Apex care Academy, Rasipuram

A Real Institute for Physics

POLY.& PG TRB PHYSICS

STATISTICAL MECHANICS

1. Planck's law of energy distribution of black body radiation agrees with the Rayleigh – Jeans law
   (A) At all wavelengths (B) at short wavelengths only
   (C) At long wavelengths only (D) only at the maximum of the energy distribution curve
2. In Debye's model of vibrations of solid the minimum wavelength is equal to
   (A) a (B) a^3 (C) 2 a (D) $\sqrt{a}$
3. The Maxwell-Boltzmann distribution law is represented by
   (A) $n_v = Cexp\left(\frac{-mv^2}{2kT}\right)$ (B) $n_v = C^2exp\left(\frac{mv^2}{2kT}\right)$ (C) $n_v = C^1exp\left(\frac{-mv^2}{kT}\right)$ (D) $n_v = Cexp\left(\frac{mv}{kT}\right)$
4. At low temperature, the specific that of hydrogen is due to
   (A) Rotational Levels (B) Translation Levels
   (C) Vibrational Levels (D) Electronic Levels
5. According to Fermi-Dirac statistics, at the Fermi energy, the occupation index is
   (A) Zero (B) almost zero (C) half (D) Unity
6. Enistein's theory of specific heat predicts values lower than the experimental values at
   (A) All temperatures (B) very low temperatures
   (C) Intermediate temperatures (D) very high temperatures
7. Bose –Einstein condensation temperature T_B refers to the temperature below which
   (A) An assembly of bose gas condenses to the liquid state.
   (B) There is an appreciable occupation of the ground state in an electron system
   (C) There is a significantly large occupancy of the ground state in a system of bosons
   (D) The bosons essentially behave like fermions.
8. For a system at a constant temperature and pressure the equilibrium state is described by
   (A) Minimum of Helmholtz free energy (B)Minimum of Gibbs potential
   (C) Minimum of entropy (D) Minimum of Volume
9. The total entropy σ of a combined system of two closed systems with entropies σ_1 and σ_2 is
   (A) $\sigma = \sigma_1 + \sigma_2$ (B) $\sigma = \sigma_1\ \sigma_2$ (C) $\sigma = |\sigma_1 + \sigma_2|$ (D) $\sigma = \log(\sigma_1 - \sigma_2)$
10. For the temperatures T< T◦ (T◦ is the bose – Einstein temperature) the number of atoms in the excited orbital's varies as
    (A) $T^{½}$ (B) T (C) $T^{3/2}$ (D) T^2

11. At absolute zero the pressure of an ideal Fermi gas is

(A) 0 (B) $\frac{2E_F}{5V}$ (C) $\frac{2E_F}{3V}$ (D) $\sqrt{\frac{E_F}{V}}$

12. The interaction between two gases A and A' isothermal interaction. The walls which allow thermal interaction are called.

(A) Adiabatic walls (B) isothermal walls (C) diathermic walls (D) isobaric walls

13. In thermodynamics, temperature can be expressed as

(A) $T=\left[\frac{\partial u}{\partial S}\right]_V$ (B) $T=\left(\frac{\partial S}{\partial u}\right)_V$ (C) $T = \Delta Q$ (D) $T=\frac{\Delta S}{\Delta Q}$

14. The partition function Z_{ij} of two independent systems i and j is given by

(A) $Z_{ij} = Z_i . Z_j$ (B) $Z_{ij} = Z_i + Z_j$ (C) $Z_{ij} = Z_i - Z_j$ (D) $Z_{ij} = \frac{Z_i}{Z_j}$

15. The volume element of phase space $\Delta\tau$ of single systems spineless particle in 3-dimension is given by

(A) $\frac{4\pi P^2}{h^3}$ (B) $\frac{4\pi P^2 dP}{h^3}$ (C) $\frac{4\pi P^2 V}{h^3}$ (D) $\frac{4\pi P^2 dPV}{h^3}$

16. The number of ways in which N objects can be distributed in k boxes with n_i ($1 \le i \le k$) objects in i^{th} box is given by

(A) N! (B) $n_1!n_2!n_3!\ldots n_k!$ (C) $\frac{N!}{n_1!n_2!n_3!\ldots n_k!}$ (D) $\frac{n_1!n_2!n_3!\ldots n_k!}{N!}$

