MODEL QUESTION PAPER

SUBJECT – PHYSICS (H)

B.Sc. IST PART

PAPER -1

Q 1. The length Contraction –

(A) Predicts that the length of an object approaches zero as its speed approaches the speed of light in vacuum.

(B) Predicts that there is no change in the length of an object when its speed approaches the speed of light in vacuum.

(C) Predicts that the length of an object reduces to half when its speed approaches the speed of light in vacuum .

(D) Predicts that the length of an object is directly proportional to its velocity.

Q 2. Lorentz Transformation assume –

(A) Space and time both are relative.

(B) Space is relative but time is absolute.

(C) Space is absolute but time is relative

(D) Space and time both are absolute.

Q 3. Possible Longitudinal normal modes of the linear symmetric triatomic molecule is –

(A) One

(B) Two

(C) Three

(D) Four

Q 4. A particle moving on a very long frictionless wire which rotates with angular velocity about a horizontal axis is an example of –

(A) Rheonomic, Holonomic, Conservative system.

(B) Only conservative.

(C) Only Holonomic & Conservative.

(D) Rheonomic, Non-Holonomic, Conservative system.

Q 5. Scleronomous constraints are –

(A) Independent of time

(B) Dependent on time

(C) Both (A) & (B)

(D) None of these

Q 6. Name the type of constraint that may expressed in the form of an equation relating the co-ordinates of the system and time –

(A) Holonomic

(B) Non-holonomic

(C) Scleronomous

(D) All of these

Q 7. The Lagrangian method of undefined multipliers can be used for the holonomic constraints if –

(A) The force of constraints is required.

(B) It is inconvenient to reduce all the co-ordinates of the system to independent ones.

(C) Both (A) & (B)

(D) None of these.

Q 8. Two particles moving on a space curve and have fixed distance between them have degrees of freedom numbering –

(A) 1

(B) 2

(C) 3

(D) 4

Q 9. The Lagrangian for the Kepler problem is given by $L=\frac{1}{2}\left(\dot{r}^2+r^2\dot{\theta}^2\right)+\frac{\mu}{r}\left(\mu>0\right)$

Where r, θ denote the polar co-ordinates and the mass of the particle is unity. Then –

(A) $P_\theta=2r^2\dot{\theta}$

(B) $P_r=2\dot{r}$

(C) The angular momentum of the particle about the centre of attraction is a constant.

(D) The total energy of the particle is time dependent.

Q 10. An inertial frame is one in which –

(A) Newton's 2nd law of motion is valid.

(B) Newton's 1st law of motion is valid.

(C) Newton's 3rd law of motion is valid.

(D) None of these

Q 11. If the speed of light were 2/3 of its present value, the energy released in a given explosion will be decreased to a factor –

(A) 2/3

(B) 4/9

(C) 5/9

(D) $\sqrt{5/9}$

Q 12. In an electromagnetic field which one of the following remains invariant under Lorentz transformation –

(A) $\vec{E}$ x $\vec{B}$

(B) $\vec{E}$ - $c^2\vec{B}^2$

(C) B^2

(D) E^2

Q 13. Rest mass energy of an electron is 9.1x 10^{-31} kg. The mass equivalent energy of its electron is –

(A) 0.511 ergs
(B) 0.511 J
(C) 0.511 eV
(D) 0.511 MeV

Q 14. Out of the following quantities, pick out one that is invariant under Galilean transformation –

(A) Displacement
(B) Velocity
(C) Force
(D) Momentum

Q 15. Kinetic energy of a relativistic particle of rest mass m_0 is moving with speed v –

(A) $\frac{1}{2}m_0 v^2$

(B) $\frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}}$

(C) $\frac{m_0 c^2}{\sqrt{1-\frac{v^2}{c^2}}} - ¿ \; m_0 c^2$

(D) $\frac{1}{2}m_0(v^2 - c^2)$

Q 16. The total Hamiltonian H is defined as –

(A) H = T + V
(B) H = T – V
(C) H = 2T
(D) None of these

Q 17. Lagrangian L is defined as –

(A) L = T – V
(B) L = T + V
(C) Neither (A) & (B)
(D) None of these

Q 18. The conservation of linear momentum is defined as –

(A) $\frac{\vec{dP}}{dt} = \vec{F} . \vec{v}$

(B) $\frac{\vec{dP}}{dt}=0$

(C) Both (A) & (B)

(D) None of these

Q 19. The angular momentum $\vec{L}$ is defined as –

(A) $\vec{L}=¿\ \vec{r}$ x $\vec{v}$

(B) $\vec{L}=¿\ \vec{r}$ x $\vec{p}$

(C) $\vec{L}=¿\ \vec{r}$. $\vec{p}$

(D) $\vec{L}=¿\ \vec{r}$. $\vec{v}$

Q 20. A constraint relations can be made independent of velocity is called –

(A) Holonomic

(B) Non-holonomic

(C) Bilateral

(D) None of these

Q 21. If constraint relations depend explicitly on time is called –

(A) Holonomic

(B) Non-holonomic

(C) Rheonomic

(D) None of these

Q 22. To describe the configuration of a system, we select the possible number of variables are called –

(A) Freedom of moment

(B) Generalised co-ordinates

(C) Both (A) & (B)

(D) None of these

Q 23. The form of Lagrange's equation remains same, even if the system is –

(A) Conservative

(B) Non-conservative

(C) Neither (A) & (B)

(D) None of these

Q 24. Lagrangian L for linear harmonic oscillator is defined as –

(A) $L=\frac{1}{2}m\dot{x}^2$

(B) $L=\frac{1}{2}m\dot{x}^2-\frac{1}{2}kx^2$

(C) $L=\frac{dk}{dx}$

(D) None of these

Q 25. In a simple pendulum, the kinetic energy T of the pendulum is defined as –

(A) $T=\frac{1}{2}mv^2$

(B) $T=\frac{1}{2}m\dot{\theta}^2$

(C) $T=\frac{1}{2}L^2\dot{\theta}^2$

(D) None of these

Q 26. Lagrangian of a system doesnot contain a particular co-ordinate q_k , then obviously for such a system $\frac{dL}{dq_k}=0$. Such a co-ordinate is referred as –

(A) Cyclic
(B) Non- cyclic
(C) Both (A) & (B)
(D) None of these

Q 27. If any function representing a property of the system does not change under some operation carried out on the system, the system is said to possess –

(A) Symmetric
(B) Anti-symmetric
(C) Isotropic
(D) None of these

Q 28. Lagrangian approach is superior than Newtonian approach because in this approach t they put emphasis on –

(A) Energy
(B) Energy & work
(C) Energy & Force
(D) None of these

Q 29. In case of phase space, the degree of freedom contributes –

(A) Only position co-ordinates
(B) Only momentum co-ordinates
(C) Both (A) & (B)
(D) Neither (A) & (B)

Q 30. In case of Kepler's law of planetary motion, we are interested in –

(A) Circular path
(B) Parabola path
(C) Elliptical path
(D) Hyperbola path

Q 31. In Kepler's law of motion, when E=0 , ε =1 , where E = Energy, ε = eccentricity then the path is –

(A) Parabola
(B) Hyperbola
(C) Elliptic
(D) Circle

Q 32. In Kepler's law, the square of the time period T of revolution is proportional to –

(A) Cube of semi-major axis
(B) Square of semi-major axis
(C) Cube of semi-minor axis
(D) Square of semi-minor axis

