Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

A

SET-Y

PG-EE-July, 2025

SUBJECT : Physics

10045

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. The moment of inertia of a solid sphere with radius R and mass M bout an axis at a distance R/2 from the centre is :

(1) $\frac{1}{2}MR^2$ (2) $\frac{11}{12}MR^2$ (3) $\frac{13}{20}MR^2$ (4) $\frac{3}{4}MR^2$

2. The rate of change of angular momentum is equal to :

(1) Torque (2) Angular velocity

(3) Force (4) Power

3. If the radius of the earth suddenly expands by 50 percent of its present radius, then the duration of the day shall be :

(1) 54 Hr (2) 36 Hr

(3) 12 Hr (4) 6 Hr

4. A projectile of mass m is moving in the vertical $x - y$ plane with the origin on the ground and y-axis pointing vertically up. Taking the gravitational potential energy to be zero on the ground, the total energy of the particle written in planar polar coordinates (r, θ) is :

(1) $\frac{m}{2}\dot{r}^2 + mgr\sin\theta$

(2) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\sin\theta$

(3) $\frac{m}{2}\dot{r}^2 + mgr\cos\theta$

(4) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\cos\theta$

5. Frame of references in which Newton's laws of motion hold good are :

(1) Ideal frame of reference (2) Non-ideal frame of reference

(3) Inertial (4) Non-Inertial

6. A uniform bar of length l and mass m is pivoted at its top end and it is oscillating with a frequency f_b. Assuming small oscillations, the value of f/f_b, (where f is the angular frequency of a simple pendulum of the same length) will be :

(1) $\sqrt{2}$

(2) $\sqrt{\frac{1}{2}}$

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

(4) $\sqrt{\frac{2}{3}}$

7. A thin uniform circular disc rolling down an inclined plane of inclination 60° without slipping. Its linear acceleration along the plane is :

(1) $\sqrt{\frac{3}{2}}g$

(2) $\sqrt{\frac{1}{2}}g$

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

(4) g

8. The divergence of a three dimensional $\frac{\hat{r}}{r^3}$ is (where $\hat{r}$ is the unit radial vector) :

(1) 0

(2) $\frac{1}{r^3}$

(3) $-\frac{1}{r^3}$

(4) $-\frac{1}{r^4}$

9. If curl of a vector field is zero, then the field is said to be :

(1) Rotational

(2) Irrotational

(3) Uniform

(4) Non-uniform

10. If $\phi = 2y^2z + 5x^3y$, then the value of grad of ϕ at (1, 1, 0) is :

(1) $15\hat{i} + 5\hat{j} + 2\hat{k}$

(2) $5\hat{i} + 15\hat{j} + 2\hat{k}$

(3) $15\hat{j} + 2\hat{k}$

(4) $5\hat{i} + 15\hat{j}$

11. Positive divergence represents :

(1) Irrotational

(2) Solenoidal

(3) Sink

(4) Source

12. Magnetic susceptibility of a perfectly diamagnetic substance is :

(1) 0

(2) 1

(3) -1

(4) $-1/2$

13. Work done by a magnetic field on a moving charged particle in the field is equal to :

(1) 0

(2) BqvS cos θ

(3) BqvS sin θ

(4) BqvS

where B is magnetic field intensity, q and v are charge and velocity of charge particle respectively, S is displacement and θ is the angle between B and S.

14. Two electrons are moving parallel to each other in free space, then the force between them will be :

(1) Repulsive

(2) Attractive

(3) No force

(4) Can't say anything

15. Pointing vector $\vec{S}$ is represented as :

(1) $\mu_0 (\vec{E} \times \vec{H})$

(2) $\vec{E} \times \vec{B}$

(3) $\vec{E} \times \vec{H}$

(4) $\frac{1}{\mu_0}(\vec{E} \times \vec{H})$

16. Which of the following has the highest elasticity ?

(1) Diamond

(2) Rubber

(3) Plastic

(4) Copper

17. A wire of length 1 m can support a maximum 10 kg weight. The same wire is cut into the same pieces, then the maximum weight that each piece can hold independently is :

(1) 40 kg

(2) 20 kg

(3) 10 kg

(4) 5 kg

18. The maximum value of Poisson's ratio can be :

(1) 1

(2) 0.5

(3) –0.5

(4) –1

19. Hydrogen and Oxygen gases are enclosed in two identical containers at S.T.P. Then the ratio of root mean square velocity of the molecules of these gases will be :

(1) 2 : 1

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

(3) 4 : 1

(4) $4\sqrt{2} : 1$

20. A gas consists of particles, each having three translational and three rotational degrees of freedom. The ratio between specific heat at constant volume and specific heat at constant pressure is :

(1) 3/4

(2) 4 /3

(3) 2/3

(4) 3/2

21. The gas constant R depends on :

(1) Pressure

(2) Volume and Temperature

(3) Pressure, Volume and Temperature

(4) None of the above

22. A rod with a proper length of 3 m moves along x-axis, making an angle of 30° w.r.t. the x-axis. If its speed is $c/2$ (c is speed of light), the its length will :

(1) Increase by 0.6 m

(2) Decrease by 0.3 m

(3) Decrease by 0.6 m

(4) Remains invariant

23. If the coefficient of self-inductance of coil of length l, area of cross-section a and no. of turns n is equal to L then the coefficient of self-inductance for a coil with same area of cross-section but with twice length and twice no. of turns will be :

(1) L (2) $2L$

(3) $4L$ (4) $8L$

24. The frequency of AC which can't be used for lightening purposes is :

(1) 25 Hz (2) 50 Hz

(3) 75 Hz (4) (1) and (4) both

25. Charge on a p-type semiconductor is :

(1) Positive

(2) Negative

(3) Zero

(4) 10^{-6} coulomb

26. Resistance of an ideal diode in reverse bias is :

(1) 0 Ω

(2) 10 Ω

(3) 50 Ω

(4) Infinity

27. If wave length of light emitted by LED is 800 nm, then the band gap of material of LED is around :

(1) 1.06 eV

(2) 1.55 eV

(3) 2.01 eV

(4) 2.55 eV

28. If a zener diode has 9.1 V break down voltage with a maximum power dissipation of 273 mW, then maximum current that can pass through zener diode is :

(1) 10 mA

(2) 20 mA

(3) 30 mA

(4) 40 mA

29. Ripple factor of half wave rectifier is :

(1) $\frac{1}{2}\sqrt{\pi^2-1}$

(2) $\frac{1}{2}\sqrt{\pi^2-2}$

(3) $\frac{1}{2}\sqrt{\pi^2-4}$

(4) $\frac{1}{2}\sqrt{\pi^2-9}$

30. For using a transistor as an amplifier, the correct option regarding resistance of base-collector (R_{BC}) and base-emitter (R_{BE}) junctions is :

(1) Both R_{BC} and R_{BE} are very high

(2) R_{BC} very high and R_{BE} very low

(3) R_{BC} very low and R_{BE} very high

(4) Both R_{BC} and R_{BE} are very low

31. The efficiency of an engine working between temperature 500 K and 300 K is :

(1) 60% (2) 40% (3) 1.67% (4) 16.7%

32. At ordinary temperature, when hydrogen escapes through a porous plug under a large pressure difference, then it shows :

(1) Cooling effect (2) Heating effect (3) No effect (4) Can't say anything

33. Isothermal compressibility is given by :

(1) $\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (2) $\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

(3) $-\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (4) $-\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

34. For a particular thermodynamic system, The internal energy $U = PV$ and P is proportional to T^2. The entropy of the system is proportional to :

(1) UV (2) $\sqrt{UV}$

(3) $\sqrt{\frac{U}{V}}$ (4) $\sqrt{\frac{V}{U}}$

35. Which of the following is known as Clausius-Clapeyron equation :

(1) $\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$

(2) $\frac{dP}{dT} = -\frac{L}{T(V_2 - V_1)}$

(3) $\frac{dV}{dT} = \frac{L}{T(P_2 - P_1)}$

(4) $\frac{dV}{dT} = -\frac{L}{T(P_2 - P_1)}$

36. During free expansion of an ideal gas under adiabatic condition, the internal energy of the gas .....

(1) Increases
(2) Decreases
(3) First increases and then decreases
(4) Remains constant

37. Which of the following does ***not*** represent Gibb's potential(G) ?

(1) $G = H - TS$
(2) $G = U + TS - PV$
(3) $G = U + PV - TS$
(4) $G = F + PV$

38. In a Fourier series expansion of a function $f(x) = 4x^4 + 7$ in the interval $-\frac{x}{2}$ to $+\frac{x}{2}$, The Fourier coefficients a_n and b_n (a_n and b_n are coefficients of $\cos(n\omega T)$ and $\sin(n\omega T)$, respectively) will be :

(1) $a_n = 0$ and $b_n = 0$
(2) $a_n \neq 0$ and $b_n = 0$
(3) $a_n = 0$ and $b_n \neq 0$
(4) $a_n \neq 0$ and $b_n \neq 0$

39. Which of the following is a first-order phase transition ?

(1) Ferromagnetic to paramagnetic
(2) Vaporization of a liquid at its boiling point
(3) Normal liquid He to superfluid He
(4) Superconducting to normal state

40. The focal length of a biconvex lens with radii 5 cm and refractive index 1.5 cm is :

(1) 0 cm
(2) 5 cm
(3) 10 cm
(4) 15 cm

41. Interference occurs in :

(1) Longitudinal waves only

(2) Transverse wave only

(3) Electromagnetic waves only

(4) All above waves

42. In Fresnel's biprism experiment for the light of which colour, the fringe width will be minimum :

(1) Red

(2) Yellow

(3) Green

(4) Violet

43. Dispersive power of material of a lens is 0.025 and it produces a chromatic aberration of 0.4 cm. Then the focal length of the lens is :

(1) 100 cm

(2) 40 cm

(3) 16 cm

(4) 4 cm

44. If two coherent sources of intensity ratio 9 : 1 interfere, then the ratio of intensity of maxima and minima in the interference pattern will be :

(1) 3 : 1

(2) 9 : 1

(3) 4 : 1

(4) 2 : 1

45. In Newton's rings arrangement, the diameter of rings formed is proportional to :

(1) λ

(2) λ^2

(3) $\sqrt{\lambda}$

(4) $\frac{1}{\sqrt{\lambda}}$

46. Sun light filtering through a tree often makes circular patches on the ground, because

(1) The space through which light penetrates is round

(2) Of the scattering of light

(3) Of the diffraction phenomenon

(4) Of the interference phenomenon

47. Which of the following are coherent sources ?

(1) A 40 W and 60 W bulbs

(2) Two bulbs each of 100 W

(3) Two halves of 200 W bulb

(4) Two virtual sources obtained by biprism

48. The probability of two independent events with probability P_1 and P_2 is :

(1) $P_1 + P_2$

(2) $P_1 \times P_2$

(3) P_1 / P_2

(4) P_2 / P_1

49. According to quantum mechanics, the volume of phase space is :

(1) $\geq h$

(2) $\geq h^2$

(3) $\geq h^3$

(4) $\leq h^3$

50. Classical mechanics assumes the energy to be :

(1) Discrete

(2) Continuous

(3) In packets

(4) All of the above

51. The average energy at 0 K is given by (where E_F is fermi energy) :

(1) $\frac{3}{5}E_F$

(2) $\frac{1}{2}E_F$

(3) $\frac{1}{3}E_F$

(4) Zero

52. According to Dulong and Petit's law, C_V is :

(1) R

(2) 2R

(3) 3R

(4) 5R

53. The condition of Fraunhauffer diffraction is that the light wave front must be :

(1) Cylindrical

(2) Plane

(3) Spherical

(4) Elliptical

54. A diffraction pattern is obtained using a beam of red light. If the green light is replaced by red light, then :

(1) Diffraction bands disappear

(2) Diffraction bands becomes narrower

(3) There is no change in diffraction pattern

(4) Diffraction bands becomes broader

55. Which of the following statements show that the light waves are transverse in nature ?

(1) Light waves can travel in vacuum

(2) Light waves show interference

(3) Light waves can be polarized

(4) Light waves can be diffracted

56. Polarisation can't occur in :

(1) Sound waves

(2) Light waves

(3) Radio waves

(4) X-rays

57. When unpolarised light enters a doubly reflecting crystal, we get two refracted ra called ordinary O-ray and extraordinary E-ray which of the following statements is tru

