ENTRANCE EXAMINATION – 2021
QUESTION PAPER BOOKLET
M.Sc. PHYSICS

Total Marks: 100
Time: 2.00 Hrs

Hall Ticket No. [ ]

I. Please confirm that

(a) This booklet has all 22 pages (including three blank pages) printed clearly and numbered.

(b) Write your Hall Ticket Number in the OMR Answer sheet given to you. Also write the Hall ticket Number in the space provided above.

II. Read **carefully all the instructions** given below and on the OMR sheet.

1. This Question paper has two parts: Part – A and Part – B.
2. **Part – A** consists of 25 objective type questions.
3. **Part – B** consists of 50 objective type questions.
4. All questions in Part-A carry 1 mark each and all questions in Part-B carry 1.5 marks each.
   There is 0.33 negative mark for every wrong answer of Part-A.
   No negative marking for a wrong answer of Part-B.
5. All answers are to be marked on the OMR answer sheet following the instructions provided there upon.
6. **No calculators are permitted. Mobile phone based calculators are not permitted. Logarithmic tables are not allowed.**
7. Handover the OMR answer sheet at the end of the examination to the invigilator.
8. **No additional sheets will be provided**. Rough work can be done in the question paper itself/ space provided at the end of the booklet.
9. All the symbols used in the text have their usual meanings.

III. Values of physical constants:

$c = 3 \times 10^8$ m/s; $h = 6.63 \times 10^{-34}$ J.s; $k_B = 1.38 \times 10^{-23}$ J/K; $e = 1.6 \times 10^{-19}$ C

$m_e = 9.1 \times 10^{-31}$ kg; $\mu_0 = 4\pi \times 10^{-7}$ Henry/m; $\varepsilon_0 = 8.85 \times 10^{-12}$ Farad/m

PART - A

1. If $\vec{A}$ and $\vec{B}$ are constant vectors, the value of $\vec{\nabla}(\vec{A}.(\vec{B} \times \vec{r}))$ is

   A. $\vec{A} \times \vec{B}$

   B. $\vec{r} \times \vec{A}$

   C. $\vec{r} \times \vec{B}$

   D. $\vec{B} \times \vec{A}$

2. If the determinant of the matrix A of dimension 3×3 is 3, then the determinant of $2A^2$ is

   A. 9

   B. 18

   C. 72

   D. 96

3. Three vectors $\vec{P}$, $\vec{Q}$ and $\vec{R}$ are given by

   $\vec{P} = \alpha\hat{\imath} - 2\hat{\jmath} + 2\hat{k}$

   $\vec{Q} = 6\hat{\imath} + 4\hat{\jmath} - 2\hat{k}$

   $\vec{R} = -3\hat{\imath} - 2\hat{\jmath} - 4\hat{k}$

   The value of α for which these vectors will be coplanar is

   A. -1

   B. 1

   C. 2

   D. -3

4. An object of mass m hangs from a string of length l and the tension is T. The object swings around in a horizontal circle, with the string making an angle θ with the vertical. The angular frequency ω of the motion is

   A. $\omega = \sqrt{g/l \cos\theta}$

   B. $\omega = \sqrt{l/g \cos\theta}$

   C. $\omega = \sqrt{g/l \sin\theta}$

   D. $\omega = \sqrt{l/g \sin\theta}$

5. The linear mass density of a rod of length L is directly proportional to x, where x is the distance from one end of the rod. The centre of mass of the rod from the same end is located at a distance
   A. $L/2$
   B. $2L/3$
   C. $4L/5$
   D. L

6. A system of n particles of masses $m, 2m, 3m, \ldots, nm$ are collinear and are at distances $L, 2L, 3L, \ldots, nL$, respectively, from a fixed point. The centre of mass of the system from the fixed point is located at a distance
   A. $(2n+1)L/3$
   B. $n(2n+1)L/3$
   C. $(n+1)L/2$
   D. $n(n+1)L/2$

