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# Review of Physiotherapy

## with Explanatory Answers

### Subjects Covered

- Biomechanic & Kinesiology
- Exercise Therapy & Electrotherapy
- Neurological Physiotherapy
- Musculoskeletal Conditions & Orthopedics and Sports Physiotherapy
- Cardio Pulmonary Physiotherapy & Emergency Care
- Physiotherapy in Obstetrics & Gynecology
- Rehabilitation Science
- Physiotherapy in Surgical Conditions
- Research & Biostatistics

### HIGHLIGHTS

- Comprehensive Coverage of MPT Entrance Exam Syllabus and Recruitment Tests
- Covered Basics of Physiotherapy
- Special Emphasis on Core Physiotherapy Subjects
- Includes Clinical Physiotherapy Specialities

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JAYPEE

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SECTION 6

# Cardio Pulmonary Physiotherapy

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## Questions

**Q1. The weight of the human heart is about:**
- **A.** 100 g
- **B.** 200 g
- **C.** 300 g
- **D.** 400 g

**Q2. Closure of semilunar valves produces:**
- **A.** 1st heart sound
- **B.** 2nd heart sound
- **C.** 3rd heart sound
- **D.** 4th heart sound

**Q3. The sinoatrial node is called cardiac pacemaker, because:**
- **A.** It allows almost immediate transmission of cardiac impulse, throughout the entire ventricular system
- **B.** It is capable of generation of impulse and conduction of heart beat
- **C.** It determines the rate which the heart beats
- **D.** The speed of conduction of impulse is fastest in SA node

**Q4. The left ventricle has more mass, compared to right ventricle:**
- **A.** The left coronary artery supplying the left ventricle has a greater flow of blood
- **B.** Left ventricle does more work, to propel the blood, compared to the right ventricle
- **C.** By the nature of hereditary
- **D.** None of the above

**Q5. The normal stroke volume at rest:**
- **A.** 50–60 mL
- **B.** 60–70 mL
- **C.** 70–80 mL
- **D.** 80–90 mL

**Q6. The QRS complex in ECG, denotes:**
- **A.** Atrial depolarization
- **B.** Ventricular depolarization
- **C.** Ventricular repolarization
- **D.** None of the above

**Q7. Normal QRS complex in ECG, is approximately:**
- **A.** 0.02 sec
- **B.** 0.04–0.06 sec
- **C.** 0.08–0.12 sec
- **D.** 0.1–0.15 sec

**Q8. The followings are true about 2nd heart sound, *except*:**
- **A.** It is produced due to closure of atrioventricular valves
- **B.** It has high pitch
- **C.** It sounds like syllable DUP
- **D.** It is heard over pulmonary and aortic area

**Q9. The followings are true about 1st heart sound, *except*:**
- **A.** It is produced due to closure of atrioventricular valves
- **B.** It has high pitch
- **C.** It sounds like syllable LUBB
- **D.** It is best heard over mitral and tricuspid area

**Q10. The followings about myocardial infarction are true, *except*:**
- **A.** It is the aseptic necrosis of myocardial cells
- **B.** The damage to heart is reversible

**C.** The serum enzyme MB isomer of creatine kinase is elevated
**D.** ECG changes of elevation of ST segment in the leads overlying the area of infarct

**Q11. The enzymes most commonly measured in myocardial infarction are all, *except*:**
**A.** MB isomer of creatine kinase
**B.** Amylase
**C.** Troponin T and A
**D.** Lipoprotein (a)

**Q12. The followings about pain due to angina pectoris are true, *except*:**
**A.** It is the substernal pain, radiating to inner border of left arm
**B.** It is the cry of the dying myocardium
**C.** It is increased by cold or after meals
**D.** The pain persists for hours

**Q13. The followings about angina pectoris are true, *except*:**
**A.** It is the cry of the dying myocardial fibers
**B.** It is the reversible damage to the myocardium
**C.** It is produced by transient occlusion of coronaries supplying the myocardium
**D.** It is the aseptic necrosis of the myocardium

**Q14. P wave in the ECG, is characterized by the followings, *except*:**
**A.** It is the 1st wave of ECG, which is directed upward
**B.** It has a duration of 0.1 sec
**C.** It is due to ventricular depolarization
**D.** Its amplitude is up to 0.5 mV

**Q15. The conduction pause at atrio-ventricular node is represented in ECG by:**
**A.** S-T segment
**B.** P-R segment
**C.** T-P segment
**D.** None of the above

**Q16. The P-R interval in an ECG, is measured by finding the interval between:**
**A.** Beginning of the P-wave and beginning of the R-wave
**B.** Beginning of P-wave and beginning of the QRS complex
**C.** End of the P-wave and beginning of the QRS complex
**D.** End of the P-wave and the end of the QRS complex

**Q17. A decrease of velocity of impulse conduction, through A-V node will usually cause:**
**A.** The P-R interval to decrease
**B.** The P-R interval to increase
**C.** Disappearance of T-wave
**D.** Increased heart rate

**Q18. The Q-wave in ECG is due to:**
**A.** Atrial depolarization
**B.** Depolarization of interventricular septum
**C.** Depolarization of major portion of both ventricles
**D.** Depolarization of base of ventricle

**Q19. The R-wave in ECG represents:**
**A.** Atrial depolarization
**B.** Excitation of interventricular apex and major portion of both ventricles
**C.** Excitation of more basal parts of the ventricles
**D.** None of the above

**Q20. S-T segment in ECG, represents:**
**A.** The isoelectric period from end of S-wave to end of T-wave
**B.** The isoelectric period from end of S-wave to beginning of T-wave
**C.** The time from the end of ventricular depolarization to start of ventricular repolarization
**D.** Both B and C

**Q21. The T wave in ECG, represents:**
**A.** Ventricular depolarization
**B.** Ventricular repolarization
**C.** Atrial depolarization
**D.** None of the above

**Q22. The Q-T interval in ECG, represents:**
**A.** Ventricular depolarization
**B.** Ventricular repolarization
**C.** Both A and B
**D.** None of the above

**Q23. Which of the followings about paroxysmal tachycardia is false?**
**A.** It has a gradual onset and decline
**B.** It appears and declines abruptly
**C.** The attack may lasts from seconds, or minutes or many days
**D.** It is a type of cardiac arrhythmia

**Q24. The following ECG features are true about atrial fibrillation, *except*:**
**A.** Normal P wave
**B.** Irregular QRS complex

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**C.** Absence of T wave
**D.** None of the above

**Q25. The followings about ventricular fibrillation are true, *except*:**
**A.** The rate of ventricular contraction is 200–350 BPM
**B.** ECG shows, irregular, extremely fast, small, potentials, fluctuating in rate, rhythm, amplitude and appearance
**C.** It is a fatal condition
**D.** None of the above

**Q26. Stoke Adams syndrome is loss of consciousness following:**
**A.** Head injury
**B.** Ventricular tachycardia
**C.** Complete heart block
**D.** Ventricular fibrillation