(1) Only O-ray is polarised

(2) Only E-ray is polarised

(3) Both O and E-rays are polarised

(4) Neither O-ray nor E-ray is polarised

58. If a quarter wave plate with its optic axis vertical is inserted in to a beam of linearl polarised light oscillating at 45°, then the emerging light will be :

(1) Linearly polarised

(2) Vertically polarised

(3) Left circularly polarised

(4) Elliptically polarized

59. The kinetic energy of electron in nth orbit is directly proportional to :

(1) n^{-2}

(2) n

(3) n^2

(4) n^3

60. The ionization potential of H-atom is :

(1) 27.2 eV

(2) 13.6 eV

(3) 6.8 eV

(4) 3.4 eV

61. For a d-electron, the values of L, S and J are :

(1) $\sqrt{6}\hbar$, $\sqrt{\frac{3}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(2) $2\hbar$, $\hbar$ and $\frac{5}{2}\hbar$

(3) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(4) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{35}}{2}\hbar$

62. Lande g-factor for the doublet term $^2D_{5/2}$ is :

(1) 4/5 (2) 1

(3) 6/5 (4) 7/5

63. Which of the following can't be possible state of a d-electron in one electron atomic system ?

(1) $^2D_{1/2}$ (2) $^2D_{3/2}$

(3) $^2D_{5/2}$ (4) All of the above

64. A spectral line of wave length 4500 Å when produced a magnetic field of 10T, a normal Zeeman triplet is observed. Then the wave length. separation between components of triplet is around :

(1) 1 Å (2) 2 Å

(3) 3 Å (4) 4 Å

65. If the rotational lines of a diatomic molecule show a separation of 8 cm^{-1}, then the rotation constant will be :

(1) 16 cm^{-1} (2) 8 cm^{-1}

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

66. Ruby laser is :

(1) One level laser system

(2) Two level laser system

(3) Three level laser system

(4) Four level laser system

67. The ratio of He and Ne gases in He-Ne laser is around :

(1) 10 : 1

(2) 5 : 1

(3) 1 : 5

(4) 1 : 10

68. Which of the following is ***correct*** about nuclear force between nucleons ?

(1) n-n > n-p > p-p

(2) n-n < n-p < p-p

(3) n-n = n-p > p-p

(4) n-n = n-p = p-p

69. The density of nucleus is of the order of :

(1) 10^{13} kg/m^3

(2) 10^{15} kg/m^3

(3) 10^{17} kg/m^3

(4) 10^{19} kg/m^3

70. The dimensional formula of electric quadrupole moment is :

(1) $[M^0L^2T^0]$

(2) $[M^1L^1T^{-2}]$

(3) $[M^2L^0T^{-2}]$

(4) $[M^0L^1T^{-2}]$

71. Which of the following is ***not*** a fermion ?

(1) Proton

(2) Neutrino

(3) Electron

(4) Photon

72. Nuclear charge can be determined by :

(1) Moseley law

(2) Malus law

(3) Gold leaf experiment

(4) Interference

73. Bohr magnetron is equal to :

(1) $\frac{e\hbar}{m_e}$

(2) $\frac{e\hbar}{2m_e}$

(3) $\frac{e\hbar}{4m_e}$

(4) $\frac{e\hbar}{8m_e}$

74. The K.E. of beta particles ejected from a radio active source is :

(1) Continuous

(2) Mono energetic

(3) Continuous but K.E. increases with increase in temperature

(4) Mono energetic but K.E. increases with increase in temperature

75. Minimum number of photons emitted during annihilation of electron and positron is/are :

(1) one

(2) two

(3) three

(4) four

76. The linear attenuation coefficient for 10 MeV gamma ray in water is about $5m^{-1}$. The distance travelled by the beam such that its intensity reduced to 1% of the original value is :

(1) 1 m

(2) 0.92 m

(3) 0.5 m

(4) 0.46 m

77. Mass of neutrino is :

(1) Almost zero

(2) 0.511 MeV/c^2

(3) 938 MeV/c^2

(4) 939 MeV/c^2

78. Which of the following is the best shielding material from beta radiation ?

(1) Lead

(2) Steel

(3) Platinum

(4) Aluminium

79. The lifetime of a nucleus in the excited state is 10^{-13} s. The uncertainty in frequency of a gamma ray emitted by the nucleus will be :

(1) 1.6×10^{12} Hz

(2) 1.6×10^{11} Hz

(3) 10^{13} Hz

(4) 10^{15} Hz

80. Which of the following does ***not*** represent the particle nature of a wave ?

(1) Photoelectric effect

(2) Compton scattering

(3) Pair production

(4) Interference

81. Most of the ejected electrons in the photoelectric effect are :

(1) K - shell electrons

(2) L - shell electrons

(3) M - shell electrons

(4) Outer most shell electrons

82. The quantum mechanical operator for the momentum pf a particle moving in one dimension is :

(1) $-i\hbar\frac{d}{dx}$ (2) $i\hbar\frac{d}{dx}$

(3) $-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}$ (4) $i\hbar\frac{\partial}{\partial t}$

83. If the K.E. of a proton and electron is same then de-Broglie wave length of neutron is :

(1) Greater than electron

(2) Less than electron

(3) Equal to electron

(4) Can't say anything

84. Ground state energy of a linear harmonic oscillator is :

(1) Zero (2) $\frac{1}{2}\hbar\omega$

(3) $\hbar\omega$ (4) $2\hbar\omega$

85. If an electron is confined to a box of length 10^{-8} m, then the minimum uncertainty in its speed may be :

(1) 1.2×10^4 ms^{-1} (2) 2.4×10^4 ms^{-1}

(3) 1.2×10^2 ms^{-1} (4) 2.4×10^2 ms^{-1}

86. The eigenfunction of an operator $\frac{d^2}{dx^2}$ is $\psi = e^{ikx}$ The corresponding eigenvalue will be :

(1) zero (2) k^2

(3) $-k^2$ (4) k

87. A free particle is moving in $+X$ direction with a linear momentum p. The wave function of the particle normalized in a length L is :

(1) $\frac{1}{\sqrt{L}} e^{i\frac{p}{\hbar}x}$

(2) $\frac{1}{\sqrt{L}} e^{-i\frac{p}{\hbar}x}$

(3) $\frac{1}{\sqrt{L}} \sin\frac{p}{\hbar}x$

(4) $\frac{1}{\sqrt{L}} \cos\frac{p}{\hbar}x$

88. In 3-D, the number of Bravais lattices are :

(1) 7 (2) 14

(3) 21 (4) 28

89. For orthorhombic crystal system :

(1) $a = b = c$; $\alpha = \beta = \gamma = 90°$

(2) $a = b \neq c$; $\alpha = 120°$, $\beta = \gamma = 90°$

(3) $a \neq b \neq c$; $\alpha = \beta = \gamma \neq 90°$

(4) $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$

90. The coordination number in case of Body-Centered Cubic crystal structure is :

(1) 12 (2) 8

(3) 6 (4) 2

91. The Miller indices of a plane, which cuts off intercepts in the ratio $2a : 3b : c/3$ along the three axes are :

(1) (3, 2, 1)

(2) (3, 2, 18)

(3) (6, 9, 1)

(4) (2, 3, 1/3)

92. Powder diffraction experiment on a sample with X-rays of wavelength 1.44 Å produces (220) reflection at an angle 30°. The lattice parameter of the material of the sample will be :

(1) 4.07 Å

(2) 0.51 Å

(3) 0.051 Å

(4) 0.77 Å

93. According to the debye model, specific heat at very low temperature is directly proportional to :

(1) T^{-3}

(2) T^{0}

(3) T^{3}

(4) T^{4}

94. The Einstein's frequency in a case for which $\theta_E = -33°C$ is :

(1) -2.5×10^{12} Hz

(2) 2.5×10^{12} Hz

(3) 5×10^{12} Hz

(4) 7.5×10^{12} Hz

95. The frequency shift in Zeeman effect is given by :

(1) eB

(2) $4\pi\, emB$

(3) $\frac{4\pi m}{eB}$

(4) $\frac{eB}{4\pi m}$

96. Which of the following statistics come under classical statistics ?

(1) Maxwell-Boltzmann Statistics

(2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics

(4) None of the above

97. ..... is applicable to the identical, indistinguishable particles of zero or integral spin.

(1) Maxwell-Boltzmann Statistics (2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics (4) None of the above

98. The types of particles described by anti-symmetric wave functions are known as :

(1) Boson (2) Fermion

(3) Magnon (4) Identical particles

99. Relation between colour and the temperature of a star is given by :

(1) Wein's displacement law (2) Hubble's law

(3) Plank's law (4) Einstein mass-energy relation

100. In the higher wavelength region, Planks law reduces to :

(1) Wein's displacement law

(2) Hubble's law

(3) Rayleigh-Jeans law

(4) None of the above

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

B

SET-Y

PG-EE-July, 2025

SUBJECT : Physics

10018

Sr. No. .....

Time : **1¼ Hours** Max. Marks : **100** Total Questions : **100**

Roll No. (in figures)_____ (in words) _____

Name _____ Date of Birth_____

Father's Name _____ Mother's Name_____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Positive divergence represents :

(1) Irrotational (2) Solenoidal

(3) Sink (4) Source

2. Magnetic susceptibility of a perfectly diamagnetic substance is :

(1) 0 (2) 1

(3) -1 (4) $-1/2$

3. Work done by a magnetic field on a moving charged particle in the field is equal to :

(1) 0 (2) BqvS cos θ

(3) BqvS sin θ (4) BqvS

where B is magnetic field intensity, q and v are charge and velocity of charge particle respectively, S is displacement and θ is the angle between B and S.