Q 33. Kepler's 3^{rd} law is known as –

(A) Law of orbit
(B) Law of area
(C) Law of time period
(D) None of these

Q 34. Kepler's 1^{st} law is known as –

(A) Law of area
(B) Law of orbit
(C) Law of time period
(D) None of these

Q 35. Kepler's 2^{nd} law is known as –

(A) Law of time period
(B) Law of orbit
(C) Law of area
(D) None of these

Q 36. The attractive force under which there is planetary motion, is given by –

(A) Newton's law
(B) Kepler's law
(C) Inverse square law

(D) None of these

Q 37. Semi-major axis is defined as –

(A) 1/3 of maximum diameter
(B) ½ of maximum diameter
(C) 1/3 of minimum diameter
(D) ½ of minimum diameter

Q 38. Semi-minor axis is defined as –

(A) 1/3 of maximum diameter
(B) ½ of maximum diameter
(C) 1/3 of minimum diameter
(D) ½ of minimum diameter

Q 39. The coriolis force is given by –

(A) $2m(\vec{\omega} X \vec{v})$
(B) $-2m(\vec{\omega} X \vec{v})$
(C) $m(\vec{\omega} X \vec{v})$
(D) $-m(\vec{\omega} X \vec{v})$

Q 40. The centrifugal force is given by –

(A) $-m\vec{\omega}(\vec{\omega} X \vec{r})$
(B) $m\vec{\omega}(\vec{\omega} X \vec{r})$
(C) $-m(\vec{\omega} X \vec{r})$
(D) $m(\vec{\omega} X \vec{r})$

Q 41. The maximum value of coriolis force is given by –

(A) $2m\omega v$
(B) $-2m\omega v$
(C) 0
(D) None of these

Q 42. The minimum value of coriolis force is given by –

(A) $2m\omega v$
(B) $-2m\omega v$
(C) 0
(D) None of these

Q 43. The direction of coriolis force is always –

(A) Perpendicular to $\vec{\omega}$ & $\vec{v}$
(B) Parallel to $\vec{\omega}$ & $\vec{v}$
(C) Both (A) & (B)

(D) Neither (A) & (B)

Q 44. In case of minimum value of coriolis force –

(A) $\vec{v}$ & $\vec{\omega}$ are parallel.

(B) $\vec{v}$ & $\vec{\omega}$ are perpendicular.

(C) 0

(D) None of these

Q 45. Gravitational intensity E is defined as –

(A) Negative of potential gradient.

(B) Positive of potential gradient.

(C) 0

(D) None of these

Q 46. When the point r is outside the spherical shell then the gravitational potential V is defined as –

(A) $V = -Gm / r$

(B) $V = Gm / r$

(C) $V = Gm / r^2$

(D) $V = -Gm / r^2$

Q 47. When the point is on the surface of spherical shell of radius a , then the gravitational potential V is given by –

(A) $V = Gm / a$

(B) $V = -Gm / a$

(C) $V = Gm / a^2$

(D) $V = 0$

Q 48. The intensity of the gravitational field inside the spherical shell is –

(A) 0

(B) 1

(C) 2

(D) 3

Q 49. The gravitational field at a point inside the solid sphere is proportional to its –

(A) Distance from the centre

(B) Distance from the surface

(C) Both (A) & (B)

(D) None of these

Q 50. When there is no external torque acting on the system of the particle , then the total angular momentum of the system will be –

(A) Variable

(B) Constant
(C) Both (A) & (B)
(D) None of these

Q 51. The total linear momentum of the system of particles about the centre of mass is –
(A) 1
(B) >1
(C) <1
(D) 0

Q52. The linear momentum of a system of two particles is equal to linear momentum of the –
(A) Centre of mass
(B) Radius
(C) Both (A) & (B)
(D) None of these

Q 53. Reduced mass μ of a body is defined as –
(A) $\mu = \frac{m_1}{m_1 + m_2}$
(B) $\mu = \frac{m_2}{m_1 + m_2}$
(C) $\mu = \frac{m_1 m_2}{m_1 + m_2}$
(D) $\mu = \frac{m_1 + m_2}{m_1 m_2}$

Q 54. The collision is said to be elastic when –
(A) Kinetic energy is conserved
(B) Kinetic energy is not conserved
(C) Potential energy is conserved
(D) Potential energy is not conserved

Q 55. The collision is said to be inelastic when –
(A) Kinetic energy is conserved
(B) Kinetic energy is not conserved
(C) Potential energy is conserved
(D) Potential energy is not conserved

Q 56. The velocity of centre of mass of a system of two particles is given by –
(A) $v_{cm} = \frac{m_1 u_1 + m_2 u_2}{m_1 + m_2}$
(B) $v_{cm} = \frac{m_1 + m_2}{m_1 u_1 + m_2 u_2}$

(C) $v_{cm}=\frac{m_1 u_1}{m_1+m_2}$

(D) $v_{cm}=\frac{m_2 u_2}{m_1+m_2}$

Q 57. After removing the external forces applied on the body, the body regains its original shape & size, is called –

(A) Elastic body
(B) Plastic body
(C) Super elastic body
(D) None of these

Q 58. After withdrawal of the external forces applied on the body, the body does not regains its original shape & size, is called –

(A) Elastic body
(B) Plastic body
(C) Super elastic body
(D) None of these

Q 59. The body whose property is same in all the directions is called –

(A) Isotropic
(B) Anisotropic
(C) Both (A) & (B)
(D) None of these

Q 60. The body which exhibits different property in different directions is called –

(A) Isotropic
(B) Anisotropic
(C) Both (A) & (B)
(D) None of these

Q 61. The restoring force per unit area which comes into play inside the body is called –

(A) Stress
(B) Strain
(C) Torque
(D) None of these

Q 62. The unit of stress is expressed in the unit of –

(A) Velocity
(B) Acceleration

(C) Force
(D) Pressure

Q 63. The unit of strain is expressed in the unit of –
(A) Force
(B) Velocity
(C) Area
(D) None of these

Q 64. Hooke's law is the ratio of –
(A) Strain / Stress
(B) 1 / Stress
(C) Stress / Strain
(D) 1 / Strain

Q 65. Young's modulus is applied in case of –
(A) Length
(B) Volume
(C) Area
(D) None of these

Q 66. Bulk modulus is applied in case of –
(A) Length
(B) Volume
(C) Area
(D) None of these

Q 67. Poisson's ratio is expressed as the ratio of –
(A) Lateral strain / Longitudinal strain
(B) Lateral stress / Longitudinal stress
(C) Lateral strain / Longitudinal stress
(D) Lateral stress / Longitudinal strain

Q 68. Which one of the following is more elastic –
(A) Rubber
(B) Glass
(C) Steel
(D) Wood

Q 69. When a wire is loaded beyond the elastic limit, the point is called –
(A) Stress point
(B) Strain point
(C) Yield point

(D) None of these

Q 70. If a body is continuously subjected to stress & strain, then after it gets –

(A) Elastic
(B) Plastic
(C) Yield point
(D) Fatigue

Q 71. The work done is stored in the body in the form of energy, known as –

(A) Energy of stress
(B) Energy of strain
(C) Energy of fatigue
(D) None of these

Q 72. Relation between Young modulus Y, Bulk modulus K & Poisson's ratio σ is expressed as –

(A) $Y = 3K (1 – \sigma)$
(B) $Y = 3K (1 – 2\sigma)$
(C) $Y = K (1 – 2\sigma)$
(D) $Y = K (1 – \sigma)$

Q 73. Relation between Young modulus Y, modulus of rigidity η & Poisson's ratio σ is expressed as –

