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ENT-73**Total No. of Pages : 10**

M.Sc. Physics Entrance Examination, 2026
Subject Code : 58718

Day and Date : Tuesday, 21-07-2026**Total Marks : 100****Time : 02.30 p.m. to 04.00 p.m.****Instructions**

- 1) All questions are compulsory.
- 2) Each question carries 1 mark.
- 3) Answers should be marked in the given OMR sheet by darkening the appropriate option.
- 4) Follow the instructions given on OMR Sheet.
- 5) Rough work shall be done on the sheet provided at the end of question paper.

1. If $a \parallel b$ then
A) $a=b$ B) $a=\lambda b$ C) $a+b=0$ D) $a \cdot b=0$
2. Orthogonal vectors satisfy
A) $\text{Cross}=0$ B) $\text{Dot}=0$ C) Both D) None
3. Unit vector along a is
A) $a|a|$ B) $a/|a|$ C) $|a|^2$ D) a^2
4. Unit vector of $3i+4j$
A) $3/5 i + 4/5 j$ B) $4/5 i + 3/5 j$ C) $5i$ D) $7j$
5. If $a \times b = 0$ then vectors are
A) Perpendicular B) Parallel C) Equal D) Opposite
6. Cross product direction is given by
A) Left hand rule B) Right hand rule C) Ampere's law D) Lenz's law
7. Scalar triple product property
A) Commutative B) Cyclic C) Associative D) Distributive
8. Vectors are equal when they have
A) Same magnitude B) Same direction C) Both D) Opposite
9. If $a \cdot b = |a||b|$ then angle between them is
A) 0° B) 90° C) 60° D) 180°

10. If $a \cdot b < 0$ angle is
A) Acute B) Right C) Obtuse D) Zero
11. Quantum confinement is observed at dimensions below
A) 100 nm B) 1000 nm C) 10 nm D) 10000 nm
12. Phosphor converts energy of incident particle into
A) heat B) current C) light D) voltage
13. From the end-on view Milky way galaxy is said to have _____ shape.
A) disc B) spiral C) spherical D) barred spiral
14. The power produced by a wind turbine is proportional to
A) v B) v^2 C) v^3 D) v^4
15. The dimensions of Universal Gravitational Constant G are
A) $[M^{-1}L^3T^{-2}]$ B) $[M^1L^2T^{-2}]$ C) $[M^{-1}L^2T^{-3}]$ D) $[M^2L^3T^{-1}]$
16. The escape velocity from the Earth's surface is approximately
A) 11.2 km/s B) 7.9 km/s C) 9.8 m/s D) 3.0×10^8 m/s
17. A body freely falling from rest has a velocity v after it falls through height h . The distance it has to fall further for its velocity to become double is
A) h B) $2h$ C) $3h$ D) $4h$
18. Hooke's Law is valid within the limit of
A) Plasticity B) Proportionality C) Breaking stress D) Yield point
19. The bending moment of a beam is zero at the
A) Free end B) Fixed end C) Center D) Neutral axis
20. Modulus of rigidity represents the ratio of
A) Linear stress to linear strain B) Volume stress to volume strain C) Shear stress to shear strain D) Tensile stress to lateral strain
21. The resolving power of a telescope can be increased by
A) Increasing the aperture of the objective B) Decreasing the aperture of the objective C) Increasing the wavelength D) Decreasing the focal length of the eyepiece
22. The visibility of fringes in Michelson's interferometer depends on
A) Reflection coefficient of the mirrors B) Coherence of the source C) Tilt of the compensator plate D) Focal length of the observing telescope

23. The function of a quarter-wave plate is to introduce a phase difference of
A) $\pi/4$ B) $\pi/2$ C) π D) 2π
24. In spontaneous emission, the emitted photon has
A) Same phase as incident photon B) Random phase C) Same direction as incident photon D) Zero momentum
25. According to Maxwell's law of distribution of velocities, the most probable velocity is
A) $\sqrt{2kT/m}$ B) $\sqrt{3kT/m}$ C) $\sqrt{8kT/\pi m}$ D) $\sqrt{kT/m}$
26. The efficiency of a reversible heat engine depends only on
A) Working substance B) Source temperature only C) Sink temperature only D) Source and sink temperatures
27. The thermodynamic potential H (Enthalpy) is defined as
A) $U - TS$ B) $U + PV$ C) $U - PV$ D) $F + PV$
28. At absolute zero temperature, the entropy of a perfect crystal is
A) Zero B) Infinite C) Maximum D) Dependent on volume
29. The acoustic impedance of a medium is defined as the product of
A) Density and velocity B) Pressure and volume C) Frequency and wavelength D) Density and volume
30. Sabine's formula is used to calculate
A) Resonance frequency B) Reverberation time C) Acoustic power D) Beat frequency
31. The phenomenon of beats is a result of
A) Diffraction B) Interference C) Polarization D) Dispersion
32. In forced oscillations, the amplitude is maximum when the driving frequency is
A) Twice the natural frequency B) Half the natural frequency C) Equal to the natural frequency D) Independent of natural frequency
33. The speed of a transverse wave on a stretched string is given by
A) $\sqrt{T/\mu}$ B) $\sqrt{\mu/T}$ C) $T\mu$ D) T/μ^2
34. Helmholtz resonator is an example of an acoustic
A) Filter B) Amplifier C) Oscillator D) Absorber

