Physics M.Sc. Physics

13P/218/4 Question Booklet No.......................

(To be filled up by the candidate by blue/black ball-point pen)

Roll No. | | | | | | | | | |

Roll No.
(Write the digits in words) ....

Serial No. of OMR Answer Sheet ....

Day and Date ....
(Signature of Invigilator)

INSTRUCTIONS TO CANDIDATES

(Use only **blue/black ball-point pen** in the space above and on both sides of the Answer Sheet)

1. Within 10 minutes of the issue of the Question Booklet, check the Question Booklet to ensure that it contains all the pages in correct sequence and that no page/question is missing. In case of faulty Question Booklet bring it to the notice of the Superintendent/Invigilators immediately to obtain a fresh Question Booklet.
2. Do not bring any loose paper, written or blank, inside the Examination Hall *except the Admit Card without its envelope.*
3. A separate Answer Sheet is given. *It should not be folded or mutilated. A second Answer Sheet shall not be provided. Only the Answer Sheet will be evaluated.*
4. Write your *Roll Number and Serial Number of the Answer Sheet by pen* in the space provided above.
5. **On the front page of the Answer Sheet, write by pen your Roll Number in the space provided at the top, and by darkening the circles at the bottom. Also, wherever applicable, write the Question Booklet Number and the Set Number in appropriate places.**
6. No overwriting is allowed in the entries of Roll No., Question Booklet No. and Set No. (if any) on OMR sheet and also Roll No. and OMR Sheet No. on the Question Booklet.
7. Any change in the aforesaid entries is to be verified by the invigilator, otherwise it will be taken as unfair means.
8. Each question in this Booklet is followed by four alternative answers. *For each question, you are to record the correct option on the Answer Sheet by darkening the appropriate circle* in the corresponding row of the Answer Sheet, by ball-point pen as mentioned in the guidelines given on the first page of the Answer Sheet.
9. For each question, darken only one circle on the Answer Sheet. If you darken more than one circle or darken a circle partially, the answer will be treated as incorrect.
10. *Note that the answer once filled in ink cannot be changed.* If you *do not wish to attempt* a question, leave all the circles in the corresponding row blank (such question will be awarded zero mark).
11. For rough work, use the inner back page of the title cover and the blank page at the end of this Booklet.
12. Deposit *only the OMR Answer Sheet* at the end of the Test.
13. You are not permitted to leave the Examination Hall until the end of the Test.
14. If a candidate attempts to use any form of unfair means, he/she shall be liable to such punishment as the University may determine and impose on him/her.

[उपर्युक्त निर्देश हिन्दी में अन्तिम आवरण-पृष्ठ पर दिये गए हैं]

[No. of Printed Pages : 28+2

No. of Questions/प्रश्नों की संख्या : 150

Time/समय : 2½ Hours/घण्टे **Full Marks/पूर्णांक :** 450

Note/नोट : (1) Attempt as many questions as you can. Each question carries **3** marks. **One** mark will be deducted for each incorrect answer. Zero mark will be awarded for each unattempted question.

अधिकाधिक प्रश्नों को हल करने का प्रयत्न करें। प्रत्येक प्रश्न **3** अंक का है। प्रत्येक गलत उत्तर के लिए एक अंक काटा जाएगा। प्रत्येक अनुत्तरित प्रश्न का प्राप्तांक शून्य होगा।

(2) If more than one alternative answers seem to be approximate to the correct answer, choose the closest one.

यदि एकाधिक वैकल्पिक उत्तर सही उत्तर के निकट प्रतीत हों, तो निकटतम सही उत्तर दें।

1. In a random walk problem, if the probability that a particle is found between x to $x+dx$ is given as $P(x)=e^{-\pi x^2}$, the mean $x(\bar{x})$ is

(1) 0 (2) 1 (3) π (4) None of these

2. The first law of thermodynamics represents conservation of energy where the change in the internal energy is equal to the transfer of heat when work is done on the system during the change of state. Mathematically this can be written as

(1) $dE = \delta Q + \delta W$ (2) $dE = dQ + \delta W$ (3) $dE = \delta Q + dW$ (4) None of these

3. Consider a gas contained in a box at pressure P and temperature T having entropy S. If the box is divided into two parts of volume V_1 and V_2 with corresponding entropies S_1 and S_2, then $S-(S_1+S_2)$ is

(1) >0 (2) <0 (3) $=0$ (4) None of these

4. Consider a sensitive spring balance characterized by a spring constant K. The balance is in an environment whose temperature is T. A small object of mass m is suspended to the spring. The thermal fluctuation in its position, that is $(x-\bar{x})^2$ is

(1) $3k_BT/2K$ (2) 0 (3) k_BT/K (4) None of these

5. In an isobaric process the heat intake or release in a thermodynamic system is equal to the change in

(1) Helmholtz free energy
(2) Gibbs free energy
(3) enthalpy
(4) None of these

6. In a canonical ensemble the entropy S can be found to be

(1) $k_B \ln Z$ (2) $k_B \beta E$ (3) $k_B(\beta E+\ln Z)$ (4) None of these

7. For a spin-$\frac{1}{2}$ system, if the pure state is

$$|\alpha\rangle=\frac{1}{\sqrt{2}}\left[\begin{pmatrix}1\\0\end{pmatrix}+\begin{pmatrix}0\\1\end{pmatrix}\right]$$

the density matrix for the up-spin state is

(1) $\begin{pmatrix}1 & 0\\0 & 0\end{pmatrix}$ (2) $\begin{pmatrix}0 & 0\\0 & 1\end{pmatrix}$ (3) $\begin{pmatrix}0 & 1\\0 & 0\end{pmatrix}$ (4) $\begin{pmatrix}0 & 0\\1 & 0\end{pmatrix}$

8. The photon statistics is characterized by the mean occupancy distribution as

(1) $(e^{\beta\varepsilon}-1)^{-1}$ (2) $(e^{\beta\varepsilon-\mu}-1)^{-1}$ (3) $(e^{\beta\varepsilon-\mu}+1)^{-1}$ (4) None of these

9. The density of states of a two-dimensional free Fermi gas depends on energy as

(1) $\varepsilon^{1/2}$ (2) $\varepsilon^{\ 1/2}$ (3) ε^0 (4) None of these

10. In an ideal Fermi gas, the specific heat varies with T at low temperature as

(1) T^0 (2) $T^{3/2}$ (3) T^1 (4) None of these

11. The magnetic flux density vector B and vector potential A are related by

(1) $A = \text{curl}\, B$ (2) $A = \text{div} \cdot B$ (3) $B = \text{div} \cdot A$ (4) $B = \text{curl}\, A$