**Q27. The 1st degree heart block, differs from 2nd degree heart block, in that, in 1st degree heart block:**
**A.** All the atrial impulses, are not conducted to the ventricles
**B.** Atrial: ventricular rate is 2:1, or 3:1
**C.** Gradual lengthening of P-R interval, until one ventricular beat is dropped
**D.** P-R interval is abnormally long with atria: ventricular rate = 1:1

**Q28. The neural mechanism that produce circulatory adjustments in the body involves all, *except*:**
**A.** Autonomic regulation
**B.** Humoral regulation
**C.** Medullary regulations
**D.** None of the above

**Q29. The followings about the sympathetic innervation of heart are true, *except*:**
**A.** Sympathetic supply to the heart are from the sympathetic nerve cells in the intermediolateral horn of the spinal cord extending from T1–T5 spinal segments
**B.** Sympathetic supply to the heart are from the sympathetic nerve cells in the intermediolateral horn of the spinal cord extending from T6–T12 spinal segments
**C.** Sympathetic supply to the heart are from the sympathetic nerve cells in the intermediolateral horn of the spinal cord extending from T1–12 spinal segments
**D.** None of the above

**Q30. Sympathetic stimulation of heart, produces the following effects, *except*:**
**A.** Increases heart rate
**B.** Increases speed and force of contraction of myocardium
**C.** Decreases conductivity in conduction tissues
**D.** Increases excitability of heart

**Q31. The followings about parasympathetic supply to the heart are true, *except*:**
**A.** The parasympathetic supply to the heart is via the two vagus nerves
**B.** Parasympathetic supply to heart produces increase of heart rate
**C.** Parasympathetic supply to heart decreases conductivity in conduction tissues
**D.** Parasympathetic supply to heart decreases speed and force of contraction of atria

**Q32. The followings about axon reflex are true, *except*:**
**A.** It is also called as dorsal root vasodilatation reflex
**B.** It is produced by antidromic conduction of impulses to the nerve endings near cutaneous arterioles, causing release of vasodilator substance-P
**C.** It is a neural mechanism regulated by CNS
**D.** It is responsible for the redness, spreading out from the injury site

**Q33. The medullary regulation of CVS is brought about by:**
**A.** Vasomotor center in medulla
**B.** Cardiac vagal center
**C.** Both A and B
**D.** None of the above

**Q34. Parasympathetic affects CVS mainly by altering:**
**A.** Vascular resistance
**B.** Heart rate
**C.** Vascular compliance
**D.** Force of contraction of heart

**Q35. When spinal cord is cut at the level of T1:**
**A.** Quadriplegia occurs
**B.** The arterioles are constricted
**C.** The sympathetic vasoconstrictors are stimulated
**D.** Blood pressure falls

**Q36. Increased pressure in the carotid sinus, causes all of the followings, *except*:**
**A.** Reflex slowing of the heart rate
**B.** Increased vagal stimulation of heart

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**C.** Increased sympathetic stimulation of the heart
**D.** Reflex dilatation of the peripheral blood vessels

**Q37. The followings about Valsalva maneuver are true, *except*:**
**A.** It causes an increase in intrathoracic pressure
**B.** It results in decrease in venous return and arterial blood pressure
**C.** With intact baroreceptors, a fall in BP, results in increase in heart rate
**D.** After, the maneuver is stopped, rebound increase in venous return and arterial BP, results in increase in heart rate

**Q38. Sudden death may occur in an individual, following a massive heart attack, due to activation of:**
**A.** Bainbridge reflex
**B.** Cushing reflex
**C.** Bezold Jarisch reflex
**D.** Hering–Breur reflex

**Q39. Emotional effects on CVS are result of activation of:**
**A.** Baroreceptors
**B.** Chemoreceptors
**C.** Cerebral cortex
**D.** Corticohypothalamic descending pathways

**Q40. The following portions of mammalian heart are innervated by vagus nerve, *except*:**
**A.** SA node
**B.** AV node
**C.** Muscles of atria
**D.** Muscles of ventricles

**Q41. The main inhibitory center of heart is:**
**A.** Nucleus tractus solitaries
**B.** Nucleus ambiguous
**C.** Nucleus parabrachialis
**D.** Dorsal nucleus of vagus

**Q42. Sino-aortic nerves are called as buffer nerves, because:**
**A.** They originate from the vagus nerve
**B.** They innervate both baroreceptors and chemoreceptors
**C.** They buffer any alteration of blood pH
**D.** They act as BP regulators

**Q43. The followings about heart rate are true, *except*:**
**A.** Heart rate is inversely related to systemic BP
**B.** Heart rate increases by fall in body temperature
**C.** For every 1° Fahrenheit rise in temperature, heart rate increases by 10 beats per minute
**D.** Stimuli that increase the heart rate also increase the blood pressure

**Q44. Marey's law denotes relationship between heart rate and:**
**A.** Blood volume
**B.** Blood pressure
**C.** Force of contraction of myocardium
**D.** Conductivity

**Q45. Due to Cushing reflex, a raised intracranial tension produces:**
**A.** Bradycardia
**B.** Tachycardia
**C.** No change in HR
**D.** All of the above

**Q46. Heart rate increases during exercise, due to the followings, *except*:**
**A.** Increase in sympathetic activity
**B.** Increase in body temperature
**C.** Changes in blood chemistry such as, hypoxia, hypercapnia and academia
**D.** Increase in vagal tone

**Q47. Heart rate is accelerated by the following, *except*:**
**A.** Inspiration
**B.** Exercise
**C.** Anger
**D.** Grief

**Q48. Sinus arrhythmia, refers to all, *except*:**
**A.** Increase in HR with inspiration
**B.** Decrease in HR, during expiration
**C.** Increase of HR, during expiration
**D.** None of the above

**Q49. Neurogenic hypertension refers to all, *except*:**
**A.** Increase of blood pressure due to occlusion of bilateral carotid artery
**B.** Increase of blood pressure after bilateral vagotomy
**C.** Bilateral destruction of nucleus of tractus solitarius
**D.** Increase of vagal activity

**Q50. The normal value of cardiac index is:**
**A.** 2.3 L/m$^2$/min
**B.** 3.2 L/m$^2$/min
**C.** 4.2 L/m$^2$/min
**D.** 5.2 L/m$^2$/min

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**Q51. Echocardiography is:**
- **A.** An invasive technique, that involves insertion of a catheter
- **B.** Noninvasive technique, where pulses of ultrasound at a frequency of 2.25 MHz is used in the diagnosis
- **C.** Noninvasive technique, where, various electrodes are used on the body to record activities of the heart
- **D.** None of the above

**Q52. Echocardiogram helps to record the followings, *except*:**
- **A.** Movement of the ventricular wall and its septum
- **B.** Functioning of heart valves during cardiac cycle.'
- **C.** Recording of cardiac outputs
- **D.** Ventricular depolarization

**Q53. The total percentage of cardiac output distributed to vital organs is:**
- **A.** 25%
- **B.** 50%
- **C.** 75%
- **D.** 100%

**Q54. Frank–Starling law of heart states:**
- **A.** Force of contraction of the ventricular muscle is directly proportional to its maximum shortened length
- **B.** Force of contraction of the ventricular muscle is directly proportional to its minimum shortened length
- **C.** Force of contraction of the ventricular muscle is directly proportional to its initial length
- **D.** None of the above