35. The intensive thermodynamic variable among the following is
A) Volume B) Entropy C) Internal Energy D) Pressure
36. Which of the following equations represents an adiabatic process for an ideal gas?
A) $PV = \text{constant}$ B) $P/T = \text{constant}$ C) $PV^\gamma = \text{constant}$ D) $V/T = \text{constant}$
37. Clausius-Clapeyron equation relates latent heat with the change in
A) Volume and Temperature B) Pressure and Temperature C) Entropy and Volume D) Pressure and Volume
38. According to the equipartition theorem, the average energy per degree of freedom is
A) kT B) $kT/2$ C) $3kT/2$ D) $R/2$
39. The ratio of emissive power to absorptive power is constant for all bodies at a given temperature. This is
A) Wien's Law B) Stefan's Law C) Kirchhoff's Law D) Planck's Law
40. Newton's formula for the velocity of sound in gases assumes the process of propagation is
A) Isothermal B) Adiabatic C) Isobaric D) Isochoric
41. Rest mass of _____ is non-zero.
A) gluon B) photon C) weak W-Boson D) graviton
42. Packing fraction of BCC crystal structure is
A) 0.68 B) 0.74 C) 0.52 D) 0.50
43. The restrictions on translational vectors a , b , c for tetragonal crystal system is
A) $a=b=c$ B) $a=b \neq c$ C) $a \neq b \neq c$ D) $a=2b=c$
44. The sequence of atomic layer in hcp structure is
A) ABCABC B) ABAB C) AAA D) ABC AB ABC AB
45. In reciprocal lattice, length of reciprocal lattice vector is proportional to
A) d_{hkl} B) $1/d_{hkl}$ C) d_{hkl}^2 D) $1/d_{hkl}^2$
46. The reciprocal of reciprocal lattice is
A) space lattice B) reciprocal lattice C) direct lattice D) inverse lattice
47. Susceptibility of _____ material is independent of the temperature.
A) paramagnetic B) ferromagnetic C) diamagnetic D) antiferromagnetic

48. The effective number of Bohr magnetrons is $P_{eff} =$
 A) $g\sqrt{J(J+1)}$ B) $g(J+1)$ C) gJ D) g/J
49. Most stable nuclide is
 A) $^{16}\text{O}_8$ B) $^{41}\text{Ca}_{20}$ C) $^{206}\text{Pb}_{82}$ D) $^3\text{H}_1$
50. Band gap energy of germanium is _____ eV.
 A) 1.12 B) 0.72 C) 7 D) 0.5
51. The process of converting biomass into biogas occurs through
 A) combustion B) fermentation C) Anaerobic digestion D) distillation
52. Majority of sun-spots occur
 A) near polar region B) near the equator C) at the pole D) both a and b
53. Betatron works on the principle of
 A) Biot-Savart's Law B) induction coil C) magnetic resonance D) charge stability
54. The susceptibility of a perfect superconductor is $\chi =$
 A) 0 B) 1 C) -1 D) 354
55. Quenching gas in GM-tube is
 A) air B) argon C) bromine vapour D) water vapour
56. _____ have not been observed physically (as isolated free particles).
 A) Leptons B) Quarks C) Bosons D) Hadrons
57. The regular and periodic arrangements of points in a space is called as
 A) unit cell B) crystal structure C) lattice D) basis
58. The co-ordinates in cylindrical co-ordinate system are
 A) x, y, z B) r, θ, z C) ρ, ϕ, z D) x, θ, z
59. In spherical polar co-ordinate system, there lies symmetry about
 A) a point B) an axis C) a plane D) none of these
60. The surface element in orthogonal curvilinear system is
 A) $h_1 du_1 du_2$ B) $h_2 du_1 du_2$ C) $h_1 h_2 du_1 du_2$ D) $h_3 du_1 du_2$
61. What is the nature of a wave equation?
 A) elliptical B) parabolic C) hyperbolic D) none of these

62. The _____ of a differential equation is highest power of the highest order differential coefficient occurring in it.
A) degree B) order C) linearity D) homogeneity
63. Photon energy E is
A) $h\nu$ B) h/ν C) h/λ D) λ/h
64. The value of Plank's constant is
A) 6.625×10^{-31} J s B) 6.625×10^{-34} J s C) 6.625×10^{-34} J/s D) 6.625×10^{-31} J/s
65. Einstein's photo electric equation is
A) $h\nu = h\nu_0 + \frac{1}{2}mv^2$ B) $h\nu = h\nu - \frac{1}{2}mv^2$ C) $h\nu_0 = h\nu + \frac{1}{2}mv^2$ D) $h\nu_0 = \frac{1}{2}mv^2$
66. Which of the following statement is true according to the uncertainty principle?
A) x and p commute B) x and p can be measured precisely C) there is certain degree of uncertainty in simultaneous measurements of x and p D) none of these
67. If the uncertainty in position decreases, then the uncertainty in momentum _____.
A) Decreases B) Increases C) First increases, then decrease D) First decreases, then increase
68. The Fermi-Dirac distribution function applies to particles that are
A) Distinguishable B) Bosons C) Fermions D) Classical
69. At absolute zero temperature, the probability of an energy state $E < E_F$ being occupied by an electron is
A) 0 B) 0.5 C) 1 D) Infinity
70. In statistical mechanics, a macrostate is defined by its
A) Individual particle positions B) Exact momentum of particles C) Macroscopic parameters (P , V , T , etc.) D) Quantum numbers
71. Phase space is a mathematical space defined by
A) Position coordinates only B) Momentum coordinates only C) Position and momentum coordinates D) Velocity and time coordinates
72. The volume of a single cell in phase space for a quantum system is
A) h B) h^2 C) h^3 D) Zero