12. The displacement vector D and electric field strength E are related by

(1) $D = E/\varepsilon$ (2) $D = \varepsilon E$ (3) $D = \varepsilon E^2$ (4) $D = \varepsilon E^{1/2}$

13. The dependence of phase velocity of an EM wave in a medium on the frequency of wave is called

(1) reflection (2) refraction (3) polarization (4) dispersion

14. For a good conductor, the skin depth varies

(1) inversely as frequency ω

(2) directly as ω

(3) inversely as $\sqrt{\omega}$

(4) directly as $\sqrt{\omega}$

15. A thin sheet of conducting material for EM wave acts as

(1) low-pass filter

(2) high-pass filter

(3) band-pass filter

(4) attenuator

16. The dielectric constant of water is 80, however its refractive index is 1·33 invalidating the expression $n^2 = \varepsilon$. This is because

(1) the water molecule has no permanent dipole moment

(2) the boiling point of water is 100 °C

(3) the two quantities are measured by different experiments

(4) water is transparent to visible light

17. Which one of the following is the correct expression for one of the four fundamental equations of electromagnetic?

(1) $\text{div} \cdot D = \rho$ (2) $\text{curl}\, D = 0$ (3) $\text{curl}\, B = 0$ (4) $\text{div} \cdot H = \partial D / \partial t$

18. A plane EM wave travels in a vacuum with a velocity given by

(1) $c = \sqrt{\mu_0 \varepsilon_0}$ (2) $c = \frac{1}{\sqrt{\mu_0 \varepsilon_0}}$ (3) $c = \sqrt{\frac{\mu_0}{\varepsilon_0}}$ (4) $c = \sqrt{\frac{\varepsilon_0}{\mu_0}}$

19. For a material medium characterized by conductivity σ and permittivity ε exposed to sinusoidally varying field E of frequency, ω. The ratio of conduction current density to displacement current density is

(1) $\frac{\sigma}{E\varepsilon}$ (2) $\frac{\sigma}{\omega\varepsilon}$ (3) $\frac{\varepsilon}{(\omega\sigma)}$ (4) $\frac{\varepsilon E}{\omega}$

20. For Cu, $\sigma = 10^{-2}$ S/m and $\varepsilon = 3\varepsilon_0$, the conduction current and displacement current will be equal at the frequency

(1) 160 Hz (2) 60 kHz (3) 60 MHz (4) 16 MHz

21. In a dielectric material having $\varepsilon_r = 12$, the displacement current is 25 times greater than the conduction current at 100 MHz, the conductivity of dielectric is

(1) 0·00267 S/m (2) 0·0267 S/m (3) 2·67 S/m (4) 0·267 S/m

22. For a good conductor the presence of an alternating electric field having wavelength λ, the skin depth is

(1) much smaller than wavelength λ
(2) much larger than wavelength λ
(3) equal to the wavelength λ
(4) None of the above

23. For an EM wave in a lossy dielectric medium the loss tangent in terms of attenuation constant α and phase constant β can be given as

(1) $\frac{2\alpha}{\alpha^2+\beta^2}$
(2) $\frac{2\beta}{\alpha^2+\beta^2}$
(3) $\frac{2\alpha\beta}{\beta^2-\alpha^2}$
(4) $\frac{2\alpha\beta}{\alpha^2-\beta^2}$

24. Wet marshy soil is characterized by $\sigma = 10^{-3}$ S/m, $\varepsilon_r = 15$, $\mu_r = 1$. At 10 GHz the soil may be considered as

(1) a good conductor
(2) quasi-conductor
(3) quasi-dielectric
(4) good dielectric

25. When a plane electromagnetic wave propagates in a linear, isotropic, dielectric medium, the electric field E and magnetic field H vectors are

(1) parallel to each other
(2) mutually perpendicular to each other
(3) at an angle of $45°$
(4) None of the above

26. The amplitude of electric field component of sinusoidal plane wave having impedance 377 ohms in free space is 20 V/m. The power per square metre carried by the wave is

(1) $0\cdot53$ W/m^2
(2) $2\cdot53$ W/m^2
(3) $37\cdot7$ W/m^2
(4) $3\cdot77$ W/m^2

27. curl $E = -\partial B/\partial t$ is representing

(1) Ampere's law (2) Gauss's law (3) Ohm's law (4) Faraday's law

28. A 300 MHz plane wave propagating through a non-conducting medium having $\mu_r = 1, \varepsilon_r = 78$. The velocity of wave through medium is

(1) $33 \cdot 97 \times 10^6$ m/s
(2) $3 \cdot 39 \times 10^6$ m/s
(3) $3 \cdot 32 \times 10^8$ m/s
(4) $7 \cdot 8 \times 10^7$ m/s

29. The direction of propagation of EM wave is given by the direction of

(1) vector E (2) vector H (3) vector $(E \times H)$ (4) None of these

30. In electromagnetic field $\sqrt{\mu/\varepsilon}$ has the dimension of

(1) an inductance
(2) a capacitance
(3) an impedance
(4) an electric field

31. One voltmeter of the range (0-200 millivolts) is connected across two rails, which are separated from each other as well as from the ground. When a train runs over these rails at a speed of 180 km/hour, then what will be the reading of the voltmeter? It is given that the vertical component of the earth's magnetic field is $0 \cdot 2 \times 10^{-4}$ Weber/m^2 and the rails are separated by a distance of 1 metre

(1) 2 millivolts (2) 20 millivolts (3) 1 millivolt (4) 10 millivolts

32. A solenoid, which has number of turns per unit length constant throughout its uniform length. It has self-inductance of $1 \cdot 8 \times 10^{-4}$ henry and resistance 6 ohms. It has been broken into two identical coils. These identical coils are connected in parallel, then connected to a 12-volt battery of negligible resistance. The time constant of the circuit will be

(1) 6×10^{-5} sec (2) 3×10^{-5} sec (3) $1 \cdot 5 \times 10^{-5}$ sec (4) 2×10^{-5} sec

