MODEL QUESTION PAPER

SUBJECT – PHYSICS (SUB.)

B.Sc. IST PART

PAPER -1

Q 1. The surface tension of all liquids decreases linearly with –

(A) Increase of temperature

(B) Decrease of temperature

(C) Both (A) & (B)

(D) None of these

Q 2. At the critical temperature, the value of surface tension is –

(A) Constant

(B) Variable

(C) Zero

(D) None

Q 3. Molar surface is defined as –

(A) $\left(\frac{M}{\rho}\right)^{\frac{2}{3}}$

(B) $\left(\frac{M}{\rho}\right)^{\frac{1}{3}}$

(C) $\left(\frac{M}{\rho}\right)$

(D) None

Q 4. The surface energy in the molar surface is termed as the –

(A) Solar energy

(B) Molar energy

(C) Surface energy

(D) None

Q 5. The gravitational wave travels at the speed of –

(A) 186000 miles / sec

(B) 184000 miles / sec

(C) Zero

(D) None

Q 6. The gravity wave is a –

(A) Visible ripples in space

(B) Invisible ripples in space

(C) Both (A) & (B)

(D) None

Q 7. The frequencies of gravitational wave are much _____than those of electromagnetic spectrum –

(A) Lower
(B) Higher
(C) Sometimes lower & sometimes higher
(D) None

Q 8. The ripples produced in space – time are called –

(A) Ripple wave
(B) Gravitational wave
(C) Both
(D) None

Q 9. Capillary waves are common in nature & are often referred as –

(A) Gravity wave
(B) Ripple wave
(C) Both
(D) None

Q 10. A longer wavelength of a fluid surface will result in –

(A) Ripple wave
(B) Gravitational wave
(C) Both
(D) None

Q 11. Which waves are influenced by both the effects of surface tension, gravity & fluid inertia?

(A) Ripple wave
(B) Gravitational wave
(C) Capillary wave
(D) Both (A) & (C)

Q 12. Which of the following wave have longer wavelength?

(A) Capillary wave
(B) Gravity wave
(C) Both
(D) None

Q 13. Gravity waves are –

(A) Longitudinal
(B) Transverse
(C) Both
(D) None

Q 14. A gravity wave is a wave travelling along the interface between two fluids whose dynamics are dominated by the effect of –

(A) Ripple wave
(B) Gravity wave
(C) Both
(D) None

Q 15. A ripple wave is a wave travelling between the interface between two fluids whose dynamics are dominated by –

(A) Surface tension
(B) Gravity
(C) Both
(D) None

Q 16. Wind generated waves on the water surface are examples of –

(A) Ripple wave
(B) Gravity wave
(C) Both
(D) None

Q 17. Who suggested for the first time that the velocity of light in free space is the same everywhere?

(A) Lorentz Experiment
(B) Michelson – Morley Experiment
(C) Both
(D) None

Q 18. According to the classical theory, the observed velocity of light should depend on the velocity of the –

(A) Object
(B) Observer
(C) Both
(D) None

Q 19. Who proves the theory that the ether medium exists?

(A) Einstein
(B) Newton
(C) Michelson – Morley
(D) Lorentz

Q 20. The device through which the ether medium was detected is called –

(A) Oscillometer
(B) Diffractometer
(C) Interferometer
(D) None

Q 21. According to Maxwell's law of distribution of velocities of molecules, the most probable velocity is –

(A) Greater than the mean velocity
(B) Equal to the mean velocity
(C) Equal to the root mean square velocity
(D) Less than the root mean square velocity

Q 22. The average value of V_x in Maxwellian distribution is given by –

(A) 0
(B) $1 / 2\alpha$
(C) KT / m
(D) $\sqrt{KT/m}$

Q 23. The Maxwell velocity distribution is valid for a chemical gas –

(A) In equilibrium irrespective of the nature of particle interaction
(B) Strictly under contact interaction amongst particles
(C) Under a steady flow of particles
(D) Only in the absence of inter particle interaction

Q 24. The root mean square speed, average speed & most probable speed for a gas are in the ratio of –

(A) $\sqrt{3}:2\sqrt{2}:3\sqrt{2}$
(B) $\sqrt{2}:2\sqrt{2}:\sqrt{3}$
(C) $\sqrt{3}:\sqrt{2}:2\sqrt{2}$
(D) $\sqrt{3}:2\sqrt{2}:\sqrt{2}$

Q 25. The mean free path λ of a gas molecule as given by Maxwell is related to its radius a as –

(A) $\lambda = \frac{1}{\sqrt{2}\,4\pi a^2 n}$
(B) $\lambda = \frac{1}{\sqrt{2}\,\pi a^2 n}$
(C) $\lambda = \frac{1}{\sqrt{2}\,2\pi^2 a^2 n}$
(D) $\lambda = \frac{1}{\sqrt{2}\,2\pi a^2 n}$

Q 26. If the degree of freedom of a gas is n, then the ratio of C_p and C_v is –

(A) 1 + 2/n
(B) 1 + 1/n
(C) 1 + 1/2n
(D) 2n / 2n +1

Q 27. Which of the following gas molecule has 3 degrees of freedom?

(A) Monoatomic
(B) Diatomic
(C) Polyatomic
(D) Triatomic

Q 28. The total number of independent quantities required to specify the configuration & position of a system is called –

(A) The order of degree of freedom of the system
(B) The number of degree of freedom of the system
(C) The phase of degree of freedom of the system
(D) None of these

Q 29. The law of equipartition of energy is applicable to the system whose constituents are –

(A) In random motion
(B) In orderly motion
(C) At rest
(D) Moving with constant speed

Q 30. The required expression in terms of partition function is given by –

(A) F = TNK logZ
(B) F = – TNK logZ
(C) F = 1 / TNKlogZ
(D) None of these

Q 31. The total energy of a molecule is shared equally by the various degrees of freedom possessed by it. This law is known as –

(A) Law of equipartition of energy
(B) Law of conservation of energy
(C) Law of degradation of energy
(D) None of these

Q 32. With increase of pressure, the mean free path –

(A) Decreases
(B) Increases
(C) Does not change
(D) Becomes zero

Q 33. Mean free path is –

(A) Maximum distance between collision
(B) Minimum distance between collision
(C) Average distance between collision
(D) (Maximum distance + Minimum distance) / 2

Q 34. Which of the following laws is applicable for the behavior of a perfect gas –

(A) Boyle's law
(B) Charle's law
(C) Gay Lussac law
(D) All

Q 35. An ideal gas as compared to a real gas at very high pressure occupies –

(A) More volume
(B) Less volume
(C) Same volume
(D) No such relation

Q 36. What is the correct formula for Vanderwaals equation?

