A

18724 **120 MINUTES**

1. Which among the following pairs *DO NOT* have the same dimensions?
   A) Angular momentum and Action
   B) Lagrangian and Hamiltonian
   C) Momentum and Impulse
   D) Density and specific gravity

2. If $\overrightarrow{A} = \frac{\sqrt{3}}{2}\,\hat{\imath} + \frac{1}{2}\,\hat{\jmath}$ then $\overrightarrow{A}$ makes an angle ------ with the positive X axis.
   A) 60° B) 45 radians C) $\frac{\pi}{6}$ radians D) $\frac{\pi}{3}$ radians

3. Which among the following relations is *NOT* correct?
   A) $\nabla \times (\nabla \times \overrightarrow{A}) = \nabla(\nabla . \overrightarrow{A}) + \nabla^2 \overrightarrow{A}$
   B) $\nabla . (\nabla \times \overrightarrow{A}) = 0$
   C) $\nabla \times (\nabla s) = 0$
   D) Both B and C are NOT correct.

4. If $\overrightarrow{A}$ is solenoidal then --------.
   A) $\nabla . (\overrightarrow{A}) = 0$ B) $\nabla \times (\overrightarrow{A}) = 0$ C) $|(\overrightarrow{A})| = 1$ D) $\nabla (\overrightarrow{A}) = 2\pi$

5. Given that $\overrightarrow{R}$ is perpendicular to both $\overrightarrow{P} = 2\,\hat{\imath} - \hat{\jmath} - 4\hat{k}$ and $\overrightarrow{Q} = 3\,\hat{\imath} - \hat{\jmath} - \hat{k}$. Which among the following is a possible representation of $\overrightarrow{R}$.
   A) $3\,\hat{\imath} + 10\,\hat{\jmath} - \hat{k}$ B) $3\,\hat{\imath} - 10\,\hat{\jmath} - 2\,\hat{k}$
   C) $6\,\hat{\imath} + 20\,\hat{\jmath} - \hat{k}$ D) None of these

6. Which among the following is *NOT* an eigen value of the matrix $\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$
   A) 0 B) -1 C) $-\,i$ D) 1

7. Which among the following statements are *NOT* true for unitary matrices?
   A) Diagonal elements are real numbers
   B) Off diagonal elements may be real or complex
   C) Determinant is always zero
   D) Conjugate transpose is the inverse

8. If A is an orthogonal matrix then the possible values of |A| are:
   A) ±1 B) +1 and 0 C) -1 and 0 D) 0

9. Given $\left(\frac{d^2y}{dx^2}\right) + \left(\frac{dy}{dx}\right)^2 + k\,y^3 = 0$. The degree of this differential equation is ------.
   A) 2 B) 1 C) 3 D) 0

10. Laplace transform of the function F(t) = 1 for t defined for all positive values is, f(s) = -------- with s > 0

A) s B) s^{-1} C) $-s$ D) None of these

11. Finite Fourier cosine transform of x is ---------.

A) π B) $\frac{\pi}{2}$ C) $\frac{\pi^2}{2}$ D) None of these

12. The residue of $f(z) = \frac{z^3-z^2+1}{z^3}$ at infinity is ----------.

A) 0 B) -1 C) +1 D) 2

13. If f(z) is a regular function of z and if f(z) is continuous at each point within and on a closed contour C, then which of the following statements is correct.

A) $\int_c f(z)dz = 2\pi$ B) $\int_c f(z)dz = 0$

C) $\int_c f(z)dz = \pi$ D) $\int_c f(z)dz = \frac{\pi}{2}$

14. Given $(1-x^2)\frac{d^2y}{dx^2} - 2x\frac{dy}{dx} + n(n+1)y = 0$. This differential equation is called -----.

A) Legendre's equation B) Laguerre's equation
C) Hermite equation D) Associated Lauguerre's equation

15. Bessel's differential equation has a singularity at --------, where x and y are the independent and dependent variables

A) y = 0 B) y = x C) x = 0 D) Y = x^2

16. ---------- polynomials are used for solving the Schroedinger equation for a linear harmonic oscillator

A) Legendre's B) Laguerre's
C) Hermite's D) Associated Lauguerre's

17. There are 10 contestants for a 100 m race. If the probability that contestant A wins the race is $\frac{1}{5}$ and the probability that contestant B wins the race is $\frac{1}{4}$, what is the probability that one of these contestants wins the race.