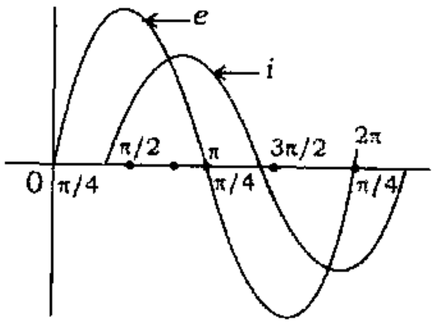
33. A small square loop of wire of side l is placed inside a large square loop of side L ($L >> l$). The loops are coplanar and their centres coincide. The mutual inductance M of the system is

(1) $\frac{l}{L}$ (2) $\frac{L}{l}$ (3) $\frac{l^2}{L}$ (4) $\frac{L^2}{l}$

34. The capacitance of a telegraphic wire of length 200 km is $0 \cdot 014\ \mu F/km$. If an AC of voltage 5 kHz is applied to this wave, then the value of the inductance connected in series with the wire so that the impedance of the circuit becomes minimum is

(1) 2·5 mH (2) 5·4 mH (3) 0·72 mH (4) 0·36 mH

35. When an AC source of e.m.f. $e = E_0 \sin(100t)$ is connected across a circuit, the phase difference between the e.m.f. e and current i in the circuit is observed to be $\pi/4$ as shown in the diagram



If the circuit contains possibly only of R-C or L-R in series, then the relation between the two elements are

(1) $R = 1\ k\Omega,\ C = 1\ \mu F$ (2) $R = 1\ k\Omega,\ L = 1\ H$

(3) $R = 1\ k\Omega,\ C = 10\ \mu F$ (4) $R = 1\ k\Omega,\ L = 10\ H$

36. The peak value of the AC voltage across the secondary of the transformer in a half-wave rectifier without filter is $9\sqrt{2}$ volts. The maximum d.c. voltage across the load will be about

(1) 9 V (2) 4 V (3) 6 V (4) 3·2 V

37. The dominant mechanisms for the motion of charge carriers in forward biased and reverse biased P-N junctions are

(1) drift in forward bias, diffusion in reverse bias

(2) diffusion in forward bias, drift in reverse bias

(3) diffusion in both forward and reverse bias

(4) drift in both forward and reverse bias

38. In an alternating circuit connected to an e.m.f. of 100 volts and frequency 50 Hz, a resistance of 10 ohms and an inductance of $\frac{1}{10\pi}$ henry are connected in series. The power dissipated in the circuit is

(1) 500 W (2) 600 W (3) 250 W (4) 300 W

39. Two similar metallic loops A and B are placed on a table without touching each other. Current in loop A increases with time. In its response loop B

(1) remains stationary as it was placed

(2) is attracted by loop A

(3) is repelled by loop A

(4) revolves about its centre of mass while the centre of mass remains stationary

40. Which one of the following Boolean expressions is not equal to the Boolean expression $(A+BC)\cdot(B+\overline{C}A)$?

(1) $(A+B)\cdot(A+C)\cdot(B+\overline{C})$ (2) $AB+A\overline{C}$

(3) $AB+A\overline{C}+BC$ (4) $(A+C)\cdot(B+\overline{C})$

41. Indicate the false statement about the need of modulation for radio communication

(1) Modulation reduces the antenna size

(2) Modulation avoids interference between the two neighbouring broadcasting stations

(3) Modulation is the process of superposition of high frequency radio wave with a low frequency radio wave

(4) By using high frequency carrier wave in modulation the power radiated by antenna increases

42. Which of the following semiconductor devices is used as demodulator in AM receiver?

(1) Transistor

(2) Silicon controlled rectifier

(3) Unijunction transistor

(4) *P*-*N* junction diode

43. In a full-wave rectifier circuit using centre tap transformer the d.c. voltage across the load is 16·48 volts, then the peak inverse voltage of each diode is

(1) 25·9 V

(2) 51·8 V

(3) 29·5 V

(4) 58·1 V

44. A multistage amplifier consists of three stages. The voltage gains of the stages are 30, 50 and 80 respectively. The overall voltage gain in dB will be

(1) 101·58

(2) 50·79

(3) 33·98

(4) 38·06

45. An amplifier with negative feedback has a voltage gain of 100. It is found that with feedback an input signal of 0·6 V is required to produce a given output whereas without feedback the input signal must be only 50 mV for the same output. Then the voltage gain without feedback *A* and feedback factor β are

(1) $A = 1000, \beta = \frac{9}{1000}$

(2) $A = 1100, \beta = \frac{10}{1100}$

(3) $A = 1400, \beta = \frac{13}{1200}$

(4) $A = 1200, \beta = \frac{11}{1200}$

46. If in Hartley oscillator tank circuit X_1 and X_2 are pure inductive and X_3 is pure capacitative reactance, then the circuit will oscillate at the frequency for which

(1) $X_1 + X_2 - X_3 = 0$
(2) $X_1 + X_2 + X_3 = 0$
(3) $X_1 - X_2 + X_3 = 0$
(4) $X_1 - X_2 - X_3 = 0$

47. The hybrid parameter h_{21} in case of transistor is known as

(1) input impedance with output shorted
(2) output admittance with input open
(3) forward current gain with output shorted
(4) reverse voltage gain with input open

48. Indicate the false statement about the consequences of early effect in transistor

(1) α decreases with increasing $|V_{CB}|$
(2) I_B decreases with increasing $|V_{CB}|$
(3) I_E increases with increasing $|V_{CB}|$
(4) voltage breakdown may occur in transistor for large $|V_{CB}|$

49. If the reverse saturation current of Si diode doubles for each increase of 10 °C in temperature, then the increase in temperature ΔT necessary to increase the reverse saturation current by a factor of 100 is

(1) 44·6 °C
(2) 64·6 °C
(3) 46·4 °C
(4) 66·4 °C

50. A resistance of 10 Ω and an inductance of 100 mH are connected in series with an AC voltage source $V = 50 \sin(100t)$. The phase difference between the current in the circuit and applied voltage will be

(1) π
(2) $\frac{\pi}{2}$
(3) $\frac{\pi}{4}$
(4) zero

51. The gradient of a scalar function is

(1) scalar quantity
(2) vector quantity
(3) tensor quantity
(4) zero

52. Magnetic field $\vec{B}$ is

(1) a solenoidal vector
(2) an irrotational vector
(3) a tensor
(4) a scalar

53. Eigenvalues of the matrix

$$\begin{pmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{pmatrix}$$

are

(1) 1, 0, –1
(2) 1, 1, 0
(3) 2, 0, –2
(4) 2, 0, 2

54. The differential equation

$$x^2 \frac{d^2y}{dx^2} + x\frac{dy}{dx} + (x^2 - n^2)y = 0$$

has solution as

(1) Bessel function $J_n(x)$
(2) Hermite polynomial $H_n(x)$
(3) Legendre polynomial $P_n(x)$
(4) Laguerre polynomial $L_n(x)$