(A) $(P + a/V^2)(V + b) = RT$
(B) $(P – a/V^2)(V – b) = RT$
(C) $(P + a/V^2)(V – b) = RT$
(D) $(P – a/V^2)(V + b) = RT$

Q 37. The value of constant "a" increases with an increase in –

(A) Pressure
(B) Intermolecular force
(C) Volume
(D) Temperature

Q38. The critical temperature of a gas is –

(A) $T_c = 8 / 27\ bR$
(B) $T_c = 27 / 8\ bR$
(C) $T_c = a / 27\ b^2$
(D) $T_c = 8a / 27\ bR$

Q 39. What does "b" represents in the Vander waals equation?

(A) The volume of the container
(B) The volume of the gas
(C) The volume of the container not filled by the gas
(D) The number of moles of the gas

Q 40. If a system A is in thermal equilibrium separately with B & C. Then B & C are also in thermal equilibrium with each other. This is the statement of –
(A) Zeroth law of thermodynamics
(B) First law of thermodynamics
(C) Second law of thermodynamics
(D) Third law of thermodynamics

Q 41. 110 J of heat is added to a gaseous system whose internal energy is 40 J. Then the amount of external work done is –
(A) 150 J
(B) 70 J
(C) 110 J
(D) 40 J

Q 42. For any process, the second law of thermodynamics requires that the change of entropy of the universe by –
(A) Positive only
(B) Positive or zero
(C) Zero only
(D) Negative or zero

Q 43. The combined form of first & second law of thermodynamics is given by –
(A) TdS = dU + PdV
(B) dQ = TdS + PdV
(C) dU = TdS + dQ
(D) TdS = dU – PdV

Q 44. The total work done in isothermal process is given by –
(A) $W = R \log \frac{V_2}{V_1}$
(B) $W = RT \log \frac{V_2}{V_1}$
(C) $W = \frac{R}{T} \log \frac{V_2}{V_1}$
(D) None

Q 45. The work done in adiabatic process is given by –

(A) $W = \frac{R}{T}(T_1 - T_2)$

(B) $W = \frac{R}{1-\gamma}(T_1 - T_2)$

(C) $W = \frac{R}{1+\gamma}(T_1 + T_2)$

(D) None

Q 46. The absolute thermodynamic temperature scale is known as –

(A) Celsius scale

(B) Fahrenheit scale

(C) Kelvin scale

(D)None of these

Q 47. The efficiency of a reversible Carnot heat engine is –

(where T_1 is the temperature of source & T_2 is the temperature of sink)

(A) $\left(1 - \frac{T_1}{T_2}\right)$

(B) $\left(1 - \frac{T_2}{T_1}\right)$

(C) $\left(\frac{T_1}{T_2} - 1\right)$

(D) $\left(\frac{T_2}{T_1} - 1\right)$

Q 48. Carnot cycle is –

(A) A reversible cycle

(B) An irreversible cycle

(C) Quasi static cycle

(D) An adiabatic irreversible cycle

Q 49. T-S diagram for a Carnot cycle is –

(A) Rectangular

(B) Circle

(C) Ellipse

(D) None

Q 50. The area of the Carnot cycle in a T-S diagram represents –

(A) Heat absorbed from source
(B) Work done in a cycle
(C) Heat rejected to the sink
(D) Efficiency of the engine

Q 51. For a cyclic process, the value of entropy $\oint \frac{dQ}{T}$ is –

(A) Always equals to zero
(B) Always positive
(C) Always negative
(D) None

Q 52. Change in entropy depends –

(A) Only on the transfer
(B) Only on the change of temperature
(C) On transfer of mass
(D) On the thermodynamical scale

Q 53. The difference in entropy between a state of volume V_i & a state of volume V_f (temperature & number of molecules remaining constant) is equal to –

(A) $nR \log \frac{V_f}{V_i}$
(B) $nR \log \frac{V_i}{V_f}$
(C) $n R^2 \log \frac{V_f}{V_i}$
(D) $n R^2 \log \frac{V_i}{V_f}$

Q 54. Which of the following is the formula for Helmholtz free energy –

(A) U + TS
(B) U + TV
(C) U – TS
(D) U x TV

Q 55. Which of the following is the formula for Gibbs free energy –

(A) $H - T \Delta S$
(B) H – T
(C) $T \Delta S$
(D) H – S

Q 56. Gibbs – Helmholtz equation is given as –

(A) $F = U + T\left(\frac{\partial F}{\partial T}\right)_V$

(B) $F = U - T\left(\frac{\partial F}{\partial T}\right)_V$

(C) $F = T - U\left(\frac{\partial F}{\partial T}\right)_V$

(D) None

Q 57. In one of the Maxwell's relations $\left(\frac{\partial S}{\partial P}\right)$ equals –

(A) $\left(\frac{\partial V}{\partial T}\right)_V$

(B) $-\left(\frac{\partial V}{\partial T}\right)_P$

(C) $-\left(\frac{\partial T}{\partial V}\right)_S$

(D) $\left(\frac{\partial P}{\partial T}\right)_V$

Q 58. Which of the the following is not Maxwell's equation?

(A) $\left(\frac{\partial S}{\partial V}\right)_T = \left(\frac{\partial P}{\partial T}\right)_V$

(B) $\left(\frac{\partial T}{\partial V}\right) = -\left(\frac{\partial P}{\partial S}\right)_V$

(C) $\left(\frac{\partial V}{\partial P}\right)_S = \left(\frac{\partial T}{\partial S}\right)$

(D) $\left(\frac{\partial T}{\partial P}\right)_S = \left(\frac{\partial V}{\partial S}\right)_P$

Q 59. First TdS equation is –

(A) $TdS = C_V\, dT + T\left(\frac{\partial T}{\partial P}\right) dV$

(B) $TdS = C_V\, dT - T\left(\frac{\partial P}{\partial T}\right) dV$

(C) $TdS = C_V\, dT + T\left(\frac{\partial P}{\partial T}\right) dV$

(D) $TdS = C_V\, dT - T\left(\frac{\partial T}{\partial P}\right) dV$

Q 60. $\frac{dP}{dT}=\frac{1}{T(V_2-V_1)}$ equation is called –

(A) Clapeyron's equation
(B) Gibbs equation
(C) Kelvin equation
(D) None

Q 61. Which of the Maxwell's relation leads to Clausius – Clapeyron equation?