A) $\frac{1}{5}$ B) $\frac{1}{20}$ C) $\frac{1}{10}$ D) $\frac{9}{20}$

18. Which among the following statements is *wrong* if n is the number of events

A) Binomial distribution is a limiting case of normal distribution when n is large
B) Normal distribution is a limiting case of Binomial distribution when n is large
C) Poisson distribution is a limiting case of binomial distribution when n is large
D) For normal distribution the mean, the mode and the median coincide.

19. Oscillations of a point mass could occur about a point of ---------- equilibrium.

A) Unstable B) Stable C) Neutral D) Both A and B

20. A system of 3 particles is constrained move in one dimension. No other constraints are involved. Then the phase space for the system is -------- dimensional.
A) 1 B) 3 C) 9 D) 6

21. A bullet fired from a gun towards a tree is embedded within the target. This is an example of -------.
A) Perfectly elastic collision
B) Perfectly inelastic collision
C) Conservation of kinetic energy
D) None of these

22. Moment of inertia tensor for a rigid body is a -------- tensor.
A) rank 1 B) rank 2 C) rank 3 D) rank 9

23. Which among the following statements is *correct*?
A) Newton's laws are valid only in noninertial frames of references
B) Inertial frames of reference is only an approximation in reality
C) Noninertial frames of references are rare in real situations
D) Both A and C are correct

24. Lagrangian L and Hamiltonian H of a system are related through -------.
A) Fourier transformation B) Laplace's transformation
C) Legendre transformation D) Henkel transformation

25. Which among the following statements is *NOT* correct with respect to the set of generalized coordinates q_i and conjugate momenta p_i.
A) $\dot{p}_i = \frac{\partial H}{\partial q_i}$ B) $p_i = \frac{\partial L}{\partial \dot{q}_i}$ C) $\dot{q}_i = \frac{\partial L}{\partial p_i}$ D) None of these

26. The shortest distance between two points on a plane is a straight line. This can be proved using the concepts of the --------.
A) principle of least action B) variational principle
C) principle of least time D) Hamilton's principle

27. Number of generalized coordinates required completely account for the rotational motion of a rigid body is ---------.
A) 1 B) 2 C) 3 D) 6

28. Number of degrees of freedom for a mass point suspended by an extensible string and constrained to move in a plane are ----------.
A) 1 B) 2 C) 3 D) None of these

29. For a particle moving under inverse square law force, the trajectory will be a hyperbola if ---------, where E is the total energy.
A) $E > 0$ B) $E = 0$ C) $E < 0$ D) None of these

30. According to Kepler's law which of the following statements is true if T is the time period of the planet and R is the semi major axis
A) $R \alpha T^2$ B) $R^2 \alpha T^3$ C) $R^3 \alpha T^2$ D) $R^{1/2} \alpha T^3$

31. Law of conservation of angular momentum is a consequence of ----------.
A) Isotropy of space B) Homogeneity of space
C) Infinite extension of space D) Homogeneity of flow of time

32. Number of degrees of freedom for a particle constrained to be stationary at the point x= 1,y = -1 in the XY plane is ---------.
A) 3 B) 2 C) 1 D) None of these

33. The number of normal modes for a two coupled one dimensional oscillator is ------.
A) 1 B) 2 C) 3 D) 4

34. Principle of least action is stated as ---------. Here L is the Lagrangian, q_i and p_i are the generalized coordinates and conjugate momenta.
A) $\Delta \int_{t1}^{t2} p_i \, \dot{q}_i \, dt = 0$ B) $\Delta \int_{t1}^{t2} H \, dt = 0$
C) $\delta \int_{t1}^{t2} p_i \, \dot{q}_i \, dt = 0$ D) $\delta \int_{t1}^{t2} H \, dt = 0$