7. The moment of inertia I of a thin rod of length L and mass M about an axis passing through its centre and perpendicular to its length is
   A. $I = ML^2$
   B. $I = \frac{ML^2}{3}$
   C. $I = \frac{ML^2}{12}$
   D. $I = \frac{1}{ML^2}$

8. A flask contains argon and chlorine gas in the ratio of 2:1 by mass. The temperature of the mixture is 27° C. The ratio of the root mean square velocity (v_{rms}) of the two gases is (atomic mass of argon = 39.9 u and molecular mass of chlorine = 70.9 u)
   A. 0.56
   B. 2.66
   C. 0.75
   D. 1.33

9. A balloon contains 5 litres of nitrogen gas at a temperature of 100 K and a pressure of 120 KPa. If the temperature of the gas is allowed to increase to 27° C and the pressure remains constant, the volume of the gas in litres is

   A. 15
   B. 22
   C. 13
   D. 20

10. A photon of wavelength λ is incident on a free electron at rest and is scattered in the backward direction. The fractional shift in its wavelength in terms of the Compton wavelength λ_C of the electron is

    A. $\lambda_C/2\lambda$
    B. $2\lambda_C/3\lambda$
    C. $3\lambda_C/2\lambda$
    D. $2\lambda_C/\lambda$

11. Work done by a Carnot engine in a complete cycle is

    A. 0
    B. Equal to the change in internal energy of the engine
    C. Equal to the heat energy absorbed by the engine
    D. Less than the heat energy absorbed by the engine

12. A particle has only two energy levels E_1 and E_2 (such that $E_2 > E_1$). The particle is in thermal equilibrium at temperature T. As $T \rightarrow 0$, the probability that the particle has average energy $\langle E \rangle = E_1$ is

    A. 0
    B. 1
    C. 1/2
    D. $\frac{E_1}{E_1 + E_2}$

13. A relativistic particle of rest mass m_0 is moving in free space with a speed v. Let c be the speed of light in free space. The value of v at which its relativistic kinetic energy is double of its rest mass energy (m_0c^2), is

A. $v = \frac{\sqrt{3}}{2}c$

B. $v = \frac{2}{3}c$

C. $v = \frac{2\sqrt{2}}{3}$ c

D. $v = \frac{2\sqrt{\sqrt{2}}}{3}\ c$

14. An electron is confined in the ground state in a one-dimensional box of width 10^{-10} m. Its energy is 28 eV. The energy of the electron in the first excited state is

A. 56 eV

B. 112 eV

C. 28 eV

D. 252 eV

15. If the electrostatic potential of some configuration at a distance $\vec{r}$ is given by the expression $V(r) = C\frac{e^{-kr}}{r}$, where C and k are constants, then the electric field $\vec{E}(\vec{r})$ at the distance $\vec{r}$ is given by

A. $C\frac{e^{-kr}(kr+1)}{r^2}\hat{r}$

B. $C\frac{e^{-kr}(kr-1)}{r^2}\hat{r}$

C. $C\frac{e^{-kr}(2rk+1)}{r^2}\hat{r}$

D. $C\frac{e^{-kr}(2kr-1)}{r^2}\hat{r}$

16. Consider an infinite solenoid with n turns per unit length, radius a, and carrying current I. The magnitude of the magnetic vector potential at a distance of s ($>a$) from the center of the solenoid is