**Q55. The term vis-a–tergo refers to:**
- **A.** Increased venous return to the heart, due to decrease in intrathoracic pressure
- **B.** Force from the front to attract blood in the veins towards the heart
- **C.** Propelling force on blood, which drives the blood forward
- **D.** Rhythmic contraction of skeletal muscles, that squeezes blood out of veins towards the heart

**Q56. Heart receives about:**
- **A.** 1% of cardiac output
- **B.** 2% of cardiac output
- **C.** 5% of cardiac output
- **D.** 10% of cardiac output

**Q57. The followings about pulse pressure are true, *except*:**
- **A.** It is the difference of systolic blood pressure and diastolic blood pressure
- **B.** It determines the pulse volume
- **C.** Lower pulse pressure is indicative of systolic hypertension
- **D.** High pulse pressure determines decrease in elasticity of blood vessels

**Q58. The followings about arterial blood pressure are true, *except*:**
- **A.** Roughly normal systolic blood pressure in adults is: 100+ age in years
- **B.** In newborn, average systolic blood pressure is 40 mm Hg
- **C.** Diastolic blood pressure increases after 50–60 years of age
- **D.** In females, after menopause, the systolic blood pressure is 4–5 mm Hg more than males of the same age

**Q59. The followings about variation of systolic blood pressure are true, *except*:**
- **A.** Systolic blood pressure is peak in the afternoon
- **B.** Systolic blood pressure is highest in the morning
- **C.** Diurnal variation of 5–10 mm Hg is common in systolic blood pressure
- **D.** Blood pressure normalizes within 5 minutes after stoppage of exercise

**Q60. The followings changes of blood pressure in various body postures are true, *except*:**
- **A.** Diastolic blood pressure increases in standing
- **B.** Diastolic blood pressure is normal in sitting
- **C.** Diastolic blood pressure increases in lying
- **D.** None of the above

**Q61. Which of the following changes occur to systemic blood pressure after meals?**
- **A.** Systolic blood pressure decreases by 5–6 mm Hg up to 1 hour after meals
- **B.** Systolic blood pressure increases by 5–6 mm Hg up to 1 hour after meals
- **C.** Diastolic blood pressure increases after meals
- **D.** None of the above

**Q62. Essential hypertension refers to:**
- **A.** Persistent arterial blood pressure greater than 120/80 mm Hg
- **B.** Persistent arterial blood pressure greater than 140/90 mm Hg
- **C.** Persistent arterial blood pressure greater than 150/90 mm Hg
- **D.** None of the above

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**Q63. The followings about malignant hypertension are true, *except*:**
- **A.** It is called malignant, because death occurs within 6 months to 2 years after its onset
- **B.** The arterial blood pressure increases up to 150/90 mm Hg
- **C.** The arterial blood pressure increases up to or above 260/150 mm Hg
- **D.** It is associated with complications such as renal failure

**Q64. The followings are causes of secondary hypertension, *except*:**
- **A.** Renal disease
- **B.** Thyrotoxicosis
- **C.** Severe polycythemia
- **D.** Stress

**Q65. The commonest cause of sustained primary hypertension is:**
- **A.** Unknown
- **B.** Renal disease
- **C.** Thyrotoxicosis
- **D.** Pheochromocytoma

**Q66. Which of the following changes would tend to cause edema in the tissues?**
- **A.** Increased precapillary vascular resistance
- **B.** Decreased post capillary vascular resistance
- **C.** Increased plasma colloid osmotic pressure
- **D.** Increased venous pressure

**Q67. The followings are true about coronary arteries, *except*:**
- **A.** The coronary arteries are end arteries
- **B.** Functional anastomoses are absent in coronary arteries
- **C.** In 20% of individuals the myocardium is predominantly supplied by left coronary artery
- **D.** In 50% of individuals the myocardium is predominantly supplied by right coronary artery

**Q68. Normal coronary blood flow of both arteries is:**
- **A.** 100–150 mL/min
- **B.** 150–200 mL/min
- **C.** 200 mL/min
- **D.** 250 mL/min

**Q69. The number of alveoli in both the lungs are about:**
- **A.** 50 million
- **B.** 100 million
- **C.** 300 million
- **D.** 500 million

**Q70. Sympathetic stimulation of the bronchus causes:**
- **A.** Bronchial constriction
- **B.** Decreased bronchial secretion
- **C.** Bronchial dilatation
- **D.** No effects

**Q71. Parasympathetic stimulation of bronchus causes:**
- **A.** Bronchoconstriction
- **B.** Bronchial dilatation
- **C.** Decreased bronchial secretion
- **D.** None of the above

**Q72. During inspiratory phase of relaxed comfortable breathing, the central tendon of diaphragm is drawn downwards by:**
- **A.** 1 cm
- **B.** 1.5 cm
- **C.** 2.5 cm
- **D.** 3 cm

**Q73. In eupnea (relaxed comfortable breathing), movement of diaphragm accounts for:**
- **A.** 50% of tidal volume
- **B.** 60% of tidal volume
- **C.** 75% of tidal volume
- **D.** 90% of tidal volume

**Q74. The followings about breathing function are true, *except*:**
- **A.** Either the diaphragm or the external intercostal muscles, can maintain adequate ventilation at rest
- **B.** Patients with bilateral phrenic nerve palsy, but intact innervation of intercostal muscles,will have labored breathing, but can manage living
- **C.** Transection of spinal cord above 3rd cervical segment is fatal without artificial ventilation
- **D.** Transection of spinal cord below 5th cervical segment, is fatal without artificial ventilation

**Q75. The following postural relationship for functioning of diaphragm are true, *except*:**
- **A.** Lying is the most comfortable position for descent of diaphragm during breathing
- **B.** Sitting is most comfortable for descent of diaphragm during breathing
- **C.** In standing, the increased intra-abdominal pressure caused by contraction of abdominals, pushes the diaphragm upward
- **D.** None of the above

**Q76. The followings are muscles of expiration, *except*:**
- **A.** Rectus abdominis
- **B.** Transversus abdominis

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**C.** Internal intercostal muscles
**D.** External intercostal muscles

**Q77. The followings are accessory muscles of inspiration, *except*:**
**A.** Scalene group of muscles
**B.** Sternocleidomastoid muscles
**C.** Posterior cricoarytenoid (abductor muscles of vocal cord)
**D.** Adductor ductor muscles of vocal cord

**Q78. Injury to recurrent laryngeal nerve (branch of vagus nerve), results in:**
**A.** Dyspnea
**B.** Inspiratory stridor
**C.** Wheezes
**D.** Crepitus

**Q79. Normal residual volume is:**
**A.** 500 mL
**B.** 750–1,000 mL
**C.** 1,200 mL
**D.** 2,000–3,200 mL

**Q80. The followings about vital capacity are true, *except*:**
**A.** Vital capacity is more in males as compared to females
**B.** Vital capacity decreases in old age
**C.** Vital capacity is more in lying as compared to sitting
**D.** Vital capacity decreases in pregnancy