35. Which among the following statements is *NOT* true. Here square bracket represents Classical Poisson bracket.
A) $[q_i, q_j]_{q,p} = 0$ B) $[q_i, p_j]_{q,p} = \delta_i$ C) $[p_i, p_j]_{q,p} = 0$ D) $[p_i, q_j]_{q,p} = \delta_{ij}$

36. Hamilton's canonical equations of motion in terms of Poisson bracket can be stated as ---------. H is the Hamiltonian, q_i and p_i represent generalized coordinates and conjugate momenta.
A) $\dot{q}_i = [q_i, H]$; $\dot{p}_i = [p_i, H]$ B) $\dot{q}_i = [H, q_i,]$; $\dot{p}_i = [H, p_i,]$
C) $\dot{q}_i = [q_i, H]$; $-\dot{p}_i = [p_i, H]$ D) $\dot{q}_i = [q_i, H]$; $\dot{p}_i = [H, p_i,]$

37. Time period of a simple pendulum is 3 sec. The mass of the bob is 200 g and length of the string is 75 cm. If the bob is replaced by a new one with mass 400 g, which among the following statements is *TRUE*
A) The time period will double
B) The time period will be half the original value
C) Time period will not change
D) Frequency of the pendulum will be four times the original value

38. Which among the following equations is invariant under Lorentz Transformation?
A) Newton's equation of motion
B) Lagrange's equations of motion
C) Maxwell' equations
D) None of these

39. A clock in a space ship emits signals at an interval of 1 second as observed by a person in the space ship. If the space ship is moving with a speed of 3 x 10^7 m/s with respect to an earth bound control station, what is the interval between successive signals as seen by an observer in the control station?
A) 0.995 seconds B) 1.005 seconds
C) 1 second D) 1.050 seconds

40. Rest mass energy of an electron is ---------.
A) 8.2×10^{-14} J B) 5.1 eV C) 1.02 eV D) 6.623×10^{-34} J

41. Diffraction of electron at a single slit can be explained using ----------.
A) Electromagnetic theory
B) Photon theory
C) Particle picture of electron together with uncertainty principle
D) None of these

42. Electromagnetic radiation of wavelength 1200 Å is incident on metal with threshold wavelength 3000 Å. Maximum kinetic energy of the electron emitted is ---------.
A) 3.2 eV B) 9.93 eV
C) 9.93×10^{-19} eV D) 9.93×10^{-19} J

43. If a non-relativistic quantum mechanical particle is under the influence of a potential which does not depend on time explicitly then ---------.
A) energy eigenvalues are always discrete
B) expectation values of dynamical variables are time independent
C) position probability will explicitly depend on time
D) momentum eigenfunctions are not normalizable.

44. Which among the following statements is *NOT* true for well behaved wave functions ψ to comply with probability interpretation?
A) ψ should be a complex number
B) ψ should be single valued and finite
C) First derivative of ψ should be single valued
D) Ψ should vanish at a point where the potential is infinity

45. Dynamics of which of the following 'particles' cannot be studied using Schrödinger equation
A) Electron in hydrogen atom B) Vibration of a diatomic molecule
C) Photon D) Alpha particle emitted from a nucleus

46. For a particle confined in a potential well of infinitely high walls, which of the following statements is *NOT* true.
A) Tunnelling probability is zero
B) Probability of finding the particle in its ground state is maximum at the centre
C) Momentum eigenvalue corresponding to ground state is not zero.
D) Minimum value of the quantum number n that determines energy is zero

47. For a two dimensional harmonic oscillator which among the following statements is *TRUE*.
A) Only the ground state is non degenerate
B) All energy eigenstates except the ground state are non degenerate
C) All energy states are degenerate
D) None of these