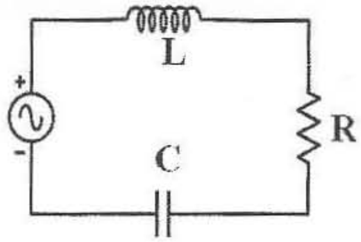
A. $\frac{\mu_0 nI}{2}\frac{a^2}{s}$

B. $\frac{\mu_0 nI}{2}s$

C. $\frac{\mu_0 nI}{2}\frac{s^2}{a}$

D. $\frac{\mu_0 nI}{2}a$

17. The root mean square current in the LCR circuit is 2A. The average power supplied to the resistor R of 200 Ω is



A. 400 W

B. 200 W

C. 800√2 W

D. 400√2 W

18. The operating regions of a transistor used in digital circuits are

A. Cutoff region and saturation region

B. Active region and cutoff region

C. Active region and saturation region

D. Breakdown region and cutoff region

19. Sea water of dielectric constant ϵ at a frequency of ν and a resistivity ρ is filled between the parallel plates separated by a distance d. If the ac voltage applied across the plates is $V_0 cos\ (2\pi\nu t)$, then the ratio of the conduction current to the displacement current amplitudes is

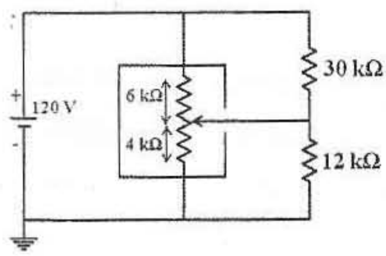
A. $\frac{3}{2\pi\nu\epsilon\rho}$

B. $\frac{1}{2\pi\nu\epsilon\rho}$

C. $\frac{1}{\sqrt{2}\pi\nu\epsilon\rho}$

D. $\frac{3}{\sqrt{2}\pi\nu\epsilon\rho}$

20. Consider the loaded potentiometer shown in Figure. The voltage across the 12 kΩ resistor is



A. 45 V

B. 48 V

C. 15 V

D. 72 V

21. A system of N non-interacting three dimensional classical harmonic oscillators is in equilibrium with a heat bath at temperature T. The average energy per harmonic oscillator is
   A. $3k_BT$
   B. $3Nk_BT$
   C. $3Nk_BT/2$
   D. $3k_BT/2$

22. The chemical potential of an ideal classical gas is
   A. Negative at all temperatures
   B. Positive at all temperatures
   C. Zero at all temperatures
   D. Negative at high temperature and positive at low temperature

23. A beam of unpolarized light incidents on a reflecting surface at the Brewster angle. Which of the following statements is correct?
   A. The reflected light is partially polarized perpendicular to the plane of incidence.
   B. The reflected light is 100% polarized perpendicular to the plane of incidence.
   C. The transmitted light is 100% polarized perpendicular to the plane of incidence.
   D. The transmitted light is partially polarized perpendicular to the plane of incidence.

24. For a pipe with an open end and a closed end, which of the following statements is correct?
   A. Closed end is always a displacement antinode and a pressure node
   B. Closed end is always a displacement node and a pressure node
   C. Open end is always a displacement antinode and a pressure node
   D. Open end is always a displacement node and a pressure antinode

25. One end of a 2 kg rope is tied to a rigid support. The other end at 100 m is tied to a weight of 20 kg. The rope is set to oscillate similar to a sonometer string with a frequency of 3 Hz. The speed of a transverse wave on the rope is
   A. 33 m/s
   B. 49 m/s
   C. 60 m/s
   D. 99 m/s

PART - B

26. The periodicity of the function $\sin(x/2) + \sin(x/3)$ is

   A. 2π

   B. 6π

   C. 12π

   D. 18π

27. The value of the integral $\int_{-\pi/2}^{+\pi/2} sin^2\theta\ \delta(3\theta + \pi) d\theta$ is

   A. $\pi/2$

   B. 1/2

   C. 1/3

   D. 1/4

28. For any complex variable $z = x+iy$, the value of $|\cos z|^2$ will be

   A. $\cos^2 x + \sinh^2 y$

   B. $\sin^2 x + \sinh^2 y$

   C. $\cos^2 x + \cosh^2 y$

   D. $\sin^2 x + \cosh^2 y$

29. The two eigenvalues of the matrix $M = \begin{pmatrix} a & b \\ c & d \end{pmatrix}$ are λ_1 and λ_2. The value of $(1/\lambda_1 + 1/\lambda_2)$ is