**Q81. The followings about surfactants are true, *except*:**
**A.** It is a protein lipid complex
**B.** It is produced by granular pneumocytes, i.e., alveolar lining epithelial type-II cells
**C.** Surface tension is directly proportional to the concentration of surfactants per unit area
**D.** In the lungs surface tension is reduced by the surface tension lowering agent, i.e., surfactant

**Q82. The followings about compliance of lung and thoracic wall are true, *except*:**
**A.** It is the distensibility of the lungs and the chest wall
**B.** It is the change in lung volume per unit change in airway pressure
**C.** It is expressed as liter/cm $H_2O$
**D.** The compliance of the lung and thoracic wall increases in pulmonary edema

**Q83. Which of the following volume is expected to be equal in both men and women?**
**A.** Inspiratory reserve volume
**B.** Residual volume
**C.** Tidal volume
**D.** Vital capacity

**Q84. Spirometry measures all, *except*:**
**A.** Vital capacity
**B.** Inspiratory reserve volume
**C.** Functional residual capacity
**D.** Functional residual volume

**85. Most sensitive index to assess the severity of obstructive lung disease is:**
**A.** FVC
**B.** FRC
**C.** FEV1
**D.** Maximum mid expiratory flow rate

**Q86. Which of the followings about surfactant of lung is true?**
**A.** It increases compliance of the lung
**B.** It decreases compliance of the lung
**C.** It is secreted by bronchus
**D.** It is absent at birth

**Q87. Major percentage of airway resistance is offered by:**
**A.** Terminal bronchioles
**B.** Trachea and bigger bronchi
**C.** Respiratory bronchioles
**D.** Alveolar ducts

**Q88. Ventilation/perfusion ratio is ratio of:**
**A.** Alveolar ventilation to pulmonary blood flow
**B.** Pulmonary ventilation to pulmonary blood flow
**C.** Minute ventilation to pulmonary capillary pressure
**D.** Expired air volume to intrapulmonary pressure

**Q89. Which of the followings is true about restrictive lung disease?**
**A.** Vital capacity is normal and FEV1 decreases
**B.** Vital capacity and FEV1 decrease
**C.** Vital capacity, FEV1 and total lung capacity decrease
**D.** Vital capacity, total lung capacity decrease, whereas FEV1 is normal

**Q90. Respiratory movements are associated with fluctuation in blood pressure. The highest fall in cardiac output occurs at the time of:**
**A.** Beginning of inspiration
**B.** Forceful expiration
**C.** Late inspiration-early expiration
**D.** Late expiration-early inspiration

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**Q91. Vital capacity is decreased, but timely vital capacity is normal in:**
- **A.** Bronchial asthma
- **B.** Chronic bronchitis
- **C.** Scoliosis
- **D.** Respiratory muscle weakness

**Q92. Maximum mid expiratory flow rate (MMEFR), indicates, flow obstruction in:**
- **A.** Small airways
- **B.** Large airways
- **C.** Trachea
- **D.** Trachea and bronchi

**Q93. The followings are the indicators of obstructive lung disease, *except*:**
- **A.** Increased mid expiratory time, estimated through Maximum mid expiratory flow rate (MMFER)
- **B.** Decreased value of peak expiratory flow rate (PEFR)
- **C.** Decreased value of FEV1
- **D.** Normal FEV1

**94. All statements are true in an infant with infant respiratory distress syndrome, *except*:**
- **A.** It is a serious disease
- **B.** The surface tension of the alveoli is low
- **C.** There is patchy atelectasis
- **D.** It is associated with reduced surfactant in the lungs

**Q95. False about bronchial asthma is:**
- **A.** Diameter of the small airways decreases
- **B.** Regarded as a disease of expiratory obstruction
- **C.** Airway resistance is high during inspiration
- **D.** FEV1 value reduces

**Q96. Shifting of oxygen-hemoglobin dissociation curve to right means:**
- **A.** Decreased oxygen delivery to tissues
- **B.** Increased oxygen delivery to tissues
- **C.** Loading of $CO_2$ to blood
- **D.** Loading of $O_2$ to blood

**Q97. Halden effect is:**
- **A.** Loading of $O_2$ to blood, causes unloading of $CO_2$
- **B.** Loading of $CO_2$ to blood, causes unloading of $O_2$
- **C.** Binding of CO to hemoglobin displaces $O_2$
- **D.** Decrease in $O_2$ affinity of hemoglobin, when pH of blood falls

**Q98. Automatic control of respiration is maintained by:**
- **A.** Spinal cord
- **B.** Cerebral cortex
- **C.** Brainstem
- **D.** None of the above

**Q99. Cheyne–Stoke's respiration refers to:**
- **A.** A type of periodic breathing, with 3–4 cycles of normal respiration, followed by abrupt onset of apnea, and again abrupt onset of normal respiration
- **B.** The repeated sequence of gradual onset of apnea, followed by gradual restoration of respiration
- **C.** Rapid, shallow respiration
- **D.** None of the above

**Q100. A decrease in pulmonary ventilation, which occurs due to causes, other than decrease in arterial H+ concentration is:**
- **A.** Respiratory alkalosis
- **B.** Respiratory acidosis
- **C.** Metabolic acidosis
- **D.** Metabolic alkalosis

**Q101. During adolescence, the shape of thoracic cavity is:**
- **A.** Circular
- **B.** Elliptical
- **C.** The transverse diameter of the chest wall, is greater than the antero-posterior diameter
- **D.** None of the above

**Q102. The followings are true about the external intercostal muscles, *except*:**
- **A.** There are 11 intercostal muscles on each side of sternum
- **B.** The external intercostal muscles are thicker than the internal intercostal muscle
- **C.** The external intercostal muscles are innervated by the intercostal nerves
- **D.** The contraction of external intercostal muscles, reduces the volume of the thoracic cavity

**Q103. The followings about the action of erector spine is true during respiration, *except*:**
- **A.** During forced inspiration, erector spine extends the spine
- **B.** The extension of the vertebral column, permits greater elevation of the ribs during inspiration
- **C.** Erector spine along with other back muscles, contract to stabilize the vertebral column
- **D.** The stabilization of the vertebral column, produced by erector spine, enables the accessory respiratory muscles, to assist expiration, through reverse action

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**Q104. The followings are true about forced expiration, *except*:**
- **A.** During forced expiration, interosseous portion of the internal intercostal muscles and abdominals contract to force air out of lungs
- **B.** Forced expiration is slow and prolonged during cough
- **C.** In patients with COPD, forced expiration is slow and prolonged
- **D.** During forced expiration, trunk flexes to compress the lungs for forcing air out

**Q105. The followings about right main stem bronchus is true, *except*:**
- **A.** The right main stem bronchus is an extension of trachea
- **B.** The right mainstem bronchus is narrower than left main stem bronchus
- **C.** The right main stem bronchus is shorter than left main stem bronchus
- **D.** The right main stem bronchus is vertical than left main stem bronchus