48. Which among the following statements is TRUE if ρ and j represent probability density and probability current density?
A) ρ is a vector and j is a scalar B) ρ is a scalar and j is a vector
C) Both ρ and j are scalars D) Both ρ and j are vectors

49. For a wave packet, $\frac{d<P>}{dt} = ----$. Here P and V represent linear momentum and potential energy
A) $-<\nabla V>$ B) $<\nabla V>$ C) $-\frac{\partial V}{\partial t}$ D) $<V>$

50. In wave mechanics, dynamical variables are represented by--------.
A) Unitary operators B) Self adjoint operators
C) Symmetric operators D) Skew Hermition operators

51. For a free quantum particle which among the following statements is *NOT TRUE*
A) Energy eigenfunctions are momentum eigenfunctions also
B) Energy eigenfunctions are box normalizable
C) Heisenberg's uncertaintly principle is obeyed
D) Energy eigenvalues are discrete.

52. If x and p_y represents the x component of position and y component of linear momentum respectively, then--------. (Square bracket represents commutator operator).

A) $[x, p_y] = i\hbar$ B) $[x, p_y] = -i\hbar$ C) $[x, p_y] = \hbar$ D) $[x, p_y] = 0$

53. Which among the commutation relations is *TRUE* for the operators corresponding to Cartesian components of angular momentum
A) [Lx, Ly] = - iħ B) [Lx, Lz] = iħ
C) [Lx, Ly] = 0 D) [Ly, Lx] = - iħLz

54. If l and j represents quantum numbers associated with the orbital angular momenta operator $\hat{L}^2$ and total angular momenta $\hat{J}^2$, then which of the following statements is *TRUE*.
A) l = 0, 1, 2, 3, ... B) j = 0, 1, 2,3, ...
C) l = 0, 1/2 , 1, 3/2, 2, ... D) j = 0, 1/2, 3/2, 5/2, ...

55. Clebsch Gordon coefficients are associated with ---------.
A) Addition of orbital angular momenta of many particles
B) Addition of orbital and spin angular momenta of a particle
C) Both A and B are correct.
D) Both A and B are wrong

56. Pauli's spin matrices can be used in the case of --------.
A) electron only B) any particle with spin = ½
C) photons D) any particle with spin = 1

57. The ground state energy of He atom calculated using -------- is closer to the experimental value than other approximate methods.
A) Time independent perturbation theory
B) Time dependent perturbation theory
C) Variational principle
D) Ehrenfest theorem

58. The WKB method is useful for solving Schroedinger equation for ----------
A) Ground state of atoms B) Ground state and First excited state of atoms
C) First excited state of atoms D) Highly excited states of atoms

59. Fermi's Goldon rule is associated with the transition ----------.
A) From one level to another level
B) From one level to a quasicontinuum of states
C) From one energy band to another energy band
D) None of these

60. Which among the following statements is *NOT* true?
A) Wavefunction representing an electron confined in a square potential well is always symmetric with respect to the centre of the well
B) Wavefunctions representing two electrons is antisymmetric with respect to exchange operation
C) Wavefunction representing two alpha particles is symmetric with respect to exchange operation
D) Wavefunction representing three electrons is antisymmetric with respect to exchange operation.

61. For a hydrostatic system, if the temperature, pressure and number of moles are fixed, then the equilibrium state has minimum --------.
A) Internal energy B) Enthalpy
C) Helmholtz free energy D) Gibb's free energy

62. At lower temperature the lattice specific heat varies as:
A) T^3 B) $\frac{1}{T^3}$ C) T D) $\frac{1}{T}$

63. The unit of chemical potential is -------.
A) mol B) mol^{-1} C) joules mol^{-1} D) joules

64. The hyper volume corresponding to a quantum state in a 6N dimensional phase space is ---------.
A) h^N B) h^{3N} C) h^3 D) None of these

65. Microcanonical ensemble can be used for studying a system ---------.
A) Only if energy and number of particles are not changing
B) Only if temperature is not changing and known
C) Only if entropy is not changing and known
D) Only if volume is kept constant