   A. $(a + d)/(ad - bc)$

   B. $(a + d)^2/(ad - bc)$

   C. $(a - d)/(ad - bc)$

   D. $(a - d)/(ad - bc)$

30. The value of the integral $\int_{-\infty}^{\infty} x^2\, e^{-ax^2} dx$, where $a > 0$ is

   A. $\sqrt{\frac{\pi}{a}}$

   B. $\sqrt{\frac{\pi}{2a}}$

   C. $\frac{1}{2a}\sqrt{\frac{\pi}{a}}$

   D. $\sqrt{\frac{\pi}{2a^{3/2}}}$

31. The sum (S) of the infinite series $1/2 - 1/3 + 1/4 - 1/5 + 1/6 - \ldots$ obeys

A. $S > \pi/4$

B. $S < 1/2$

C. $S < 0$

D. $S > 1/2$

32. Diagonalization of the matrix $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ under similarity transformation is

A. $\begin{pmatrix} i & 0 \\ 0 & -i \end{pmatrix}$

B. $\begin{pmatrix} i & 0 \\ 0 & 1 \end{pmatrix}$

C. $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$

D. $\begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}$

33. A body of mass m moving with a speed u strikes a stationary body of the same mass. After the collision, the first body moves with a speed v at an angle θ with respect to the original line of motion. If the collision is elastic, the speed of the second body is given by

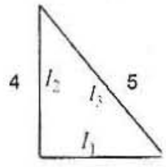
A. $\sqrt{u^2 + v^2 + 2uv\cos\theta}$

B. $\sqrt{u^2 + v^2 - 2uv\cos\theta}$

C. $\sqrt{u^2 + v^2 + uv\cos\theta}$

D. $\sqrt{u^2 + v^2 - uv\cos\theta}$

34. A right-angled triangular lamina has sides of lengths 3 cm, 4 cm and 5 cm and the moment of inertia of the lamina about these sides are, respectively, I_1, I_2 and I_3 as shown in the figure. Which of the following statements is correct?



A. $I_1 = I_2 = I_3$

B. $I_1 > I_2 > I_3$

C. $I_1 < I_2 < I_3$

D. $I_1 < I_2 = I_3$

35. The angular momentum of a particle relative to a certain point is given as $\vec{L} = at^2\hat{\imath} + b\hat{\jmath}$, where a and b are constants and t denotes time. If the angle between the torque about the point and the angular momentum is 45°, the magnitude of the torque and angular momentum, respectively, are

A. $\sqrt{a}, ab$

B. $b, \sqrt{ab}$

C. $\sqrt{2}ab, 2\sqrt{b}$

D. $2\sqrt{ab}, \sqrt{2}b$

36. A particle of mass m is moving in one dimension under a force with potential $V(x) = \frac{x^3}{3} - \frac{3x^2}{2} + 2x$. The position of stable equilibrium is

A. $x = 1$

B. $x = -1$

C. $x = 2$

D. $x = -2$

37. As a result of Coriolis effect, air currents

A. Appear to bend to the right in the Northern hemisphere and to the left in the Southern hemisphere.

B. Appear to bend to the right in the Southern hemisphere and to the left in the Northern hemisphere

C. Do not bend in the Northern hemisphere and bends to the right only in the Southern hemisphere.

D. Do not bend in the Southern hemisphere and bends to the left only in the Northern hemisphere.

38. Latent heat for the first order phase transition from one mole liquid to one mole ideal gas is L. If the specific volume of the liquid (V_l) is negligible with respect to the specific volume of the ideal gas (V_g), then the saturated vapour pressure (p) for the phase transition at temperature T is proportional to