**Q106. The number of bronchopulmonary segments in right lung are:**
- **A.** 8
- **B.** 9
- **C.** 10
- **D.** 11

**Q107. The followings are true about Hering–Breur reflex, *except*:**
- **A.** Distention of the lungs causes a decrease in frequency of inspiration
- **B.** Distention of the lungs decreases expiratory time
- **C.** Receptors for this reflex, lie in the smooth muscles of airways from the trachea to bronchioles
- **D.** More than 800 mL of long volume above the functional residual capacity are needed to activate the reflex

**Q108. The surface markings of heart include all, *except*:**
- **A.** On the right, the heart extends from the third to sixth costal cartilage, at a distance of 10–15 mm from the sternum
- **B.** On the left, the heart extends from the second costal cartilage to the fifth intercostal space, 12–15 mm and 9 cm from the left sternal border respectively
- **C.** The heart is rotated to right in the chest
- **D.** The right side of heart is fore most

**Q109. The followings about stable angina are true, *except*:**
- **A.** Stable angina generally occurs during physical effort
- **B.** Stable angina pain is substernal
- **C.** Stable angina pain radiates to left upper limb
- **D.** Stable angina pain lasts for 5–15 minutes after the individual is freed from stress

**Q110. The followings about unstable angina are true, *except*:**
- **A.** Unstable angina occurs during physical exertion/psychological stress
- **B.** In unstable angina, pain episodes are more frequent
- **C.** In unstable angina, the duration of pain is usually less than 15 minutes
- **D.** Individuals with unstable angina, are at increased risk of myocardial infarction

**Q111. The followings are obstructive lung diseases, *except*:**
- **A.** Chronic bronchitis
- **B.** Emphysema
- **C.** Pneumonia
- **D.** Bronchiectasis

**Q112. A patient with pulmonary disease, reports with pulmonary function test results of,increased residual volume, normal vital capacity and decreased FEV1. The diagnosis is:**
- **A.** Restrictive lung disease
- **B.** Obstructive lung disease
- **C.** Pulmonary arrest
- **D.** None of the above

**Q113. A patient with pulmonary disease, reports with pulmonary function test results of decreased residual volume, reduced vital capacity and total lung capacity and normal FEV1. The diagnosis is:**
- **A.** Restrictive lung disease
- **B.** Obstructive lung disease
- **C.** Pulmonary arrest
- **D.** None of the above

**Q114. The followings about chronic bronchitis are true, *except*:**
- **A.** It is associated with chronic swelling and inflammation of the bronchi and bronchioles
- **B.** Diagnosis is based on report of cough producing sputum on most days for 3 months, for 2 consecutive years
- **C.** It results from long-term irritation of tracheobronchial tree
- **D.** Smoking is not the most common cause of this condition

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**Q115. Abnormal and permanent enlargement and destruction of airways, distal to the terminal bronchioles is:**
- **A.** Bronchitis
- **B.** Bronchiectasis
- **C.** Emphysema
- **D.** Asthma

**Q116. Abnormal dilatation of the medium sized bronchi and bronchioles occur in:**
- **A.** Bronchitis
- **B.** Bronchiectasis
- **C.** Emphysema
- **D.** Asthma

**Q117. In digital clubbing, there occurs:**
- **A.** Increased angle between the nail bed and the DIP joint
- **B.** Loss of angle between the nail bed and the DIP joint
- **C.** Both A and B
- **D.** None of the above

**Q118. The followings about jugular venous pressure are true, *except*:**
- **A.** Jugular venous pressure, provides prognostic information in patients with heart failure
- **B.** Jugular veins empty into the superior vena cava, and reflect left sided heart function
- **C.** Jugular venous distention can be best seen, when the patient lies with head and neck flexed to an angle of 45°
- **D.** Normal jugular venous pressure is 6–8 cm $H_2O$

**Q119. The chest deformity in which the sternum and ribs protrude anteriorly is called:**
- **A.** Pectus excavatum (funnel chest)
- **B.** Pectus carinatum (pigeon chest)
- **C.** Barrel chest
- **D.** None of the above

**Q120. The chest deformity, in which the lower sternum is depressed, making the anterior chest wall concave is:**
- **A.** Pectus excavatum (funnel chest)
- **B.** Pectus carinatum (pigeon chest)
- **C.** Barrel chest
- **D.** None of the above

**Q121. The deformity of chest wall, in which the rib cage remains expanded, due to hyperinflation of lungs is:**
- **A.** Pectus excavatum (funnel chest)
- **B.** Pectus carinatum (pigeon chest)
- **C.** Barrel chest
- **D.** None of the above

**Q122. Hoover's sign is a feature of:**
- **A.** Obstructive airways disease
- **B.** Restrictive airways disease
- **C.** Both A and B
- **D.** None of the above

**Q123. Pursed lip breathing refers to:**
- **A.** An abnormal breathing pattern, characterized by complete irregularity of breathing
- **B.** Breathing in COPD, performed to keep the airways open
- **C.** Deep rapid breathing, performed as an attempt to remove carbon dioxide
- **D.** An abnormal breathing pattern, with prolonged inspiratory time and short expiratory time

**Q124. The breathing technique, taught to a patient with high cervical cord injury, where diaphragm is paralyzed is:**
- **A.** Pursed lip breathing
- **B.** Glossopharyngeal breathing
- **C.** Air shift maneuver
- **D.** Costal breathing

**Q125. The breathing technique followed, for a person with paradoxical breathing is:**
- **A.** Pursed lip breathing
- **B.** Glossopharyngeal breathing
- **C.** Air shift maneuver
- **D.** Costal breathing

**Q126. The breathing pattern, where the chest and abdominal wall moves inwards, rather than outwards, during inspiration is called:**
- **A.** Cheyne–Stokes respiration
- **B.** Paradoxical breathing
- **C.** Kussmaul's respiration
- **D.** Apneustic breathing

**Q127. Cheyne–Stokes respiration refers to:**
- **A.** The breathing pattern, where the chest and abdominal wall moves inwards, rather than outwards, during inspiration
- **B.** An abnormal breathing pattern, characterized by progressively deeper and sometimes faster breathing, followed by gradual decrease, that result in temporary stop of breathing
- **C.** An abnormal breathing pattern, with prolonged inspiratory time and short expiratory time
- **D.** An abnormal breathing pattern, characterized by complete irregularity of breathing

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**Q128. The sputum, that looks frothy pink, could be due to:**
- **A.** Tuberculosis
- **B.** Severe pulmonary edema
- **C.** Infection
- **D.** Pneumonia

**Q129. Yellowish green sputum is a feature of:**
- **A.** Pulmonary edema
- **B.** Cystic fibrosis.'
- **C.** Chronic allergic bronchitis
- **D.** Asthma

**Q130. The followings are adventitious breath sounds, *except*:**
- **A.** Crackles
- **B.** Wheezes
- **C.** Stridor
- **D.** Vesicular sound

**Q131. The followings are features of bronchial breath sound, *except*:**
- **A.** It is harsh/hollow and tubular in quality
- **B.** It is felt near trachea/larynx
- **C.** It is felt more during expiration than inspiration
- **D.** It has low pitch

**Q132. The followings are features of vesicular breath sound, *except*:**
- **A.** It has low pitch
- **B.** It is the rustling like sound of wind in tree
- **C.** It is felt more during inspiration, than expiration
- **D.** It is felt over trachea/larynx

