of  $O_2$  to  $CO_2$  remains constant.
  - (3) The  $PO_2$  decreases.
  - (4) The  $CO_2$  concentration increases.

724. The increased tissue requirements of  $O_2$  are normally met by :
- (1) Vasoconstriction at the tissues.
  - (2) An increase in the blood flow to the tissues.
  - (3) A shift of the  $O_2$  dissociation curve to the left.
  - (4) Removal of more  $O_2$  per ml. of blood.

725. Peripheral chemoreceptor stimulation occurs in :
- (1) Conditions of decreased arterial  $PO_2$  e.g. emphysema.
  - (2) CO poisoning.
  - (3) Cyanide poisoning.
  - (4) Anaemia.

726. In chronic respiratory failure, the administration of pure  $O_2$  :
- (1) Increases the vital capacity.
  - (2) Improves the condition.
  - (3) Increases the cerebral functions.
  - (4) May further depress respiration.

727. During acclimatization at high altitudes :

- (1) The Hb concentration increases.
- (2) Cyanosis often develops.
- (3) The pulmonary ventilation increases.
- (4) The urine pH becomes alkaline.

728. In comparison to atmospheric air, alveolar air has :

- (1) A lower total pressure.
- (2) A lower  $PO_2$ .
- (3) A lower % of water vapour.
- (4) A higher  $PCO_2$ .

729. The muscles of inspiration include the :

- (1) Diaphragm.
- (2) Scaleni.
- (3) External intercostals.
- (4) Internal intercostals.

730. Hypoxia :

- (1) Is always associated with cyanosis.
- (2) Due to CO poisoning is histotoxic hypoxia.
- (3) Causes a decrease in the cardiac output.
- (4) Induces pulmonary V.C.

731. About Cheyne-Stokes breathing :

- (1) It is a type of periodic breathing.
- (2) The periods of apnea occur as a result of hypercapnia.
- (3) Some cases are due to increased sensitivity of the respiratory centre to  $CO_2$ .
- (4) It is always a pathological condition.

732. From the relaxation pressure curve, which of the following can be measured :

- (1) The airway resistance.
- (2) The lung compliance.
- (3) The dead space.
- (4) The work of breathing.

733. In diseases causing alveolar-capillary block :

- (1) The gas diffusion is not affected.
- (2) There is severe hypercapnia.
- (3) The resulting hypoxia is often mild.
- (4)  $O_2$  diffusion is decreased earlier than  $CO_2$  diffusion.

734. As blood passes through the systemic capillaries :

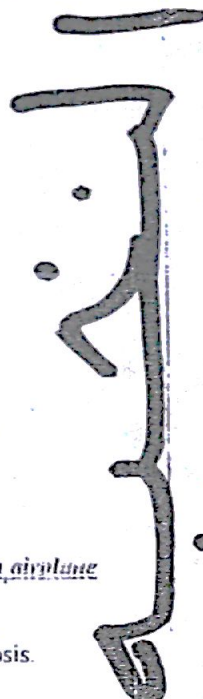
- (1)  $HCO_3^-$  passes from the R.B.C.s to the plasma.
- (2) Its pH rises.
- (3) The  $O_2$  dissociation curve shifts to the right.
- (4) The concentration of  $Cl^-$  in the R.B.C.s falls.

735. During the initial part of inspiration, the :

- (1) Intrathoracic and intrapleural pressures rise.
- (2)  $PO_2$  in the dead space rises.
- (3) Intra-abdominal pressure falls.
- (4) Intrapulmonary pressure falls.

736. In the normal lung, the :

- (1) Volume of alveolar ventilation / minute is greater than the perfusion volume.
- (2) Transfer of  $O_2$  is an active process.
- (3) Ventilation / perfusion ratio increases from apex to base.
- (4) Dead space significantly increases during maximal inspiration.





743. Ascending from the sea level to a height of 6000 meters causes:

- (1) An increase in the pulmonary ventilation.
- (2) A decrease in the alveolar and arterial blood  $PO_2$ .
- (3) An increase in the blood pH.
- (4) An increase in the cerebral blood flow.

744. In the pulmonary circulation the:

- (1) Blood flow is directed to the poorly-ventilated alveoli.
- (2) Fall of alveolar  $PO_2$  by 25 % decreases the %  $O_2$  saturation of Hb also by 25 %.
- (3) Haemoglobin is deoxygenated.
- (4) Carbonic anhydrase catalyzes the breakdown of  $H_2CO_3$  to  $H_2O$  and  $CO_2$ .

745. A patient suffering chronic respiratory failure:

- (1) Can increase his ventilation in response to  $O_2$  lack.
- (2) Should be given 100 %  $O_2$  on admission to hospital.
- (3) Might have received  $O_2$  therapy if his  $PCO_2$  was 150 mmHg.
- (4) Has an increased respiratory sensitivity to  $CO_2$ .