4. Two electrons are moving parallel to each other in free space, then the force between them will be :

(1) Repulsive

(2) Attractive

(3) No force

(4) Can't say anything

5. Pointing vector $\vec{S}$ is represented as :

(1) $\mu_0 (\vec{E} \times \vec{H})$

(2) $\vec{E} \times \vec{B}$

(3) $\vec{E} \times \vec{H}$

(4) $\frac{1}{\mu_0}(\vec{E} \times \vec{H})$

6. Which of the following has the highest elasticity ?

(1) Diamond

(2) Rubber

(3) Plastic

(4) Copper

7. A wire of length 1 m can support a maximum 10 kg weight. The same wire is cut into the same pieces, then the maximum weight that each piece can hold independently is :

(1) 40 kg

(2) 20 kg

(3) 10 kg

(4) 5 kg

8. The maximum value of Poisson's ratio can be :

(1) 1

(2) 0.5

(3) –0.5

(4) –1

9. Hydrogen and Oxygen gases are enclosed in two identical containers at S.T.P. Then the ratio of root mean square velocity of the molecules of these gases will be :

(1) 2 : 1

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

(3) 4 : 1

(4) $4\sqrt{2} : 1$

10. A gas consists of particles, each having three translational and three rotational degrees of freedom. The ratio between specific heat at constant volume and specific heat at constant pressure is :

(1) 3/4

(2) 4 /3

(3) 2/3

(4) 3/2

11. The Miller indices of a plane, which cuts off intercepts in the ratio $2a : 3b : c/3$ along the three axes are :

(1) (3, 2, 1)
(2) (3, 2, 18)
(3) (6, 9, 1)
(4) (2, 3, 1/3)

12. Powder diffraction experiment on a sample with X-rays of wavelength 1.44 Å produces (220) reflection at an angle 30°. The lattice parameter of the material of the sample will be :

(1) 4.07 Å
(2) 0.51 Å
(3) 0.051 Å
(4) 0.77 Å

13. According to the debye model, specific heat at very low temperature is directly proportional to :

(1) T^{-3}
(2) T^{0}
(3) T^{3}
(4) T^{4}

14. The Einstein's frequency in a case for which $\theta_E = -33°C$ is :

(1) -2.5×10^{12} Hz
(2) 2.5×10^{12} Hz
(3) 5×10^{12} Hz
(4) 7.5×10^{12} Hz

15. The frequency shift in Zeeman effect is given by :

(1) eB
(2) $4\pi\, emB$
(3) $\frac{4\pi m}{eB}$
(4) $\frac{eB}{4\pi m}$

16. Which of the following statistics come under classical statistics ?

(1) Maxwell-Boltzmann Statistics

(2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics

(4) None of the above

17. ..... is applicable to the identical, indistinguishable particles of zero or integral spin.

(1) Maxwell-Boltzmann Statistics (2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics (4) None of the above

18. The types of particles described by anti-symmetric wave functions are known as :

(1) Boson (2) Fermion

(3) Magnon (4) Identical particles

19. Relation between colour and the temperature of a star is given by :

(1) Wein's displacement law (2) Hubble's law

(3) Plank's law (4) Einstein mass-energy relation

20. In the higher wavelength region, Planks law reduces to :

(1) Wein's displacement law

(2) Hubble's law

(3) Rayleigh-Jeans law

(4) None of the above

21. Which of the following is ***not*** a fermion ?

(1) Proton (2) Neutrino

(3) Electron (4) Photon

22. Nuclear charge can be determined by :

(1) Moseley law

(2) Malus law

(3) Gold leaf experiment

(4) Interference

23. Bohr magnetron is equal to :

(1) $\frac{e\hbar}{m_e}$ (2) $\frac{e\hbar}{2m_e}$

(3) $\frac{e\hbar}{4m_e}$ (4) $\frac{e\hbar}{8m_e}$

24. The K.E. of beta particles ejected from a radio active source is :

(1) Continuous

(2) Mono energetic

(3) Continuous but K.E. increases with increase in temperature

(4) Mono energetic but K.E. increases with increase in temperature

25. Minimum number of photons emitted during annihilation of electron and positron is/are :

(1) one (2) two

(3) three (4) four

26. The linear attenuation coefficient for 10 MeV gamma ray in water is about $5m^{-1}$. The distance travelled by the beam such that its intensity reduced to 1% of the original value is :

(1) 1 m
(2) 0.92 m
(3) 0.5 m
(4) 0.46 m

27. Mass of neutrino is :

(1) Almost zero
(2) 0.511 MeV/c^2
(3) 938 MeV/c^2
(4) 939 MeV/c^2

28. Which of the following is the best shielding material from beta radiation ?

(1) Lead
(2) Steel
(3) Platinum
(4) Aluminium

29. The lifetime of a nucleus in the excited state is 10^{-13} s. The uncertainty in frequency of a gamma ray emitted by the nucleus will be :

(1) 1.6×10^{12} Hz
(2) 1.6×10^{11} Hz
(3) 10^{13} Hz
(4) 10^{15} Hz

30. Which of the following does ***not*** represent the particle nature of a wave ?

(1) Photoelectric effect
(2) Compton scattering
(3) Pair production
(4) Interference

31. The average energy at 0 K is given by (where E_F is fermi energy) :

(1) $\frac{3}{5}E_F$ (2) $\frac{1}{2}E_F$

(3) $\frac{1}{3}E_F$ (4) Zero

32. According to Dulong and Petit's law, C_V is :

(1) R (2) 2R

(3) 3R (4) 5R

33. The condition of Fraunhauffer diffraction is that the light wave front must be :

(1) Cylindrical (2) Plane

(3) Spherical (4) Elliptical

34. A diffraction pattern is obtained using a beam of red light. If the green light is replaced by red light, then :

(1) Diffraction bands disappear

(2) Diffraction bands becomes narrower

(3) There is no change in diffraction pattern

(4) Diffraction bands becomes broader

35. Which of the following statements show that the light waves are transverse in nature ?

(1) Light waves can travel in vacuum

(2) Light waves show interference

(3) Light waves can be polarized

(4) Light waves can be diffracted

36. Polarisation can't occur in :

(1) Sound waves

(2) Light waves

(3) Radio waves

(4) X-rays

37. When unpolarised light enters a doubly reflecting crystal, we get two refracted rays called ordinary O-ray and extraordinary E-ray which of the following statements is ***true*** :

(1) Only O-ray is polarised

(2) Only E-ray is polarised

(3) Both O and E-rays are polarised

(4) Neither O-ray nor E-ray is polarised

38. If a quarter wave plate with its optic axis vertical is inserted in to a beam of linearly polarised light oscillating at 45°, then the emerging light will be :

(1) Linearly polarised

(2) Vertically polarised

(3) Left circularly polarised

(4) Elliptically polarized

39. The kinetic energy of electron in nth orbit is directly proportional to :

(1) n^{-2}

(2) n

(3) n^2

(4) n^3

40. The ionization potential of H-atom is :

(1) 27.2 eV

(2) 13.6 eV

(3) 6.8 eV

(4) 3.4 eV

41. The efficiency of an engine working between temperature 500 K and 300 K is :

(1) 60% (2) 40% (3) 1.67% (4) 16.7%

42. At ordinary temperature, when hydrogen escapes through a porous plug under a large pressure difference, then it shows :

(1) Cooling effect (2) Heating effect (3) No effect (4) Can't say anything

43. Isothermal compressibility is given by :

(1) $\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (2) $\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

(3) $-\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (4) $-\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

44. For a particular thermodynamic system, The internal energy $U = PV$ and P is proportional to T^2. The entropy of the system is proportional to :

(1) UV (2) $\sqrt{UV}$

(3) $\sqrt{\frac{U}{V}}$ (4) $\sqrt{\frac{V}{U}}$

45. Which of the following is known as Clausius-Clapeyron equation :

(1) $\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$

(2) $\frac{dP}{dT} = -\frac{L}{T(V_2 - V_1)}$

(3) $\frac{dV}{dT} = \frac{L}{T(P_2 - P_1)}$

(4) $\frac{dV}{dT} = -\frac{L}{T(P_2 - P_1)}$

46. During free expansion of an ideal gas under adiabatic condition, the internal energy of the gas .....

(1) Increases
(2) Decreases
(3) First increases and then decreases
(4) Remains constant

47. Which of the following does ***not*** represent Gibb's potential(G) ?

(1) $G = H - TS$
(2) $G = U + TS - PV$
(3) $G = U + PV - TS$
(4) $G = F + PV$

48. In a Fourier series expansion of a function $f(x) = 4x^4 + 7$ in the interval $-\frac{x}{2}$ to $+\frac{x}{2}$, The Fourier coefficients a_n and b_n (a_n and b_n are coefficients of cos(nωT) and sin(nωT), respectively) will be :

(1) $a_n = 0$ and $b_n = 0$
(2) $a_n \neq 0$ and $b_n = 0$
(3) $a_n = 0$ and $b_n \neq 0$
(4) $a_n \neq 0$ and $b_n \neq 0$

49. Which of the following is a first-order phase transition ?

(1) Ferromagnetic to paramagnetic
(2) Vaporization of a liquid at its boiling point
(3) Normal liquid He to superfluid He
(4) Superconducting to normal state

50. The focal length of a biconvex lens with radii 5 cm and refractive index 1.5 cm is :

(1) 0 cm
(2) 5 cm
(3) 10 cm
(4) 15 cm

51. The gas constant R depends on :

(1) Pressure

(2) Volume and Temperature

(3) Pressure, Volume and Temperature

(4) None of the above

52. A rod with a proper length of 3 m moves along x-axis, making an angle of 30° w.r.t. the x-axis. If its speed is $c/2$ (c is speed of light), the its length will :

(1) Increase by 0.6 m

(2) Decrease by 0.3 m

(3) Decrease by 0.6 m

(4) Remains invariant

53. If the coefficient of self-inductance of coil of length l, area of cross-section a and no. of turns n is equal to L then the coefficient of self-inductance for a coil with same area of cross-section but with twice length and twice no. of turns will be :

(1) L (2) $2L$

(3) $4L$ (4) $8L$

54. The frequency of AC which can't be used for lightening purposes is :

(1) 25 Hz (2) 50 Hz

(3) 75 Hz (4) (1) and (4) both

55. Charge on a p-type semiconductor is :

(1) Positive

(2) Negative

(3) Zero

(4) 10^{-6} coulomb

56. Resistance of an ideal diode in reverse bias is :

(1) 0 Ω

(2) 10 Ω

(3) 50 Ω

(4) Infinity

57. If wave length of light emitted by LED is 800 nm, then the band gap of material of LED is around :

(1) 1.06 eV

(2) 1.55 eV

(3) 2.01 eV

(4) 2.55 eV

58. If a zener diode has 9.1 V break down voltage with a maximum power dissipation of 273 mW, then maximum current that can pass through zener diode is :

(1) 10 mA

(2) 20 mA

(3) 30 mA

(4) 40 mA

59. Ripple factor of half wave rectifier is :

(1) $\frac{1}{2}\sqrt{\pi^2-1}$

(2) $\frac{1}{2}\sqrt{\pi^2-2}$

(3) $\frac{1}{2}\sqrt{\pi^2-4}$

(4) $\frac{1}{2}\sqrt{\pi^2-9}$

60. For using a transistor as an amplifier, the correct option regarding resistance of base-collector (R_{BC}) and base-emitter (R_{BE}) junctions is :

(1) Both R_{BC} and R_{BE} are very high

(2) R_{BC} very high and R_{BE} very low

(3) R_{BC} very low and R_{BE} very high

(4) Both R_{BC} and R_{BE} are very low

61. Interference occurs in :

(1) Longitudinal waves only

(2) Transverse wave only

(3) Electromagnetic waves only

(4) All above waves

62. In Fresnel's biprism experiment for the light of which colour, the fringe width will be minimum :

(1) Red (2) Yellow

(3) Green (4) Violet

63. Dispersive power of material of a lens is 0.025 and it produces a chromatic aberration of 0.4 cm. Then the focal length of the lens is :