**Q133. The followings are true about rhonchi/wheeze, *except*:**
- **A.** It is the coarse rattling sound
- **B.** It is the short, high pitched, intermittently crackling sound
- **C.** Broncho spasm in the small airways, produces this sound
- **D.** The most common cause of recurrent wheeze is asthma

**Q134. Grating, creaky sound that is nonmusical and resembles the sound made by walking on fresh snow, is a feature of:**
- **A.** Crackles
- **B.** Rhonchi
- **C.** Pleural rub
- **D.** Stridor

**Q135. The followings are true about vocal resonance test, *except*:**
- **A.** It is a test for assessment of density of lung tissue
- **B.** It is performed by auscultating the chest and asking the patient to speak
- **C.** Increased vocal resonance suggests decreased density of lung tissue
- **D.** Reduced vocal resonance suggests, increase in the amount of air present in the lungs

**Q136. The followings are true about murmurs in heart, *except*:**
- **A.** Murmurs are produced in the heart, due to turbulent flow of blood
- **B.** They are usually heard as rattling sound
- **C.** Stenosis of mitral valve produces a low frequency, soft, rumbling murmur
- **D.** Regurgitation through the mitral valve, produces the pansystolic murmur

**Q137. Systolic ejection murmur is a feature of:**
- **A.** Stenosis of mitral valve
- **B.** Stenosis of aortic valve
- **C.** Regurgitation through mitral valve
- **D.** Regurgitation through the aortic valve

**Q138. A loud pansystolic murmur is a feature of:**
- **A.** Stenosis of mitral valve
- **B.** Stenosis of aortic valve
- **C.** Regurgitation through mitral valve
- **D.** Regurgitation through the aortic valve

**Q139. A low frequency soft-rumbling murmur is a feature of:**
- **A.** Stenosis of mitral valve
- **B.** Stenosis of aortic valve
- **C.** Regurgitation through mitral valve
- **D.** Regurgitation through the aortic valve

**Q140. The followings about second heart sound are true, *except*:**
- **A.** It sounds like Dubb
- **B.** It indicates simultaneous closure of aortic and pulmonary valves
- **C.** A wide and split second heart sound is found in ASD
- **D.** It is found by auscultating over the 5th inter-costal space on mid clavicular line on left side of heart

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**Q141. The followings about first heart sound are true, *except*:**
- **A.** It sounds like lubb
- **B.** It indicates closure of mitral and tricuspid valves
- **C.** A split first heart sound indicates delayed closure of tricuspid valve
- **D.** It is felt on the base of heart at the 2nd intercostal space in the right side

**Q142. The followings about 3rd heart sound are true, *except*:**
- **A.** This is a rare sound, called protodiastolic gallop or Kentucky gallop
- **B.** It is considered as early sign of congestive heart failure
- **C.** It occurs at beginning of diastole after second heart sound
- **D.** The 3rd heart sound is best heard at the apex of heart with the patient in left side lying and holding his/her breath

**Q143. The followings are true about the 4th heart sound, *except*:**
- **A.** It sounds like ta-lub-dub
- **B.** It is a sign of left ventricular hypertrophy
- **C.** It is heard in pulmonary stenosis
- **D.** It is heard at the base of heart, i.e., the 2nd intercostal space in the right side

**Q144. The pH of arterial blood in normal state is:**
- **A.** 6.8–7.0
- **B.** 7.0–7.2
- **C.** 7.38–7.42
- **D.** None of the above

**Q145. Normal partial pressure of oxygen in arterial blood is:**
- **A.** 50–60 mm Hg
- **B.** 60–75 mm Hg
- **C.** 75–100 mm Hg
- **D.** 100–125 mm Hg

**Q146. The maneuver used to overcome inability to breath, due to blockage in the throat is called.**
- **A.** Chest clapping
- **B.** Chest vibration
- **C.** Chest shaking
- **D.** Heimlich maneuver

**Q147. The followings about invasive ventilator are true, *except*:**
- **A.** It is the use of breathing support, administered through the face mask
- **B.** It is the positive pressure ventilation applied through endotracheal tube/tracheostomy tube
- **C.** It is applicable to patients who can not breath spontaneously or from an oxygen cylinder
- **D.** It is applicable to patients treated in ACU

**Q148. Nebulization therapy helps to:**
- **A.** Stimulate ventilation
- **B.** Stimulate blood flow to the lungs
- **C.** Liquify and loosen secretion in the lungs
- **D.** None of the above

**Q149. The followings are the benefits of pulmonary rehabilitation, *except*:**
- **A.** Pulmonary rehabilitation reduces COPD symptoms and perceived intensity of breathlessness
- **B.** Pulmonary rehabilitation can be started in hospital, out patient clinic and at patient's home
- **C.** Pulmonary rehabilitation is delivered in ACU
- **D.** Pulmonary rehabilitation reduces periods of hospitalization

**Q150. The followings are true about pulmonary rehabilitation, *except*:**
- **A.** Pulmonary rehabilitation is specific to the individual patient
- **B.** The program benefits patients with lung disease, such as COPD, Sarcoidosis, pulmonary fibrosis etc.
- **C.** It can be delivered to patients with congestive heart failure
- **D.** The family of the patient is also involved in pulmonary rehabilitation

**Q151. The components of pulmonary rehabilitation include all, *except*:**
- **A.** Medical management
- **B.** Surgical management
- **C.** Chest secretion clearance techniques
- **D.** Exercise testing and training

**Q152. Warm up exercises before intensive therapy should consist of:**
- **A.** 20–30 minutes of high intensity exercises
- **B.** 20–30 minutes of low intensity exercises
- **C.** 5–10 minutes of high intensity exercises
- **D.** 5–10 minutes of low intensity exercises

**Q153. The followings are indications for cardiac rehabilitation, *except*:**
- **A.** Postcoronary artery bypass grafting through open heart surgery
- **B.** Valve replacement and repair
- **C.** Acute myocardial infarction
- **D.** Post myocardial infarction

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**Q154. Which of the followings is a relative contra-indications for cardiac rehabilitation?**
- **A.** Heart transplantation
- **B.** Unstable cardiac arrhythmia
- **C.** Acute pulmonary infarction
- **D.** Severe hypertension (200/110 mm Hg or more)

**Q155. Which of the following is a contraindication for postural drainage?**
- **A.** Chronic bronchitis
- **B.** Bronchiectasis
- **C.** Cystic fibrosis
- **D.** Empyema

**Q156. The followings are sub-maximal exercise tests, *except*:**
- **A.** The Astrand–Rhyming Cycle ergometer test
- **B.** 6 minutes walk test
- **C.** Step test
- **D.** Graded exercise test

**Q157. The followings about cardio pulmonary exercise test (CPET)/symptom limited treadmill or cycle ergometer tests are true, *except*:**
- **A.** It is a stress test, that examines how well the heart and lung muscles work
- **B.** This is a provocative test, that combines standard methods of ECG, and indices of gas exchange
- **C.** This test monitors the individuals heart and lung functions during a steadily decreasing work load
- **D.** This test is recommended when dyspnea can not be explained by simpler tests