A. $p \propto e^{L/RT}$

B. $p \propto e^{-L/RT}$

C. $p \propto \frac{RT}{L} e^{-L/RT}$

D. $p \propto \frac{L}{RT} e^{-L/RT}$

39. The number of ways in which N identical bosons can be distributed in two degenerate energy levels is

A. $N+1$

B. $N(N-1)/2$

C. $N(N+1)/2$

D. N

40. Equation of state for a gas of volume V, pressure p and temperature T is given by $pV^{3/2} = KRT$ where K is a constant and R is the molar gas constant. The difference of the heat capacity at constant pressure (C_p) and the heat capacity at constant volume (C_v) for this system is

A. $\frac{2}{3}R$

B. $\frac{3KR}{2}V^{1/2}$

C. $\frac{2KR}{3}$

D. $\frac{2KR}{3}V^{-1/2}$

41. The mechanical work done by an ideal gas to change the volume from V_1 to V_2 in an adiabatic process (for which $pV^{\gamma} = C$) is

A. $C\left[\frac{1}{V_1^{\gamma-1}} - \frac{1}{V_2^{\gamma-1}}\right]$

B. $\frac{C}{\gamma}\left[\frac{1}{V_1^{\gamma-1}} - \frac{1}{V_2^{\gamma-1}}\right]$

C. $\frac{C}{\gamma-1}\left[\frac{1}{V_1^{\gamma-1}} - \frac{1}{V_2^{\gamma-1}}\right]$

D. $\frac{C}{\gamma-1}\left[\frac{1}{V_2^{\gamma-1}} - \frac{1}{V_1^{\gamma-1}}\right]$

42. The eigenfunction of the differential operator $\left(x + \frac{d}{dx}\right)$, corresponding to eigenvalue λ is of the form

A. $e^{-i\lambda x+x^2/2}$

B. $e^{\lambda x-x^2/2}$

C. $e^{-i\lambda x-x^2/2}$

D. $e^{-\lambda x-x^2/2}$

43. Free neutrons have a mean lifetime τ and a deBroglie wavelength λ_{dB}. If the mass of a neutron is m, then the distance they would travel before decaying to half of their initial value is

A. $\frac{h}{m\lambda_{dB}}\tau ln2$

B. $\frac{h}{m\lambda_{dB}}2ln\tau$

C. $\frac{h}{m\lambda_{dB}}\frac{\tau}{2}$

D. $\frac{h}{m\lambda_{dB}}\tau$

44. In which of the following radioactive decay processes, the mass number of the nucleus remains same even after the decay?

A. Alpha decay and Beta decay

B. Alpha decay and Gamma decay

C. Beta decay and Gamma decay

D. Only Gamma decay

45. For a hydrogen atom, the energy level separations for very large n and Rydberg constant R_H is proportional to

A. $1/n^3$

B. $1/n^2$

C. $1/n$

D. $1/n^{1/2}$

46. The commutator of $[\hat{p}_x, f(x)]$ is equal to

A. $i\hbar$

B. $-i\hbar\frac{df(x)}{dx}$

C. $i\hbar\frac{df(x)}{dx}$

D. $i\hbar f(x)$

47. Given the one-dimensional wavefunction $\psi(x) = \frac{A}{x^2+a^2}$ with $-\infty < x < \infty$, the value of A required to normalize $\psi(x)$ is

A. $(2a^3/\pi)^{1/2}$

B. $(a^3/\pi^2)^{1/2}$

C. $(a^2/2\pi^2)^{1/2}$

D. $(a^2/2\pi)^{1/2}$

48. The probability current density for a particle of mass m with wavefunction of the form $\psi(x) = Ae^{ikx} + Be^{-ikx}$ is

A. $\frac{\hbar k}{m}(|A|^2 + |B|^2)$

B. $\frac{\hbar}{m}(|A|^2 - |B|^2)$

C. $\frac{\hbar k}{m}(|A|^2 - |B|^2)$

D. $\frac{\hbar}{2m}(A * B - B * A)$

49. A particle is confined to a region $-\pi/2 < x < \pi/2$ and has a normalized wave function of the form $\psi(x) = \sqrt{\frac{8}{3\pi}}\, cos^2 x$. The probability that the particle will be found between $x = 0$ and $x = \pi/4$ is