(A) $\left(\frac{\partial T}{\partial V}\right)_S=-\left(\frac{\partial P}{\partial V}\right)_V$
(B) $\left(\frac{\partial S}{\partial V}\right)_T=\left(\frac{\partial P}{\partial T}\right)_V$
(C) $\left(\frac{\partial T}{\partial P}\right)_S=\left(\frac{\partial V}{\partial S}\right)_P$
(D) $\left(\frac{\partial V}{\partial T}\right)_P=-\left(\frac{\partial S}{\partial P}\right)_T$

Q 62. Joule – Thomson effect is based upon –

(A) Sudden compression of gases
(B) Cooling of gases
(C) Sudden expansion of gases
(D) Heating of gases

Q 63. Joule – Thomson effect is which process?

(A) Constant enthalpy
(B) Constant entropy
(C) Constant pressure
(D) None

Q 64. For an ideal gas, the value of Joule – Thomson coefficient is –

(A) 0.5
(B) Unity
(C) Zero
(D) Infinite

Q 65. Helium shows negative Joule – Thomson effect due to its –

(A) Low viscosity
(B) Inert nature
(C) Resistance of Polarize

(D) Low density

Q 66. Liquid Helium above 2.19 K which behaves in a normal way is called –

(A) Liquid Helium I
(B) Liquid Helium II
(C) Liquid Helium III
(D) None

Q 67. Liquid Helium below 2.19 K which behaves in a normal way is called –

(A) Liquid Helium I
(B) Liquid Helium II
(C) Liquid Helium III
(D) None

Q 68. The essence of Kirchoff's law is that –

(A) A good observer must be a bad radiator
(B) A good observer must be a good radiator
(C) A good observer must be a good conductor
(D) Both (A) & (B) are true

Q 69. Black body is defined as the body –

(A) Which absorbs all the radiations of any wavelength falling on it
(B) Which does not absorb any radiation
(C) Which absorbs radiations in ultraviolet region
(D) Which absorbs radiations in infrared region

Q70. Planck's formula for black body radiation is given by –

(A) $E(\vartheta)=\left(\frac{4\pi h\pi\vartheta^3}{c^3}\right)\left(\frac{1}{e^{E/kT}-1}\right)$

(B) $E(\vartheta)=\left(\frac{8\pi h\pi\vartheta^3}{c^3}\right)\left(\frac{1}{e^{E/kT}-1}\right)$

(C) $E(\vartheta)=\left(\frac{4\pi h\pi\vartheta^3}{c^3}\right)/\left(\frac{1}{e^{E/kT}-1}\right)$

(D)None

Q 71. Wein's displacement law is given by –

(A) $\frac{\lambda_m}{T}=constant$

(B) $\lambda_m T=constant$

(C) hc = constant

(D) None

Q 72. Stefan's law states that –

(A) $E=\sigma T^2$

(B) $E=\sigma T^3$

(C) $E=\sigma T^4$

(D) $E=\sigma T^8$

Q 73. Rayleigh –Jeans law is given as –

(A) $E(\lambda)=4\pi\lambda^{-4}kT$

(B) $E(\lambda)=8\pi\lambda^{-4}kT$

(C) $E(\lambda)=2\pi\lambda^{-4}kT$

(D) None

Q 74. Which among the following is correct for Stefan-Boltzmaan law –

(A) This law gives total emissive power of a black body

(B) It is based on quantum theory

(C) Both (A) & (B) are correct

(D) None

Q 75. The wavelength λ at which the velocity is minimum is called the critical wavelength, and it may be denoted by λ_c which varies with surface tension T as –

(A) T

(B) $T^{1/2}$

(C) T^2

(D) $T^{-1/2}$

Q 76. The measurement of surface tension by ripples method is also known as –

(A) Qunick's method

(B) Rankine's method

(C) Rayleigh-Jeans method

(D) Joeger's method

Q 77. In surface tension, the wavelength for which the velocity is minimum is called the critical wavelength. The wavelength of ripple waves are –

(A) Equal to critical wavelength

(B) Smaller than critical wavelength

(C) Greater than critical wavelength

(D) None

Q 78. Amplitude of the gravity wave is –

(A) Greater than wavelength
(B) Equal to wavelength
(C) Smaller than wavelength
(D) None

Q 79. Which of the following statement is true for gravity wave?

(A) Velocity of gravity waves depends on surface tension.
(B) Velocity of gravity waves depends on gravity alone.
(C) Velocity of gravity waves depends on both surface tension & gravity.
(D) Velocity of gravity waves is independent of both surface tension & gravity.

Q 80. What are ripples?

(A) It is very small wave on the surface of water.
(B) It is very large wave on the surface of water.
(C) It is a longitudinal wave inside the surface of water.
(D) None

Q 81. The relation for the velocity of the wave under the action of both gravity & surface tension is –

(A) $V=\sqrt{\frac{\lambda}{2\pi}\left(g-\frac{4\pi^2 T}{\rho}\right)}$

(B) $V=\sqrt{\frac{\lambda}{2\pi}\left(g+\frac{4\pi^2 T}{\rho}\right)}$

(C) $V=\sqrt{\frac{\lambda}{4\pi}\left(g-\frac{4\pi^2 T}{\rho}\right)}$

(D) $V=\sqrt{\frac{\lambda}{4\pi}\left(g+\frac{4\pi^2 T}{\rho}\right)}$

Q 82. Brownian motion is due to the large number of –

(A) Atomic collision
(B) Molecular collision
(C) Both
(D) None

Q 83. Brownian motion follows the path which is –

(A) Rectilinear
(B) Circular
(C) Elliptical
(D) Zig-Zag

Q 84. Brownian motion takes place due to –
(A) Thermal agitation
(B) Atomic collision
(C) Wave agitation
(D) None

Q 85. Brownian motion was first observed in the year –
(A) 1827
(B) 1829
(C) 1905
(D) 1927

Q 86. The side of the colloidal particle have the solution is in the order of –
(A) 10^{-3} cm
(B) 10^{-4} cm
(C) 10^{-5} cm
(D) 10^{-6} cm