73. Bose-Einstein condensation occurs when
 A) A large fraction of bosons occupy the lowest quantum state B) Fermions pair up C) Temperature approaches infinity D) Gases become plasmas
74. The Miller indices of a plane parallel to the X and Y axes are
 A) (100) B) (010) C) (001) D) (111)
75. The number of atoms per unit cell in a Face-Centered Cubic (FCC) lattice is
 A) 1 B) 2 C) 4 D) 8
76. In X-ray diffraction, if the glancing angle is θ , the angle of scattering is
 A) θ B) 2θ C) $90 - \theta$ D) $180 - 2\theta$
77. Intrinsic carrier concentration in a semiconductor
 A) Is independent of temperature B) Increases exponentially with temperature C) Decreases with temperature D) Depends only on doping
78. The Hall coefficient R_H is defined as
 A) $E_y/j_x B_z$ B) $j_x B_z/E_y$ C) $E_y j_x/B_z$ D) $B_z/E_y j_x$
79. The binding energy per nucleon is maximum for
 A) Helium B) Iron C) Uranium D) Lead
80. Radioactive decay follows
 A) Linear law B) Polynomial law C) Exponential law D) Inverse square law
81. The half-life of a radioactive substance is related to its decay constant (λ) by
 A) $1/\lambda$ B) $0.693/\lambda$ C) 0.693λ D) $\lambda/0.693$
82. Alpha particles are essentially
 A) Electrons B) Protons C) Helium nuclei D) Photons
83. Nuclear fission is best explained by the
 A) Liquid drop model B) Shell model C) Fermi gas model D) Optical model
84. Magic numbers in nuclear physics refer to
 A) Number of stable isotopes B) Number of nucleons leading to high stability C) Number of quarks in a proton D) Number of electrons in a stable atom
85. The strong nuclear force is mediated by
 A) Photons B) Gluons/Pions C) W and Z bosons D) Gravitons

86. A GM counter operates in the
 A) Ionization region B) Proportional region C) Geiger-Muller region D) Continuous discharge region
87. The Q-value of a nuclear reaction is positive if the reaction is
 A) Exoergic B) Endoergic C) Elastic D) Reversible
88. According to the special theory of relativity, the speed of light in a vacuum
 A) Depends on the source's speed B) Depends on the observer's speed C) Is constant for all inertial observers D) Is infinite
89. The relativistic mass of a particle moving with velocity v is given by
 A) $m_0\sqrt{1 - v^2/c^2}$ B) $m_0/\sqrt{1 - v^2/c^2}$ C) $m_0(1 - v^2/c^2)$ D) m_0
90. Mass-energy equivalence is expressed by the famous equation
 A) $E = mc$ B) $E = mc^2$ C) $E = \frac{1}{2}mc^2$ D) $E = m^2c$
91. The concept of length contraction states that a moving object appears
 A) Longer along its direction of motion B) Shorter along its direction of motion C) Shorter perpendicular to its motion D) Thicker
92. The phenomenon of time dilation implies that a moving clock runs
 A) Faster B) Slower C) At the same rate D) Backwards
93. The rest energy of an electron is approximately
 A) 1 MeV B) 0.511 MeV C) 931 MeV D) 13.6 eV
94. Compton shift is independent of the
 A) Scattering angle B) Wavelength of incident X-rays C) Mass of the scattering target (electron) D) None of the above
95. In the hydrogen atom, the fine structure of spectral lines is explained by
 A) Bohr model B) Spin-orbit coupling C) Zeeman effect D) Stark effect
96. The splitting of spectral lines in the presence of a strong magnetic field is known as
 A) Anomalous Zeeman effect B) Normal Zeeman effect C) Paschen-Back effect D) Stark effect
97. L-S coupling is prominent in
 A) Heavy atoms B) Light atoms C) All atoms D) Molecules only

98. Molecular rotational spectra fall in the

A) X-ray region B) Ultraviolet region C) Visible region D) Microwave region

99. The selection rule for rotational transitions of a rigid diatomic molecule is

A) $\Delta J = 0$ B) $\Delta J = \pm 1$ C) $\Delta J = \pm 2$ D) $\Delta J = 0, \pm 1$

100. Raman scattering involves a change in the molecule's

A) Electronic state B) Polarizability C) Dipole moment D) Nuclear mass



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