(A) $Y = \eta (1 + \sigma)$
(B) $Y = 2 \eta (1 + \sigma)$
(C) $Y = 2 \eta (1 – \sigma)$
(D) $Y = \eta (1 – \sigma)$

Q 74. For homogenous isotropic material, the value of Poisson's ratio must lie between –

(A) – 1 to +1
(B) – 1 to + 0.5
(C) – 0.5 to + 0.5
(D) None of these

Q 75. The twisting couple per unit angular twist of the wire or cylinder is called its –

(A) Modulus of torsion
(B) Modulus of elasticity
(C) Modulus of rigidity
(D) None of these

Q 76. The beam clamped at one end and loaded with other is called –

(A) Restoring couple

(B) Bending couple
(C) Bending of beam
(D) Restoring of beam

Q77. The section of the neutral surface by the plane of bending which is perpendicular to it, is called the –
(A) Parallel axis
(B) Perpendicular axis
(C) Neutral axis
(D) None of these

Q 78. Bending moment may be defined as, the total moment of all the couples arising in a bend beam and trying to resist its deformation caused by –
(A) External couple
(B) Internal couple
(C) Rectangular couple
(D) Cylindrical couple

Q 79. A wire is 0.5 mm long and 1 mm^2 in cross section. Its Young's modulus is 1.24×10^{11} N/m^2 . How much work is done in stretching it through 1 mm?
(A) 0.142 J
(B) 0.124 J
(C) 0.214 ergs
(D) 0.241 ergs

Q 80. The property by virtue of which a liquid opposes relative motion between different layers is called –
(A) Friction
(B) Elasticity
(C) Viscosity
(D) Surface tension

Q 81. Poise is the unit of –
(A) Stress
(B) Strain
(C) Elasticity
(D) Viscosity

Q 82. The line along which the velocity of the liquid does not change with respect to time is

called –

(A) Critical velocity
(B) Streamline velocity
(C) Turbulent velocity
(D) None of these

Q 83. The flow is streamline only as long as the velocity of the liquid does not exceed a particular value, called the –

(A) Streamline velocity
(B) Turbulent velocity
(C) Critical velocity
(D) None of these

Q 84. When the flow of the liquid changes with respect to time is known as –

(A) Streamline velocity
(B) Turbulent velocity
(C) Critical velocity
(D) None of these

Q 85. When the velocity of the flow of the liquid is greater than the critical value, the flow of the liquid is called –

(A) Streamline velocity
(B) Turbulent velocity
(C) Both (A) & (B)
(D) None of these

Q 86. The viscosity of liquid is inversely proportional to –

(A) Mass
(B) Density
(C) Radius
(D) None of these

Q 87. Using Poiseuille's formula, we can calculate the viscosity using –

(A) Circular tube
(B) Rectangular tube
(C) Cylindrical tube
(D) Square tube

Q 88. The viscosity of a liquid decreases with increase of –

(A) Temperature
(B) Pressure

(C) Both (A) & (B)
(D) None of these

Q 89. Water is flowing through a horizontal pipe in streamline flow. At the narrowest part of the pipe –
(A) Velocity is maximum & pressure is minimum
(B) Pressure is maximum & velocity is minimum
(C) Both velocity & pressure is minimum
(D) Both velocity & pressure is maximum

Q 90. The flow of fluid is laminar or streamline is determined by –
(A) Rate of flow of fluid
(B) Density of fluid
(C) Radius of tube
(D) Coefficient of viscosity of fluid

Q 91. Reynold's number is low for –
(A) Low velocity.
(B) Low density.
(C) High velocity.
(D) All of the above.

Q 92. In Bernoulli's theorem which of the following is conserved –
(A) Mass.
(B) Energy.
(C) Linear momentum.
(D) Angular momentum.

Q 93. More liquid rises in a thin tube because of –
(A) Large value of radius.
(B) Smaller value of radius
(C) Large value of surface tension.
(D) Smaller value of surface tension.

Q 94. Viscosity in fluid motion is analogous to –
(A) friction in the motion of solids.
(B) Random motion of gas molecules.
(C) Non uniform motion of solid.
(D) Internal motion.

Q 95. The lift of an aresoplane is based on.
(A) Toricelli's theorem.
(B) Bernoulli's theorem.
(C) Law of gravitation.

(D) Coulomb's law.

Q 96. In an ordinary siphon, the rate of flow of a liquid does not depend on –

(A) Acceleration due to gravity.
(B) Changes in biometric pressure.
(C) Difference of the length of the two column of the siphon.
(D) The area of the cross section of the siphon tube.

Q 97. The rate of flow of liquid through an orifice at the bottom of the tank does not depend on –

(A) Density of the liquid.
(B) The area of cross-section of the orifice.
(C) The height of the liquid above the orifice.
(D) The acceleration due to gravity.

Q 98. The viscous force between two liquid layers is –

(A) Radial.
(B) Normal to the liquid surface.
(C) Tangential to the liquid surface.
(D) Neither purely tangential nor purely normal.

Q 99. A small spherical liquid drop is moving in a viscous medium, the viscous force does not depend on –

(A) The nature of the medium.
(B) The density of the medium.
(C) The instantaneous speed of the spherical drop.
(D) The radius of the spherical drop.

Q 100. The streamline flow of a fluid Bernoulli's theorem states that following remains constant –

(A) $\frac{1}{2}\rho v^2$

(B) $P+\frac{1}{2}\rho v^2$

(C) $P+\frac{1}{2}\rho v^2+\rho gh$

(D) None of these.

Q 101. A fluid of density ρ and viscosity η is flowing through a pipe of radius r with a vel v , then Reynold's no. R is –

(A) $R=\frac{2r\rho v}{\eta}$

(B) $R=\frac{r\rho v}{\eta}$

(C) $R=\frac{r\rho v}{\eta^2}$

(D) $R=\frac{2\eta rv}{\rho}$

Q 102. When there are no external forces, the shape of the liquid drop is determined by –

(A) Surface tension of the liquid.
(B) Density of the liquid.
(C) Viscosity of the liquid.
(D) Temperature of air only.

Q 103. Soap helps in better cleaning of clothes because –

(A) It reduces the surface tension of the solution.
(B) It gives strength to solution.
(C) It absorbs the dirt.
(D) Chemical of soaps change.

Q 104. A drop of liquid of diameter 2.8 mm breaks up into 125 identical drops. The change in energy is nearly [given surface tension of the liquid = 75 dyne/cm] –

(A) zero
(B) 19 ergs
(C) 46 ergs
(D) 74 ergs

Q 105. A liquid does not wet the surface of a solid if the angle of contact is –

(A) Zero
(B) An acute one.
(C) 45^0
(D) An obtuse one.

Q 106. When a soap bubble is charged –

(A) It contracts
(B) It expands
(C) It does not undergo any changes in size
(D) None of these

Q 107. When two capillary tubes of different diameters are dipped vertically, the rose of the liquid is –

(A) Same in both the tubes.
(B) More in tube of larger diameter.
(C) Less in tube of smaller diameter.

(D) More in the tube of smaller diameter

Q 108. With the rise in temperature, the surface tension of liquid –

(A) Increases.
(B) Decreases.
(C) Does not change.
(D) Changes erratically.