17. At room temperatures, the molar heat capacity of all solids is nearly

(A) R (B) 2R (C) 3R (D) 4R

18. Transport properties of liquid Helium II in normal state are similar to those of

(A) Solid (B) Gas (C) Liquid (D) Vapor

19. The Zeroth law of thermodynamics enables us to give a precise meaning to

(A) Pressure (B) Temperatures (C) Entropy (D) free energy

20. If a system is such that it neither show a tendency to undergo a spontaneous change in its internal structure (Such as during a chemical reaction) nor allows transfer of matter from one portion of it to another (such as in diffusion), it is said to be in

(A) Chemical equilibrium (B) Thermal equilibrium
(C) Mechanical equilibrium (D) Statistical equilibrium

21. For a reversible isothermal an isobaric process

(A) $\Delta E=0$ (B) $\Delta S=0$ (C) $\Delta F=0$ (D) $\Delta G=0$

22. In the case of a free gas of Fermi particles, the quantum exchange effects lead to the occurrence of

(A) An additional effective attraction between the particles at the low temperature region
(B) An additional effective attraction between the particles at the higher temperature region
(C) An additional effective repulsion between the particles
(D) None of the above.

23. In Fermions, the spin of the nucleus is

(A) An integral multiple of ½ (B) Zero

(C) Even integral multiple of ½ (D) odd integral multiple of ½

24. The chemical potential of a photon gas is

(A) Zero (B) Positive (C) Negative (D) Imaginary

25. The chemical potential of a fermionic system with a fixed number of particles at absolute zero of temperature is

(A) Zero (B) Negative (C) Positive (D) Imaginary

26. The classical statistical mechanics will give accurate results for a gas of free molecules, when the mean separation ($\bar{r}$) between the molecules and their thermal de Broglie wavelength (λ) have the following relationship.

(A) $\lambda >> \bar{r}$ (B) $\lambda = \bar{r}$ (C) $\lambda << \bar{r}$ (D) none of the above

27. A micro – canonical ensemble represents

(A) A system in contact with a heat reservoir

(B) An isolated system in equilibrium

(C) A system that can exchange particles with its surroundings

(D) A system under constant external pressure

28. Mean total energy of a classical 3D harmonic oscillator in equilibrium with a heat reservoir at temperature T is

(A) k_BT (B) 3/2 k_BT (C) 2k_BT (D) 3k_BT

29. which of the following is not an exact differential

(A) dQ(Q= heat absorbed) (B) du (u = internal energy)

(B) dS(S= entropy (D) dF(F=free energy)

30. The root mean square speed of a particle of mass m in the kinetic theory is given by

(A) $\sqrt{\frac{k_BT}{m}}$ (B) $\sqrt{\frac{2k_BT}{m}}$ (C) $\sqrt{\frac{3k_BT}{m}}$ (D) $\sqrt{\frac{8k_BT}{m}}$

31. The temperature of a wire vibrating between two fixed supports will

(A) Remain same (B) becomes zero (C) drop (D) increase if tension is increased

32. At equilibrium the entropy of an isolate system having energy between u an u+δu is

(A) ln Ω(u,v,w) (B) k ln Ω(u,v,w) (C) –k ln Ω(u,v,w) (D) – ln Ω(u,v,w)

33. The differential form of the first law of thermodynamics for a non- diffusively interacting system is

(A) du = δQ+δW(B) du = δQ-δW (C) δQ = δW + μdN (D) du = δQ + δW + μdN

34. System consisting of identical of half odd integral spin $\frac{\hbar}{2}, \frac{3\hbar}{2}, \frac{5\hbar}{2}$ . . . described by

(A) Bose – Einstein statistics (B) symmetric wave function Ψ(S)