Q 87. Vanderwaal's equation of state is valid for –
(A) Ideal gas
(B) Real gas
(C) Both
(D) None

Q 88. The pressure correction term associated with the Vanderwaal's gas equation is –
(A) $\left(P-\frac{a}{V^2}\right)$
(B) $\left(P+\frac{a}{V^2}\right)$
(C) $\left(\frac{P}{a+V^2}\right)$
(D) $\left(\frac{P}{a-V^2}\right)$

Q 89. Critical pressure (P_c) in case of Vanderwaal's gas equation can be written as –

(A) $P_c = a / 27b^2$
(B) $P_c = b / 27a^2$
(C) $P_c = 27a / b^2$
(D) $P_c = 27b / a^2$

Q 90. Critical coefficient of a gas in case of Vanderwaal's gas equation can be expressed as –
(A) $P_c V_c / RT_c = 8 / 3$
(B) $RT_c / P_c V_c = 8 / 3$
(C) $RT_c / P_c V_b = 8 / 3$
(D) None

Q 91. The first law of thermodynamics gives the relation between –
(A) Workdone & Heat
(B) Workdone & Temperature
(C) Heat & Temperature
(D) None of these

Q 92. First law of thermodynamics is given by –
(A) Carnot
(B) Joule
(C) Thomson
(D) None of the above

Q 93. In isochoric process, which one of the following is constant?
(A) Pressure
(B) Temperature
(C) Volume
(D) Heat

Q 94. Isobaric process is one in which the _____ acting on the working substance remains constant –
(A) Pressure
(B) Volume
(C) Temperature
(D) None

Q 95. Expression for adiabatic process can be –
(A) PV = RT
(B) $PV^{\gamma} = constant$
(C) Both
(D) None

Q 96. Any mechanical device whose operation consists in transforming heat energy into

mechanical energy is called –

(A) Refrigeretor

(B) Heat engine

(C) Thermal temperature

(D) None of the above

Q 97. The efficiency of perfectly reversible engine is maximum & is independent of the –

(A) Heat

(B) Temperature

(C) Working substance

(D) None of these

Q 98. Coefficient of performance of Carnot's refrigerator is expressed as –

(A) $E=\frac{T_1}{T_1-T_2}$

(B) $E=\frac{T_2}{T_1-T_2}$

(C) $E=\frac{T_1-T_2}{T_1}$

(D) $E=\frac{T_1-T_2}{T_2}$

Q 99. In an adiabatic process –

(A) Entropy change is maximum.

(B) Entropy change is minimum.

(C) Entropy change is zero.

(D) None of the above

Q 100. Maxwell gave how many numbers of thermodynamical relations?

(A) Two

(B) Three

(C) Four

(D) Five

Q 101. Which of the following statement is incorrect?

(A) Entropy can be expressed as a function of P & T.

(B) Entropy can be expressed as a function of T & V.

(C) Entropy can be expressed as a function of T & U.

(D) All statements are correct.

Q 102. Using Maxwell's thermodynamical relations, which of the following law can be derived?

(A) Boyle's law
(B) Charle's law
(C) Ideal gas equation
(D) None of these

Q 103. The third law of thermodynamics is also known as –

(A) Definition of energy
(B) Law of conservation of energy
(C) Conversion of heat into work
(D) Nernst heat theorem

Q 104. Nernst heat theorem is related to –

(A) Law of conservation of energy
(B) Temperature of heat
(C) Unattenability of absolute zero
(D) None of these

Q 105. Latent heat is actually the heat evolved or absorbed in –

(A) Change of phase
(B) Change of temperature
(C) Change of pressure
(D) None

Q 106. Temperature is a measure of hotness & coldness of an object, is based on –

(A) Zeroth law of thermodynamics
(B) First law of thermodynamics
(C) Second law of thermodynamics
(D) Newton's law of cooling

Q 107. In adiabatic expansion of a gas –

(A) Its pressure increases.
(B) Its temperature increases.
(C) Its temperature decreases.
(D) Its thermal energy increases.

Q 108. If for a gas, $R / C_v = 0.67$. This is made of molecules which are –

(A) Monoatomic
(B) Diatomic
(C) Polyatomic
(D) Mixture of all

Q 109. The process in which the heat is not transferred from one state to another is –

(A) Isothermal process
(B) Adiabatic process
(C) Isobaric process
(D) Isochoric process

Q 110. A given system undergoes a change in which the work done by the system equals the decrease in its internal energy –
(A) Isothermal change
(B) Adiabatic change
(C) Isobaric change
(D) Isochoric change

Q 111. Entropy of the thermodynamic system does not change when the system is used for –
(A) Conduction of heat from higher to lower temperature.
(B) Conversion of heat into work, isobarically.
(C) Conversion of work into heat, isochorically.
(D) Conversion of heat into internal energy.

Q 112. Which of the following is not a thermodynamic coordinate?
(A) P
(B) V
(C) T
(D) R

Q 113. The principle of increased in entropy comes from –
(A) First law of thermodynamics
(B) Second law of thermodynamics
(C) Third law of thermodynamics
(D) Zeroth law of thermodynamics

Q 114. What is the lowest possible temperature in Kelvin scale?
(A) – 273 K
(B) – 373 K
(C) -273^0 C
(D) -373^0 C

Q 115. Why thermodynamical scale of temperature is called absolute scale of temperature ?
(A) The temperature in this scale doesnot depend on the working substance.
(B) The temperature in this scale depends on the working substance.
(C) This scale is very useful.
(D) None of these.

Q 116. Entropy is expressed in terms of its –
(A) Absolute value

(B) Change in entropy
(C) Change in temperature
(D) Calorie

Q 117. Which of the following is a thermodynamic potential ?
(A) Volume
(B) Pressure
(C) Entropy
(D) Helmoltz function

Q 118. If $\Delta Q > 0$ when heat flows into a system, $\Delta W > 0$ when work is done on the system & then increases in internal energy of the system is –
(A) $\Delta W + \Delta Q$
(B) $\Delta W - \Delta Q$
(C) $\Delta Q - \Delta W$
(D) $-(\Delta Q + \Delta W)$

Q 119. A heat engine takes 100 J heat from the heat source & gives 60 J heat to the sink. Then efficiency of the engine is –
(A) 5/3
(B) 2/5
(C) 3/5
(D) None

Q 120. A heat engine is working between temperatures 300 K & 100 K. The efficiency of the engine is –
(A) 33.3%
(B) 40%
(C) 55%
(D) 66.6%

Q 121. In a Carnot's engine, the piston is supposed to move inside the cylinder –
(A) With larger friction
(B) With very low friction
(C) Frictionless
(D) By an external force

Q 122. In porous plug experiment, the gas is –

(A) Compressed adiabatically
(B) Compressed isothermally
(C) Expands adiabatically
(D) Expands isothermally

Q 123. In porous plug experiment, the gas is passed from –
(A) High pressure region to low pressure region.
(B) Low pressure region to high pressure region.
(C) High temperature region to low temperature region.
(D) Low temperature region to high temperature region.