55. The spherical Bessel function $j_n(x)$ is related to the Bessel function $J_n(x)$ by the relation

(1) $j_n(x) = \sqrt{\frac{\pi}{2x}}\, J_{n+\frac{1}{2}}(x)$
(2) $j_n(x) = \sqrt{\frac{\pi}{2x}}\, J_n(x)$
(3) $j_n(x) = \sqrt{\frac{2x}{\pi}}\, J_{n+\frac{1}{2}}(x)$
(4) $j_n(x) = \sqrt{\frac{2x}{\pi}}\, J_n(x)$

56. The value of $J_0(x)$ at $x=0$ is given by

(1) 1 (2) 0 (3) ∞ (4) $\sqrt{\pi}$

57. Momentum of a charged particle moving in an electromagnetic field is

(1) given by its mass times its velocity

(2) zero

(3) given by its mass times its velocity + a term that depends on its charge, speed of light and vector potential characterizing the field

(4) given by its mass times its velocity + a term that depends on its charge, speed of light and scalar and vector potential characterizing the field

58. Which of the following vectors is not an eigenvector of the matrix $\begin{pmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$?

(1) $\vec{r}=\left(\frac{1}{\sqrt{2}}, -\frac{1}{\sqrt{2}}, 0\right)$ (2) $\vec{r}=(0, 0, 1)$

(3) $\vec{r}=\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{2}}, 0\right)$ (4) $\vec{r}=(1, 0, -1)$

59. For any square matrix A, which of the following matrices is not Hermitian?

(1) $A+A^{+}$ (2) AA^{+} (3) $A^{+}A$ (4) $A^{+}-A$

60. Line integral of the vector $\vec{A}=(x+y)\hat{i}+(2x-z)\hat{j}+(y+z)\hat{k}$ along the sides of the triangle cut from the plane $3x+2y+z=6$ by the coordinate axes is

(1) 21 (2) 36 (3) −16 (4) 1

61. Given a one-dimensional wave function $\psi(x) = Ae^{-\alpha x^2}$ $(\alpha > 0)$, the normalization factor A would be

(1) $|A| = \left(\frac{2\alpha}{\pi}\right)^{1/4}$

(2) $|A| = \left(\frac{\pi}{2\alpha}\right)^{1/4}$

(3) $|A| = \left(\frac{2\alpha}{\pi}\right)^{1/2}$

(4) $|A| = \left(\frac{2\pi}{\alpha}\right)^{1/2}$

62. A quantum particle moves in a three-dimensional space with momenta $\vec{p} = (p_x, p_y, p_z)$ and position $\vec{r} = (x, y, z)$. The uncertainty in the measurement of position and momentum along z-axis is

(1) $\Delta z \, \Delta p_y \geq \hbar$

(2) $\Delta y \, \Delta p_z \geq \hbar$

(3) $\Delta x \, \Delta p_z \geq \hbar$

(4) $\Delta z \, \Delta p_z \geq \hbar$

63. The electron of the hydrogen atom is in its ground state. If we use the standard integral

$$\int_0^\infty \bar{e}^x x^n \, dx = n!$$

the expectation value $\langle r \rangle$ is

(1) $\frac{2}{3} a_0$

(2) $\frac{3}{2} a_0$

(3) $\frac{4}{3} a_0$

(4) $\frac{3}{4} a_0$

64. An electron is confined to a box of length 10^{-8} m. Calculation of the minimum uncertainty in its velocity, with $m_e = 9 \times 10^{-31}$ kg, $\hbar = 1{\cdot}05 \times 10^{-34}$ J-sec, is

(1) $1{\cdot}17 \times 10^4$ m/sec

(2) $1{\cdot}17 \times 10^6$ m/sec

(3) $1{\cdot}17 \times 10^2$ m/sec

(4) $1{\cdot}17 \times 10^8$ m/sec

65. A particle of mass m is restricted to move in one-dimension between two points such that $0 \leq x \leq a$. If the potential function is such that

$$V(x) = \infty \quad x < 0 \text{ and } x > a$$
$$= 0 \quad 0 \leq x \leq a$$

the particle will have discrete energy spectrum as

(1) $E_n = \dfrac{\pi^2 \hbar^2}{4ma^2} \cdot n^2 \quad n = 0, 1, 2, \cdots$

(2) $E_n = \dfrac{3\pi^2 \hbar^2}{2ma^2} (n+1)^2 \quad n = 0, 1, 2, \cdots$

(3) $E_n = \dfrac{\pi^2 \hbar^2}{2ma^2} (n+1)^2 \quad n = 0, 1, 2, \cdots$

(4) $E_n = \dfrac{3}{2} \dfrac{\pi^2 \hbar^2}{ma^2} \cdot n^2 \quad n = 0, 1, 2, \cdots$

66. In terms of lowering and raising angular momentum operators J_- and J_+, the following relation is true

(1) $J_x^2 + J_y^2 = J_+ J_- + \hbar J_z$

(2) $J_x^2 + J_y^2 = J_- J_+ + \hbar J_z$

(3) $J_x^2 + J_y^2 = J_- J_z + J_+$

(4) $J_x^2 + J_y^2 = J_- J_+ - \hbar J_z$

67. In hydrogen atom energy spectrum, the Brackett series are there where the transition takes place from higher orbits to

(1) third stationary orbit

(2) second stationary orbit

(3) fifth stationary orbit

(4) fourth stationary orbit

68. The ground state eigenfunction for a linear harmonic oscillator, in terms of $\alpha = \sqrt{\dfrac{mk}{\hbar^2}}$ where k = force constant and m = mass of the linear oscillator, is

(1) $\psi(x) = \left(\dfrac{\alpha}{\sqrt{\pi}} \right)^{1/4} e^{\alpha x^2/2}$

(2) $\psi(x) = \left(\dfrac{\alpha}{\sqrt{\pi}} \right)^{1/2} e^{-\alpha x^2/2}$

(3) $\psi(x) = \left(\dfrac{\alpha}{\sqrt{\pi}} \right)^{1/2} e^{-\alpha^2 x^2/2}$

(4) $\psi(x) = \left(\dfrac{\alpha}{\sqrt{\pi}} \right)^{1/4} e^{+\alpha^2 x^2/2}$