A. $\frac{1}{4} + \frac{2}{3\pi}$

B. $\frac{1}{16} - \frac{8}{3\pi}$

C. $\frac{1}{2} + \frac{3}{8\pi}$

D. $\frac{1}{4} - \frac{3}{8\pi}$

50. If a capacitor of $100\mu F$ is discharged from 100 V to 10 V, then the work done by the electric field due to the discharge is

A. 1.495 J

B. 0.495 J

C. 1.0 J

D. 0.6 J

51. If a particle with charge $2e$ is moving in a circle of radius $2R$ in a direction perpendicular to the magnetic field of strength $B/2$, then the magnitude of the momentum of the charged particle is

A. eRB

B. $2eRB$

C. $eRB/2$

D. $4eRB$

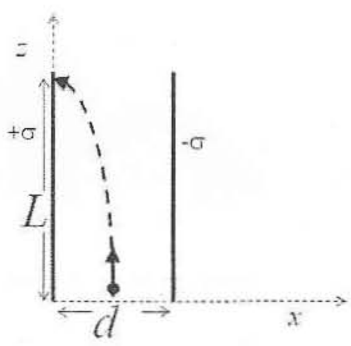
52. Two thin parallel plates of length L with surface charge density σ are placed vertically, separated by a distance d with a potential V_0. An electron is projected from the centre of the plates with a velocity of v_0 as shown in the figure. If the potential between the plates varies as $V = V_0\left(1 - \frac{x}{d}\right)$, then velocity of the electron when it reaches the end of the plates is

A. $v_f = \left(\frac{e\sigma d^2}{2\epsilon_o m}\right)^{1/2}$

B. $v_f = \left(\frac{2e\sigma d^2}{\epsilon_o m}\right)^{1/2}$

C. $v_f = \left(\frac{e\sigma d^2}{\epsilon_o m}\right)^{1/2}$

D. $v_f = \left(\frac{e\sigma d}{\epsilon_o m}\right)^{1/2}$



53. The dispersion relation for a low-density plasma is $\omega^2 = \omega_0^2 + c^2k^2$ where ω_0 is the plasma frequency and c is the speed of light in free space. The relationship between the group velocity (v_g) and phase velocity (v_p) is

A. $v_p = v_g$

B. $v_p = v_g^{1/2}$

C. $v_p v_g = c^2$

D. $v_g = v_p^{1/2}$

54. A toy of 7.5 mm tall is on the central axis 100 cm from the front face of a bi convex lens of 20 cm focal length. If the image of the toy formed on a wall is 30 mm tall, the transverse magnification of the lens is

A. + 4

B. − 2

C. − 5

D. − 4

55. A thin positive lens of refractive index 1.6 in air has a focal length of 40 cm. This lens is immersed in an aquarium 60 cm in front of a small fish to form an image. The image characteristics of the fish are

A. The image is real, inverted and magnified 2 times

B. The image is virtual, inverted and magnified 3.6 times

C. The image is real, inverted and magnified 2 times

D. The image is virtual, inverted and magnified 2 times

56. A Keplerian telescope operating at infinite conjugates is composed of two thin positive lenses separated by 1.55 m providing an angular magnification of 30. The viewer pulls the eyepiece out by 5 cm to clearly see the object with a relaxed eye. The location of the object is

A. 64.50 m

B. 46.50 m

C. 31.55 m

D. 55.13 m

57. A common lens coating material used for non-reflective coating has a refractive index of 1.6. The thickness of a non-reflective coating to be used for 800 nm light is