Q 124. The low temperature is obtained using –
(A) Liquefaction of Helium
(B) Liquefaction of Oxygen
(C) Liquefaction of Hydrogen
(D) Liquefaction of Carbon Dioxide

Q 125. The low temperature is produced by using –
(A) Compton effect
(B) Zeeman effect
(C) Joule-Thomson effect
(D) None of these

Q 126. In Joule-Thomson effect –
(A) Cooling is produced.
(B) Heating is produced.
(C) Sometimes heating, sometimes cooling.
(D) Temperature does not change.

Q 127. Cooling is produced in Joule-Thomson effect if room temperature –
(A) Is greater than the temperature of inversion.
(B) Is less than the temperature of inversion.
(C) Equals to the temperature of inversion.
(D) None of these

Q 128. The temperature of inversion is given by –
(A) $T_i = 2a/Rb$
(B) $T_i = 2b/Ra$

(C) $T_i = R/2ab$
(D) $T_i = 2a^2/Rb$

Q 129. Oxygen produces cooling in Joule-Thomson effect because its temperature of inversion is _____than the room temperature.
(A) Less
(B) Greater
(C) Equals to
(D) Negative

Q 130. If $P_1 V_1 = P_2 V_2$ are pressure & volume respectively of a gas before & after passing through a porous plug, then the net external work done by the gas is –
(A) $P_1 V_1 - P_2 V_2$
(B) $P_2 V_2 - P_1 V_1$
(C) $P_1 V_1 + P_2 V_2$
(D) $P_1 V_2 - P_2 V_1$

Q 131. Heat cannot flow by itself from a body at lower temperature to a body at higher temperature. This is explained by –
(A) First law of thermodynamics
(B) Second law of thermodynamics
(C) Third law of thermodynamics
(D) All of these

Q 132. Which of the following statement is incorrect?
(A) Practically, absolute zero temperature cannot be reached.
(B) Negative value of temperature is possible in absolute scale.
(C) Negative value of temperature is impossible in absolute scale.
(D) All values of temperature are possible in absolute scale.

Q 133. To determine most probable speed, we find the value of c for which the speed distribution function is a –
(A) Maximum
(B) Minimum
(C) Remains constant
(D) None of these

Q 134. The number of independent variables that must be known to describe the position of a body completely is called –
(A) Position coordinate

(B) Cartesian coordinate
(C) Degree of freedom
(D) None of these

Q 135. A diatomic molecules has _____ degree of freedom.
(A) 2
(B) 3
(C) 4
(D) 5

Q 136. The average kinetic energy per molecule associated with each degree of freedom is equal to –
(A) ½ kT
(B) 3/2 kT
(C) 7/2 kT
(D) None

Q 137. Slope of isothermal is equal to –
(A) P/V
(B) –P/V
(C) PV/T
(D) None

Q 138. Slope of isothermal is equal to –
(A) –P/V
(B) $-\left(\frac{P}{V}\right)^{\gamma}$
(C) $-\left(\frac{P}{V}\right)^{\gamma^2}$
(D) None

Q 139. Both isothermal & adiabatic curves have _____ slopes in an indicator diagram –
(A) Zero
(B) Negative
(C) Positive
(D) None

Q 140. When the heat engine operated in the reverse manner, the process is called –
(A) Carnot cycle

(B) Refrigeration cycle
(C) Temperature cycle
(D) None of these

Q 141. Stefan – Boltzmann's constant in the MKS system is given by –
(A) 5.67×10^{-8} wm^2K^4
(B) 6.57×10^{-6} wm^2K^4
(C) 6.67×10^{-8} wm^2K^4
(D) 3.57×10^{-6} wm^2K^4

Q 142. In thermal equilibrium at a given temperature, the average kinetic energy associate with each degree of freedom has the same value. This is –
(A) Rayleigh-Jeans law
(B) Stefan's law
(C) Principle of equipartition of energy
(D) None of these

Q 143. Wein's formula is valid for –
(A) Short wavelength
(B) Long wavelength
(C) Both
(D) None

Q 144. Rayleigh-Jeans formula is valid for –
(A) Short wavelength
(B) Long wavelength
(C) All wavelengths
(D) None

Q 145. Planck's formula holds well for –
(A) Short wavelength
(B) Long wavelength
(C) All wavelengths
(D) None

Q 146. In which of the laws thermal radiation is as the working substance?
(A) Wein's law
(B) Rayleigh-Jeans law
(C) Stefan's law

(D) Planck's law

Q 147. The quantum theory of blackbody radiation was proposed by Max Planck in –
(A) 1900
(B) 1905
(C) 1907
(D) 1910

Q 148. The rate of emission of radiation is directly propotional to –
(A) Pressure
(B) Volume
(C) Temperature
(D) None

Q 149. The relation between entropy & the probability can be expressed as –
(A) $S = K \log W$
(B) $S = W \log K$
(C) $S = K \log W^2$
(D) $S = W \log K^2$

Q 150. The parameter with which a relative disorder in a system can be measured in –
(A) Pressure
(B) Volume
(C) Temperature
(D) Entropy

Q 151. The differential form of equation related to first law of thermodynamics, second law of Thermodynamics & entropy is given by –
(A) $TdS = dU - dW$
(B) $TdS = dU + dW$
(C) $TdS = dU + dQ$
(D) $TdS = dU - dQ$

Q 152. The entropy of a system remains constant during a –
(A) Reversible cycle process
(B) Irreversible cycle process
(C) Both
(D) None

Q 153. Operating Carnot's reversible cycle, one would always get the result –
(A) $Q/T = \infty$
(B) $Q/T = 0$
(C) Q/T = constant