746. In emphysema, it is false that the:

- (1) Ratio  $FEV_1/FVC$  is not changed.
- (2) Vital capacity is increased.
- (3) Arterial  $PO_2$  increases.
- (4) Lung compliance is decreased.

747. A diver breathing air at a depth of 30 meters under water:

- (1) Has a 2-3 fold increase in the  $O_2$  content of the blood.
- (2) Often loses consciousness as a result of nitrogen narcosis.
- (3) Expend less energy for the work of breathing than at the surface.
- (4) Is exposed to a pressure 4 times that at the surface.

748. Which of the following statements is correct?

- (1) Cyanosis is more likely to occur in persons having a high rather than a low Hb content.
- (2) Restrictive lung diseases differ from obstructive airway diseases in that the total lung capacity (TLC) is lower in the former condition.
- (3) A region in the lung where the V/P ratio is low tends to lower the systemic arterial  $O_2$  content.
- (4) A spinal cord transection at the midthoracic level tends to decrease the pulmonary ventilation.

749. Which of the following statements is correct?

- (1) The airway resistance increases in bronchial asthma.
- (2) The major factor that affects the blood ability to transport  $O_2$  is the Hb content.
- (3) Most  $CO_2$  is transported in the blood as  $HCO_3^-$ .
- (4) The most important buffer in the interstitial fluid is the bicarbonate system.

750. About 2,3 DPG:

- (1) It decreases when the  $H^+$  in R.B.C.s increases.
- (2) It increases in hypoxic hypoxia.
- (3) It shifts the  $O_2$  dissociation curve to the right.
- (4) It is not changed in stored blood.

751. Breathing would stop after:

- (1) Bilateral vagotomy.
- (2) A spinal cord transection at the first thoracic segment.
- (3) A transection of the brain stem above the pons.
- (4) A transection of the brain stem at the lower 1/3 of the medulla.

752. Which of the following statements is correct?

- (1) An increased plasma  $K^+$  level accelerates respiration and  $O_2$  delivery to the tissues.
- (2) The inspiratory neurons discharge spontaneously during expiration.
- (3) Peripheral chemoreceptor stimulation decreases the pH of arterial blood.
- (4) The neurons in the pneumotaxic centre are normally inhibitory to the inspiratory centre.

753.  $CO_2$  retention occurs in:

- (1) High altitudes.
- (2) CO poisoning.
- (3) Hysterical hyperventilation.
- (4) Ventilatory (respiratory) failure.

754. Which of the following statements is wrong?

- (1) Lung fibrosis leads to anaemic hypoxia.
- (2) Chronic smoking leads to stagnant hypoxia.
- (3) Cyanide poisoning leads to reduction of the blood  $O_2$  content.
- (4)  $O_2$  toxicity leads to convulsions, dizziness and bronchial irritation.

755. The blood flow in the lungs is normally:

- (1) Constant throughout the respiratory cycle.
- (2) Directed mainly to the hypoxic areas.
- (3) Finely regulated by autonomic nerves.
- (4) More at the base than at the apex in the erect posture.

756. The  $FEV_1$  is reduced in:

- (1) Restrictive lung diseases.
- (2) Obstructive lung diseases.
- (3) Increased airway resistance.
- (4) Weakness of the respiratory muscles.

757. The pulmonary irritant receptors:

- (1) Are found mainly in the bronchiolar mucosa.
- (2) Can be stimulated mechanically.
- (3) Initiate hyperpnea and bronchoconstriction when stimulated.
- (4) Are located in the smooth muscles of the airways.

758. The pulmonary surfactant:

- (1) Does not appear until birth.
- (2) Produces a constant surface tension.
- (3) Increases when the pulmonary blood flow is interrupted.
- (4) Increases the lung compliance.

759. The functional residual capacity:

- (1) Is the volume at which some airways begin to close during expiration.
- (2) Can be measured by the helium dilution method.
- (3) Is reduced when the airway resistance is increased.
- (4) Is approximately 2200 ml.





6. Factors that increase ventilation include:

- (1) Decrease in the arterial  $PO_2$  less than 40 mmHg.
- (2) Increase in the partial pressure of arterial  $CO_2$ .
- (3) Rise in the arterial pH more than 7.4.
- (4) Increase in the cerebral blood flow.

7. Changes during respiration may accompany:

- (1) Hyperventilation.
- (2) Primary emphysema.
- (3) Anoxia at high altitude.
- (4) Ischaemic congestive heart failure.

8. Which is the normal  $PO_2$  in venous blood?

- (1) 100 mmHg.
- (2) 40 mmHg.
- (3) 40 mmHg in the pulmonary venous blood.
- (4) 100 mmHg in the pulmonary venous blood.