Q 109. A soap bubble has a radius r . The surface tension of the soap film is T. The energy needed to double the diameter of the bubble without change of temperature is –

(A) $4\pi r^2T$
(B) $2\pi r^2T$
(C) $12\pi r^2T$
(D) $24\pi r^2T$

Q 110. A liquid drop of radius R is broken up in to N small droplets. The work done is Proportional to –

(A) N
(B) $N^{2/3}$
(C) $N^{1/3}$
(D) N^0

Q 111. Which one of the following represents correctly the variation of surface tension T with temperature θ –

(A) $T \propto \theta$
(B) $T \propto \frac{1}{\theta}$
(C) $T \propto \theta^0$
(D) $T \propto \frac{1}{\theta^2}$

Q 112. When a drop of oil is allowed to touch the surface of water, the drop of oil will –

(A) Retain its spherical surface.
(B) Spread out in a very thin film over the surface.
(C) Spread out in a very then film at the bottom.
(D) Mixed with water.

Q 113. A capillary tube is dipped in a water container so that loss in weight of the capillary tube is –

(A) Equal to the upward buoyant force.
(B) More than the upward buoyant force.
(C) Less than the upward buoyant force.
(D) Half of the buoyant force.

Q 114. Meniscus of mercury in capillary is –
(A) concave.
(B) convex.
(C) plane.
(D) cylindrical.

Q 115. The excess of pressure in a soap bubble of radius R and surface tension T is given by –
(A) $P = 2T / R$
(B) $P = T / R$
(C) $P = 4T / R$
(D) $P = 6T / R$

Q 116. The unit of surface tension is MKS unit is given by –
(A) dyne / cm^2
(B) dyne / cm
(C) Newton / m
(D) Newton / m^2

Q 117. Mercury dos not wet wood, glass and iron. It indicates that if cohesive force is –
(A) Greater than its adhesive force.
(B) Less than its adhesive force.
(C) Equal to its adhesive force.
(D) None of these.

Q 118. A wire 10cm long is placed horizontal on the surface of water and is gently pulled up with a force of 1.8×10^{-2} N to keep the wire in equilibrium, what is the surface tension of water –
(A) 0.09 N/m
(B) 0.80 N/m
(C) 0.60 N/m
(D) 0.50 N/m

Q 119. Calculate the work done in a soap bubble of radius 0.2 m the surface tension of soap solution been 0.06 N/m –
(A) $192\pi \times 10^{-4}$ J

(B) $180\pi \times 10^{-4}$ J
(C) $175\pi \times 10^{-4}$ J
(D) $152\pi \times 10^{-4}$ J

Q 120. Calculate the force required to take away a flat circular plate of radius 2cm from the surface of the water. The surface tension of the water is 70 dyne /cm –
(A) 180π dyne
(B) 280π dyne
(C) 380π dyne
(D) 480π dyne

Q 121. The pressure inside two soap bubbles is 1.01 & 1.02 atm respectively. The ratio of their volume is –
(A) 102:101
(B) 101:102
(C) 8:1
(D) 2:1

Q 122. The surface tension of a soap is T. The work done in blowing a soap bubble of diameter D to that of a diameter 2D is –
(A) $2\pi D^2T$
(B) $4\pi D^2T$
(C) $6\pi D^2T$
(D) $8\pi D^2T$

Q 123. The surface tension of a liquid is T, then increase in its energy on increasing the area of the surface by A is –
(A) AT^{-1}
(B) AT^{-2}
(C) AT
(D) A^2T^2

Q 124. Excess pressure inside a liquid drop of radius R and surface tension T is –
(A) 2T / R
(B) 4T / R
(C) 6T / R
(D) 8T / R

Q 125. Excess pressure inside soap bubble radius R and surface tension T is –
(A) 2T / R
(B) 4T / R

(C) 6T / R
(D) 8T / R

Q 126. The rise of liquid due to surface tension in a narrow capillary tube of diameter d is h. If the diameter is reduced to d/2 , the rise will be –
(A) h
(B) 2h
(C) 3h
(D) 4h

Q 127. When there is no external force, the shape of a small liquid drop is determined by –
(A) Viscosity.
(B) Elasticity .
(C) Surface tension.
(D) None of these .

Q 128. For any system to be in stable equilibrium, the potential energy must be –
(A) Minimum
(B) Maximum
(C) Zero
(D) None of these

Q 129. Surface tension of a pure solvent is less than the surface tension of solution –
(A) True.
(B) False.
(C) Neither true nor false .
(D) None of these.

Q 130. Angle of contact of water in glass capillary is less than 90^0 –
(A) True.
(B) False.
(C) Neither true nor false .
(D) None of these.

Q 131. A water proofing agent changes the angle of contact from an acute angle to an obtuse angle –
(A) True.
(B) False.
(C) Neither true nor false.
(D) None of these.

Q 132. Intermolecular force of attraction varies inversely proportional to 8^{th} power of inter molecular distance –
(A) True.

(B) False.
(C) Neither true nor false.
(D) None of these.

Q 133. Water rises in capillary tube. It is against law of conservation of energy –
(A) True.
(B) False.
(C) Neither true nor false.
(D) None of these.

Q 134. The viscosity of the gas with the rise of temperature –
(A) Increases.
(B) Decreases.
(C) Remains constant.
(D) None of these.

Q 135. The terminal velocity of a ball falling in a viscous liquid is directly proportional to the –
(A) Cube of the radius.
(B) Square of the radius.
(C) Radius.
(D) None of these.

Q 136. Deep water is still because the viscosity of water increases with increase in –
(A) Volume.
(B) Temperature.
(C) Pressure.
(D) None of these.

Q 137. The velocity head of the fluid flowing through a capillary tube in streamline motion is –
(A) $v / 2g$
(B) $v^2 / 2g$
(C) $v^3 / 2g$
(D) None of these

Q 138. A cube of ice is floating in water contained in a vessel, when the ice melts the level of water in the vessel –
(A) Rises

(B) Falls
(C) Remains unchanged.
(D) None of these.

Q 139. A piece of ice with a stone frozen inside it, is floating in water contained in a beaker.When the ice melts, the level of water in the beaker –
(A) Rises
(B) Falls
(C) Remains unchanged.
(D) None of these.

Q 140. The dimensions of Reynolds number are –
(A) $[M^0L^0T^0]$
(B) $[ML^{-1}T^{-1}]$
(C) $[ML^{-1}T^{-2}]$
(D) $[ML^{-2}T^{-2}]$

Q 141. A rectangular tank is filled to the brim with water. When a hole at the bottom is unplugged, the tank is emptied in time T. If the tank is half filled with water, it will be emptied in time –
(A) $\frac{T}{\sqrt{2}}$
(B) $\frac{T}{\sqrt{3}}$
(C) $\frac{T}{2}$
(D) $\frac{T}{2\sqrt{2}}$

Q 142. The height to which liquid rises or falls in a capillary tube is directly proportional to –
(A) Radius of the capillary.
(B) Surface tension of the liquid .
(C) Density of the angle .
(D) The angle of contact.

Q 143. A balloon of mass m contains water of mass M. If it is completely immersed in water, the apparent mass of the balloon with water in it will be –
(A) M + m
(B) M – m
(C) M

(D) m

Q 144. A cylindrical jar has radius r. To what height h should it be filled with a liquid so that the force exerted by the liquid on the sides of the jar equals the force exerted on the bottom –

(A) h = r / 2
(B) h = r
(C) h = 2r
(D) h = 4r

Q 145. If W be the amount of work done in blowing a bubble of volume V, what will be the amount of work done to blow a bubble of 8V –

(A) 2W
(B) 4W
(C) 8W
(D) 16W

Q 146. Which one of the following physical quantities does not have the dimensions of force per unit area –

(A) Stress
(B) Strain
(C) Young's Modulus
(D) Pressure

Q 147. What are the dimensions of stress –

(A) $[MLT^{-2}]$
(B) $[ML^{-1}T^{-2}]$
(C) $[ML^{-2}T^{-1}]$
(D) $[ML^{0}T^{-1}]$

Q 148. Which of the following statement is correct :- When a fluid passes through the narrow part of non- uniform pipe –

(A) Its velocity & pressure both increases.
(B)Its velocity & pressure both decreases.
(C) Its velocity decreases but pressure increases.
(D) Its velocity increases but pressure decreases.