66. "An isolated system in equilibrium will be found with equal probability in each of its accessible microstates". This statement is called ----------.
A) Ergodic hypothesis B) Liouville's theorem
C) Gibb's paradox D) None of these

67. The extensive thermodynamic variable used for describing the state of a paramagnetic crystal is ---------.
A) Magnetic field intensity B) Magnetic moment
C) Relative permeability D) Relative permittivity

68. Triple point of water is---------.
A) 273 K B) 273.16 K C) 273.25 K D) 273.35 K

69. --------- law states that the total electric flux linked with a closed surface is $1/\varepsilon_0$ times the charge enclosed by it.
A) Coulomb's B) Poisson's
C) Gauss' D) Ampere's circuital

70. Which among the following statements is *NOT* correct?
A) Displacement current cannot produce a magnetic field
B) Magnitude of displacement current is equal to the time rate of change of electric displacement vector
C) Displacement current in a good conductor is negligibly small compared to conduction current
D) Displacement current can have a finite value in vacuum

71. The direction of Poynting's vector is ---------.
A) parallel to the direction of electric field
B) parallel to the direction of magnetic field
C) perpendicular to the plane containing the electric and magnetic fields
D) None of these

72. Lorentz gauge concept is --------- the coordinate system used.
A) dependent on B) independent of
C) may or may not depend on D) none of these

73. -------- mode cannot propagate through a rectangular wave guide.
A) TE_{00} B) TE_{10} C) TE_{01} D) TE_{11}

74. In the case of electromagnetic radiations falling on ultra thin metallic foil, which among the following statements is *NOT* true
A) The intensity of transmitted waves is very small
B) Waves which are strongly absorbed are strongly reflected
C) Transmitted and reflected colours will be complementary
D) Reflectivity is closer to unity for higher wavelengths and decreases for lower frequencies

75. Vector potential due to an oscillating dipole at a point r distant from the centre of the dipole is ------- if $\dot{p}$ is the time rate of change of dipole moment.

A) $\frac{\mu_0 \dot{p}}{4\pi r}$ B) $\frac{\mu_0 \dot{p}}{4\pi r^2}$ C) $\frac{\mu_0 \dot{p}^2}{4\pi r}$ D) $\frac{\mu_0 \dot{p}}{2\pi r}$

76. When electromagnetic waves goes across a boundary between two mediums which among the following statements is *TRUE*.

A) Normal component of electric displacement, D is continuous across the boundary
B) Normal component of magnetic induction, B is discontinuous across the boundary
C) Tangential component of electric field, E is continuous across the boundary
D) Tangential component of magnetic intensity, H is continuous across the boundary

77. In the case of normal dispersion of electromagnetic radiation, ----------.

A) refractive index decreases as frequency increases
B) refractive index increases as frequency increases
C) refractive index does not change as frequency changes
D) rate of change of refractive index with frequency does not follow a general pattern

78. Electromagnetic radiation is passing through a solid medium with complex refractive index, $n = n_1 + i\, n_2$. Which among the following statements is true?

A) n_1 is related to the absorption of radiation by the medium
B) $(n_1^2+n_2^2)^{1/2}$ is related to the transmitted intensity
C) n_2 is related to the transmitted part
D) n_2 is related to the absorption of radiation by the medium

79. Which among the following statements is *TRUE* for the propagation of electromagnetic waves through a wave guide?

A) TEM waves can propagate along the axis
B) TM_{01} mode exist
C) Guide velocity can sometimes be greater than c
D) Phase velocity is always greater than c

80. State of an atom is given as $^2P_{3/2}$, then

A) L =1, S = 1/2, J = 3/2 B) L = 0, S = 2, J = 2
C) L = 1, S = 3/2, L=3/2 D) L = 0, S = 1, J = 1

81. Which among the following is *NOT* a correct rule for optical transition of electrons in atoms?

A) Transition for which $\Delta L = \Delta J$ leads to intense spectral lines
B) Transitions for which ΔL and ΔJ are positive leads to spectral lines that are less intense than those for which ΔL and ΔJ are negative
C) Transitions for which ΔL and ΔJ have opposite signs leads to weak spectral lines
D) Only those transitions for which $\Delta L = \pm 1$ and $\Delta J = \pm 1, 0$ are allowed.