69. The matrix representation of $J_+ = J_x + iJ_y$ for $j = \frac{1}{2}$ is

(1) $J_+ = \hbar\begin{pmatrix} 0 & 0 \\ 1 & 0 \end{pmatrix}$ (2) $J_+ = \hbar\begin{pmatrix} 0 & 1 \\ 0 & 0 \end{pmatrix}$ (3) $J_+ = \hbar\begin{pmatrix} 1 & 0 \\ 0 & 0 \end{pmatrix}$ (4) $J_+ = \hbar\begin{pmatrix} 0 & 0 \\ 0 & 1 \end{pmatrix}$

70. The energy of a linear harmonic oscillator of mass m and angular frequency ω turns out to be a function of parameter α as

$$E(\alpha) = \frac{\hbar^2\alpha}{2m} + \frac{m\omega^2}{\hbar\alpha}$$

The minimum of this energy with respect to α is $\frac{1}{2}\hbar\omega$. The critical value of α turns out to be

(1) $\alpha_c = \frac{2\hbar}{m\omega}$ (2) $\alpha_c = \frac{3}{2}\frac{\hbar}{m\omega}$ (3) $\alpha_c = \frac{m\omega}{2\hbar}$ (4) $\alpha_c = \frac{m\omega}{\hbar^2}$

71. S'-frame of reference has uniform angular velocity with respect to S-frame. These frames of references are

(1) inertial with respect to each other

(2) non-inertial with respect to each other

(3) both are inertial as well as non-inertial

(4) both are neither inertial nor non-inertial

72. S'-frame of reference has uniform angular velocity with respect to the frame S. The velocity of light in the S-frame would be

(1) the same in S'-frame magnitude as well as directionwise

(2) different in S'-frame magnitude as well as directionwise

(3) neither same nor different in magnitude as well as directionwise in S'-frame

(4) the same magnitudewise but different directionwise in S'-frame

73. The energy in electron volt, that would be generated after the annihilation of 1 gm of matter, is

(1) $5 \cdot 6 \times 10^{32}$ eV (2) $6 \cdot 5 \times 10^{23}$ eV (3) $6 \cdot 5 \times 10^{36}$ eV (4) $5 \cdot 6 \times 10^{43}$ eV

74. If the boost is along x-axis with a uniform velocity $\vec{v}$, the Lorentz invariant quantity is

(1) $y^2 - c^2t^2$ (2) $z^2 - c^2t^2$ (3) $y^2 + z^2 - c^2t^2$ (4) $x^2 - c^2t^2$

75. Two particles are travelling in the opposite directions with speed $0 \cdot 9c$ relative to the laboratory frame. Their relative speed would be

(1) $0 \cdot 995c$ (2) $1 \cdot 8c$ (3) $0 \cdot 895c$ (4) $0 \cdot 905c$

76. The length of a rod moving with velocity equal to $0 \cdot 8c$, would be modified if the proper length is equal to 100 cm. The modified length of this moving rod would be equal to

(1) 50 cm (2) 60 cm (3) 70 cm (4) 65 cm

77. If the boost is along z-axis with uniform velocity, the Lorentz invariant quantity would be

(1) $z^2 + c^2t^2$ (2) $z^2 + x^2$ (3) $z^2 + y^2$ (4) $x^2 + y^2$

78. If

$$\gamma = \frac{1}{\sqrt{1 - \beta^2}}, \quad \beta^2 = \frac{v^2}{c^2}$$

it is clear that $\gamma^2 - \beta^2\gamma^2 = 1$. The choices of γ and $\beta\gamma$ can be made in the language of trigonometrical functions as

(1) $\gamma = \operatorname{cosec}\theta,\ \beta\gamma = \cot v$ (2) $\gamma = \sec\theta,\ \beta\gamma = \tan\theta$

(3) $\gamma = \cosh\theta,\ \beta\gamma = \sinh\theta$ (4) None of the above

79. The coherence length of a sodium discharge lamp is

(1) of the order of a fraction of a cm (2) of the order of a few cm

(3) of the order of a few m (4) of the order of a few km

80. Coherence time τ_{coh} and coherence length l_{coh} are related by

(1) $l_{coh} = c\tau_{coh}$ (2) $\tau_{coh} = cl_{coh}$ (3) $l_{coh} \times \tau_{coh} = c$ (4) $l_{coh} = c^2 \tau_{coh}$

81. In a Fresnel's biprism experiment one face of the biprism is coated with an absorbing material so that the intensity of the light passing through it is reduced to 25% of its original intensity. The visibility of the fringe pattern is

(1) unaffected (2) 0·6 (3) 0·8 (4) zero

82. The sunlight is passed through a narrow slit and is allowed to illuminate a grating having 30000 lines per inch. The number of lines of sun after grating is

(1) seven (2) three (3) infinite (4) zero

83. For a lens of aperture d and focal length f illuminated by a light of wavelength λ the radius of the Airy disc is

(1) $\frac{f\lambda}{d}$ (2) $\frac{1 \cdot 22 f\lambda}{d}$ (3) $\frac{f\lambda}{1 \cdot 22 d}$ (4) $\frac{1 \cdot 22\lambda^2}{\sqrt{fd}}$

84. The radius of the Rowland circle is equal to the

(1) radius of the concave grating

(2) half of the radius of the concave grating

(3) one-third of the radius of the concave grating

(4) twice the radius of the concave grating

85. In an anisotropic crystal, the refractive index is

(1) same in all directions (2) different in different directions

(3) not well defined (4) infinitely large

86. For a Fabry-Perot etalon with mirrors of reflectivity 0·9, the wavelength difference of two close lying lines at 5000 Å is of the order of

(1) 5 Å (2) 0·5 Å (3) 0·05 Å (4) 0·005 Å

87. In Michelson interferometer, the circular fringes are

(1) fringes of equal inclination

(2) fringes of equal thickness

(3) fringes of equal inclination as well as equal thickness

(4) neither fringes of equal inclination nor fringes of equal thickness

88. In a grating the angular width of a principal maxima depends on

(1) number of lines per cm (2) total number of lines

(3) total width of the ruled surface (4) None of the above

89. When a plane polarized light is passed through a calcite crystal with electric vector at 45° with the optic axis two rays are obtained on emergence. If one combines these two rays these will produce

(1) interference pattern (2) linearly polarised light again

(3) elliptically polarized light (4) circularly polarized light

90. In Young's double-slit experiment, the interference fringes are hyperbolic in shape. The eccentricity of such hyperbolae is of the order of