(1) 100 cm (2) 40 cm

(3) 16 cm (4) 4 cm

64. If two coherent sources of intensity ratio 9 : 1 interfere, then the ratio of intensity of maxima and minima in the interference pattern will be :

(1) 3 : 1 (2) 9 : 1

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

65. In Newton's rings arrangement, the diameter of rings formed is proportional to :

(1) λ (2) λ^2

(3) $\sqrt{\lambda}$ (4) $\frac{1}{\sqrt{\lambda}}$

66. Sun light filtering through a tree often makes circular patches on the ground, because :

(1) The space through which light penetrates is round

(2) Of the scattering of light

(3) Of the diffraction phenomenon

(4) Of the interference phenomenon

67. Which of the following are coherent sources ?

(1) A 40 W and 60 W bulbs

(2) Two bulbs each of 100 W

(3) Two halves of 200 W bulb

(4) Two virtual sources obtained by biprism

68. The probability of two independent events with probability P_1 and P_2 is :

(1) $P_1 + P_2$

(2) $P_1 \times P_2$

(3) P_1 / P_2

(4) P_2 / P_1

69. According to quantum mechanics, the volume of phase space is :

(1) $\geq h$

(2) $\geq h^2$

(3) $\geq h^3$

(4) $\leq h^3$

70. Classical mechanics assumes the energy to be :

(1) Discrete

(2) Continuous

(3) In packets

(4) All of the above

71. For a d-electron, the values of L, S and J are :

(1) $\sqrt{6}\hbar$, $\sqrt{\frac{3}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(2) $2\hbar$, $\hbar$ and $\frac{5}{2}\hbar$

(3) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(4) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{35}}{2}\hbar$

72. Lande g-factor for the doublet term $^2D_{5/2}$ is :

(1) 4/5 (2) 1

(3) 6/5 (4) 7/5

73. Which of the following can't be possible state of a d-electron in one electron atomic system ?

(1) $^2D_{1/2}$ (2) $^2D_{3/2}$

(3) $^2D_{5/2}$ (4) All of the above

74. A spectral line of wave length 4500 Å when produced a magnetic field of 10T, a normal Zeeman triplet is observed. Then the wave length. separation between components of triplet is around :

(1) 1 Å (2) 2 Å

(3) 3 Å (4) 4 Å

75. If the rotational lines of a diatomic molecule show a separation of 8 cm^{-1}, then the rotation constant will be :

(1) 16 cm^{-1} (2) 8 cm^{-1}

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

76. Ruby laser is :

(1) One level laser system

(2) Two level laser system

(3) Three level laser system

(4) Four level laser system

77. The ratio of He and Ne gases in He-Ne laser is around :

(1) 10 : 1 (2) 5 : 1

(3) 1 : 5 (4) 1 : 10

78. Which of the following is ***correct*** about nuclear force between nucleons ?

(1) n-n > n-p > p-p

(2) n-n < n-p < p-p

(3) n-n = n-p > p-p

(4) n-n = n-p = p-p

79. The density of nucleus is of the order of :

(1) 10^{13} kg/m^3 (2) 10^{15} kg/m^3

(3) 10^{17} kg/m^3 (4) 10^{19} kg/m^3

80. The dimensional formula of electric quadrupole moment is :

(1) $[M^0L^2T^0]$ (2) $[M^1L^1T^{-2}]$

(3) $[M^2L^0T^{-2}]$ (4) $[M^0L^1T^{-2}]$

81. The moment of inertia of a solid sphere with radius R and mass M bout an axis at a distance R/2 from the centre is :

(1) $\frac{1}{2}MR^2$ (2) $\frac{11}{12}MR^2$ (3) $\frac{13}{20}MR^2$ (4) $\frac{3}{4}MR^2$

82. The rate of change of angular momentum is equal to :

(1) Torque (2) Angular velocity

(3) Force (4) Power

83. If the radius of the earth suddenly expands by 50 percent of its present radius, then the duration of the day shall be :

(1) 54 Hr (2) 36 Hr

(3) 12 Hr (4) 6 Hr

84. A projectile of mass m is moving in the vertical $x - y$ plane with the origin on the ground and y-axis pointing vertically up. Taking the gravitational potential energy to be zero on the ground, the total energy of the particle written in planar polar coordinates (r, θ) is :

(1) $\frac{m}{2}\dot{r}^2 + mgr\sin\theta$

(2) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\sin\theta$

(3) $\frac{m}{2}\dot{r}^2 + mgr\cos\theta$

(4) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\cos\theta$

85. Frame of references in which Newton's laws of motion hold good are :

(1) Ideal frame of reference (2) Non-ideal frame of reference

(3) Inertial (4) Non-Inertial

86. A uniform bar of length l and mass m is pivoted at its top end and it is oscillating with a frequency f_b. Assuming small oscillations, the value of f/f_b, (where f is the angular frequency of a simple pendulum of the same length) will be :

(1) $\sqrt{2}$ (2) $\sqrt{\frac{1}{2}}$

(3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{2}{3}}$

87. A thin uniform circular disc rolling down an inclined plane of inclination 60° without slipping. Its linear acceleration along the plane is :

(1) $\sqrt{\frac{3}{2}}g$ (2) $\sqrt{\frac{1}{2}}g$

(3) $\frac{g}{2}$ (4) g

88. The divergence of a three dimensional $\frac{\hat{r}}{r^3}$ is (where $\hat{r}$ is the unit radial vector) :

(1) 0 (2) $\frac{1}{r^3}$

(3) $-\frac{1}{r^3}$ (4) $-\frac{1}{r^4}$

89. If curl of a vector field is zero, then the field is said to be :

(1) Rotational (2) Irrotational

(3) Uniform (4) Non-uniform

90. If $\phi = 2y^2z + 5x^3y$, then the value of grad of ϕ at (1, 1, 0) is :

(1) $15\hat{i} + 5\hat{j} + 2\hat{k}$ (2) $5\hat{i} + 15\hat{j} + 2\hat{k}$

(3) $15\hat{j} + 2\hat{k}$ (4) $5\hat{i} + 15\hat{j}$

91. Most of the ejected electrons in the photoelectric effect are :

(1) K - shell electrons

(2) L - shell electrons

(3) M - shell electrons

(4) Outer most shell electrons

92. The quantum mechanical operator for the momentum pf a particle moving in one dimension is :

(1) $-i\hbar\frac{d}{dx}$

(2) $i\hbar\frac{d}{dx}$

(3) $-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}$

(4) $i\hbar\frac{\partial}{\partial t}$

93. If the K.E. of a proton and electron is same then de-Broglie wave length of neutron is :

(1) Greater than electron

(2) Less than electron

(3) Equal to electron

(4) Can't say anything

94. Ground state energy of a linear harmonic oscillator is :

(1) Zero

(2) $\frac{1}{2}\hbar\omega$

(3) $\hbar\omega$

(4) $2\hbar\omega$

95. If an electron is confined to a box of length 10^{-8} m, then the minimum uncertainty in its speed may be :

(1) $1.2 \times 10^4\ ms^{-1}$

(2) $2.4 \times 10^4\ ms^{-1}$

(3) $1.2 \times 10^2\ ms^{-1}$

(4) $2.4 \times 10^2\ ms^{-1}$

96. The eigenfunction of an operator $\frac{d^2}{dx^2}$ is $\psi = e^{ikx}$ The corresponding eigenvalue will be :

(1) zero (2) k^2

(3) $-k^2$ (4) k

97. A free particle is moving in $+X$ direction with a linear momentum p. The wave function of the particle normalized in a length L is :

(1) $\frac{1}{\sqrt{L}} e^{i\frac{p}{\hbar}x}$

(2) $\frac{1}{\sqrt{L}} e^{-i\frac{p}{\hbar}x}$

(3) $\frac{1}{\sqrt{L}} \sin\frac{p}{\hbar}x$

(4) $\frac{1}{\sqrt{L}} \cos\frac{p}{\hbar}x$

98. In 3-D, the number of Bravais lattices are :

(1) 7 (2) 14

(3) 21 (4) 28

99. For orthorhombic crystal system :

(1) $a = b = c$; $\alpha = \beta = \gamma = 90°$

(2) $a = b \neq c$; $\alpha = 120°$, $\beta = \gamma = 90°$

(3) $a \neq b \neq c$; $\alpha = \beta = \gamma \neq 90°$

(4) $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$

100. The coordination number in case of Body-Centered Cubic crystal structure is :

(1) 12 (2) 8

(3) 6 (4) 2

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

C

SET-Y

PG-EE-July, 2025

SUBJECT : Physics

Sr. No. 10003

Time : 1¼ Hours | Max. Marks : 100 | Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

1. Interference occurs in :

(1) Longitudinal waves only

(2) Transverse wave only

(3) Electromagnetic waves only

(4) All above waves

2. In Fresnel's biprism experiment for the light of which colour, the fringe width will be minimum :

(1) Red (2) Yellow

(3) Green (4) Violet

3. Dispersive power of material of a lens is 0.025 and it produces a chromatic aberration of 0.4 cm. Then the focal length of the lens is :

(1) 100 cm (2) 40 cm

(3) 16 cm (4) 4 cm

4. If two coherent sources of intensity ratio 9 : 1 interfere, then the ratio of intensity of maxima and minima in the interference pattern will be :

(1) 3 : 1 (2) 9 : 1

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

5. In Newton's rings arrangement, the diameter of rings formed is proportional to :

(1) λ (2) λ^2

(3) $\sqrt{\lambda}$ (4) $\frac{1}{\sqrt{\lambda}}$

6. Sun light filtering through a tree often makes circular patches on the ground, because :

(1) The space through which light penetrates is round

(2) Of the scattering of light

(3) Of the diffraction phenomenon

(4) Of the interference phenomenon

7. Which of the following are coherent sources ?

(1) A 40 W and 60 W bulbs

(2) Two bulbs each of 100 W

(3) Two halves of 200 W bulb

(4) Two virtual sources obtained by biprism

8. The probability of two independent events with probability P_1 and P_2 is :

(1) $P_1 + P_2$ (2) $P_1 \times P_2$

(3) P_1 / P_2 (4) P_2 / P_1

9. According to quantum mechanics, the volume of phase space is :

(1) $\geq h$ (2) $\geq h^2$

(3) $\geq h^3$ (4) $\leq h^3$

10. Classical mechanics assumes the energy to be :

(1) Discrete (2) Continuous

(3) In packets (4) All of the above

11. The gas constant R depends on :

(1) Pressure

(2) Volume and Temperature

(3) Pressure, Volume and Temperature

(4) None of the above

12. A rod with a proper length of 3 m moves along x-axis, making an angle of 30° w.r.t. the x-axis. If its speed is $c/2$ (c is speed of light), the its length will :

(1) Increase by 0.6 m

(2) Decrease by 0.3 m

(3) Decrease by 0.6 m

(4) Remains invariant

13. If the coefficient of self-inductance of coil of length l, area of cross-section a and no. of turns n is equal to L then the coefficient of self-inductance for a coil with same area of cross-section but with twice length and twice no. of turns will be :