(D) None

Q 154. Clausius's latent heat equation can be represented as –

(A) $(S_1 - S_2) = \frac{dL}{dT} + \frac{L}{T}$

(B) $(S_1 - S_2) = \frac{dL}{dT} - \frac{L}{T}$

(C) $(S_2 - S_1) = \frac{dT}{dL} - \frac{T}{L}$

(D) $(S_2 - S_1) = \frac{dT}{dL} + \frac{T}{L}$

Q 155. The differential equation of wave is –

(A) $\frac{d^2y}{dt^2} = v^2 \frac{d^2y}{dx^2}$

(B) $\frac{d^2y}{dx^2} = v^2 \frac{d^2y}{dt^2}$

(C) $\frac{d^2y}{dx^2} = \frac{1}{v} \frac{d^2y}{dt^2}$

(D) $\frac{d^2y}{dx^2} = -v \frac{d^2y}{dt^2}$

Q 156. If F is restoring force, K is force constant & y is displacement. Which of the following equation represents the equation of wave –

(A) F = – Ky

(B) $F = \sqrt{Ky}$

(C) F = Ky

(D) None of these

Q 157. Which of the following properties of wave is affected by change in medium temperature?

(A) Amplitude

(B) Frequency

(C) Wavelength

(D) None

Q 158. Which of the following is transmitted by a wave?

(A) Amplitude

(B) Velocity

(C) Energy

(D) Momentum

Q 159. Which of the following phenomenon is not shown by sound wave?

(A) Diffraction
(B) Interference
(C) Polarisation
(D)None of these

Q 160. The angle between particle velocity & wave velocity in a transverse wave is –
(A) 0
(B) π/4
(C) π/2
(D) π

Q 161. Which of the following is a longitudinal wave?
(A) Sound wave
(B) Wave on plucked string
(C) Water wave
(D) Light wave

Q 162. The equation of stationary wave is given by –
(A) $y = 2y_0 \sin kx \cos \omega t$
(B) $y = y_0 \sin k(x - vt)$
(C) $y = y_0 \cos 2\pi \left(\frac{kx}{\lambda} - \frac{t}{T} \right)$
(D) $y = y_0 \sin \left(\frac{2vT}{\lambda} \right)$

Q 163. In a stationary waves –
(A) Energy is uniformly distributed.
(B) Energy is maximum at nodes & minimum at antinodes.
(C) Energy is minimum at nodes & maximum at antinodes.
(D) Alternating maxima & minima of energy are produced at nodes & antinodes.

Q 164. In a stationary waves –
(A) Strain is maximum at antinodes.
(B) Strain is maximum at nodes.
(C) Strain is minimum at nodes.
(D) Amplitudes is zero at all points.

Q 165. The distance between successive nodes is –
(A) λ
(B) λ/2
(C) λ/4
(D) 2 λ

Q 166. Which of the following equation represents a progressive wave?

(A) $y = a(\omega t - kx)$

(B) $y = a\sin\omega t$

(C) $y = \cos kx$

(D) $y = a\sin(at - bx + c)$

Q 167. Velocity of waves in a string depends upon –

(A) Length of the string.

(B) Tension of the string.

(C) Density of the surrounding medium.

(D) Temperature of the atmosphere.

Q 168. If frequency of vibration of a string is increased by a factor 2, then tension in string will be –

(A) Half

(B) Double

(C) One fourth

(D) Four times

Q 169. The sonometer wire is vibrating in a second overtone. We may say that there are –

(A) Two nodes & two antinodes.

(B) One node & two antinodes.

(C) Four nodes & three antinodes.

(D) Three nodes & three antinodes.

Q 170. The loudness of sound depends upon –

(A) Amplitude

(B) Pitch

(C) Velocity

(D) Wavelength

Q 171. Loudness of sound is measured as –

(A) Bells

(B) Ergs

(C) Cycles/second

(D)Weber

Q 172. The relationship between the objective measurements of intensity of sounds I & subjective response called loudness L is given by –

(A) L = I

(B) L = K log I

(C) I = K log L

(D) $L = K \log I^2$

Q 173. Oscillations become damped due to –

(A) Normal force
(B) Friction force
(C) Tangential force
(D) Parallel force

Q 174. In a damped harmonic oscillator, the damping force is proportional to –

(A) Displacement
(B) Acceleration
(C) Velocity
(D) None of these

Q 175. In which of the following oscillations the amplitude varies with time?

(A) Damped oscillator
(B) Forced oscillator
(C) Undamped oscillator
(D) None of these

Q 176. Which of the following is an example of Forced harmonic oscillator?

(A) Sound produced by flute.
(B) Sound produced by an organ pipe.
(C) Vibrations produced in Violin string.
(D) Vibrations produced in telephone transmitter during station convertor.

Q 177. As the amplitude of resonant vibrations decrease, degree of damping –

(A) Increases.
(B) Decreases.
(C) Remain same.
(D) Varies.

Q 178. For a resonating system, it should oscillate –

(A) Bound
(B) Only for sometime
(C) Freely
(D) For infinite times

Q 179. The amount of power supplied to a system is equal to the rate of dissipation of energy

in –
(A) Forced vibration
(B) Damped vibration
(C) Simple Harmonic Motion
(D) Oscillatory motion

Q 180. The technique or method to absorb undesirable sounds by soft & porous surface is called –
(A) Acoustic protection.
(B) Unacoustic protection.
(C) Audible protection.
(D) Decibel protection.

Q 181. The echo of sound is more prominent if the surface is –
(A) Soft
(B) Rigid
(C) Porous
(D) Smooth

Q 182. To communicate with each other, elephants use –
(A) High frequency sound waves.
(B) Low frequency heat waves.
(C) Low frequency sound waves.
(D) Low frequency light waves.

Q 183. The wavelength of ultrasonic waves is –
(A) More than audible sound.
(B) Less than audible sound.
(C) Equals to audible sound.
(D) Greater than light waves.