(1) 1 (2) 10^{-3} (3) 10^{6} (4) ∞

91. The Rydberg constant for H atom has the value in cm^{-1} as

(1) 109677·759 (2) 109707·387

(3) 109722·403 (4) 109728·84

92. Paschen series in H atom spectra is obtained as a result of transitions from level with principal quantum number n_1 to the level with principal quantum number n_2, where

(1) $n_1 = 1$; $n_2 = 2, 3, \cdots$ (2) $n_1 = 3$; $n_2 = 4, \cdots$

(3) $n_1 = 4$; $n_2 = 5, 6, \cdots$ (4) $n_1 = 6$; $n_2 = 7, 8, \cdots$

93. Ground state of H atom is

(1) $^2S_{1/2}$ (2) $^1S_0$ (3) $^3S_0$ (4) None of the above

94. In Na the principal series arises due to transition from

(1) upper *P* levels to the lowest *S* level

(2) upper *S* levels to the lowest *P* level

(3) upper *D* levels to the lowest *P* level

(4) upper *P* levels to the lowest *D* level

95. The two sodium *D* lines have wavelengths 5890 and 5896 Å. These arise due to transitions from $^2S_{1/2}$ to

(1) $^2P_{3/2}$ and $^2P_{1/2}$ (2) $^2P_{1/2}$ and $^2P_{3/2}$

(3) $^2D_{5/2}$ and $^2D_{3/2}$ (4) $^2D_{3/2}$ and $^2D_{5/2}$

96. The energy corresponding to shortest wavelength of Lyman series in the H atom spectrum is

(1) −13·6 eV (2) 13·6 eV (3) 10·2 eV (4) −10·2 eV

97. The radius of the Bohr first circular orbit of hydrogen atom is

(1) $\sim 0 \cdot 5$ Å (2) $\sim 1 \cdot 0$ Å (3) $\sim 2 \cdot 0$ Å (4) $\sim 4 \cdot 0$ Å

98. D_1 and D_2 lines of sodium belong to

(1) sharp series (2) principal series

(3) fundamental series (4) diffuse series

99. The radial part of the eigenfunction of electron in H atom satisfies the differential equation with solution as

(1) the Hermite polynomial (2) Bessel function

(3) Laguerre polynomial (4) Legendre polynomial

100. Lorentz unit L is given by

(1) $L = \dfrac{eH}{4\pi mc^2}$ (2) $L = \dfrac{4\pi mc^2}{eH}$ (3) $L = \dfrac{2\pi e^2}{ch}$ (4) $L = \dfrac{ch}{2\pi e^2}$

101. The transition $^1D_2$-$^1P_1$ gives rise to 9 transitions in a weak magnetic field. These 9 transitions result in

(1) 9 lines (2) 6 lines (3) 3 lines (4) single line

102. The value of Rydberg constant

(1) decreases with increasing atomic number

(2) increases with increasing atomic number

(3) does not depend on atomic number

(4) increases as square of atomic number

103. Metastable state is

(1) state of multiplicity different from the ground state

(2) state of the multiplicity of the ground state

(3) a state in which atom is most stable

(4) a state in which atom is least stable

104. The fine-structure separation due to spin-orbit interaction for ^2P, ^2D and ^2F is in the order

(1) $^2P > {}^2D > {}^2F$

(2) $^2P < {}^2D < {}^2F$

(3) $^2P > {}^2F > {}^2D$

(4) $^2D > {}^2P > {}^2F$

105. In a normal Zeeman triplet, the unshifted component when absorbed parallel to the applied magnetic field

(1) appears absent

(2) is plane polarized

(3) is circularly polarized

(4) is elliptically polarized

106. An X-ray tube operated at 30 kV emits a continuous X-ray spectrum. The short wavelength limit λ_{min} (given that $e = 1 \cdot 6 \times 10^{-19}$ coulomb, $c = 3 \times 10^8$ m/sec and $h = 6 \cdot 624 \times 10^{-34}$ J-sec) is given by

(1) 0·1656 nm

(2) 0·0414 nm

(3) 0·0207 nm

(4) 0·2040 nm

107. X-ray spectrum of a cobalt target ($Z = 27$) contains strong K_α line of wavelength 0·1785 nm and a weak K_α line having wavelength 0·2285 nm due to impurity. The atomic number of impurity element is

(1) 24

(2) 27

(3) 30

(4) 23

108. For an FCC lattice the ratio of $d_{200} : d_{220} : d_{222}$ is

(1) $\sqrt{3} : \sqrt{6} : \sqrt{2}$

(2) $1 : \sqrt{2} : \sqrt{6}$

(3) $1 : 2 : 3$

(4) $\sqrt{6} : \sqrt{3} : \sqrt{2}$

109. Magnesium has h.c.p. structure. The radius of magnesium atom is 0·1605 nm. The volume of unit cell of magnesium is

(1) $0{\cdot}7\times10^{-28}$ m^3

(2) $2{\cdot}8\times10^{-28}$ m^3

(3) $1{\cdot}4\times10^{-28}$ m^3

(4) $0{\cdot}35\times10^{-28}$ m^3

110. The spacing d_{hkl} of the planes (hkl) in a tetragonal crystal is

(1) $\left[\frac{h^2}{a^2}+\frac{k^2}{b^2}+\frac{l^2}{c^2}\right]^{-\frac{1}{2}}$

(2) $\left[\frac{h^2+k^2}{a^2}+\frac{l^2}{c^2}\right]^{-\frac{1}{2}}$

(3) $\left[\frac{4}{3}\left(\frac{h^2+hk+k^2}{a^2}\right)+\frac{l^2}{c^2}\right]^{-\frac{1}{2}}$

(4) $a[h^2+k^2+l^2]^{-\frac{1}{2}}$

111. Diamond has the following crystal structure

(1) hexagonal

(2) simple cubic

(3) face-centred cubic

(4) body-centred cubic

112. In the Kronig-Penney model, discontinuities in E versus k curve occur for

(1) $k=\frac{n\pi}{a}$

(2) $k=\frac{8n\pi}{a}$

(3) $k=\frac{n^2\pi}{a}$

(4) $k=\frac{n\pi}{4a}$

113. The Fermi energy of silver is 5·51 electron volt. The average energy of the free electrons in silver at 0 °K is give by