(1) L (2) $2L$

(3) $4L$ (4) $8L$

14. The frequency of AC which can't be used for lightening purposes is :

(1) 25 Hz (2) 50 Hz

(3) 75 Hz (4) (1) and (4) both

15. Charge on a p-type semiconductor is :

(1) Positive

(2) Negative

(3) Zero

(4) 10^{-6} coulomb

16. Resistance of an ideal diode in reverse bias is :

(1) $0\ \Omega$ (2) $10\ \Omega$

(3) $50\ \Omega$ (4) Infinity

17. If wave length of light emitted by LED is 800 nm, then the band gap of material of LED is around :

(1) 1.06 eV (2) 1.55 eV

(3) 2.01 eV (4) 2.55 eV

18. If a zener diode has 9.1 V break down voltage with a maximum power dissipation of 273 mW, then maximum current that can pass through zener diode is :

(1) 10 mA (2) 20 mA

(3) 30 mA (4) 40 mA

19. Ripple factor of half wave rectifier is :

(1) $\frac{1}{2}\sqrt{\pi^2-1}$ (2) $\frac{1}{2}\sqrt{\pi^2-2}$

(3) $\frac{1}{2}\sqrt{\pi^2-4}$ (4) $\frac{1}{2}\sqrt{\pi^2-9}$

20. For using a transistor as an amplifier, the correct option regarding resistance of base-collector (R_{BC}) and base-emitter (R_{BE}) junctions is :

(1) Both R_{BC} and R_{BE} are very high

(2) R_{BC} very high and R_{BE} very low

(3) R_{BC} very low and R_{BE} very high

(4) Both R_{BC} and R_{BE} are very low

21. The moment of inertia of a solid sphere with radius R and mass M bout an axis at a distance R/2 from the centre is :

(1) $\frac{1}{2}MR^2$ (2) $\frac{11}{12}MR^2$ (3) $\frac{13}{20}MR^2$ (4) $\frac{3}{4}MR^2$

22. The rate of change of angular momentum is equal to :

(1) Torque (2) Angular velocity

(3) Force (4) Power

23. If the radius of the earth suddenly expands by 50 percent of its present radius, then the duration of the day shall be :

(1) 54 Hr (2) 36 Hr

(3) 12 Hr (4) 6 Hr

24. A projectile of mass m is moving in the vertical $x - y$ plane with the origin on the ground and y-axis pointing vertically up. Taking the gravitational potential energy to be zero on the ground, the total energy of the particle written in planar polar coordinates (r, θ) is :

(1) $\frac{m}{2}\dot{r}^2 + mgr\sin\theta$

(2) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\sin\theta$

(3) $\frac{m}{2}\dot{r}^2 + mgr\cos\theta$

(4) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\cos\theta$

25. Frame of references in which Newton's laws of motion hold good are :

(1) Ideal frame of reference (2) Non-ideal frame of reference

(3) Inertial (4) Non-Inertial

26. A uniform bar of length l and mass m is pivoted at its top end and it is oscillating with a frequency f_b. Assuming small oscillations, the value of f/f_b, (where f is the angular frequency of a simple pendulum of the same length) will be :

(1) $\sqrt{2}$ (2) $\sqrt{\frac{1}{2}}$

(3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{2}{3}}$

27. A thin uniform circular disc rolling down an inclined plane of inclination 60° without slipping. Its linear acceleration along the plane is :

(1) $\sqrt{\frac{3}{2}}g$ (2) $\sqrt{\frac{1}{2}}g$

(3) $\frac{g}{2}$ (4) g

28. The divergence of a three dimensional $\frac{\hat{r}}{r^3}$ is (where $\hat{r}$ is the unit radial vector) :

(1) 0 (2) $\frac{1}{r^3}$

(3) $-\frac{1}{r^3}$ (4) $-\frac{1}{r^4}$

29. If curl of a vector field is zero, then the field is said to be :

(1) Rotational (2) Irrotational

(3) Uniform (4) Non-uniform

30. If $\phi = 2y^2z + 5x^3y$, then the value of grad of ϕ at (1, 1, 0) is :

(1) $15\hat{i} + 5\hat{j} + 2\hat{k}$ (2) $5\hat{i} + 15\hat{j} + 2\hat{k}$

(3) $15\hat{j} + 2\hat{k}$ (4) $5\hat{i} + 15\hat{j}$

31. The Miller indices of a plane, which cuts off intercepts in the ratio $2a : 3b : c/3$ along the three axes are :

(1) (3, 2, 1)
(2) (3, 2, 18)
(3) (6, 9, 1)
(4) (2, 3, 1/3)

32. Powder diffraction experiment on a sample with X-rays of wavelength 1.44 Å produces (220) reflection at an angle 30°. The lattice parameter of the material of the sample will be :

(1) 4.07 Å
(2) 0.51 Å
(3) 0.051 Å
(4) 0.77 Å

33. According to the debye model, specific heat at very low temperature is directly proportional to :

(1) T^{-3}
(2) T^{0}
(3) T^{3}
(4) T^{4}

34. The Einstein's frequency in a case for which $\theta_E = -33°C$ is :

(1) -2.5×10^{12} Hz
(2) 2.5×10^{12} Hz
(3) 5×10^{12} Hz
(4) 7.5×10^{12} Hz

35. The frequency shift in Zeeman effect is given by :

(1) eB
(2) $4\pi\, emB$
(3) $\frac{4\pi m}{eB}$
(4) $\frac{eB}{4\pi m}$

36. Which of the following statistics come under classical statistics ?

(1) Maxwell-Boltzmann Statistics

(2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics

(4) None of the above

37. ..... is applicable to the identical, indistinguishable particles of zero or integral spin.

(1) Maxwell-Boltzmann Statistics (2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics (4) None of the above

38. The types of particles described by anti-symmetric wave functions are known as :

(1) Boson (2) Fermion

(3) Magnon (4) Identical particles

39. Relation between colour and the temperature of a star is given by :

(1) Wein's displacement law (2) Hubble's law

(3) Plank's law (4) Einstein mass-energy relation

40. In the higher wavelength region, Planks law reduces to :

(1) Wein's displacement law

(2) Hubble's law

(3) Rayleigh-Jeans law

(4) None of the above

41. For a d-electron, the values of L, S and J are :

(1) $\sqrt{6}\hbar, \sqrt{\frac{3}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(2) $2\hbar, \hbar$ and $\frac{5}{2}\hbar$

(3) $\sqrt{6}\hbar, \sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(4) $\sqrt{6}\hbar, \sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{35}}{2}\hbar$

42. Lande g-factor for the doublet term $^2D_{5/2}$ is :

(1) 4/5 (2) 1

(3) 6/5 (4) 7/5

43. Which of the following can't be possible state of a d-electron in one electron atomic system ?

(1) $^2D_{1/2}$ (2) $^2D_{3/2}$

(3) $^2D_{5/2}$ (4) All of the above

44. A spectral line of wave length 4500 Å when produced a magnetic field of 10T, a normal Zeeman triplet is observed. Then the wave length. separation between components of triplet is around :

(1) 1 Å (2) 2 Å

(3) 3 Å (4) 4 Å

45. If the rotational lines of a diatomic molecule show a separation of 8 cm^{-1}, then the rotation constant will be :

(1) 16 cm^{-1} (2) 8 cm^{-1}

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

46. Ruby laser is :

(1) One level laser system

(2) Two level laser system

(3) Three level laser system

(4) Four level laser system

47. The ratio of He and Ne gases in He-Ne laser is around :

(1) 10 : 1 (2) 5 : 1

(3) 1 : 5 (4) 1 : 10

48. Which of the following is ***correct*** about nuclear force between nucleons ?

(1) n-n > n-p > p-p

(2) n-n < n-p < p-p

(3) n-n = n-p > p-p

(4) n-n = n-p = p-p

49. The density of nucleus is of the order of :

(1) 10^{13} kg/m^3 (2) 10^{15} kg/m^3

(3) 10^{17} kg/m^3 (4) 10^{19} kg/m^3

50. The dimensional formula of electric quadrupole moment is :

(1) $[M^0L^2T^0]$ (2) $[M^1L^1T^{-2}]$

(3) $[M^2L^0T^{-2}]$ (4) $[M^0L^1T^{-2}]$

51. The efficiency of an engine working between temperature 500 K and 300 K is :

(1) 60% (2) 40% (3) 1.67% (4) 16.7%

52. At ordinary temperature, when hydrogen escapes through a porous plug under a large pressure difference, then it shows :

(1) Cooling effect (2) Heating effect (3) No effect (4) Can't say anything

53. Isothermal compressibility is given by :

(1) $\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (2) $\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

(3) $-\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (4) $-\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

54. For a particular thermodynamic system, The internal energy $U = PV$ and P is proportional to T^2. The entropy of the system is proportional to :

(1) UV (2) $\sqrt{UV}$

(3) $\sqrt{\frac{U}{V}}$ (4) $\sqrt{\frac{V}{U}}$

55. Which of the following is known as Clausius-Clapeyron equation :

(1) $\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$

(2) $\frac{dP}{dT} = -\frac{L}{T(V_2 - V_1)}$

(3) $\frac{dV}{dT} = \frac{L}{T(P_2 - P_1)}$

(4) $\frac{dV}{dT} = -\frac{L}{T(P_2 - P_1)}$

56. During free expansion of an ideal gas under adiabatic condition, the internal energy of the gas .....

(1) Increases
(2) Decreases
(3) First increases and then decreases
(4) Remains constant

57. Which of the following does ***not*** represent Gibb's potential(G) ?

(1) $G = H - TS$
(2) $G = U + TS - PV$
(3) $G = U + PV - TS$
(4) $G = F + PV$

58. In a Fourier series expansion of a function $f(x) = 4x^4 + 7$ in the interval $-\frac{x}{2}$ to $+\frac{x}{2}$, The Fourier coefficients a_n and b_n (a_n and b_n are coefficients of cos(nωT) and sin(nωT), respectively) will be :

(1) $a_n = 0$ and $b_n = 0$
(2) $a_n \neq 0$ and $b_n = 0$
(3) $a_n = 0$ and $b_n \neq 0$
(4) $a_n \neq 0$ and $b_n \neq 0$

59. Which of the following is a first-order phase transition ?

(1) Ferromagnetic to paramagnetic
(2) Vaporization of a liquid at its boiling point
(3) Normal liquid He to superfluid He
(4) Superconducting to normal state

60. The focal length of a biconvex lens with radii 5 cm and refractive index 1.5 cm is :

(1) 0 cm
(2) 5 cm
(3) 10 cm
(4) 15 cm

61. Which of the following is ***not*** a fermion ?

(1) Proton
(2) Neutrino
(3) Electron
(4) Photon

62. Nuclear charge can be determined by :

(1) Moseley law
(2) Malus law
(3) Gold leaf experiment
(4) Interference

63. Bohr magnetron is equal to :

(1) $\frac{e\hbar}{m_e}$
(2) $\frac{e\hbar}{2m_e}$
(3) $\frac{e\hbar}{4m_e}$
(4) $\frac{e\hbar}{8m_e}$

64. The K.E. of beta particles ejected from a radio active source is :

(1) Continuous
(2) Mono energetic
(3) Continuous but K.E. increases with increase in temperature
(4) Mono energetic but K.E. increases with increase in temperature