9. Which of the following statements is correct?

- (1) The arterial resistance is greater during inspiration than during expiration.
- (2) The arterial resistance is less during inspiration than during expiration.
- (3) The resistance in the small pulmonary arteries is less during inspiration than during expiration.
- (4) The pulmonary resistance is less during inspiration than during expiration.

10. Which of the following is correct?

- (1) Arterial  $PO_2$  is 100 mmHg.
- (2) The  $PO_2$  in the pulmonary venous blood is 100 mmHg.
- (3) The  $PO_2$  in the pulmonary arterial blood is 100 mmHg.
- (4) When the arterial  $PO_2$  is 100 mmHg, the pulmonary venous  $PO_2$  is 100 mmHg.

11. Which of the following statements is correct?

- (1) In comparison to the atmospheric air, the arterial air has lower  $PO_2$ .
- (2) In comparison to the systemic circulation, the pulmonary circulation has much lower resistance.
- (3) Inhalation of  $PO_2$  at a normal atmospheric pressure increases the  $PO_2$  in the CSF.
- (4) During acclimatization, both the vital capacity and  $Hb$  content are decreased.

12. Which of the following is not a factor of benefit in hypoxia due to:

- (1)  $CO_2$  poisoning.
- (2) Obstruction of the pulmonary arteries.
- (3) Paralysis of the respiratory muscles.
- (4) Tissue anoxia at high altitude.

13. The symptoms of decompression sickness:

- (1) May include paralysis.
- (2) Are usually painless.
- (3) May include angina pectoris.
- (4) Occur when the  $PO_2$  inside the body is less than that outside the body.

14. Which of the following statements is correct?

- (1) Direct readings from the spirometer inform about all lung volumes and capacities.
- (2)  $CO_2$  enters the R.B.C.s as  $O_2$  is unloaded to bind to the reduced  $Hb$ .
- (3) A shift of the  $O_2$ -dissociation curve to the right means that at a given  $PO_2$  there is more  $O_2$  / gm of  $Hb$ .
- (4) The reserve volume is the inspiratory reserve volume.

15. Which of the following statements is wrong?

- (1) The Hering-Breuer reflex influences both the rate and depth of respiration.
- (2) As the  $PO_2$  in the inspired air rises, the arterial  $PO_2$  falls.
- (3) The maximum dead space may be less than the physiological dead space.
- (4) The  $PO_2$  in the expired air is lower than that in the inspired air because the  $PO_2$  is lower in the former.

16. The main function of myoglobin is to:

- (1) Transfer  $O_2$  from the haemoglobin.
- (2) Counteract the Bohr effect of  $CO_2$  and  $H^+$ .
- (3) Counter  $O_2$  transport across the cell membrane.
- (4) Supply  $O_2$  in the muscle during periods of anaemia.

17. The surface tension of the alveolar lining fluid:

- (1) is normally less than the atmospheric pressure due to the effect of the surfactant.
- (2) is normally low, as a result of the surfactant.
- (3) affects the lung compliance in the static component of the lung.
- (4) helps to maintain the lung in an expanded position.

18. Which of the following is correct?

- (1) The arterial compliance increases.
- (2) The pulmonary compliance increases.
- (3) The arterial  $PO_2$  increases.
- (4) Both the  $PO_2$  and the  $PO_2$  in the arterial blood increase.

19. Which of the following is correct?

- (1)  $CO_2$  poisoning.
- (2) Polycythemia.
- (3) Anaemia and vitamin  $B_{12}$  deficiency.
- (4) Hypoxia at high altitude.

20. Respiration of the mammalian respiratory system is divided into:

- (1) Accelerated respiration.
- (2) Cheyne-Stokes respiration.
- (3) Decelerated respiration.
- (4) Apnoeic respiration.

21. Which of the following statements is correct?

- (1) At a barometric pressure of 250 mmHg, the  $PO_2$  is about 40 mmHg.
- (2) Breathing through a tube increases the dead space by the same volume of the tube.
- (3) Acetylcholine and botulinum cause bronchial muscle contraction.
- (4) During inspiration, the intrapleural pressure increases.

22. Which of the following statements is wrong?

- (1) The arterial ventilation is more with 12 breaths / minute and a tidal volume of 500 ml than with 10 breaths / minute and a tidal volume of 500 ml.
- (2) The arteriovenous  $O_2$  concentration is more in the renal vein than in the pulmonary vein.
- (3) The affinity of  $Hb$  for  $O_2$  is less than that of  $Hb A$ .
- (4) The anatomically active principle is more in the R.B.C.s of the arterial blood than in the R.B.C.s of the venous blood.