(1) 4·205 eV

(2) 0·864 eV

(3) 3·306 eV

(4) 9·425 eV

114. A crystal system whose unit cell is specified by $a\neq b\neq c$, $\alpha=\gamma=90\neq\beta$ is known as

(1) monoclinic

(2) rhombohedral

(3) tetragonal

(4) orthorhombic

115. Which of the following statements is true about the effective mass of electron in crystals?

(1) It is positive near the top of energy band

(2) It is negative near the bottom of energy band

(3) It is constant through out the band

(4) It is negative near the top of energy band

116. For hexagonal close-packed structure, the ratio of lattice parameters a and c, i.e., $\frac{c}{a}$ is given by

(1) $\frac{1}{2}\left(\frac{8}{3}\right)^{1/2}$ (2) $\left(\frac{3}{8}\right)^{1/2}$ (3) $\left(\frac{8}{3}\right)^{1/2}$ (4) $\frac{1}{2}\left(\frac{3}{8}\right)^{1/2}$

117. The specific heat C_v due to free electrons in metals varies as

(1) $C_v \propto T$

(2) $C_v \propto T^2$

(3) C_v is constant

(4) $C_v \propto T^{-1}$

118. According to Debye model heat capacity $[C_v]_{\text{lattice}}$ at low temperature varies as proportional to

(1) T (2) T^3 (3) T^{-1} (4) T^2

119. According to Moseley's law, the relation between the atomic number Z and frequency ν is given by

(1) $\nu \propto (Z-b)$ (2) $\nu \propto Z$ (3) $\nu \propto (Z-b)^3$ (4) $\nu \propto (Z-b)^2$

120. Indicate the statement about the semiconductors which is false

(1) n-type semiconductors are obtained by doping phosphorus into silicon

(2) The conductivity of all semiconductors always increases with temperature

(3) p-type semiconductors are obtained by doping boron into silicon

(4) Intrinsic semiconductors are insulators at $T = 0$ °K

121. The electrical conductivity of a metal in terms of mass (m), charge (e), collision time (τ) and concentration (n) of electrons is given by

(1) $\frac{me\tau}{n}$ (2) $mne\tau$ (3) $\frac{ne^2\tau^2}{m}$ (4) $\frac{ne^2\tau}{m}$

122. According to Dulong and Petit's law, value of molar lattice specific heat is

(1) $\frac{3R}{2}$ (2) $3R$ (3) $\frac{R}{2}$ (4) R

123. Which of the statements is false?

(1) A semiconductor exhibits negative temperature coefficient of resistivity

(2) In an n-type semiconductor, as the density of donor atoms is increased, the Fermi level shifts towards the valence band

(3) Mobility carriers in a p-type semiconductors are holes

(4) In an intrinsic semiconductor, the Fermi level lies midway in the forbidden gap

124. The short wavelength limit of X-rays depends upon

(1) nature of the target

(2) potential difference across the X-ray tube

(3) nature of the filament used

(4) None of these

125. The de Broglie wavelength associated with an electron of mass m and accelerated by a potential V is

(1) $\frac{h}{\sqrt{2mVe}}$ (2) $\frac{\sqrt{2mVe}}{h}$ (3) $\frac{h}{\sqrt{Vem}}$ (4) $\frac{h}{2Vem}$

126. The number of ions in the unit cell of CsCl crystal is

(1) 1 (2) 2 (3) 3 (4) 4

127. The Miller indices of the plane parallel to the x and y axes are

(1) (100) (2) (111) (3) (001) (4) (010)

128. The number of lattice points in a primitive cell is

(1) 2 (2) 3 (3) 1 (4) 4

129. If n is the number of atoms in the unit cell of the cubic system, N and M are the Avogadro's number and atomic weight respectively and ρ is the density of the element, then the lattice constant a is given by

(1) $\left[\frac{M\rho}{nN}\right]^{1/3}$ (2) $\left[\frac{nM}{N\rho}\right]^{1/3}$ (3) $\left[\frac{nN}{M\rho}\right]^{1/3}$ (4) $\left[\frac{\rho N}{Mn}\right]^{1/3}$

130. On the application of forward bias to a p-n junction diode, the depletion width

(1) remains unchanged

(2) decreases

(3) increases

(4) increases in the beginning then becomes constant

131. The average energy of the γ-rays is

(1) $\approx 0{\cdot}53 \times 10^5$ eV (2) $\approx 0{\cdot}53 \times 10^6$ eV

(3) $\approx 0{\cdot}53 \times 10^4$ eV (4) $\approx 0{\cdot}53 \times 10^3$ eV

132. The half-life (T) of a radioactive element is

(1) $T = \frac{0 \cdot 782}{\lambda}$ (2) $T = \frac{0 \cdot 693}{\lambda}$ (3) $T = \frac{0 \cdot 936}{\lambda}$ (4) $T = \frac{0 \cdot 369}{\lambda}$

133. The unit 'one-Rutherford' stands for

(1) 10^5 disintegrations per sec (2) 10^7 disintegrations per sec

(3) 10^4 disintegrations per sec (4) 10^6 disintegrations per sec

134. The unit 'one-Curie' of disintegration of radioactive decay corresponds to

(1) $3 \cdot 7 \times 10^{10}$ disintegrations per sec (2) $3 \cdot 7 \times 10^{9}$ disintegrations per sec

(3) $3 \cdot 7 \times 10^{8}$ disintegrations per sec (4) $3 \cdot 7 \times 10^{6}$ disintegrations per sec

135. A free neutron can decay to a proton through electron β-decay. The life-term of such a decay is approximately

(1) 2000 sec (2) 5000 sec (3) 1000 sec (4) 7000 sec

136. Radium nucleus has a half-life approximately equal to 1620 years. Thus, its decay constant would be

(1) $8 \cdot 24 \times 10^{-6}$ per year (2) $2 \cdot 48 \times 10^{-5}$ per year

(3) $8 \cdot 24 \times 10^{-3}$ per year (4) $4 \cdot 28 \times 10^{-4}$ per year