65. Minimum number of photons emitted during annihilation of electron and positron is/are :

(1) one
(2) two
(3) three
(4) four

66. The linear attenuation coefficient for 10 MeV gamma ray in water is about $5m^{-1}$. The distance travelled by the beam such that its intensity reduced to 1% of the original value is :

(1) 1 m

(2) 0.92 m

(3) 0.5 m

(4) 0.46 m

67. Mass of neutrino is :

(1) Almost zero

(2) 0.511 MeV/c^2

(3) 938 MeV/c^2

(4) 939 MeV/c^2

68. Which of the following is the best shielding material from beta radiation ?

(1) Lead

(2) Steel

(3) Platinum

(4) Aluminium

69. The lifetime of a nucleus in the excited state is 10^{-13} s. The uncertainty in frequency of a gamma ray emitted by the nucleus will be :

(1) 1.6×10^{12} Hz

(2) 1.6×10^{11} Hz

(3) 10^{13} Hz

(4) 10^{15} Hz

70. Which of the following does ***not*** represent the particle nature of a wave ?

(1) Photoelectric effect

(2) Compton scattering

(3) Pair production

(4) Interference

71. Most of the ejected electrons in the photoelectric effect are :

(1) K - shell electrons

(2) L - shell electrons

(3) M - shell electrons

(4) Outer most shell electrons

72. The quantum mechanical operator for the momentum pf a particle moving in one dimension is :

(1) $-i\hbar\frac{d}{dx}$ (2) $i\hbar\frac{d}{dx}$

(3) $-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}$ (4) $i\hbar\frac{\partial}{\partial t}$

73. If the K.E. of a proton and electron is same then de-Broglie wave length of neutron is :

(1) Greater than electron

(2) Less than electron

(3) Equal to electron

(4) Can't say anything

74. Ground state energy of a linear harmonic oscillator is :

(1) Zero (2) $\frac{1}{2}\hbar\omega$

(3) $\hbar\omega$ (4) $2\hbar\omega$

75. If an electron is confined to a box of length 10^{-8} m, then the minimum uncertainty in its speed may be :

(1) 1.2×10^4 ms^{-1} (2) 2.4×10^4 ms^{-1}

(3) 1.2×10^2 ms^{-1} (4) 2.4×10^2 ms^{-1}

76. The eigenfunction of an operator $\frac{d^2}{dx^2}$ is $\psi = e^{ikx}$ The corresponding eigenvalue will be :

(1) zero (2) k^2

(3) $-k^2$ (4) k

77. A free particle is moving in $+X$ direction with a linear momentum p. The wave function of the particle normalized in a length L is :

(1) $\frac{1}{\sqrt{L}} e^{i\frac{p}{\hbar}x}$

(2) $\frac{1}{\sqrt{L}} e^{-i\frac{p}{\hbar}x}$

(3) $\frac{1}{\sqrt{L}} \sin\frac{p}{\hbar}x$

(4) $\frac{1}{\sqrt{L}} \cos\frac{p}{\hbar}x$

78. In 3-D, the number of Bravais lattices are :

(1) 7 (2) 14

(3) 21 (4) 28

79. For orthorhombic crystal system :

(1) $a = b = c$; $\alpha = \beta = \gamma = 90°$

(2) $a = b \neq c$; $\alpha = 120°$, $\beta = \gamma = 90°$

(3) $a \neq b \neq c$; $\alpha = \beta = \gamma \neq 90°$

(4) $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$

80. The coordination number in case of Body-Centered Cubic crystal structure is :

(1) 12 (2) 8

(3) 6 (4) 2

81. Positive divergence represents :

(1) Irrotational

(2) Solenoidal

(3) Sink

(4) Source

82. Magnetic susceptibility of a perfectly diamagnetic substance is :

(1) 0

(2) 1

(3) -1

(4) $-1/2$

83. Work done by a magnetic field on a moving charged particle in the field is equal to :

(1) 0

(2) BqvS cos θ

(3) BqvS sin θ

(4) BqvS

where B is magnetic field intensity, q and v are charge and velocity of charge particle respectively, S is displacement and θ is the angle between B and S.

84. Two electrons are moving parallel to each other in free space, then the force between them will be :

(1) Repulsive

(2) Attractive

(3) No force

(4) Can't say anything

85. Pointing vector $\vec{S}$ is represented as :

(1) $\mu_0 (\vec{E} \times \vec{H})$

(2) $\vec{E} \times \vec{B}$

(3) $\vec{E} \times \vec{H}$

(4) $\frac{1}{\mu_0}(\vec{E} \times \vec{H})$

86. Which of the following has the highest elasticity ?

(1) Diamond

(2) Rubber

(3) Plastic

(4) Copper

87. A wire of length 1 m can support a maximum 10 kg weight. The same wire is cut into the same pieces, then the maximum weight that each piece can hold independently is :

(1) 40 kg

(2) 20 kg

(3) 10 kg

(4) 5 kg

88. The maximum value of Poisson's ratio can be :

(1) 1

(2) 0.5

(3) –0.5

(4) –1

89. Hydrogen and Oxygen gases are enclosed in two identical containers at S.T.P. Then the ratio of root mean square velocity of the molecules of these gases will be :

(1) 2 : 1

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

(3) 4 : 1

(4) $4\sqrt{2} : 1$

90. A gas consists of particles, each having three translational and three rotational degrees of freedom. The ratio between specific heat at constant volume and specific heat at constant pressure is :

(1) 3/4

(2) 4 /3

(3) 2/3

(4) 3/2

91. The average energy at 0 K is given by (where E_F is fermi energy) :

(1) $\frac{3}{5}E_F$ (2) $\frac{1}{2}E_F$

(3) $\frac{1}{3}E_F$ (4) Zero

92. According to Dulong and Petit's law, C_V is :

(1) R (2) 2R

(3) 3R (4) 5R

93. The condition of Fraunhauffer diffraction is that the light wave front must be :

(1) Cylindrical (2) Plane

(3) Spherical (4) Elliptical

94. A diffraction pattern is obtained using a beam of red light. If the green light is replaced by red light, then :

(1) Diffraction bands disappear

(2) Diffraction bands becomes narrower

(3) There is no change in diffraction pattern

(4) Diffraction bands becomes broader

95. Which of the following statements show that the light waves are transverse in nature ?

(1) Light waves can travel in vacuum

(2) Light waves show interference

(3) Light waves can be polarized

(4) Light waves can be diffracted

96. Polarisation can't occur in :

(1) Sound waves

(2) Light waves

(3) Radio waves

(4) X-rays

97. When unpolarised light enters a doubly reflecting crystal, we get two refracted rays called ordinary O-ray and extraordinary E-ray which of the following statements is ***true*** :

(1) Only O-ray is polarised

(2) Only E-ray is polarised

(3) Both O and E-rays are polarised

(4) Neither O-ray nor E-ray is polarised

98. If a quarter wave plate with its optic axis vertical is inserted in to a beam of linearly polarised light oscillating at 45°, then the emerging light will be :

(1) Linearly polarised

(2) Vertically polarised

(3) Left circularly polarised

(4) Elliptically polarized

99. The kinetic energy of electron in nth orbit is directly proportional to :

(1) n^{-2}

(2) n

(3) n^2

(4) n^3

100. The ionization potential of H-atom is :

(1) 27.2 eV

(2) 13.6 eV

(3) 6.8 eV

(4) 3.4 eV

Total No. of Printed Pages : 21

(DO NOT OPEN THIS QUESTION BOOKLET BEFORE TIME OR UNTIL YOU ARE ASKED TO DO SO)

D

SET-Y

PG-EE-July, 2025

SUBJECT : Physics

Sr. No. 10032

Time : 1¼ Hours | Max. Marks : 100 | Total Questions : 100

Roll No. (in figures) _____ (in words) _____

Name _____ Date of Birth _____

Father's Name _____ Mother's Name _____

Date of Examination _____

_____ _____

(Signature of the Candidate) (Signature of the Invigilator)

CANDIDATES MUST READ THE FOLLOWING INFORMATION/INSTRUCTIONS BEFORE STARTING THE QUESTION PAPER.

1. ***All questions are compulsory.***
2. The candidates ***must return*** the question booklet as well as OMR Answer-Sheet to the Invigilator concerned before leaving the Examination Hall, failing which a case of use of unfair-means / mis-behaviour will be registered against him / her, in addition to lodging of an FIR with the police. Further the answer-sheet of such a candidate will not be evaluated.
3. Keeping in view the transparency of the examination system, carbonless OMR Sheet is provided to the candidate so that a copy of OMR Sheet may be kept by the candidate.
4. Question Booklet along with answer key of all the A, B, C & D code shall be got uploaded on the University Website immediately after the conduct of Entrance Examination. Candidates may raise valid objection/complaint if any, with regard to discrepancy in the question booklet/answer key within 24 hours of uploading the same on the University Website. The complaint be sent by the students to the Controller of Examinations by hand or through email. Thereafter, no complaint in any case, will be considered.
5. The candidate ***must not*** do any rough work or writing in the OMR Answer-Sheet. Rough work, if any, may be done in the question booklet itself. Answers ***must not*** be ticked in the question booklet.
6. ***There will be no negative marking. Each correct answer will be awarded one full mark. Cutting, erasing, overwriting and more than one answer in OMR Answer-Sheet will be treated as incorrect answer.***
7. Use only **Black** or **Blue Ball Point Pen** of good quality in the OMR Answer-Sheet.
8. *Before answering the questions, the candidates should ensure that they have been supplied correct and complete booklet. Complaints, if any, regarding misprinting etc. will not be entertained* **30** *minutes after starting of the examination.*

SEAL

1. Which of the following is ***not*** a fermion ?

(1) Proton (2) Neutrino

(3) Electron (4) Photon

2. Nuclear charge can be determined by :

(1) Moseley law

(2) Malus law

(3) Gold leaf experiment

(4) Interference

3. Bohr magnetron is equal to :

(1) $\frac{e\hbar}{m_e}$ (2) $\frac{e\hbar}{2m_e}$

(3) $\frac{e\hbar}{4m_e}$ (4) $\frac{e\hbar}{8m_e}$

4. The K.E. of beta particles ejected from a radio active source is :

(1) Continuous

(2) Mono energetic

(3) Continuous but K.E. increases with increase in temperature

(4) Mono energetic but K.E. increases with increase in temperature

5. Minimum number of photons emitted during annihilation of electron and positron is/are :

(1) one (2) two

(3) three (4) four

6. The linear attenuation coefficient for 10 MeV gamma ray in water is about $5m^{-1}$. The distance travelled by the beam such that its intensity reduced to 1% of the original value is :

(1) 1 m

(2) 0.92 m

(3) 0.5 m

(4) 0.46 m

7. Mass of neutrino is :

(1) Almost zero

(2) 0.511 MeV/c^2

(3) 938 MeV/c^2

(4) 939 MeV/c^2

8. Which of the following is the best shielding material from beta radiation ?

(1) Lead

(2) Steel

(3) Platinum

(4) Aluminium

9. The lifetime of a nucleus in the excited state is 10^{-13} s. The uncertainty in frequency of a gamma ray emitted by the nucleus will be :