A. 125 nm

B. 250 nm

C. 400 nm

D. 500 nm

58. The state of polarization of the wave $\vec{E} = E_0\, sin(\omega t - kz)\hat{\imath} + E_0\, sin(\omega t - kz - \frac{\pi}{4})\hat{\jmath}$ is

A. Circular 45° with X-axis and clockwise rotating

B. Elliptical 45° with X-axis and clockwise rotating

C. Circular 45° with X-axis and counter-clockwise rotating

D. Elliptical 45° with X-axis and counter-clockwise rotating

59. The total number of lines a grating must have in order to separate two wavelengths 8790 Å and 8810 Å in the 4^{th} order is

A. 110

B. 220

C. 440

D. 880

60. The thickness of a zero order half-wave plate made using a material with a difference of 0.2 between the extraordinary and ordinary refractive indices for a light of 600 nm is

A. 6.0 μm

B. 3.0 μm

C. 1.5 μm

D. 1.2 μm

61. Two physical pendulums with a natural angular frequency of 0.6 s^{-1} are coupled with the help of a spring of spring constant of 3.14 N/m. If the out of phase frequency of the pendulum is 0.8 s^{-1}, the coupling strength of the system is

A. 0.314

B. 0.628

C. 0.157

D. 0.280

62. A measuring tape is exactly 80.0000 m long at a temperature of 20°C. If the expansion coefficient of the material used for tape is 1.2×10^{-5} K^{-1}, then the length of the tape at 40°C is

A. 80.0160 m

B. 80.0192 m

C. 80.0240 m

D. 80.1920 m

63. A medium with a density of 2 kg/m^3 has a sound speed of 400 m/s at room temperature. A sinusoidal wave of moderate loudness creates a maximum pressure of 4.0×10^{-2} Pa. The intensity of the sound wave in the units of W/m^2 is

A. 0.80×10^{-6}

B. 0.32×10^{-6}

C. 0.25×10^{-6}

D. 0.16×10^{-6}

64. The amount of force required to pull the two glass plates separated by a distance *d* which are wetted by the liquid drop of surface tension *T* and radius *r* (>>*d*), is

A. $\pi r^2 T/d$

B. $2\pi r^2 T/d$

C. $\pi r T/d$

D. $2\pi r T/d$

65. The additional work done for blowing the soap bubble formed with a liquid of surface tension *T* from the radius r_1 to r_2 (where $r_2 > r_1$), is

A. $8\pi r_1^2 T$

B. $4\pi r_2^2 T$

C. $8\pi(r_2^2 - r_1^2)T$

D. $4\pi(r_2 - r_1)T$

66. Van der Walls bond is formed due to

A. complete transfer of electrons

B. sharing of electrons

C. electrons and ion cores interaction

D. dipole-dipole interaction

67. If a crystal plane intercepts the crystal axes a, b at 0.5, p and is parallel to the c-axis, Then the Miller indices of the plane can be

A. (120)

B. (012)

C. (210)

D. (102)

68. The condition for an atom to possess orbital magnetic moment is that the atom must have

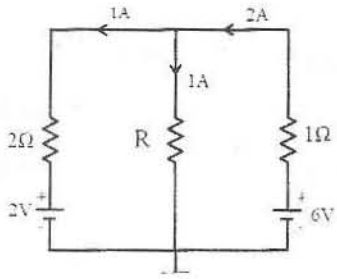
A. completely filled *s*-shells

B. partially filled *s*-shells

C. partially filled *p*, *d* or *f* shells

D. completely filled *p*, *d* or *f* shells

69. The value of the resistance R to maintain the specified branch currents in the circuit shown in the figure is



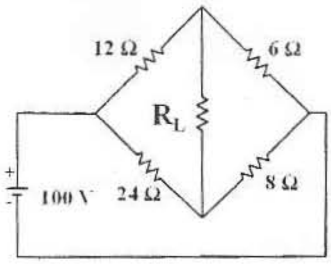
A. 0 Ω

B. 2 Ω

C. 3 Ω

D. 4 Ω

70. The value of the load resistance (R_L) to draw the maximum power in the circuit shown in the figure is



A. 6 Ω

B. 11.4 Ω

C. 10 Ω

D. 9.5 Ω

71. The minority carriers in a p-n junction diode can be activated by

I: Illuminating the junction with radiation of energy higher than the bandgap

II: Increasing the temperature

III: Applying forward voltage

IV: Applying pressure

Which of the above statements are correct?