Q 149. The dimensional formula of surface tension is –

(A) $[MLT^{-1}]$
(B) $[MLT^{-2}]$
(C) $[ML^{0}T^{-2}]$
(D) $[ML^{-1}T^{-1}]$

Q 150. Surface tension in a liquid is due to –

(A) Adhesive force between the molecules.
(B) Cohesive force between the molecules.
(C) Gravitational force between the molecules.
(D) Electrical force between the molecules.

Q 151. If the wave is propagating perpendicular to the axis, called –
(A) Longitudinal wave
(B) Transverse wave
(C) Damped wave
(D) Undamped wave

Q 152. If the wave is propagating parallel to its axis, called –
(A) Longitudinal wave
(B) Transverse wave
(C) Damped wave
(D) Undamped wave

Q 153. If a particle repeats their motion between two fixed points in a fixed interval of time is called –
(A) Rotational motion
(B) Translational motion
(C) Simple harmonic motion
(D) None of these

Q 154. If a particle oscillates between two fixed points, but due to some frictional force its motion gradually decreases, such a motion is called –
(A) Simple oscillation
(B) Harmonic oscillation
(C) Damped oscillation
(D) Undamped oscillation

Q 155. During the process of simple harmonic motion, the maximum velocity of the particle is observed at their –
(A) End position
(B) Mean position
(C) Same everywhere
(D) None of these

Q 156. In the equation, $y = a \sin \omega t$, here a is –
(A) Displacement
(B) Velocity
(C) Acceleration
(D) Amplitude

Q 157. In the oscillatory motion, phase represents the –

(A) Position of the particle
(B) Displacement of the particle
(C) Velocity of the particle
(D) None of these

Q 158. Frequency of the particle is inversely proportional to –
(A) Wavelength
(B) Phase
(C) Angle
(D) None of these

Q 159. Timeperiod of the particle is inversely proportional to –
(A) Wavelength
(B) Velocity
(C) Frequency
(D) None of these

Q 160. The equation of a progressive wave –
(A) $y = a\,sin\omega t$
(B) $y = a\sin\frac{2\pi}{\lambda}(vt - x)$
(C) $y = a\sin\frac{2\pi}{\lambda}(vt + x)$
(D) None of these

Q 161. The rate of transmission of energy across unit area of the wavefront is known as –
(A) Velocity
(B) Acceleration
(C) Energy flux
(D) None of these

Q 162. If v is the wave velocity, it means a wave travels the distance v in –
(A) 1 s
(B) 2 s
(C) 3 s
(D) 4 s

Q 163. Energy current is the product of –
(A) Energy density x frequency
(B) Energy density x wave velocity
(C) Energy density x particle velocity
(D) None of these

Q 164. Intensity is defined as the square of –
(A) Phase

(B) Velocity
(C) Amplitude
(D) None of these

Q 165. Loudness of the sound depends on –
(A) Velocity
(B) Acceleration
(C) Density of the medium
(D) None of these

Q 166. Loudness of the sound is measured in –
(A) meter
(B) $meter^2$
(C) decibel
(D) $decibel^2$

Q 167. If a wire vibrates in single mode, then frequency n can be defined as –
(A) $n=\frac{1}{2l}\sqrt{\frac{m}{T}}$
(B) $n=\frac{1}{2l}\sqrt{\frac{T}{m}}$
(C) $n=\sqrt{\frac{m}{T}}$
(D) $n=\sqrt{\frac{T}{m}}$

Q 168. If l & m are constants, the frequency of fundamental note is directly propotional to –
(A) Squareroot of tension
(B) Cuberoot of tension
(C) Squareroot of frequency
(D) Cuberoot of frequency

Q 169. The frequency of the fundamental note varies inversely as –
(A) The length of the wire
(B) The density of the wire
(C) The radius of the wire
(D) None of these

Q 170. Phase velocity & group velocity is related by –
(A) $v_p = a / k$
(B) $v_p = \omega / k$
(C) $v_p = a / \omega$
(D) $v_p = \omega / a$

Q 171. The maximum intensity is observed when the superposition of the waves is –

(A) In phase
(B) Out of phase
(C) Not related with phase
(D) None of these

Q 172. The minimum intensity is observed when the superposition of the waves is –
(A) In phase
(B) Out of phase
(C) Not related with phase
(D) None of these

Q 173. The equation of motion of a damped simple harmonic motion is –
(A) $F = -kx - r\frac{dx}{dt}$
(B) $F = -r\frac{dx}{dt}$
(C) $F = -kx$
(D) None of these

Q 174. If a particle exhibits like a forced harmonic oscillator when an external periodic force applied on it, that force will be –
(A) $F_0 sinPt$
(B) $\frac{F_0 sinPt}{\lambda}$
(C) $\frac{F_0 sinPt}{k}$
(D) None of these

Q 175. If the body vibrates with a constant amplitude and with the same frequency at that of the applied force, such vibrations are called –
(A) Damped vibration
(B) Forced vibration
(C) Free vibration
(D) Undamped vibration

Q 176. Forced amplitude is maximum, when the forced frequency coincides with the –
(A) Natural frequency
(B) Applied frequency
(C) Resonant frequency
(D) None of these

Q 177. The quality factor Q is defined as [where the symbols have their usual meaning] –
(A) $Q = \sqrt{\frac{m}{r}}$

(B) $Q=\sqrt{\frac{km}{\omega r}}$

(C) $Q=\sqrt{\frac{km}{r}}$

(D) None of these

Q 178. The oscillator is free from damping when –

(A) $r \longrightarrow 0$

(B) $r \longrightarrow \infty$

(C) Both (A) & (B)

(D) None of the above

Q 179. The dimensions of force constant is –

(A) $[MLT^{-2}]$

(B) $[MT^{-2}]$

(C) $[M^{-1}T^{-2}]$

(D) $[MT^{-1}]$

Q 180. The unit of force constant is –

(A) N

(B) N / m^2

(C) N / m

(D) N / m^3

Q 181. Damping force is independent of displacement & acceleration, but it depends only upon –

(A) Frequency

(B) Velocity

(C) Phase

(D) All of the above

Q 182. The value of energy decay exponentially in case of –

(A) Forced harmonic motion

(B) Damped harmonic motion

(C) Undamped harmonic motion

(D) All of the above

Q 183. The relaxation time is defined as the time in which the amplitude of the damped oscillation falls to –

(A) 1 / e

(B) $1 / e^2$
(C) $1 / e^3$
(D) 0

Q 184. The quality factor Q is small if the damping co-efficient is –
(A) Large
(B) Small
(C) Very large
(D) Very small

Q 185. At resonance condition, higher the damping, smaller is the –
(A) Phase
(B) Velocity
(C) Amplitude
(D) All of the above

Q 186. The quality factor Q measures the sharpness of –
(A) Frequency
(B) Phase
(C) Resonance
(D) Amplitude

Q 187. The vibration taking place in diaphragm of microphone will be –
(A) Free vibration
(B) Forced vibration
(C) Damped vibration
(D) Electrically maintained vibration

Q 188. Velocity of sound in air –
(A) Decreases with increase in temperature.
(B) Increases with decrease in temperature.
(C) Decreases with decrease in temperature.
(D) Does not depend on temperature.