(1) 1.6×10^{12} Hz

(2) 1.6×10^{11} Hz

(3) 10^{13} Hz

(4) 10^{15} Hz

10. Which of the following does ***not*** represent the particle nature of a wave ?

(1) Photoelectric effect

(2) Compton scattering

(3) Pair production

(4) Interference

11. The average energy at 0 K is given by (where E_F is fermi energy) :

(1) $\frac{3}{5}E_F$ (2) $\frac{1}{2}E_F$

(3) $\frac{1}{3}E_F$ (4) Zero

12. According to Dulong and Petit's law, C_V is :

(1) R (2) 2R

(3) 3R (4) 5R

13. The condition of Fraunhauffer diffraction is that the light wave front must be :

(1) Cylindrical (2) Plane

(3) Spherical (4) Elliptical

14. A diffraction pattern is obtained using a beam of red light. If the green light is replaced by red light, then :

(1) Diffraction bands disappear

(2) Diffraction bands becomes narrower

(3) There is no change in diffraction pattern

(4) Diffraction bands becomes broader

15. Which of the following statements show that the light waves are transverse in nature ?

(1) Light waves can travel in vacuum

(2) Light waves show interference

(3) Light waves can be polarized

(4) Light waves can be diffracted

16. Polarisation can't occur in :

(1) Sound waves

(2) Light waves

(3) Radio waves

(4) X-rays

17. When unpolarised light enters a doubly reflecting crystal, we get two refracted rays called ordinary O-ray and extraordinary E-ray which of the following statements is ***true*** :

(1) Only O-ray is polarised

(2) Only E-ray is polarised

(3) Both O and E-rays are polarised

(4) Neither O-ray nor E-ray is polarised

18. If a quarter wave plate with its optic axis vertical is inserted in to a beam of linearly polarised light oscillating at 45°, then the emerging light will be :

(1) Linearly polarised

(2) Vertically polarised

(3) Left circularly polarised

(4) Elliptically polarized

19. The kinetic energy of electron in nth orbit is directly proportional to :

(1) n^{-2}

(2) n

(3) n^2

(4) n^3

20. The ionization potential of H-atom is :

(1) 27.2 eV

(2) 13.6 eV

(3) 6.8 eV

(4) 3.4 eV

21. The efficiency of an engine working between temperature 500 K and 300 K is :

(1) 60% (2) 40% (3) 1.67% (4) 16.7%

22. At ordinary temperature, when hydrogen escapes through a porous plug under a large pressure difference, then it shows :

(1) Cooling effect (2) Heating effect (3) No effect (4) Can't say anything

23. Isothermal compressibility is given by :

(1) $\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (2) $\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

(3) $-\frac{1}{P}\left(\frac{\partial P}{\partial V}\right)_T$ (4) $-\frac{1}{V}\left(\frac{\partial V}{\partial P}\right)_T$

24. For a particular thermodynamic system, The internal energy $U = PV$ and P is proportional to T^2. The entropy of the system is proportional to :

(1) UV (2) $\sqrt{UV}$

(3) $\sqrt{\frac{U}{V}}$ (4) $\sqrt{\frac{V}{U}}$

25. Which of the following is known as Clausius-Clapeyron equation :

(1) $\frac{dP}{dT} = \frac{L}{T(V_2 - V_1)}$

(2) $\frac{dP}{dT} = -\frac{L}{T(V_2 - V_1)}$

(3) $\frac{dV}{dT} = \frac{L}{T(P_2 - P_1)}$

(4) $\frac{dV}{dT} = -\frac{L}{T(P_2 - P_1)}$

26. During free expansion of an ideal gas under adiabatic condition, the internal energy of the gas .....

(1) Increases

(2) Decreases

(3) First increases and then decreases

(4) Remains constant

27. Which of the following does ***not*** represent Gibb's potential(G) ?

(1) $G = H - TS$

(2) $G = U + TS - PV$

(3) $G = U + PV - TS$

(4) $G = F + PV$

28. In a Fourier series expansion of a function $f(x) = 4x^4 + 7$ in the interval $-\frac{x}{2}$ to $+\frac{x}{2}$, The Fourier coefficients a_n and b_n (a_n and b_n are coefficients of cos(nωT) and sin(nωT), respectively) will be :

(1) $a_n = 0$ and $b_n = 0$

(2) $a_n \neq 0$ and $b_n = 0$

(3) $a_n = 0$ and $b_n \neq 0$

(4) $a_n \neq 0$ and $b_n \neq 0$

29. Which of the following is a first-order phase transition ?

(1) Ferromagnetic to paramagnetic

(2) Vaporization of a liquid at its boiling point

(3) Normal liquid He to superfluid He

(4) Superconducting to normal state

30. The focal length of a biconvex lens with radii 5 cm and refractive index 1.5 cm is :

(1) 0 cm

(2) 5 cm

(3) 10 cm

(4) 15 cm

31. Positive divergence represents :

(1) Irrotational
(2) Solenoidal
(3) Sink
(4) Source

32. Magnetic susceptibility of a perfectly diamagnetic substance is :

(1) 0
(2) 1
(3) -1
(4) $-1/2$

33. Work done by a magnetic field on a moving charged particle in the field is equal to :

(1) 0
(2) BqvS cos θ
(3) BqvS sin θ
(4) BqvS

where B is magnetic field intensity, q and v are charge and velocity of charge particle respectively, S is displacement and θ is the angle between B and S.

34. Two electrons are moving parallel to each other in free space, then the force between them will be :

(1) Repulsive
(2) Attractive
(3) No force
(4) Can't say anything

35. Pointing vector $\vec{S}$ is represented as :

(1) $\mu_0 (\vec{E} \times \vec{H})$
(2) $\vec{E} \times \vec{B}$
(3) $\vec{E} \times \vec{H}$
(4) $\frac{1}{\mu_0}(\vec{E} \times \vec{H})$

36. Which of the following has the highest elasticity ?

(1) Diamond

(2) Rubber

(3) Plastic

(4) Copper

37. A wire of length 1 m can support a maximum 10 kg weight. The same wire is cut into the same pieces, then the maximum weight that each piece can hold independently is :

(1) 40 kg

(2) 20 kg

(3) 10 kg

(4) 5 kg

38. The maximum value of Poisson's ratio can be :

(1) 1

(2) 0.5

(3) –0.5

(4) –1

39. Hydrogen and Oxygen gases are enclosed in two identical containers at S.T.P. Then the ratio of root mean square velocity of the molecules of these gases will be :

(1) 2 : 1

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

(3) 4 : 1

(4) $4\sqrt{2} : 1$

40. A gas consists of particles, each having three translational and three rotational degrees of freedom. The ratio between specific heat at constant volume and specific heat at constant pressure is :

(1) 3/4

(2) 4 /3

(3) 2/3

(4) 3/2

41. The Miller indices of a plane, which cuts off intercepts in the ratio $2a : 3b : c/3$ along the three axes are :

(1) (3, 2, 1)
(2) (3, 2, 18)
(3) (6, 9, 1)
(4) (2, 3, 1/3)

42. Powder diffraction experiment on a sample with X-rays of wavelength 1.44 Å produces (220) reflection at an angle 30°. The lattice parameter of the material of the sample will be :

(1) 4.07 Å
(2) 0.51 Å
(3) 0.051 Å
(4) 0.77 Å

43. According to the debye model, specific heat at very low temperature is directly proportional to :

(1) T^{-3}
(2) T^{0}
(3) T^{3}
(4) T^{4}

44. The Einstein's frequency in a case for which $\theta_E = -33°C$ is :

(1) -2.5×10^{12} Hz
(2) 2.5×10^{12} Hz
(3) 5×10^{12} Hz
(4) 7.5×10^{12} Hz

45. The frequency shift in Zeeman effect is given by :

(1) eB
(2) $4\pi\, emB$
(3) $\frac{4\pi m}{eB}$
(4) $\frac{eB}{4\pi m}$

46. Which of the following statistics come under classical statistics ?

(1) Maxwell-Boltzmann Statistics

(2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics

(4) None of the above

47. ..... is applicable to the identical, indistinguishable particles of zero or integral spin.

(1) Maxwell-Boltzmann Statistics (2) Bose-Einstein Statistics

(3) Fermi-Dirac Statistics (4) None of the above

48. The types of particles described by anti-symmetric wave functions are known as :

(1) Boson (2) Fermion

(3) Magnon (4) Identical particles

49. Relation between colour and the temperature of a star is given by :

(1) Wein's displacement law (2) Hubble's law

(3) Plank's law (4) Einstein mass-energy relation

50. In the higher wavelength region, Planks law reduces to :

(1) Wein's displacement law

(2) Hubble's law

(3) Rayleigh-Jeans law

(4) None of the above

51. For a d-electron, the values of L, S and J are :

(1) $\sqrt{6}\hbar$, $\sqrt{\frac{3}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(2) $2\hbar$, $\hbar$ and $\frac{5}{2}\hbar$

(3) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{15}}{2}\hbar$

(4) $\sqrt{6}\hbar$, $\sqrt{\frac{1}{2}}\hbar$ and $\frac{\sqrt{35}}{2}\hbar$

52. Lande g-factor for the doublet term $^2D_{5/2}$ is :

(1) 4/5 (2) 1

(3) 6/5 (4) 7/5

53. Which of the following can't be possible state of a d-electron in one electron atomic system ?

(1) $^2D_{1/2}$ (2) $^2D_{3/2}$

(3) $^2D_{5/2}$ (4) All of the above

54. A spectral line of wave length 4500 Å when produced a magnetic field of 10T, a normal Zeeman triplet is observed. Then the wave length. separation between components of triplet is around :

(1) 1 Å (2) 2 Å

(3) 3 Å (4) 4 Å

55. If the rotational lines of a diatomic molecule show a separation of 8 cm^{-1}, then the rotation constant will be :

(1) 16 cm^{-1} (2) 8 cm^{-1}

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

56. Ruby laser is :

(1) One level laser system

(2) Two level laser system

(3) Three level laser system

(4) Four level laser system

57. The ratio of He and Ne gases in He-Ne laser is around :

(1) 10 : 1

(2) 5 : 1

(3) 1 : 5

(4) 1 : 10

58. Which of the following is ***correct*** about nuclear force between nucleons ?

(1) n-n > n-p > p-p

(2) n-n < n-p < p-p

(3) n-n = n-p > p-p

(4) n-n = n-p = p-p

59. The density of nucleus is of the order of :

(1) 10^{13} kg/m^3

(2) 10^{15} kg/m^3

(3) 10^{17} kg/m^3

(4) 10^{19} kg/m^3

60. The dimensional formula of electric quadrupole moment is :

(1) $[M^0L^2T^0]$

(2) $[M^1L^1T^{-2}]$

(3) $[M^2L^0T^{-2}]$

(4) $[M^0L^1T^{-2}]$

61. Most of the ejected electrons in the photoelectric effect are :

(1) K - shell electrons

(2) L - shell electrons

(3) M - shell electrons

(4) Outer most shell electrons

62. The quantum mechanical operator for the momentum pf a particle moving in one dimension is :

(1) $-i\hbar\frac{d}{dx}$ (2) $i\hbar\frac{d}{dx}$

(3) $-\frac{\hbar^2}{2m}\frac{d^2}{dx^2}$ (4) $i\hbar\frac{\partial}{\partial t}$