**Q158. The followings about 6 minutes walk test are true, *except*:**
- **A.** The 6-minute walk test provides information regarding functional capacity and prognosis for chronic cardiopulmonary conditions
- **B.** The 6 minute walk test is performed on a straight 30 meter track
- **C.** The subject is asked to walk as far as possible for 6 minutes
- **D.** The total distance covered is combined with ECG monitoring, and indices of gas exchange to monitor the patients performance

**Q159. The intensity of exercise for cardiac rehabilitation can be determined from:**
- **A.** Maximum oxygen consumption ($VO_2$ max)
- **B.** Target heart rate
- **C.** Rate of perceived exertion (RPE)
- **D.** All of the above

**Q160. Which of the followings is considered as intensity of exercise for cardiac rehabilitation?**
- **A.** $VO_2$ max
- **B.** Rate of perceived exertion (RPE)
- **C.** Exercise heart rate
- **D.** All of the above

**Q161. The maximum heart rate for establishing the target heart for exercise prescription for cardiac patient is determined from:**
- **A.** 220-age of the patient
- **B.** An exercise tolerance test
- **C.** Age predicted rate
- **D.** None of the above

**Q162. Target heart rate range (THRR) for exercise prescription can be calculated by:**
- **A.** Karvonen's formula
- **B.** Adding percentage (45–85%) of Target heart rate range (THRR) to resting heart rate
- **C.** Both A and B
- **D.** None of the above

**Q163. A level of perceived exertion of "somewhat hard" in Borg rating scale of perceived exertion is rated:**
- **A.** 11
- **B.** 13
- **C.** 17
- **D.** 19

**Q164. SF-36 survey is implicated for:**
- **A.** Determination of exercise capacity
- **B.** Determination of maximum heart rate
- **C.** Determination of maximum oxygen consumption
- **D.** Measurement of health related quality of life

**Q165. The in-patient phase of cardiac rehabilitation is:**
- **A.** Phase-A
- **B.** Phase-B
- **C.** Phase-C
- **D.** Phase-D

**Q166. The physician supervised exercise program, taking place in an out patient setting is:**
- **A.** Phase-I cardiac rehabilitation
- **B.** Phase-II cardiac rehabilitation
- **C.** Phase-III cardiac rehabilitation
- **D.** Phase-IV cardiac rehabilitation

**Q167. The maintenance phase of cardiac rehabilitation, occurring at cardiac rehabilitation center or**

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**at home, once the patient has left the hospital is:**
- **A.** Phase-I cardiac rehabilitation
- **B.** Phase-II cardiac rehabilitation
- **C.** Phase-III cardiac rehabilitation
- **D.** Phase-IV cardiac rehabilitation

**Q168. The long-term maintenance phase of cardiac rehabilitation occurring in a cardiac rehabilitation center or local leisure center is:**
- **A.** Phase-I cardiac rehabilitation
- **B.** Phase-II cardiac rehabilitation
- **C.** Phase-III cardiac rehabilitation
- **D.** Phase-IV cardiac rehabilitation

**Q169. Phase-IV, pulmonary rehabilitation involves:**
- **A.** Rehabilitation care for the postsurgical or medical patient on day-0: discharge
- **B.** Postacute episode or discharge, that include exercise re-test, pulmonary hygiene and life style recommendations
- **C.** Postcompletion of out patient pulmonary rehabilitation program, revision of life style recommendations
- **D.** Life-long commitment to behavior and life style changes

**Q170. Basic airway skills used to ventilate a patient include all, *except*:**
- **A.** Neck flexion
- **B.** Mouth to mouth ventilation
- **C.** Mouth to nose ventilation
- **D.** Bag-mask ventilation

**Q171. The Basic life support approach includes all, *except*:**
- **A.** Early CPR
- **B.** Basic airway management
- **C.** Defibrillation
- **D.** Advanced airway techniques

**Q172. The followings are true about high quality CPR, *except*:**
- **A.** The chest should be compressed hard and fast at least 5 cm
- **B.** The rate of chest compression is 70–80 per minute
- **C.** The compression–ventilation ratio is 30:2, if no advanced air way is available
- **D.** The chest should be allowed to completely recoil after each compression

**Q173. If the pulmonary function test results reveal decreased total lung capacity (TLC), decreased vital capacity (VC), decreased residual volume (RV), increased FEV1/FVC ratio, and normal maximum inspiratory pressure (MIP), the correct diagnosis will be:**
- **A.** Idiopathic pulmonary fibrosis
- **B.** Bronchial Asthma
- **C.** Chronic obstructive pulmonary disease (COPD)
- **D.** Bronchiectasis

**Q174. The pathological changes in patients with chronic obstructive airways disease include all, *except*:**
- **A.** Severe reduction in airflow rates
- **B.** Significant mismatch of ventilation-Perfusion (V/Q ratio)
- **C.** Work of breathing is significantly decreased
- **D.** Flattening of diaphragm and altered geometry of respiratory muscles, which is a disadvantage in the mechanical function of the muscles

**Q175. Which of the followings is false for functional residual capacity (FRC)?**
- **A.** During exercise FRC is reduced
- **B.** It reduces the work of breathing by maintaining an open lung with a liquid-gas interphase
- **C.** FRC is increased for asthmatic patients
- **D.** Positive end expiratory pressure decreases FRC

**Q176. The followings are absolute contraindications for use of noninvasive ventilation (NIV), *except*:**
- **A.** Need for immediate endotracheal intubation
- **B.** Decreased consciousness level
- **C.** Severe hypoxia and/or hypercapnia
- **D.** Risk of aspiration, due to excess respiratory secretions

**Q177. Which of the followings best correlate with severe Asthma?**
- **A.** Audible wheeze
- **B.** Peak expiratory flow rate <40% of predicted
- **C.** Respiratory rate >40 per minute
- **D.** Heart rate of >120 bpm

**Q178. A patient's blood oxygen saturation $SpO_2$ drops to 87% on room rehabilitation. What is the most appropriate immediate action?**
- **A.** Continue with the planned exercise session
- **B.** Stop activity, have the patient rest and inform ICU staff
- **C.** Ask the patient to perform deep breathing
- **D.** Document the reading, later

**Q179. Which of the following findings, best describe ICU acquired weakness?**
- **A.** Localized weakness of limb
- **B.** Acute onset of neurological deficit

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**C.** Generalized, predominantly proximal and distal weakness in patients with severe sepsis or on mechanical ventilation
**D.** Weakness caused only by spinal cord injury

**Q180. When conducting rehabilitation with the patient on mechanical ventilation, the best indicator of the patients tolerance to activity is:**
**A.** The patient's pain score
**B.** Stable HR, BP and $SpO_2$ level
**C.** The total amount of time spent out of bed
**D.** The setting of the positive end expiratory pressure

**Q181. During CPR, if no advanced Airways are in place, the compression to ventilation ratio is:**
**A.** 15:2
**B.** 30:2
**C.** 5:1
**D.** 10:1