(C) antisymmetric wave function Ψ(S) (D) Maxwell's Boltzmann statistics

35. Helmoltz free energy of system A in the surroundings of constant temperature T^v is

(A) – T ln Z (B) $U + T^v S$ (C) $U - T^v S$ (D) kT ln Z

36. System consisting of identical particles of integral spin 0, 1ħ, 2ħ, . . . are described by

(A) Anti-symmetric wave functions (B) symmetric wave functions

(C) Fermi - Dirac statistics (D) Maxwell's - Boltzmann statistics

37. An operator whose expectation value for all admissible wave functions is real is known as

(A) Lagrangian operator (B) Hermitian operator

(C) Skew Hermitian operator (D) Laplacian operator

38. The thermal de Broglie wavelength associated with the molecule of a gas at temperature T is

(A) h 2πmkT (B) $\frac{h}{2\pi mkT}$ (C) $h(2\pi mkT)^{½}$ (D) $\frac{h}{(2\pi mkT)^{1/2}}$

39. The mixing of two different gases is an irreversible process. It is therefore attended by

(A) Constant entropy (B) decrease of entropy (C) zero entropy (D) an increase in entropy

40. The total rate of change of density $\frac{dP}{dt}$ in the vicinity of any selected phase point of a system as it moves through the P space

(A) Increases (B) decreases (C) is zero (D) is constant

41. According to Nernst postulate, the entropy of any system vanishes in the state for which

(A) T = 0K (B) T = 4K (C) T = 298.16K D) T = 77K

42. The point in phase space is actually a cell whose minimum volume – is of the order of

(A) H (B) h^3 (C) h^2 (D) h^5

43. The value of the thermal de Broglie wavelength λ in Å for an electron at room temperature is

(A) $0.745T^{-½}$ (B) $0.745T^{-½}$ (C) $745T^{-1/2}$ (D) $745T^{½}$

44. In bosons, the spin of the nucleus is

(A) Zero only (B) an integral number (C) either zero or an integral number

(D) an odd integral multiple of ½

45. G = U-TS + PV is Gibbs free energy of system A in an environment of

(A) Constant entropy S and constant pressure p

(B) Constant temperature T and constant entropy S

(C) Constant temperature T and constant pressure p

(D) Constant volume V and constant pressure p

46. The work function ϕ of the metal is

(A) $\mu_B T \mu(T)$ (B) $\mu_B - \mu(T)$ (C) $\mu_B . \mu(T)$ (D) $\frac{\mu \mathbf{B}}{\mu(\mathbf{T})}$

47. Richardson – Dushmann equation for thermionic emission is

(A) $J = AT^2 e^{-\phi / kT}$ (B) $J = AT^4 e^{\phi / kT}$ (C) $J = AT^2 e^{\phi / kT}$ (D) $J = AT^4 e^{-\phi / kT}$

48. The lowest value of partition function at absolute zero when all particles occupy the lowest energy stat is

(A) Zero (B) 1 (B) -1 (D) 10

49. At atmospheric pressure, helium condenses into a normal liquid at

(A) 4.2 K (B) 0.42 K (C) 3 K (D) 3.2 K

50. The Fermi energy of electron gas in copper at 300 K is

(A) 0.7 eV (B) 0.07eV (C) 7.0 eV (D) 70 eV

51. The number of microstates accessible to a system should increase with

(A) Increase in its energy (B) Decrease in its energy

(C) Decrease in entropy (D) Decrease in ensemble

52. In Bose - Einstein statistics, the chemical potential is always

(A) Zero (B) Positive (C) infinity (D) negative

53. When two systems at different temperatures are put into thermal conductivity, the total entropy

(A) Remains same (B) Becomes zero (C) Decreases (D) Increases

54. Which law of thermodynamics states that the entropy of a system vanishes at absolute zero?

(A) Zeroth law (B) First law (C) Second law (D) Third law

55. At short wavelength, Plank's radiation formula reduces to

(A) Wien's law (B) Stefan's law (C) Rayleigh – Jean's law (D) Kirchhoff's law

56. In canonical ensemble, the individual system are separated by

(A) Rigid, impermeable and insulated walls (C) Non – rigid, impermeable and insulated walls

(B) Rigid, impermeable and conducting walls. (D) Rigid, permeable and conducting walls.

57. For a micro canonical ensemble the phase density inside a smalls energy interval remains constant and outside the region?

(A) Same as inside (B) Zero (C) According to the representation of the system

(D) We cannot represent about energy outside.

58. In the grand canonical ensemble particles can be exchanged between the system and allow the fluctuation in the

(A) Energy but not in the number of particles. (C) Energy as well as number of particles

(B) Pressure but not in the number of particles. (D) None of this.