82. Hyperfine structure of electronic spectra of atoms originates due to --------.

A) angular momentum of nucleus
B) mass of nucleus
C) charge of nucleus
D) spin of electrons

83. As sodium vapour lamp emits two spectral lines D1 and D2. It is placed between the pole pieces of a strong electromagnet. If the magnetic field is switched on and viewed with the help of a spectrograph of very high resolving power in a direction perpendicular to the direction of the magnetic field ---------- line will be observed.
A) 2 B) 3 C) 4 D) 6

84. Transition from anomalous Zeeman effect to normal Zeeman effect on increasing the external magnetic field is called ----------.
A) Paschen-Back effect B) Stark effect
C) Faraday rotation D) Fermi resonance

85. Which among the following is an example of a spherical top molecule?
A) H_2O B) CO_2 C) CH_4 C) C_6H_6

86. For linear molecules, the selection rule for pure rotational Raman Spectra is:
A) $\Delta J = 0, \pm 2$ B) $\Delta J = 0, \pm 1$ C) $\Delta J = 0, \pm 3$ D) $\Delta J = 0$

87. Number of fundamental vibrations of a nonlinear molecule containing N atoms is-----
A) 3N B) 3N-3 C) 3N-5 D) 3N-6

88. The rule of mutual exclusion of IR and Raman active mode of vibrations is relevant in the case of ----------.
A) CO B) CO_2 C) CH_3F D) H_2O

89. ESR spectra are recorded in --------- region of the electromagnetic spectrum.
A) visible B) infrared C) microwave D) radio frequency

90. Which among the following is an example of a four level laser?
A) Ruby laser B) He-Ne laser
C) Dye laser D) None of these

91. If B_{12}, B_{21} and A_{21} are the Einstein's coefficients absorption, stimulated emission and spontaneous emission respectively, then
A) $A_{21} = B_{12}$ B) $A_{21} = B_{21}$ C) $B_{12} = B_{21}$ D) $B_{12} = A_{21} + B_{21}$

92. ${}_6C^{14}$ and ${}_7N^{15}$ are examples of --------.
A) isotopes B) isotones C) isobars D) mirror nuclei

93. Find the binding energy of an alpha particle. Given mass of alpha particle is 4.001506 u. Mass of proton is 1.007276 u and mass of neutron is 1.008665 u.

A) 28.29 eV B) 28.29 keV C) 45.32×10^{-13} J D) 2.829 MeV

94. Strong forces of interaction are through the exchange of --------.
A) protons B) neutrons C) pi-mesons D) neutrino

95. According to Liquid drop model of nucleus, ---------.
A) Nucleus is spherical in shape
B) Density of nucleus increases with its volume
C) Each nucleon interacts with all other nucleons of the nucleus
D) Binding energy is inversely proportional to the total number of nucleons

96. Among α – particles, β- particles and γ-rays, ionisation power is maximum for -------.
A) α- particles B) β-particles
C) γ-rays D) Both α-particles and β-particles

97. When a $_{90}Th^{234}$ nucleus emits a β particle one ------nucleus is formed.

A) $_{90}Th^{233}$ B) $_{91}Pa^{234}$ C) $_{91}Pa^{233}$ D) $_{92}U^{235}$

98. Nuclear fission chain reaction is critical when the multiplication factor, k is ---------.
A) > 0 B) 1 C) >1 D) 100

99. Which among the following is *NOT* used as a moderator in a nuclear reactor?
A) Graphite B) Heavy water C) Berylium D) Boron