Q 189. The velocity of sound in air is –
(A) Directly proportional to pressure.
(B) Inversely proportional to pressure.
(C) Directly proportional to square root of pressure.
(D) Independent of pressure.

Q 190. Transverse wave can propagate –
(A) Both in a gas and a metal.
(B) In a gas but not in a metal.
(C) Neither in a gas nor in a metal.

(D) Not in a gas but in a metal.

Q 191. Which of the following is transmitted by a wave –

(A) Amplitude
(B) Velocity
(C) Energy
(D) Energy & Momentum

Q 192. It is possible to distinguish between transverse wave and longitudinal wave by studying the property of –

(A) Polarization
(B) Interference
(C) Diffraction
(D) Deflection

Q 193. Which of the following can be classified as musical sound –

(A) Humming of bees
(B) Chirping of birds
(C) Sound produced by harmonium
(D) All of the above

Q 194. The quality of musical notes depend upon its –

(A) Amplitude
(B) Frequency
(C) Wave velocity
(D) Number of harmonics present in it

Q 195. A supersonic jet produces waves in air, the wavefront is –

(A) Spherical
(B) Elliptical
(C) Conical
(D) Parabolidal

Q 196. Quality of a note changes when changes occur in –

(A) Pitch
(B) Nature of overtones
(C) Loudness
(D) Wavelength

Q 197. Which of the following relation between loudness and intensity is correct?

(A) $I \propto logL$
(B) $I \propto \log L^2$
(C) $L \propto logI$

(D) $L \propto \log I^2$

Q 198. The interior surfaces of walls in a studio should be of _____ materials –

(A) Absorbent
(B) Adsorbent
(C) Reflective
(D) Refractive

Q 199. Rotatable cylinders are provided in the ceiling of a studio in order to obtain variable –

(A) Amplitude
(B) Frequency
(C) Reverberation time
(D) Intensity

Q 200. Which of the following is not an acoustical defect?

(A) Reverberation
(B) Formation of echoes
(C) Sound Foci
(D) Absorption

Q 201. Excessive reverberation is caused due to –

(A) Sufficient absorption
(B) Insufficient absorption
(C) Sufficient adsorption
(D) Insufficient adsorption

Q 202. Sound foci is a defect caused by _____ interior surfaces –

(A) Convex reflecting
(B) Concave reflecting
(C) Convex refracting
(D) Concave refracting

Q 203. The branch of science which deals with origin & propagation of sound is called –

(A) Acoustics
(B) Thermodynamics
(C) Anemology
(D) Optics

Q 204. Which of the following is not a property of good acoustic materials?

(A) They have a low coefficient of absorption
(B) They are comparatively cheap
(C) They are durable

(D) They are efficient over a wide frequency range

Q 205. What are the condition called which are required for a signal to fulfill to be represented as Fourier series –

(A) Dirichlet's conditions
(B) Gibb's Conditions
(C) Fourier's Condition
(D) Fourier's phenomena

Q 206. What are the two types of Fourier series?

(A) Trigonometric & Logarithmic
(B) Exponential & Logarithmic
(C) Trigonometric & exponential
(D) Trigonometric only

Q 207. How is a trigonometry Fourier series represented –

(A) $A_0 + \sum a\cos(\omega_0 ¿ t) + a\sin(\omega_0 t) ¿$
(B) $\sum a\cos(\omega_0 ¿ t) + a\sin(\omega_0 t) ¿$
(C) $A_0 * \sum a\cos(\omega_0 ¿ t) + a\sin(\omega_0 t) ¿$
(D) $A_0 + \sum a\cos(\omega_0 ¿ t) + a\sin(\omega_0 t) + \sin\omega t ¿$

Q 208. How is the exponential fourier series represented –

(A) $X(t) = \sum X_n e^{j\omega t + \omega t}$
(B) $X(t) = \frac{1}{t} \sum X_n e^{j\omega t}$
(C) $X(t) = \sum X_n e^{j\omega t}$
(D) None of these

Q 209. An accelerated frame of reference is called –

(A) Inertial
(B) Non-Inertial
(C) Rotating
(D) All of the above

Q 210. An interial frame of reference is one in which Newton's laws are _____

(A) Valid
(B) Invalid
(C) Both
(D) None

Q 211. The special theory of relativity deals with which frame of references?

(A)Non-inertial
(B) Inertial

(C) Both
(D) None

Q 212. The description of motion of a particle is determined by the –
(A) Observer
(B) Frame of reference
(C) Nature of motion
(D) Velocity of the particle

Q 213. A light from a distant star shows a blue shift. The star is _____
(A) At rest
(B) Moving towards the earth
(C) Moving away from earth
(D) None of these

Q 214. The relativistic mass of the particle :- $m = \frac{m_0}{\sqrt{1-\frac{v^2}{c^2}}}$, which of the following is true?
(A) Increase in mass is due to increase in its potential energy
(B) Increase in mass is equal to increase in its kinetic energy divided by c^2
(C) There is no increase in mass
(D) Mass increases only when v = 0

Q 215. According to relativity, the length of a rod in motion –
(A) Is same as its rest length.
(B) Is more than its rest length.
(C) Is less than its rest length.
(D) None of these.

Q 216. In which of the velocity ranges the velocity of the particle is inversely proportional to the time elapsed?
(A) Newtonian
(B) Relativistic
(C) Ultra relativistic
(D) None of these

Q 217. A Spaceship in space will have –
(A) Clock running slower than the stationary clock by a factor $\sqrt{1-\frac{v^2}{c^2}}$
(B) Its length shrunk is the direction of the relative motion by a factor of $\sqrt{1-\frac{v^2}{c^2}}$

(C) Its mass is increased by a factor $\sqrt{1-\frac{v^2}{c^2}}$

(D) All of the above

Q 218. Which of the following correlates the observation of two observers in different inertial frames?

(A) Only Lorentz transformation

(B) Only Galilean transformation

(C) Both (A) & (B)

(D) Neither (A) nor (B)

Q 219. Who derived the space & time transformation equations to maintain the invariance of Maxwell's Equations of electromagnetism?

(A) Maxwell

(B) Lorentz

(C) Einstein

(D) None of these

Q 220. If x and x' are the co-ordinates of a particle in two frames of references s and s' moving with respect to each other with a velocity v along the x-axis and having the co-ordinate axis parallel to each other, then which of the following is correct?

(A) $x = x'$

(B) $\frac{dx}{dt} = \frac{dx'}{dt'}$

(C) $\frac{d^2x}{dt^2} = \frac{d^2x'}{dt'^2}$

(D) None of the above

Q 221. Einstein's mass-energy relation ($E = mc^2$) shows that –

(A) Mass disappears to reappear as energy

(B) Energy disappears to reappear as mass

(C) Mass &Energy are the two different forms of same entity

(D) All of the above statements are correct

Q 222. Einstein proposed the special theory of relativity in :-

(A) 1900

(B) 1904

(C) 1905

(D) 1916

Q 223. "All the inertial frames are equivalent" – this statement is called the principle of –

(A) Equivalence

(B) Correspondence

(C) Relative Motion

(D) Inertia

Q 224. A reference frame attached to the earth is an –

(A) Inertial frame by definition.

(B) Cannot be an inertial frame because the earth is revolving around the sun.