59. Micro canonical ensemble is the collection of large number of essentially independent system having

(A) Some energy, temperature, and the number of particles

(B) Some energy, volume, and the number of particles

(C) Some temperature, volume, and chemical potential

(D) Some temperature, energy, and chemical potential

60. Liouville's theorem deals with the

(A) Conservation of density in phase space. (B) Conservation of energy in phase space

(C) Conservation of density and energy in phase space

(D) Conservation of density of during the extension in phase space.

61. The Helmholtz free energy is related to the partition function of the system in the following way.

(A) $F = -NKT \log Z$ (B) $F = KT^2 \log (Z)$ (C) $F = KT \log (Z^{1/2})$ (D) $F = KT^2 \log (Z^{1/2})$

62. The Classical partition function Z givens the

(A) Sum of energy of the system (B) Sum of states of the system

(C) Sum of momentum of the system (D) none of there.

63. The Classical partition function Z is related the thermodynamically quantities in the following

(A) $S = NK \log Z + ½ KT$ (B) $S = NK \log Z + 3/2 KT$

(C) $S = NK \log (Z)^{½} + ½ KT$ (D) $S = NK \log (Z)^{1/2} + 3/2 KT$

64. Particles processing high energy at absolute zero are

(A) Bosons (B) Fermions (C) Phonons (D) Photons

65. In MB statistics the partition function Z is

(A) $\frac{V}{h} (2\pi mKT)^{3/2}$ (B) $\frac{V}{h^2} (2\pi mKT)^{3/2}$ (C) $\frac{V}{h^3} (\pi mKT)^{3/2}$ (D) $\frac{V}{h^2} (2\pi mKT)$

66. Select the correct statement

(A) Photons are distinguishable and obey B.E statistics.

(B) Photons are indistinguishable and obey B.E statistics.

(C) Photons are distinguishable and obey F.D statistics

(D) Photons are indistinguishable and obey F.D statistics.

67. In B.E statistics of perfect gas the average K.E per molecule is have.

(A) ½ KT (B) 5/2 KT (C) 3/2 KT (D) KT

68. A particle of M.B Velocity distribution. The average speed of the particle is given.

(A) $\sqrt{\frac{2KT}{\pi m}}$ (B) $\sqrt{\frac{8KT}{m\pi}}$ (C) $\frac{3KT}{2}$ (D) $\frac{3NKT}{2}$

69. In quantum statistics the volume of phase cell V is

(A) $V = \frac{1}{h^3}$ (B) $V = h^3$ (C) $V = 0$ (D) $V = h^2$

70. Pauli's exclusion principle is imposed on

(A) M.B. Statistics (B) B.E Statistics (C) F.D Statistics (D) All these three.

71. The unit of phase space Volume is

(A) $J^3 S^3$ (B) $Kgm^6 m^{-3}$ (C) J^3 / S^3 (D) Js

72. The statistical theory which readily leads to Black body radiation is

(A) M.B Statistics (B) B.E Statistics (C) F.D Statistics (D) all these three

73. R.M.S Velocity of a particle V_{rms} is

(A) $\sqrt{\frac{2KT}{m}}$ (B) $\sqrt{\frac{3KT}{m}}$ (C) $\sqrt{\frac{2NKT}{m}}$ (D) $\sqrt{\frac{8KT}{m}}$

74. As the energy of a cell increase, the number of particles distributed in the cell

(A) Increases (B) Decreases (C) Increases and then decreases

(D) Decreases and the increases.

75. Planck's law governing the black body radio can be deduced wing

(A) M.B. Statistics (B) B.E Statistics (C) F.D Statistics (D) All these three.

76. The statistical theory which supports the zero point energy of a gas even at absolute zero is

(A) Classical statistics (B) B.E statistics (C) F.D statistics (D) All of these.

77. The number of dimension in phase a pace is

(A) 3 (B) 4 (C) 1 (D) 6

78. The most probable speed of a molecule is

(A) $\sqrt{\frac{8KT}{\pi m}}$ (B) $\sqrt{\frac{2KT}{m}}$ (C) $\sqrt{\frac{3KT}{m}}$ (D) $1.59\sqrt{\frac{KT}{m}}$

79. Free electrons theory is explained by

(A) M-B statistics (B) F-D Statistics (C) B.E Statistics and F.D Statistics (D) All the above.