Q 184. SONAR emits which of the following waves?
(A) Radio waves
(B) Ultrasonic waves
(C) Light waves
(D) Heat waves

Q 185. SONAR is the abbreviation of –
(A) Small Navigation And Random

(B) Sky Navigation And Ranging
(C) Sun Nuclear Ranging
(D) Sound Navigation And Ranging

Q 186. When damping constant is very small, the acceleration amplitude of resonance frequency equals to the natural frequency of the –
(A) Damped oscillator
(B) Forced oscillator
(C) Both
(D) None

Q 187. When the amplitude at resonance falls rapidly as the frequency of the applied force is change slightly from its resonant value, the resonance is said to be –
(A) Flat
(B) Sharp
(C) Curve
(D) None

Q 188. When the amplitude at resonance falls gradually as the frequency of the applied force is change slightly from its resonant value, the resonance is said to be –
(A) Flat
(B) Sharp
(C) Curve
(D) None

Q 189. The sharpness of resonance depends upon –
(A) Frequency
(B) Forced oscillator
(C) Damping
(D) None of these

Q 190. When there is no damping, the amplitude at resonance becomes –
(A) 0
(B) ∞
(C) Both
(D) None

Q 191. At resonance, displacement lags behind the driving force by an angle –
(A) π
(B) 2π

(C) π/2
(D) π/4

Q 192. General differential equation of motion of a simple harmonic oscillator is given by –

(A) $\frac{d^2y}{dt^2} - \omega^2 y = 0$

(B) $\frac{d^2y}{dt^2} = -\omega^2 y$

(C) $\frac{d^2y}{dt^2} + \omega^2 = 0$

(D) None

Q 193. The velocity of the oscillator is maximum when –

(A) $V_{max} = a\omega$

(B) $V_{max} = a^2\omega$

(C) $V_{max} = -a\omega^2$

(D) $V_{max} = -a^2\omega$

Q 194. Total energy in case of simple harmonic oscillator can be written as –

(A) $T = \frac{1}{2} m\omega^2 y^2$

(B) $T = \frac{1}{2} m\omega^2 a^2$

(C) $T = \frac{1}{2} m\omega^2$

(D) $T = \frac{1}{2} \omega^2 y^2$

Q 195. The potential energy of an oscillator is maximum at –

(A) Mean position
(B) Extreme position
(C) In between mean & Extreme position
(D) None of the above

Q 196. The unit of force constant or stiffness is –

(A) N
(B) N/m
(C) N/m^2
(D) N^2/m^2

Q 197. The phenomena in which waxing & Waning of sound at regular interval is heard is called –

(A) Beats
(B) Interference
(C) Both
(D) None

Q 198. Beats are heard only when the difference in frequency is not more than –

(A) 5
(B) 10
(C) 15
(D) 20

Q 199. Displacement resonance occurs at an angular frequency ω is given by –

(A) $\omega=\sqrt{\omega_0^2-b^2}$
(B) $\omega=\sqrt{\omega_0^2-2b^2}$
(C) $\omega=\sqrt{2b^2-\omega_0^2}$
(D) None of these

Q 200. The natural frequency of damped oscillation is –

(A) $\omega'=\sqrt{\omega_0^2-2b^2}$
(B) $\omega'=\sqrt{\omega_0^2-b^2}$
(C) $\omega'=\sqrt{\omega_0^2+2b^2}$
(D) $\omega'=\sqrt{\omega_0^2+b^2}$

Q 201. The natural frequency of damped oscillation is _____ the frequency at which displacement resonance occurs.

(A) Greater than
(B) Less than
(C) Equals to
(D) None

Q 202. Amplitude of the forced oscillator at resonance becomes –

(A) Large
(B) Very large
(C) Low

(D) Very low

Q 203. The forced oscillator & applied force are –

(A) In phase
(B) Out of phase
(C) Zero
(D) None

Q 204. When the damping is almost zero, the forced oscillator & applied force are –

(A) In phase
(B) Out of phase
(C) Both
(D) None

Q 205. The damping is maximum, when the forced oscillator & applied force are –

(A) In phase
(B) Out of phase
(C) Both
(D) None

Q 206. It is impossible to transmit any signal with a velocity _____ the velocity of light.

(A) Greater than
(B) Less than
(C) Equals to
(D) None

Q 207. To determine the relative velocity of light with respect to earth was proposed by –

(A) Lorentz
(B) Michelson – Morley
(C) Galilean
(D) Einstein

Q 208. All material bodies moving with velocity v are contracted in the direction of motion by a factor –

(A) $\left(1-\frac{v^2}{c^2}\right)$

(B) $\frac{1}{\left(1-\frac{v^2}{c^2}\right)^{1/2}}$

(C) $\frac{1}{\left(1+\frac{v^2}{c^2}\right)^{1/2}}$

(D) $\left(1-\frac{v^2}{c^2}\right)^{1/2}$

Q 209. The concept of absolute time was ruled out by –
(A) Lorentz
(B) Einstein
(C) Galilean
(D) Newton

Q 210. The new concept of space & time is explained by –
(A) Classical theory
(B) Quantum theory
(C) Theory of relativity
(D) None

Q 211. Special theory of relativity deals with inertial system. This is the system moving with –
(A) Variable velocity
(B) Uniform velocity
(C) Both
(D) None

Q 212. The failure of the Michelson – Morley experiment which was performed to determine the velocity of earth through ether. According to these postulates –
(A) Velocity is not absolute, but relative.
(B) Velocity is absolute, but relative.
(C) Both
(D) None

Q 213. The velocity of light in vacuum is _____ of the velocity of observer or the velocity of the source.
(A) Dependent
(B) Independent
(C) Both dependent & independent
(D) Neither dependent nor independent

Q 214. The Lorentz transformation reduce to Galilean transformation if –
(A) V << C
(B) V >> C
(C) V = C
(D) None of given is correct

Q 215. The inverse of Lorentz transformation is –

(A) Also a Lorentz transformation
(B) Not a Lorentz transformation
(C) A Galilean transformation
(D) None of the above

Q 216. If the clock moves with respect to the observer with velocity v^2 , then it appears to go at a slowest rate by a factor –

(A) $\left(1-\frac{v^2}{c^2}\right)^{1/2}$

(B) $\left(1+\frac{v^2}{c^2}\right)^{1/2}$

(C) $\frac{1}{\left(1-\frac{v^2}{c^2}\right)^{1/2}}$

(D) $\frac{1}{\left(1+\frac{v^2}{c^2}\right)^{1/2}}$

Q 217. Any two events are said to simultaneous if they occur at the –
(A) Same time
(B) Different time
(C) Does not depend on time
(D) None

Q 218. Δt & $\Delta t'$ satisfy the time – dilation relation as –

(A) $\Delta t' = \Delta t\left(1-\frac{v^2}{c^2}\right)^{1/2}$

(B) $\Delta t' = \Delta t\left(1+\frac{v^2}{c^2}\right)^{1/2}$

(C) $\Delta t' = \left(1-\frac{v^2}{c^2}\right)^{1/2}$

(D) $\Delta t' = \left(1+\frac{v^2}{c^2}\right)^{1/2}$

Q 219. The velocity of light “c” cannot be changed by adding to a velocity –
(A) Smaller than c
(B) Larger than c
(C) Equals to c
(D) None

Q 220. The velocity of light is called fundamental velocity due to the properties that –

(A) It is constant in all directions.
(B) It is variable in all directions.
(C) It moves in a particular direction.
(D) None of the statements is correct.