63. If the K.E. of a proton and electron is same then de-Broglie wave length of neutron is :

(1) Greater than electron

(2) Less than electron

(3) Equal to electron

(4) Can't say anything

64. Ground state energy of a linear harmonic oscillator is :

(1) Zero (2) $\frac{1}{2}\hbar\omega$

(3) $\hbar\omega$ (4) $2\hbar\omega$

65. If an electron is confined to a box of length 10^{-8} m, then the minimum uncertainty in its speed may be :

(1) 1.2×10^4 ms^{-1} (2) 2.4×10^4 ms^{-1}

(3) 1.2×10^2 ms^{-1} (4) 2.4×10^2 ms^{-1}

66. The eigenfunction of an operator $\frac{d^2}{dx^2}$ is $\psi = e^{ikx}$ The corresponding eigenvalue will be :

(1) zero (2) k^2

(3) $-k^2$ (4) k

67. A free particle is moving in $+X$ direction with a linear momentum p. The wave function of the particle normalized in a length L is :

(1) $\frac{1}{\sqrt{L}} e^{i\frac{p}{\hbar}x}$

(2) $\frac{1}{\sqrt{L}} e^{-i\frac{p}{\hbar}x}$

(3) $\frac{1}{\sqrt{L}} \sin\frac{p}{\hbar}x$

(4) $\frac{1}{\sqrt{L}} \cos\frac{p}{\hbar}x$

68. In 3-D, the number of Bravais lattices are :

(1) 7 (2) 14

(3) 21 (4) 28

69. For orthorhombic crystal system :

(1) $a = b = c$; $\alpha = \beta = \gamma = 90°$

(2) $a = b \neq c$; $\alpha = 120°$, $\beta = \gamma = 90°$

(3) $a \neq b \neq c$; $\alpha = \beta = \gamma \neq 90°$

(4) $a \neq b \neq c$; $\alpha = \beta = \gamma = 90°$

70. The coordination number in case of Body-Centered Cubic crystal structure is :

(1) 12 (2) 8

(3) 6 (4) 2

71. Interference occurs in :

(1) Longitudinal waves only

(2) Transverse wave only

(3) Electromagnetic waves only

(4) All above waves

72. In Fresnel's biprism experiment for the light of which colour, the fringe width will be minimum :

(1) Red (2) Yellow

(3) Green (4) Violet

73. Dispersive power of material of a lens is 0.025 and it produces a chromatic aberration of 0.4 cm. Then the focal length of the lens is :

(1) 100 cm (2) 40 cm

(3) 16 cm (4) 4 cm

74. If two coherent sources of intensity ratio 9 : 1 interfere, then the ratio of intensity of maxima and minima in the interference pattern will be :

(1) 3 : 1 (2) 9 : 1

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

75. In Newton's rings arrangement, the diameter of rings formed is proportional to :

(1) λ (2) λ^2

(3) $\sqrt{\lambda}$ (4) $\frac{1}{\sqrt{\lambda}}$

76. Sun light filtering through a tree often makes circular patches on the ground, because :

(1) The space through which light penetrates is round

(2) Of the scattering of light

(3) Of the diffraction phenomenon

(4) Of the interference phenomenon

77. Which of the following are coherent sources ?

(1) A 40 W and 60 W bulbs

(2) Two bulbs each of 100 W

(3) Two halves of 200 W bulb

(4) Two virtual sources obtained by biprism

78. The probability of two independent events with probability P_1 and P_2 is :

(1) $P_1 + P_2$ (2) $P_1 \times P_2$

(3) P_1 / P_2 (4) P_2 / P_1

79. According to quantum mechanics, the volume of phase space is :

(1) $\geq h$ (2) $\geq h^2$

(3) $\geq h^3$ (4) $\leq h^3$

80. Classical mechanics assumes the energy to be :

(1) Discrete (2) Continuous

(3) In packets (4) All of the above

81. The gas constant R depends on :

(1) Pressure

(2) Volume and Temperature

(3) Pressure, Volume and Temperature

(4) None of the above

82. A rod with a proper length of 3 m moves along x-axis, making an angle of 30° w.r.t. the x-axis. If its speed is $c/2$ (c is speed of light), the its length will :

(1) Increase by 0.6 m

(2) Decrease by 0.3 m

(3) Decrease by 0.6 m

(4) Remains invariant

83. If the coefficient of self-inductance of coil of length l, area of cross-section a and no. of turns n is equal to L then the coefficient of self-inductance for a coil with same area of cross-section but with twice length and twice no. of turns will be :

(1) L (2) $2L$

(3) $4L$ (4) $8L$

84. The frequency of AC which can't be used for lightening purposes is :

(1) 25 Hz (2) 50 Hz

(3) 75 Hz (4) (1) and (4) both

85. Charge on a p-type semiconductor is :

(1) Positive

(2) Negative

(3) Zero

(4) 10^{-6} coulomb

86. Resistance of an ideal diode in reverse bias is :

(1) 0 Ω

(2) 10 Ω

(3) 50 Ω

(4) Infinity

87. If wave length of light emitted by LED is 800 nm, then the band gap of material of LED is around :

(1) 1.06 eV

(2) 1.55 eV

(3) 2.01 eV

(4) 2.55 eV

88. If a zener diode has 9.1 V break down voltage with a maximum power dissipation of 273 mW, then maximum current that can pass through zener diode is :

(1) 10 mA

(2) 20 mA

(3) 30 mA

(4) 40 mA

89. Ripple factor of half wave rectifier is :

(1) $\frac{1}{2}\sqrt{\pi^2-1}$

(2) $\frac{1}{2}\sqrt{\pi^2-2}$

(3) $\frac{1}{2}\sqrt{\pi^2-4}$

(4) $\frac{1}{2}\sqrt{\pi^2-9}$

90. For using a transistor as an amplifier, the correct option regarding resistance of base-collector (R_{BC}) and base-emitter (R_{BE}) junctions is :

(1) Both R_{BC} and R_{BE} are very high

(2) R_{BC} very high and R_{BE} very low

(3) R_{BC} very low and R_{BE} very high

(4) Both R_{BC} and R_{BE} are very low

91. The moment of inertia of a solid sphere with radius R and mass M bout an axis at a distance R/2 from the centre is :

(1) $\frac{1}{2}MR^2$ (2) $\frac{11}{12}MR^2$ (3) $\frac{13}{20}MR^2$ (4) $\frac{3}{4}MR^2$

92. The rate of change of angular momentum is equal to :

(1) Torque (2) Angular velocity

(3) Force (4) Power

93. If the radius of the earth suddenly expands by 50 percent of its present radius, then the duration of the day shall be :

(1) 54 Hr (2) 36 Hr

(3) 12 Hr (4) 6 Hr

94. A projectile of mass m is moving in the vertical $x - y$ plane with the origin on the ground and y-axis pointing vertically up. Taking the gravitational potential energy to be zero on the ground, the total energy of the particle written in planar polar coordinates (r, θ) is :

(1) $\frac{m}{2}\dot{r}^2 + mgr\sin\theta$

(2) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\sin\theta$

(3) $\frac{m}{2}\dot{r}^2 + mgr\cos\theta$

(4) $\frac{m}{2}(\dot{r}^2 + r^2\dot{\theta}^2) + mgr\cos\theta$

95. Frame of references in which Newton's laws of motion hold good are :

(1) Ideal frame of reference (2) Non-ideal frame of reference

(3) Inertial (4) Non-Inertial

96. A uniform bar of length l and mass m is pivoted at its top end and it is oscillating with a frequency f_b. Assuming small oscillations, the value of f/f_b, (where f is the angular frequency of a simple pendulum of the same length) will be :

(1) $\sqrt{2}$ (2) $\sqrt{\frac{1}{2}}$

(3) $\sqrt{\frac{3}{2}}$ (4) $\sqrt{\frac{2}{3}}$

97. A thin uniform circular disc rolling down an inclined plane of inclination 60° without slipping. Its linear acceleration along the plane is :

(1) $\sqrt{\frac{3}{2}}g$ (2) $\sqrt{\frac{1}{2}}g$

(3) $\frac{g}{2}$ (4) g

98. The divergence of a three dimensional $\frac{\hat{r}}{r^3}$ is (where $\hat{r}$ is the unit radial vector) :

(1) 0 (2) $\frac{1}{r^3}$

(3) $-\frac{1}{r^3}$ (4) $-\frac{1}{r^4}$

99. If curl of a vector field is zero, then the field is said to be :

(1) Rotational (2) Irrotational

(3) Uniform (4) Non-uniform

100. If $\phi = 2y^2z + 5x^3y$, then the value of grad of ϕ at (1, 1, 0) is :

(1) $15\hat{i} + 5\hat{j} + 2\hat{k}$ (2) $5\hat{i} + 15\hat{j} + 2\hat{k}$

Answer keys of M.Sc.(Physics) entrance exam dated 16.07.2025				
Q. NO.	A	B	C	D
1	3	4	4	4
2	1	3	4	1
3	1	1	3	2
4	2	1	3	1
5	3	3	3	2
6	4	1	3	2
7	1	3	4	1
8	4	2	2	4
9	2	3	3	1
10	1	1	2	4
11	4	2	4	1
12	3	1	2	3
13	1	3	2	2
14	1	3	1	4
15	3	4	3	3
16	1	1	4	1
17	3	2	2	3
18	2	2	3	3
19	3	1	3	1
20	1	3	2	2
21	4	4	3	2
22	2	1	1	2
23	2	2	1	4
24	1	1	2	2
25	3	2	3	1
26	4	2	4	4
27	2	1	1	2
28	3	4	4	2
29	3	1	2	2
30	2	4	1	2
31	2	1	2	4
32	2	3	1	3
33	4	2	3	1
34	2	4	3	1
35	1	3	4	3
36	4	1	1	1
37	2	3	2	3
38	2	3	2	2
39	2	1	1	3
40	2	2	3	1
41	4	2	1	2
42	4	2	3	1
43	3	4	1	3
44	3	2	1	3
45	3	1	3	4
46	3	4	3	1
47	4	2	1	2
48	2	2	4	2
49	3	2	3	1
50	2	2	1	3

16/07/2025 16/07/2025 16/7/2025 16/7/25

Answer keys of M.Sc.(Physics) entrance exam dated 16.07.2025				
Q. NO.	A	B	C	D
51	1	4	2	1
52	3	2	2	3
53	2	2	4	1
54	4	1	2	1
55	3	3	1	3
56	1	4	4	3
57	3	2	2	1
58	3	3	2	4
59	1	3	2	3
60	2	2	2	1
61	1	4	4	1
62	3	4	1	1
63	1	3	2	2
64	1	3	1	2
65	3	3	2	1
66	3	3	2	3
67	1	4	1	3
68	4	2	4	2
69	3	3	1	4
70	1	2	4	2
71	4	1	1	4
72	1	3	1	4
73	2	1	2	3
74	1	1	2	3
75	2	3	1	3
76	2	3	3	3
77	1	1	3	4
78	4	4	2	2
79	1	3	4	3
80	4	1	2	2
81	1	3	4	4
82	1	1	3	2
83	2	1	1	2
84	2	2	1	1
85	1	3	3	3
86	3	4	1	4
87	3	1	3	2
88	2	4	2	3
89	4	2	3	3
90	2	1	1	2
91	2	1	1	3
92	1	1	3	1
93	3	2	2	1
94	3	2	4	2
95	4	1	3	3
96	1	3	1	4
97	2	3	3	1
98	2	2	3	4
99	1	4	1	2
100	3	2	2	1

16/07/2025 16/07/25 16/7/2025 16/7/25