80. The following is a quantum statistics.

(A) M-B Statistics only (B) B.E Statistics only (C) M-D and FD Statistics

(E) B-E and F-D statistics

81. In micro canonicals ensemble the system can

(A) Exchange energy only (B) Exchange particle only

(C) Do not exchange energy or particles (D) All the above

82. Canonical ensemble is a collection of essentially independent assemblies having the

(A) Same energy, volume and no of particles.

(B) Same energy, Temperature and volume

(C) Same temperature, volume and no of particles

(D) Same volume and no of particles.

83. One of the Liouville's theorem is

(A) $\frac{d}{dt}(\partial\Gamma) = 0$ (B) $\frac{d}{dt}(d\Gamma) = \infty$ (C) $\frac{\partial\Gamma}{\partial t} \neq 0$ (D) $\frac{d}{dt}(\partial P) = 0$

84. Pauli's theory of Para magnetism is explained by

(A) Classical Statistics (B) B.E Statistics (C) F.D Statistics (D) All the three.

85. In the case of Liquid Helium the λ point corresponds to

(A) 2.2 K (B) 4.2K (C) 2.9 K (D) 2.19 K

86. Identical but indistinguishable particles of spin ½ obey

(A) M.B Law only

(B) Fermi – Dirac Statistic only

(C) Bore – Einstein statistic only

(D) Fermi – Dirac statistics and Pauli's exclusion principle.

87. Photons are the particles of

(A) M.B Statistics (B) B.E Statistics (C) F.D Statistics (D) Both B.E and FD Statistics.

88. Volume in phase space is not known for the particles of

(A) M.B Statistics (B) B.E Statistics (C) F.D Statistics (D) Both B.E and FD Statistics

89. There is no restriction on the number of particles in

(A) M.B Statistics and F.P. Statics (B) F.D. Statistics only

(C) M.B and B.E statistics (D) B.E Statistics only

90. Zero point energy of electron gas

(A) $1/2\ n\ \varepsilon_f$ (B) $2/5\ n\varepsilon_f$ (C) $3/2\ n\varepsilon_f$ (D) $3/5\ n\varepsilon_f$

91. For electron gas, the degeneracy is

(A) Sufficiently low (B) Optimum (C) Sufficiently high (D) None of these.

92. Richardson equation of thermionic emission is

(A) $\text{Log}_e (J/T^2) = \log A - e\phi/K$ (C) $\text{Log}_e (J/T^2) = \log A - e\phi/KT$

(B) $\text{Log}_e (J/T^2) = \log A - b\phi/K$ (D) $\text{Log}_e (J/T^2) = \log A + e\phi/K$

93. Number of phase cell in the given range of energy for 3- Dimensional free particle

(A) $\frac{4\pi V}{3h^3}(2mE)^{3/2}$ (B) $\frac{4\pi V}{3h^3}(2mE)^{1/2}$ (C) $\frac{4\pi V}{3h^3}(2mE)^{1/2}$ (D) $\frac{4\pi V}{h^3}(2mE)^{3/2}$

94. The macro state is defined by

(A) Pressure , temperature and volume of the gas (C) Pressure and temperature of the gas

(B) Position and velocity component of molecules (D) Pressure and volume of the gas.

95. Ideal gas molecule is explained by

(A) M.B Statistics (B) B.E Statistics (C) FD Statistics (D) All these three.

96. In canonical ensembles

(A) Sub systems exchange particles (B) Sub systems exchange energy

(C) Sub system exchange energy but not particles (D) sub system exchange both energy and particles

97. The spin of boson is

(A) 0 (or) -1 (B) 0 (or) 1 (C) -1/2 (or) +1/2 (D) 1 (or) -1

98. Which of the following statement is wrong Gibbs function is

(A) Also known as thermodynamic potential

(B) The difference between enthalpy and of latent energy

(C) A constant in sublimation (D) A constant in an adiabatic process.

99. μ - Space, the points is represented at any instant

(A) Momentum, Position (B) Position only (C) Momentum only (D) none.