(C) Is an inertial frame because Newton's laws are applicable in the frame.

(D) Cannot be an inertial frame because the earth is rotating about its own axis.

Q 225. In which of the following frame of reference, the acceleration of the particle is zero?

(A) Inertial

(B) Non-inertial

(C) Cartesian

(D) Non-Cartesian

Q 226. When were the Lorentz transformation equation obtained for the 1^{st} time?

(A) 1905

(B) 1904

(C) 1916

(D) 1900

Q 227. The two photons recede from each other, their relative velocity will be –

(A) C

(B) 2C

(C) C/2

(D) 0

Q 228. When a material particle of rest mass m_0 , attains speed c , its mass becomes –

(A) ∞

(B) 0

(C) 2m

(D) 4m

Q 229. The rest mass of an electron is m_0. When it moves with a velocity v = 0.63c , then its mass is –

(A) m_0

(B) 5/4 m_0

(C) 4/5 m_0

(D) $2m_0$

Q 230 . Which of the following is not invariant under Galilean transformation?

(A) Space internal

(B) Time interval

(C) Mass
(D) Momentum

Q 231. The Kinetic Energy of a potential is double of its rest mass energy, then the speed of particle in terms of light is –
(A) c
(B) 0.943c
(C) 2 c
(D) c / 2

Q 232. Which of the following is not assumed to be absolute in Newtonian's mechanics?
(A) Space
(B) Time
(C) Mass
(D) State of rest / motion

Q 233. Which of the following is invariant under Galilean transformation ?
(A) Velocity
(B) Acceleration
(C) Speed
(D) None of these

Q 234. A beam of light moves towards right with speed c . If the earth also moves towards right with speed v then the speed of light relative to earth is –
(A) c
(B) c + v
(C) c – v
(D) $\sqrt{c^2+v^2}$

Q 235. According to special theory of relativity : -
(A) Only length is relative.
(B) Only mass is relative.
(C) Only Time is relative.
(D) Mass , length & time all are relative.

Q 236. The maximum limiting velocity that can be attained by a material particle may be –
(A) Speed of sound
(B) Speed of light
(C) Half of the speed of light
(D) Twice the speed of light

Q 237. Which one of the following statement is not correct ?
(A) All motions are relative
(B) Description of motion depends on the frame of reference
(C) Speed of light is different in different medium
(D) From within a frame of reference , We can detect the state of rest or uniform

motion of a frame of reference .

Q 238. Which experimental work prove that the velocity of light is a universal & natural constant ?

(A) Maxwell
(B) Michelson
(C) Lorentz
(D) Einstein

Q 239. One of the important consequences of special theory of relativity is that it correlates the observations taken in –

(A) Two accelerated frames
(B) One inertial and one accelerated frame
(C) Two inertial frame
(D) None of these

Q 240 . Which of the following can help an observer to know whether his own frame of reference is at rest or in uniform motion ?

(A) Determination of speed of light
(B) Measurement of mass
(C) Measurement of time
(D) None of these

Q 241. Which of the following relations is not valid according to the theory of relativity ?

(A) $\vec{F} = m\vec{a}$
(B) $\vec{F} = \frac{d\vec{P}}{dt}$
(C) $\vec{P} = m\vec{v}$
(D) $\Delta\vec{P} = \vec{F}t$

Q 242. Einstein was awarded Noble prize for –

(A) Photoelectric effect.
(B) Special theory of relativity.
(C) General theory of relativity.
(D) Cosmological Prediction.

Q 243. Which of the following is not the consequence of the special theory of relativity?

(A) Energy has inertial properties.
(B) Energy is conserved.
(C) Mass can be annihilated.

(D) Mass is condensed from of energy.

Q 244. The rest mass of a particle is defined as –

(A) Mass when the particle is absolutely at rest.

(B) Mass when the particle is moving with the speed of light.

(C) Mass of the particle moving at a speed very small compared with the speed of light.

(D) None of these

Q 245. Which of the following is not the characteristic of the observer?

(A) Observes the events.

(B) Makes measurement.

(C) Find all the uniformly moving frames inertial.

(D) Find all the uniformly moving frames non inertial.

Q 246. Which of the following is the correct relativistic relation between energy E, momentum P and mass m of a particle?

(A) $E = Pc + m_0 c^2$

(B) $E = Pc - m_0 c^2$

(C) $E^2 = P^2 c^2 + m_0^2 c^4$

(D) $E^2 = P^2 c^2 - m_0^2 c^4$

Q 247. An inertial frame of reference must be –

(A) At absolute rest.

(B) In absolute motion.

(C) Not accelerate.

(D) Attached to an observer.

Q 248. A young fat girl dances with high velocity. To her stationary friends she will appear –

(A) Less fat

(B) More fat

(C) Of same dimension

(D) Sometimes less & sometimes more fat

Q 249. One of the postulates of special theory of relativity is –

(A) Speed of light is relative

(B) Speed of light is same in all inertial frames

(C) Time is relative

(D) Mass is relative

Q 250. The special theory of relativity shows that the Newtonian mechanics is valid at –

(A) All velocities

(B) Velocity nearer to that of light

(C) Velocity much smaller than that of light

(D) Velocity in the ultra relativistic range.

Q 251. Doppler's effect is observed in the year –

(A) 1842
(B) 1942
(C) 1863
(D) 1963

Q 252. Doppler observed the motion related change in –

(A) Pitch of the wave
(B) Sound of the wave
(C) Loudness of the wave
(D) None of these

Q 253. In the case of sound wave, which type of Doppler's effect is observed?

(A) Transverse
(B) Longitudinal
(C) Both (A) & (B)
(D) None of these

Q 254. If the observer move in the same direction as of the wave, the crossing of one wave will take a –

(A) Shorter time
(B) Longer time
(C) Same time
(D) None

Q 255. If the wave velocity & observed velocity are opposite, the wave will quickly cross the observer. The time taken t will be –

(A) $\frac{\lambda}{v+v_0}$
(B) $\frac{\lambda}{v-v_0}$
(C) $\frac{\lambda}{v*v_0}$
(D) None

Q 256. If the wave velocity & observed velocity are opposite, the wave will quickly cross the observer. The frequency ϑ will be –

(A) $\frac{v-v_0}{\lambda}$
(B) $\frac{v+v_0}{\lambda}$
(C) $\frac{v*v_0}{\lambda}$

(D) None

Q 257. If the observer moves in the same direction as of the wave, then in this case wave will travel relative to observer, then time t will be –

(A) $\frac{\lambda}{v+v_0}$

(B) $\frac{\lambda}{v-v_0}$

(C) $\frac{\lambda}{v*v_0}$

(D) None

Q 258. The motion of the source relative to air and motion of observer relative to air are –

(A) Identical

(B) Non identical

(C) Similar

(D) None

Q 259. The Doppler effect in sound is –

(A) Asymmetric

(B) Symmetric

(C) Super symmetric

(D) None

Q 260. Pulsation of heart valves can be observed using Doppler effect, the technique is known as –

(A) Ultrasonography

(B) Pulse measurement

(C) Echocardiogram

(D) None

Q 261. A bat estimates the radial velocity of an insect by an effect X and its distance by an effect Y. these effects are –

(A) X Doppler effect, Y reflection of sound

(B) X & Y reflection of sound

(C) X & Y Doppler effect

(D) Y Doppler effect, X reflection of sound

Q 262. Three sonic source are in same phase at t = 0 and estimating waves of frequencies 400 Hz, 401 Hz, 403 Hz. The beat frequency heard will be –