100. Which among the following has a spin s = 3/2?
A) μ-neutrino B) η meson C) Σ-hyperon D) Ω-hyperon

101. Parity of the wavefunction is conserved in ---------.
A) only in strong interaction
B) only in electromagnetic interaction
C) both strong and electromagnetic interactions
D) only in weak interaction

102. In quark model, considering both quarks and antiquarks, the quantum number "colour" can have -------- different values.
A) 4 B) 3 C) 2 D) 6

103. NaCl crystallises with --------- symmetry.
A) simple cubic B) body centred cubic
C) face centred cubic D) hexagonal

104. Reciprocal lattice of a body centred cubic lattice is--------.
A) body centred cubic lattice B) face centred cubic lattice
C) simple cubic lattice D) tetragonal lattice

105. A given plane intercepts the crystal axes $\vec{a}$, $\vec{b}$ and $\vec{c}$ at 2a, 3b and 1c respectively. Here a, b, c are the lattice constants. Find the Miller indices for the plane
A) (2 3 1) B) (1 3 2) C) (3 2 6) D) (2 3 6)

106. Arrange the three cubic lattices in the increasing order of packing factor
A) SC, FCC, BCC B) SC, BCC, FCC
C) BCC, FCC, SC D) FCC, BCC, SC

107. The thermal conductivity of metal A is greater than that of metal B. Then, --------
A) electrical conductivity of A will be less than that of B
B) electrical conductivity of A will be equal to that of B
C) electrical conductivity of A will be greater than that of B
D) nothing about electrical conductivity can be concluded from thermal coductivity values

108. The unit of Hall coefficient is:
A) Vm^2Awb^{-1} B) $Vm^3A^{-1}wb^{-1}$ C) $V^{-1}m^3A^{-1}wb$ D) $Vm^{-3}Awb^{-1}$

109. Transition from antiferromagnetic state to paramagnetic state occur at--------.
A) Curie temperature B) Curie-Weiss temperature
C) Fermi temperature D) Neel temperature

110. The probability of occupancy of Fermi level of a semiconductor at 273 K is ---------.
A) 0 B) ½ C) 1 D) None of these

111. Ripple factor for half wave rectifier and bridge rectifier are respectively ---------- .
A) 1 and 0.5 B) 1.21 and 2.1 C) 1 and 0.48 D) 1.21 and 0.48

112. Which among the following semiconductor devices have a negative resistance region in its I-V characterestics
A) Zener diode B) Photodiode
C) Field Effect Transistor D) Unijunction Transistor (UJT)

113. Which among the following statements is *NOT TRUE* for an emitter follower?
A) Emitter follower is a current amplifier.
B) In emitter follower both voltage and current are amplified
C) Emitter follower is a negative current feedback circuit
D) Emitter follower has high input impedance and low output impedance

114. Which among the following materials is used for constructing an LED?
A) Si B) Ge C) SiO_2 D) GaAs

115. Which among the following statements is *TRUE* for a solar cell
A) Open circuit voltage VOC is a nonlinear function of illumination
B) Closed circuit current ISC is a nonlinear function of illumination
C) Both VOC and ISC are nonlinear functions of illumination
D) Both VOC and ISC are constants and does not vary with illumination

116. For more reliable operation of an Operational amplifier, CMRR should be ---------.
A) 1 B) 0
C) as high as possible D) as low as possible

117. Which among the list are Universal Gates?
A) AND and OR B) AND and NAND
C) OR and NOR D) NAND and NOR

118. If V_r is the reference voltage range of a N bit Analog to Digital converter then the resolution ΔV is ----------.

A) $\frac{V_r}{N}$ B) $\frac{V_r}{N^2}$ C) $\frac{V_r}{2^N}$ D) $V_r 2^N$

119. Type of error caused due to the carelessness or ignorance of the person doing an experiment is --------.

A) random error B) systematic error
C) least square error D) gross error

120. Which among the following statements is *TRUE?*

A) Precision is a necessary condition for accuracy
B) Accuracy is a necessary condition for precision
C) Accuracy and Precision are one and the same
D) Precision is a sufficient condition for accuracy