100. Which of the following is classical particle

(A) Photon (B) Proton (C) Molecule (D) electron

101. Micro canonical ensemble can be expressed in

(A) E, V, N (B) E,V,T (C) E,P, T (D) E,V,P

102. If there is no exchange particle between two ensemble it may be called

(A) Micro Canonical (B) Canonical (C) both (a) and (b) (D) grand canonical

103. Photons is called

(A) Classical particle (B) Fermi Particle (C) Einstein Particle (D) None.

104. If the exchange of energy takes place between two ensemble, then it they be called as

(A) Cannonical (B) Grand Cannonical (C) both (a) and (b) (D) Micro Cannonical

105. If the Temperature, Volume and no of particles is restricted to exchange between two ensemble, then it is known as

(A) Cannonical (B) Micro Cannonical (C) Grand Cannonical (D) None.

106. In Liouville's theorem, the conservative quantity in phase space is

(A) Momentum (B) Energy (C) Density, extension of space (D) None

107. In first law of thermodynamics, the conservation quantity is

(A) Momentum (B) Energy (C) Density (D) All of these

108. Identical distinguishable particle are obey to

(A) M-B Statistics (B) F-D (C) B.E (D) All of these

109. Identical, indistinguishable particle may obey

(A) M-B Statistics (B) F-D (C) B.E (D) Both (b) and (c)

110. The particle which obey the Pauli's exclusion principle is known as

(A) Einstein Particle (B) Paul's Particle (C) Fermi Particles (D) Maxwell's particle.

111. Radiation is contained in a volume (V) Pressure (p) and the total Energy (E), then the correct value of

(A) 1/3 E (B) ½ E (C) 2/3 E (D) E

112. Ina gas the expression for the root mean square speed of a molecule is given by

(A) $\sqrt{\frac{3NKT}{m}}$ (B) $\sqrt{\frac{2KT}{m}}$ (C) $\sqrt{\frac{8KT}{m\pi}}$ (D) $\sqrt{\frac{3KT}{m}}$

113. The path covered by a molecule between two consecutive collation is known as

(A) Cohenance length (B) Mean free bath (C) Interatomic space (D) Relaxation time

114. Energy density in a black body radiation is proportional to

(A) T^{-3} (B) T^{5} (C) T^{4} (D) T

115. Intensity of heat is measured using

(A) Thermometer (B) Manometer (D) monometers (D) Bolometer

116. At absolute temperature the maximum K.E of an electron in F-D statistics is

(A) Total energy (B) Kinetic Energy (C) Fermi energy (D) None.

117. Fermi temperature of free electron gas is

(A) $T_f = E_f / k$ (B) $T_f = 3/2\ E_f / k$ (C) $T_f = 1/2\ E_f / k$ (D) Zero

118. Stirling approximation for log n! is

(A) n log n – n (B) nlogn –n ! (C) logn $-n^2$ (D) n (log n -1)

119. The entropy and partizion function is related as

(A) S=R log Z + E/T (B) S=R log Z (C) S = R log Z - E (D) none

120. Gibbs function (G) and Free energy (F) related as

(A) G = F + PV (B) G = F-TS (C) G = F+TS (D) G=G - PV

121. Liouville's theorem is

(A) $d\rho/dt = 0$ (B) $d\rho/dt\ (\Gamma)$ = constant (C) $d/dt\ (d\Gamma)$ = Constant (D) $d/dt\ (d\Gamma) = 0$

122. Pauli's theory of Para magnetism has examined by

(A) F-D statistics (B) M-B (C) B.E (D) Classical

123. Thermionic current emission density per unit area for a metal of more function E is

(A) $J\alpha T^2\ \bar{e}^{E/KT}$ (B) $J\alpha T\ e^{E/KT}$ (C) $J\alpha T^2\ e^{E/KT}$ (D) $J\alpha T\ \bar{e}^{E/KT}$

124. As temperature of thermionic filament doubled, the current increases

(A) 4 times (B) 6 times (C) 9 times (D) 36 times

125. A quantum of acoustical energy is referred as

(A) Proton (B) Photon (C) Positron (D) Phonon

126. The restriction on number of particles is taken in account in

(A) F-D Statistics (B) B-E Statistics (C) M-B Statistics (D) Classical

127. In temperature and entropy of the liquid helium graph, the above λ point indicates

(A) Helium – I (B) Helium – II (C) both (a) & (b) (D) None.