**Q182. Which of the followings is not a strategy to reduce elevated intra-cranial pressure?**
**A.** Head elevation
**B.** Mannitol administration
**C.** Active chest percussion
**D.** Hyperventilation

**Q183. Hyperbaric oxygen is indicated by FDA, in the following situations, *except*:**
**A.** Decompression sickness
**B.** Ischemic skin grafts
**C.** Early radiation injury
**D.** Burns

**Q184. After open tracheostomy, for the first time tracheostomy tube is removed after:**
**A.** 7days
**B.** 10 days
**C.** 12 days
**D.** 14 days

**Q185. The feature that differentiates between ventilator associated pneumonia(VAP) and ventilator associated tracheobronchitis (VAT) is:**
**A.** Purulent secretions after 48 hours of intubation
**B.** Fever (>38.5 degree centigrade) or hypothermia (<36 degree centigrade)
**C.** Leucocytosis
**D.** Presence of pulmonary infiltrates

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## Answers with References

**1. C. 300 g**

The weight of the human heart is about 300 g, containing 4 chambers. Two thin walled atria are separated by each other, by an interatrial septum. The two thick walled ventricles are separated from each other by interventricular septum.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-34/p. 287.

**2. B. 2nd heart sound**

The closure of semilunar valves produces 2nd heart sound, whereas closure A-V valves produces first heart sound. The 3rd heart sound is produced by the rapid filling phase of the ventricles, during ventricular diastole. The 4th heart sound is produced due to atrial systole.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-34/pp. 288, 298.

**3. C. It determines the rate which the heart beats**

The cells of SA node are highly vascular, and consists of thin elongated muscle fibers, rich in glycogen and mitochondria, called pacemaker cells. These fibers normally can generate and discharge impulses more rapidly, than any other pacemaker tissue, and their rate of discharge determines, the rate at which heart beats. That is why, SA node is called the cardiac pacemaker.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-34/p. 289.

**4. B. Left ventricle does more work, to propel the blood, compared to the right ventricle**

The left ventricle, supplies the systemic circuit via aorta. As the systemic arteries offer greater resistance, to blood flow, left ventricle has to do larger amount of work, compared to right ventricle. Therefore left ventricle wall becomes thicker than right ventricle. The thickness left ventricle wall to right ventricle wall is 3:1, hence left ventricle has more mass, compared to right ventricle.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-34/p. 287.

**5. C. 70–80 mL**

The amount of blood ejected by each ventricle per stroke at rest is 70–80 mL. This is called normal stroke volume.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-36/p. 294.

**6. B. Ventricular depolarization**

ECG is the record of electrical changes generated with each heart beat. The waves associated with electrical activity of the heart during each cardiac cycle are represented by letter P, Q, R, S and T. The P wave is due to atrial depolarization and precedes atrial systole. The QRS complex, are due to ventricular depolarization, which precedes ventricular systole. The T wave is due to ventricular repolarization, which coincides with closure of semilunar valves.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 302.

**7. C. 0.08–0.12 sec**

The QRS complex of ECG, extends from the beginning of Q-wave to the end of S-wave, with 0.08–0.12 sec duration and amplitude of 1.5–2 millivolt. If the duration is more than 0.12 sec, it indicates heart block.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**8. A. It is produced due to closure of atrioventricular valves**

The second heart sound is produced due to closure of semilunar valves. It has high pitch and sounds like syllable DUP. It is heard over pulmonary area (2nd intercostal space on the left) and aortic area (2nd intercostal space on the right).

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. Delhi: Arya Publishing House; Ch-36/p. 298.

**9. B. It has high pitch**

The first heart sound is produced due to closure of atrioventricular valves. It has low pitch and sounds like the syllable LUBB. It is best heard in the mitral area (left 5th intercostal space internal to mid clavicular line) and tricuspid area (left 5th intercostal space, near to sternal border).

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-36/p. 298.

**10. B. The damage to heart is reversible**

Myocardial infarction is an irreversible damage to myocardium. Prolonged ischemia to myocardium causes death of myocardial cells leading to aseptic necrosis of myocardium. As the myocardial cells die, they leak enzymes into the circulation, causing raised level of enzymes such as MB isomer of

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creatine kinase, Troponin T and I, Lipoprotein (a). In ECG, there is abnormal elevation of ST segment in the leads overlying the area of infarct, and depression of ST segment in the reciprocal leads.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37, p. 314.

**11. B. Amylase**

The enzymes most commonly measured in myocardial infarction are MB isomer of creatine kinase, Troponin T & I, Lipoprotein (a). However, serum amylase is measured to diagnose acute pancreatitis.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-43/p. 379.

**12. D. The pain persists for hours**

Pain due to angina pectoris is substernal, which radiates to inner border of left arm. The pain which is hot, pressing and constricting lasts only for a few minutes, which increases by cold and after meals. It is the cry of the dying myocardium.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 314.

**13. D. It is the aseptic necrosis of the myocardium**

Angina pectoris is the cry of the dying myocardial fibers, which is reversible damage to myocardium. This is produced by transient occlusion of coronaries supplying the myocardium. However, myocardial infarction is the aseptic necrosis of the myocardium.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 314.

**14. C. It is due to ventricular depolarization**

The P wave of ECG, which has a duration of 0.1 ms, and amplitude of 0.5 mV, is the 1st wave of ECG, that, represent atrial depolarization.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 302.

**15. B. P-R segment**

In ECG, following P-wave, there is a brief isoelectric period of 0.04 sec, called P-R segment. This is a period of conduction pause at A-V node.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 302.

**16. B. Beginning of P-wave and beginning of the QRS complex**

The P-R interval in an ECG, is measured by finding the interval between, beginning of P-wave and beginning of the QRS complex.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 302.

**17. B. The P-R interval to increase**

A decrease of velocity of impulse conduction, through A-V node will usually cause the P-R interval to increase.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 302.

**18. B. Depolarization of interventricular septum**

The Q-wave in ECG is due to depolarization of interventricular septum. The Q wave, may not always be visible in ECG.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**19. B. Excitation of interventricular apex and major portion of both ventricles**

The R-wave in ECG represents excitation of interventricular apex and major portion of both ventricles, whereas the S-wave represents excitation of more basal part of the ventricles.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**20. D. Both B and C**

S-T segment in ECG, represents the isoelectric period from end of S-wave to beginning of T-wave. It measures the time from the end of ventricular depolarization to start of ventricular repolarization.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**21. B. Ventricular repolarization**

The T wave in ECG, represents, ventricular repolarization. The end of T-wave, coincides with the closure of the semilunar valves.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**22. C. Both A and B**

The interval from beginning of Q wave to end of T wave, that represents ventricular depolarization and repolarization, is the Q-T interval. Its normal duration is 0.40–0.43 sec.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 303.

**23. A. It has a gradual onset and decline**

If tachycardia appears and decline abruptly, it is called paroxysmal tachycardia.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 311.

**24. A. Normal P wave**

In atrial fibrillation, there is absence of P-wave and T wave and irregular QRS complex.

*Ref*: Jain AK. Textbook of Physiology. Vol 1. 5th ed. New Delhi: Arya Publishing House; Ch-37/p. 311.

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