137. The minimum energy of the γ-rays to decay into electron-positron pair is

(1) 2·01 MeV (2) 1·02 MeV (3) 3·01 MeV (4) 4·02 MeV

138. Neutrinos are the only particles that experience

(1) only electromagnetic interaction

(2) only weak and gravitational interactions

(3) only strong and weak interactions

(4) only strong and gravitational interactions

139. The radio-carbon, used in the carbon-dating, has the half-life time about

(1) 6057 years (2) 7057 years (3) 5760 years (4) None of the above

140. The half-life ($T_{1/2}$) and mean life ($\bar{T}$) of radioactivity are connected by

(1) $\bar{T} = 1 \cdot 44\, T_{1/2}$

(2) $\bar{T} = 5 \cdot 45\, T_{1/2}$

(3) $\bar{T} = 4 \cdot 54\, T_{1/2}$

(4) $\bar{T} = 0 \cdot 693\, T_{1/2}$

141. The decay probability per unit time (λ) and mean-life-time ($\bar{T}$) of a radioactive nucleus, are related by

(1) $\bar{T} = 0 \cdot 693\lambda$ (2) $\bar{T} = \frac{1}{\lambda}$ (3) $\bar{T} = \frac{0 \cdot 693}{\lambda}$ (4) $\bar{T} = \frac{\lambda}{0 \cdot 693}$

142. α-decay occurs in nuclei which contain number of nucleons

(1) 310 or more (2) 110 or more (3) 210 or more (4) None of the above

143. A long-lived excited nucleus is called as

(1) isotope (2) isobar (3) isomer (4) None of the above

144. Theory of α-decay process can be explained using the concepts of

(1) classical mechanics

(2) quantum mechanics

(3) statistical mechanics

(4) thermal physics

145. The liquid-drop model of nucleus is essential for the explanation of

(1) nuclear β-decay

(2) nuclear radioactivity in general

(3) nuclear transmutation

(4) nuclear fission

146. A compound nucleus is formed for approximately

(1) 10^{-34} sec (2) 10^{-8} sec (3) 10^{-10} sec (4) 10^{-16} sec

147. The phenomenon of carbon cycle in stars is generated due to

(1) nuclear α-decay
(2) nuclear fission
(3) nuclear fusion
(4) None of the above

148. The 'hydrogen' bomb is made on the basis of

(1) nuclear fission
(2) nuclear fusion
(3) nuclear transmutation
(4) None of the above

149. The γ-rays are emitted when

(1) excited nuclei return to their ground state
(2) excited atoms return to their ground state
(3) excited molecules return to their ground state
(4) None of the above

150. The unit of nuclear cross-section is 'barn'. One barn is equal to

(1) 10^{-38} (metre)^2 (2) 10^{-28} (metre)^2 (3) 10^{-48} (metre)^2 (4) None of the above

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अभ्यर्थियों के लिए निर्देश

(इस पुस्तिका के प्रथम आवरण-पृष्ठ पर तथा उत्तर-पत्र के दोनों पृष्ठों पर केवल नीली या काली बाल-प्वाइंट पेन से ही लिखें)

1. प्रश्न पुस्तिका मिलने के 10 मिनट के अन्दर ही देख लें कि प्रश्नपत्र में सभी पृष्ठ मौजूद हैं और कोई प्रश्न छूटा नहीं है। पुस्तिका दोषयुक्त पाये जाने पर इसकी सूचना तत्काल कक्ष-निरीक्षक को देकर सम्पूर्ण प्रश्नपत्र की दूसरी पुस्तिका प्राप्त कर लें।
2. परीक्षा भवन में *लिफाफा रहित प्रवेश-पत्र के अतिरिक्त*, लिखा या सादा कोई भी खुला कागज साथ में न लायें।
3. उत्तर-पत्र अलग से दिया गया है। ***इसे न तो मोड़ें और न ही विकृत करें। दूसरा उत्तर-पत्र नहीं दिया जायेगा, केवल उत्तर-पत्र का ही मूल्यांकन किया जायेगा।***
4. अपना *अनुक्रमांक तथा उत्तर-पत्र का क्रमांक प्रथम आवरण-पृष्ठ पर पेन* से निर्धारित स्थान पर लिखें।
5. **उत्तर पत्र के प्रथम पृष्ठ पर पेन से अपना अनुक्रमांक निर्धारित स्थान पर लिखें तथा नीचे दिये वृत्तों को गाढ़ा कर दें। जहाँ-जहाँ आवश्यक हो वहाँ प्रश्न-पुस्तिका का क्रमांक तथा सेट का नम्बर उचित स्थानों पर लिखें।**
6. ओ० एम० आर० पत्र पर अनुक्रमांक संख्या, प्रश्न-पुस्तिका संख्या व सेट संख्या (यदि कोई हो) तथा प्रश्न पुस्तिका पर अनुक्रमांक सं० और ओ० एम० आर० पत्र सं० की प्रविष्टियों में उपरिलेखन की अनुमति नहीं है।
7. उपर्युक्त प्रविष्टियों में कोई भी परिवर्तन कक्ष निरीक्षक द्वारा प्रमाणित होना चाहिये अन्यथा यह एक अनुचित साधन का प्रयोग माना जायेगा।
8. प्रश्न-पुस्तिका में प्रत्येक प्रश्न के चार वैकल्पिक उत्तर दिये गये हैं। ***प्रत्येक प्रश्न के वैकल्पिक उत्तर के लिये आपको उत्तर पत्र की सम्बन्धित पंक्ति के सामने दिये गये वृत्त को उत्तर-पत्र के प्रथम पृष्ठ पर दिये गये निर्देशों के अनुसार पेन से गाढ़ा करना है।***
9. प्रत्येक प्रश्न के उत्तर के लिये केवल एक ही वृत्त को गाढ़ा करें। एक से अधिक वृत्तों को गाढ़ा करने पर अथवा एक वृत्त को अपूर्ण भरने पर वह उत्तर गलत माना जायेगा।
10. ध्यान दें कि एक बार स्याही द्वारा अंकित उत्तर बदला नहीं जा सकता है। यदि आप किसी प्रश्न का *उत्तर **नहीं** देना चाहते **हैं***, तो सम्बन्धित पंक्ति के सामने दिये गये सभी वृत्तों को खाली छोड़ दें। ऐसे प्रश्नों पर शून्य अंक दिये जायेंगे।
11. रफ कार्य के लिये प्रश्न-पुस्तिका के मुखपृष्ठ के अन्दर वाले पृष्ठ तथा अंतिम पृष्ठ का प्रयोग करें।
12. परीक्षा के उपरान्त केवल ***ओ०एम०आर० उत्तर पत्र*** परीक्षा भवन में जमा कर दें।
13. परीक्षा समाप्त होने से पहले परीक्षा भवन से बाहर जाने की अनुमति नहीं होगी।
14. यदि कोई अभ्यर्थी परीक्षा में अनुचित साधनों का प्रयोग करता है, तो वह विश्वविद्यालय द्वारा निर्धारित दंड का/की, भागी होगा/होगी।