128. Super fluidity of liquid helium flows through a capillary table rapidly became

(A) Specific heat large (B) Viscosity is large (C) Entropy is Zero (D) Viscosity is zero.

129. Average energy of a particle in a temperature (T) with Seven degrees of Freedom

(A) 7 KT (B) ½ KT (C) 7/2 KT (D) 7/2 RT

130. Helmholtz free energy (F) related with partitions function (τ) by

(A) F= RT log Z (B) F= KT (log Z) (C) F= -KT (log Z) (D) F= -RT (log Z)

131. The restriction imposed on chemical potential to transfer between two ensembles is

(A) Micro Canonical (B) Cannonical (C) Macro Cannonical (D) Grand Cannonical

132. Which of the following is wrong statement related to Gibbs function?

(A) It is Non PdV work (B) Also known as free energy of a system

(C) it is known as thermodynamically potential (D) Gibbs function varied in sublimation

134. The internal energy E of the system in terms of partition function is

(A) $NKT\frac{d(\log z)}{dt}$ (B) $NKT^2\frac{d(\log z)}{dt}$ (C) $NK^2T\frac{d(\log z)}{dt}$ (D) $NK^2T^2\frac{d(\log z)}{dt}$

135. For a gas at N.T.P. which shall be maximum ?

(A) V_{av} (B) $V_{r.m.s.}$ (C) $V_{m.p.}$ (D) None of these

136. Out of n particles in a gas, the number of particles having exactly the most probable velocity is

A) zero B) n C) $\frac{n}{2}$ D) 1

137. The root mean square speed of gas molecules of mass m at a given temperature T is proportional to

A) m^o B) m C) $m^{-1/2}$ D) $m^{1/2}$

138. The rms speed of hydrogen gas molecules at N.T.P. is m/s. The gas is heated at constant volume till the pressure becomes 9 times. The final rms speed will be :

A) 3 v B) 9 v C) 18 v D) v/3

139. The speeds of 10 particles in m/s are 0, 1.0, 2.0, 3.0, 3.0, 4.0, 4.0, 5.0 and 6.0. The most probable speed

A) 3 m/s B) 4 m/s C) zero D) none of these

140. Four particles have speeds 1, 2, 3 and 4 cm/s respectively. Their rms speed is :

A) 2.5 B) 10 C) $\frac{\sqrt{30}}{2}$ D) $\sqrt{30}$

141. A gas having rms speed at 400 K is :

A) Twice the value at 100 K B) Four times the value at 100 K

C)Half the value at 100 K D) Same as at 100 K

142. The most probable speed of molecules varies with temperature T as Vmp ∝ Tn, the value of n is :

A) 0 B) $\frac{1}{2}$ C) 2 D) $\frac{1}{3}$

143. From Fermi-Dirac statistics n_i = ?

A) $\frac{g_i}{e^{\alpha+\beta E_i}+1}$ B) $\frac{2g_i}{e^{\alpha+\beta E_i}+1}$ C) $\frac{2g_i}{e^{\alpha+\beta E_i}-1}$ D) $\frac{g_i}{e^{\alpha+\beta E_i}-1}$

144. In how many ways two particles can be arranged in three phase cells according to B-E statistics:

A) 6 B) 9 C) 3 D) 27

145. According to F-D statistics, 3 particles can be distributed in 4 energy states, in number of ways:

A) 16 B) 4 C) 9 D) 12

146. In which the probability of occupation index can tend to zero:

A) Maxwell-Boltzmann B) Fermi-Dirac

C) Bose-Einstein D) None of these

147. The number of meaningful ways 4 Fermions can be arranged in 5 compartments:

A) 1 B) 4 C) 5 D) 9

148. Einstein's theory of specific heat:

A) Accepts different frequencies of molecular vibrations

B) Accepts same frequencies of all molecular vibrations

C) Rejects molecular vibrations D) None of these

149. According to Dulong and Pettit's law, the average energy of an atom of a solid at temperature T is :

A) $\frac{1}{2}kT$ B) kT C) 2 kT D) 3 kT

150. According to Dulong and Pettit's law, the atomic heat of an element of constant volume:

A) Increases with increase of temperature B) decreases with increase of temperature

C) Becomes zero at absolute zero D) is constant