A. I & II

B. II & III

C. III & IV

D. I, II & III

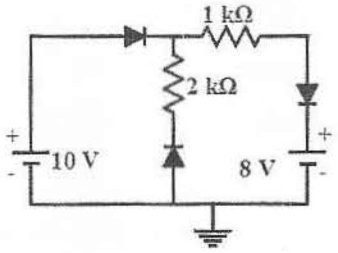
72. The forward voltage drop and the reverse breakdown voltage of the diodes in the circuit shown in figure are 0.7 V and 20 V respectively. Then the voltage drop across the 1 kΩ resistance is

A. 2 V

B. 0.7 V

C. 1.4 V

D. 0.6 V



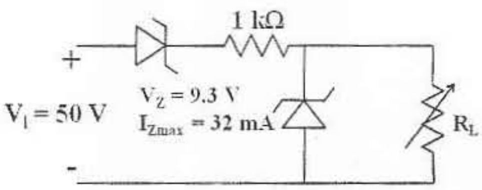
73. The forward voltage drop, Zener Voltage (V_Z) and the maximum reverse current (I_{Zmax}) of the Zener diodes in the circuit shown in the figure are 0.7 V, 9.3 V and 32 mA, respectively. The maximum value of the load resistance (R_L) that can be used without exceeding I_{Zmax} in any of the Zener diodes is

A. 4.64 kΩ

B. 1.16 kΩ

C. 3.48 kΩ

D. 2.32 kΩ



74. In a bridge rectifier circuit build with four Si diodes of 0.7 V forward voltage drop. If the input peak to peak voltage is 15 V then the output peak voltage is

A. 8.2 V

B. 7.5 V

C. 6.8 V

D. 6.1 V

75. The simplified expression for the Boolean function $F = (\overline{X} + \overline{Y})W + \overline{XY}$ is

A. $\overline{XY}$

B. $\overline{X + Y}$

C. $\overline{X}$

D. W

University of Hyderabad
Entrance Examinations - 2021

School/Department/Centre : PHYSICS
Course/Subject : M.Sc.

Q.No.	Answer	Q.No.	Answer	Q.No.	Answer	Q.No.	Answer
1	A	26	C	51	B	76	
2	C	27	D	52	C	77	
3	D	28	A	53	C	78	
4	A	29	A	54	D	79	
5	B	30	C	55 #	A, C	80	
6	A	31	B	56	B	81	
7	C	32	D	57	A	82	
8	D	33	B	58	D	83	
9	A	34	B	59	A	84	
10	D	35	D	60	C	85	
11*	C,D	36	C	61	D	86	
12	B	37	A	62	B	87	
13	C	38	B	63	C	88	
14	B	39	A	64	B	89	
15	A	40	D	65	C	90	
16	A	41	C	66	D	91	
17 **	---	42	B	67	C	92	
18	A	43	A	68	C	93	
19	B	44	C	69	D	94	
20	A	45	A	70	C	95	
21	A	46	B	71	A	96	
22	A	47	A	72	D	97	
23	B	48	C	73	B	98	
24	C	49	A	74	D	99	
25	D	50	B	75	A	100	

Note/Remarks:

1) * For question 11, both the options C and D are correct. Mark to be given for **either C or D**.
2) ** For question 17, everybody to be given 1 mark.
3) # For question 55, both the options A and C are correct. Mark to be given for **either A or C**.

9/9/21

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