Q 221. The time recorded by a clock moving with a given system is called –
(A) Relative time
(B) Proper time
(C) Improper time
(D) Stationary time

Q 222. Moving clock runs more slowly than a stationary one. We thus conclude that there are –
(A) One proper time
(B) Two proper time
(C) Three proper time
(D) Four proper time

Q 223. When source & observer are approaching each other, the apparent frequency is –
(A) Increased
(B) Decreased
(C) Same
(D) None

Q 224. Doppler effect occurs in –
(A) Same kind of wave motion.
(B) Different kind of wave motion.
(C) All kind of wave motions.
(D) All statements are correct.

Q 225. The spectral lines shifted towards violet. This indicates –
(A) Increase in wavelength.
(B) Decrease in wavelength.
(C) Neither increase nor decrease in wavelength.
(D) Does not depend on wavelength.

Q 226. The spectral lines shifted towards red. This indicates –
(A) Increase in wavelength.
(B) Decrease in wavelength.
(C) Neither increase nor decrease in wavelength.
(D) Does not depend on wavelength.

Q 227. When source & observer are receding from each other, the apparent frequency is –
(A) Increased

(B) Decreased
(C) Same
(D) None

Q 228. When the star is approaching the earth, the following relation is valid –

(A) $\lambda' = \left(\frac{c+v}{c}\right)\lambda$

(B) $\lambda' = \left(\frac{c-v}{c}\right)\lambda$

(C) $\lambda' = \left(\frac{c}{c-v}\right)\lambda$

(D) $\lambda' = \left(\frac{c}{c+v}\right)\lambda$

Q 229. When the star is receding from the earth, the following relation is correct –

(A) $\lambda' = \left(\frac{c+v}{c}\right)\lambda$

(B) $\lambda' = \left(\frac{c-v}{c}\right)\lambda$

(C) $\lambda' = \left(\frac{c}{c-v}\right)\lambda$

(D) $\lambda' = \left(\frac{c}{c+v}\right)\lambda$

Q 230. Lorentz transformation is simply a rotation in –

(A) Two dimensional space.
(B) Three dimensional space.
(C) Four dimensional space.
(D) None of the above.

Q 231. The amount of energy required to break neutrons & protons of a nucleus to infinite distance is known as –

(A) Potential energy
(B) Kinetic energy
(C) Binding energy
(D) Thermal energy

Q 232. On the concept of binding energy, we know that the mass of the nucleus is _____ the mass of the constituent nucleus.

(A) Smaller than

(B) Greater than
(C) Equals to
(D) None of these

Q 233. Variation of mass with velocity is –

(A) $m=\frac{m_0}{\sqrt{\left(1+\frac{v^2}{c^2}\right)}}$

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

(C) $m=\frac{m_0}{\sqrt{\left(1-\frac{v^2}{c^2}\right)}}$

(D) $m=\frac{m_0}{\sqrt{\left(1+\frac{c^2}{v^2}\right)}}$

Q 234. In Michelson – Morley experiment, the monochromatic light falling on the silver plate at an angle –
(A) 45^0
(B) 90^0
(C) 180^0
(D) 360^0

Q 235. Number of mirrors used in Michelson – Morley experiment is –
(A) 1
(B) 2
(C) 3
(D) 4

Q 236. 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 237. 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 238. Scleronomous constraints are –
(A) Independent of time
(B) Dependent on time
(C) Both (A) & (B)
(D) None of these

Q 239. 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 240. 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 241. 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 242. 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 243. 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 244. Out of the following quantities, pick out one that is invariant under Galilean transformation –

(A) Displacement

(B) Velocity

(C) Force

(D) Momentum

Q 245. Kinetic energy of a relativistic particle of rest mass m_0 is moving with speed v –

(A) $\frac{1}{2}m_0v^2$

(B) $\frac{m_0c^2}{\sqrt{1-\frac{v^2}{c^2}}}$

(C) $\frac{m_0c^2}{\sqrt{1-\frac{v^2}{c^2}}}-¿\ m_0c^2$

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

Q 246. Lagrangian L is defined as –

(A) L = T – V

(B) L = T + V

(C) Neither (A) & (B)

(D) None of these

Q 247. 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 248. 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 249. A constraint relations can be made independent of velocity is called –

(A) Holonomic

(B) Non-holonomic

(C) Bilateral

(D) None of these

Q 250. If constraint relations depend explicitly on time is called –

(A) Holonomic

(B) Non-holonomic

(C) Rheonomic

(D) None of these

Q 251. 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 252. 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 253. 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 254. 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 255. 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 256. 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 257. 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 258. 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 259. 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 260. 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 261. 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 262. 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 263. 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 264. The minimum value of coriolis force is given by –

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

Q 265. 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 266. 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 267. 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 268. 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 269. The unit of stress is expressed in the unit of –

(A) Velocity
(B) Acceleration
(C) Force
(D) Pressure

Q 270. Hooke's law is the ratio of –

(A) Strain / Stress
(B) 1 / Stress
(C) Stress / Strain
(D) 1 / Strain

Q 271. Young's modulus is applied in case of –

(A) Length
(B) Volume
(C) Area
(D) None of these

Q 272. Bulk modulus is applied in case of –

(A) Length
(B) Volume
(C) Area
(D) None of these

Q 273. 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 274. 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 275. 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 276. 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 277. 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

Q 278. 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 279. 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 280. 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 281. Using Poiseuille's formula, we can calculate the viscosity using –

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

Q 282. 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 283. 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 284. Reynold's number is low for –

(A) Low velocity
(B) Low density
(C) High velocity
(D) All of the above

Q 285. 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 286. 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 287. 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 288. 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 289. 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 290. 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 291. 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 292. With the rise in temperature, the surface tension of liquid –

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

Q 293. 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 294. 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 295. 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 296. 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 297. 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 298. 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 299. 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 300. What are the dimensions of stress –

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