(A) 1 s^{-1}

(B) 2 s^{-1}

(C) 3 s^{-1}

(D) $4\ s^{-1}$

Q 263. The sound is usually pictured as a displacement wave or a pressure wave. These two differ in phase by –

(A) π

(B) 0

(C) π / 2

(D) π / 4

Q 264. The distance between two consecutive antinodes in a harmonic standing wave is equal to –

(A) One fourth of wavelength

(B) The distance between consecutive nodes

(C) Wavelength

(D) Double of wavelength

Q 265. The intensity of the two waves are I & 4I. The intensity produced by their consecutive interference will be –

(A) 5I

(B) 11 I

(C) 9I

(D) 3I

Q 266. Euler equation is valid for the study of –

(A) Viscous & Compressible fluid

(B) Viscous & Incompressible fluid

(C) Non Viscous & Compressible fluid

(D) Non Viscous & Incompressible fluid

Q 267. Bernoulli's theorem is valid for the study of –

(A) Steady flow of liquid

(B) Turbulent flow of liquid

(C) Both (A) & (B)

(D) None of these

Q 268. According to Poiseuille's formula, the rate of flow v of a liquid through a capillary tube of length l and radius r is given by –

(A) $v = \frac{P\pi r^3}{8\eta l}$

(B) $v = \frac{P\pi r^4}{8\eta l}$

(C) $v = \frac{P r^4}{8\pi\eta l}$

(D) None

Q 269. Equation of continuity can be expressed as –

(A) $a_1v_1 = a_2v_2$

(B) $a_1v_2 = a_2v_1$

(C) $a_1v_1 = a_2 / v_2$

(D) $a_2v_2 = a_1 / v_1$

Q 270. The total momentum of all couples arising in a bend beam & trying to resist its deformation caused by an external force is called –

(A) Linear moment

(B) Angular moment

(C) Bending moment

(D) None of these

Q 271. Flexural rigidity is defined as –

(A) $I = ak^2$

(B) $I = 2ak^2$

(C) $I = 3ak^2$

(D) None

Q 272. Bending moment is a ratio of –

(A) Flexural rigidity : Radius of curvature

(B) Angular rigidity : Radius of curvature

(C) Flexural rigidity : Angular rigidity

(D) Angular rigidity : Flexural rigidity

Q 273. Restoring couple & Bending couple act in the –

(A) Same direction

(B) Opposite direction

(C) Perpendicular direction

(D) None

Q 274. The section of the neutral surface by the plane of bending which is perpendicular to it, is called the –

(A) Plane of bending

(B) Natural axis

(C) Angular axis

(D) Neutral axis

Q 275. If C is the couple per unit angular twist of the wire, then couple required to produce a twist θ in the wire will be –

(A) $C\theta$

(B) C / θ
(C) θ / C
(D) $1 / C\theta$

Q 276. The work done in twisting the wire through a small angle $d\theta$ is given by –
(A) $W = C.d\theta$
(B) $W = C.\theta.d\theta$
(C) $W = C / \theta.d\theta$
(D) None

Q 277. If C' & C are the torsional rigidity for hollow cylinder & solid cylinder of the same mass, length & material, then which of the following is correct?
(A) $C' > C$
(B) $C' < C$
(C) $C' = C$
(D) None

Q 278. The product of torque & time for which it acts is called –
(A) Linear impulse
(B) Angular impulse
(C) Both
(D) None

Q 279. A point in space is such that the vector sum of the moments of the mass point around it is zero is called –
(A) Weight
(B) Mass
(C) Centre of mass
(D) None

Q 280. In the absence of external force, the acceleration of centre of mass is –
(A) ∞
(B) 0
(C) 1 / 2
(D) None

Q 281. In the absence of external force, the acceleration of centre of mass is zero & therefore the velocity is –
(A) Variable vector
(B) Constant vector
(C) Both
(D) None

Q 282. The total linear momentum of a system of particles about the centre of mass is –
(A) 0
(B) ∞

(C) Both
(D) None

Q 283. The centre of mass frame is sometimes called –
(A) Inertial frame
(B) Non inertial frame
(C) Zero momentum frame
(D) None

Q 284. The linear momentum of a system of two particles is equal to linear momentum of the centre of –
(A) Velocity
(B) Acceleration
(C) Mass
(D) Weight

Q 285. If no external force acting on the system & the only forces are those of mutual interaction then the velocity of the centre of mass is –
(A) 0
(B) ∞
(C) Variable
(D) Constant

Q 286. The Lorentz transformation approaches Galilean transformation in the limit of _____ compared to the speed of light.
(A) Low speed
(B) High speed
(C) Both
(D) None

Q 287. Lorentz transformations are merely the orthogonal transformations of –
(A) Two dimensional space
(B) Three dimensional space
(C) Four dimensional space
(D) None

Q 288. The four dimensional volume element dx, dy, dz & dt is invariant under –
(A) Galilean transformation
(B) Lorentz transformation
(C) Laplace transformation
(D) None

Q 289. Area swept out by the radius vector from the sun to a planet in equal time are equal. This statement governs –

(A) Newton's 1st law
(B) Newton's 2nd law
(C) Kepler's 1st law
(D) Kepler's 2nd law

Q 290. The planets move in ellipse with sun at one of its foci. This statement gives –
(A) Kepler's 1st law
(B) Kepler's 2nd law
(C) Newton's 1st law
(D) Newton's 2nd law

Q 291. Relation between energy & semi major axis of ellipse is –
(A) E = K / 2a
(B) E = – K / 2a
(C) E = Ka / 2
(D) E = 2 / Ka

Q 292. Kepler's 1st law of planetary motion states that the orbits are –
(A) Circular section
(B) Triangular section
(C) Conic section
(D) Rectangular section

Q 293. There are two main features of the motion of a particle under the action of a central force. One is conservation of energy & the other is conservation of –
(A) Linear momentum
(B) Angular momentum
(C) Linear velocity
(D) Angular velocity

Q 294. The angular momentum about any axis through the centre of force is –
(A) Constant
(B) Variable
(C) Zero
(D) None of these

Q 295. For central force, the orbit always lies in a fixed plane, which is perpendicular to the fixed direction of –
(A) Linear momentum
(B) Angular momentum
(C) Linear velocity
(D) Angular velocity

Q 296. Gauge pressure at a point in a liquid is the difference of total pressure at that point and –
(A) Atmospheric pressure

(B) Gravitational pull
(C) Gravitational force
(D) None of the above

Q 297. What will be the radius of new bubble formed when two bubbles of coalesce?
(A) $r = r_1^2 + r_2^2$
(B) $r = r_1^2 - r_2^2$
(C) $r = \sqrt{r_1^2 + r_2^2}$
(D) $r = \sqrt{r_1^2 - r_2^2}$

Q 298. Radius of the interface when two soap bubbles of different radii are in contact. (If $r_2 ¿ r_1$). Which of the following is correct?
(A) $r = \frac{r_1 r_2}{r_2 - r_1}$
(B) $r = \frac{r_1 r_2}{r_2 + r_1}$
(C) $r = \frac{r_2 - r_1}{r_1 r_2}$
(D) $r = \frac{r_2 + r_1}{r_1 r_2}$

Q 299. What is the value of surface tension of a liquid at critical temperature?
(A) ∞
(B) 0
(C) 4K
(D) None of these

Q 300. A wave propagated on a liquid surface or in a fluid through the effects of gravity known as –
(A) Ripple wave
(B) Stationary wave
(C) Gravitational wave
(D) None