Total No. of Printed Pages : 05 **Roll No. .....**

Ph.D. Entrance Examination
November - 2022
Part - C
(Physics)
Time : 50 Minutes
Maximum Marks : 50
(Minimum Passing Marks : 25)

Note :

(i) This question booklet comprises of 50 questions.

(ii) All questions are compulsory.

(iii) The question booklet along with answer sheet is to be handed over by the candidate to the Invigilator at the end of the examination.

(iv) There is no negative marking.

(v) Each question carries one mark.

Multiple Choice Questions -

1. The interfacial angles of a cubic crystal system are given by

   (a) $a = \beta = \gamma = 90^0$ (b) $a = \beta = 90^0 \gamma = 120^0$

   (c) $a = \beta = \gamma \neq 90^0$ (c) $a \neq \beta \neq \gamma \neq 90^0$

2. The magnetic susceptibility of superconductor is

   (a) 0 (b) -1 (c) 1 (d) -0.5

3. Valence band is also the conduction band in

   (a) Conductors (b) Insulators (c) Semiconductors (d) None of these

4. Max Born gave

   (a) wave function (b) wave nature

   (c) wave velocity (d) wave phase velocity

5. The value of potential energy for free particle is

   (a) Finite (b) Infinite (c) Zero (d) One

6. Central forces are _____in nature

   (a) Conservative (b) Non-conservative

   (c) Both (a) and (b) (d) Neither (a) nor (b)

7. The reduced mass of two objects having masses m_1 and m_2 is

(a) Less than m_1 and m_2 (b) Greater than m_1 and m_2 both

(c) Between m_1 and m_2 (d) Equal to m_1

8. The unit of sound is

(a) Watt (b) dB (c) Volume (d) Hertz

9. If the momentum of a particle is increased to 4 times, then the De-Broglie wavelength will become

(a) Two times (b) Four times (c) Half times (d) One-fourth times

10. The plane in which the electric field vector of plane polarized light vibrates is known as

(a) Principal Plane (b) Plane of Polarization

(c) Plane of vibration (d) Plane of oscillation

11. The inverse of resolution is called

(a) Dispersive power (b) Resolving power

(c) Constructive power (d) Destructive power

12. What is the effect of increasing the number of slits on the intensity of Central maxima of diffraction pattern of a diffraction grating?

(a) Intensity of central maxima will decrease

(b) Intensity of central maxima will increase

(c) There will not be any effect

(d) Diffraction pattern will disappear

13. In an optical resonator, two plane mirrors are

(a) Parallel to each other (b) Anti Parallel to each other

(c) Perpendicular to each other (d) make 45degree angle with each other

14. The need of pumping in laser is

(a) To reduce the life time of atoms in ground state

(b) To excite most of the atoms to higher energy state

(c) To bring most of the atoms to ground state

(d) To achieve stable condition

15. The number of atoms per unit volume at an energy level is called

(a) Population (b) Population Inversion

(c) Population density (d) Thermal population

16. The output of three level laser system is

(a) A pulse wave (b) A continuous wave

(c) A square wave (d) A rectangular wave

17. The coherence with time in the waves travelling in one path is called

(a) Temporal coherence (b) Spatial coherence

(c) Linear coherence (d) Non linear coherence

18. According to stoke's law, the expression for maxima is

(a) $2\mu t \cos r = (n+1)\lambda / 2$ (b) $2\mu t \cos r = n\lambda$

(b) $2\mu t \cos r = 2n\lambda$ (d) $2\mu t \cos r = (2n+1)\lambda / 2$

19. The expression for fringe width is

(a) $\beta = \lambda d / 2D$ (b) $\beta = 2d / D\lambda$

(c) $\beta = D / 2d\lambda$ (d) $\beta = D\lambda / 2d$

20. The path difference corresponding to a phase difference of π radian is

(a) 2λ (b) $\lambda / 2$ (c) $\lambda / 4$ (d) λ

21. Interference in thin film is mainly because of

(a) Division amplitude (b) Division of wave fronts

(c) Addition of amplitude (d) Addition of wave fronts

22. Michelson's fringes are

(a) Haidinger's fringes (b) Newton's fringes

(c) Young's fringes (d) Fresnel's fringes

23. The fringe width and the angle of wedge are related to

(a) $\beta = \lambda / 2\theta$ (b) $\theta = \lambda / 2\beta$

(c) $\beta = \lambda / \theta$ (d) $\lambda = \beta / 2\theta$

24. Stimulated emission is called

(a) Spontaneous emission (b) Inverted absorption

(c) Stimulated absorption (d) Stimulated radiation

25. Production of Laser does not include

(a) Active medium (b) Optical medium

(c) Optical activity (d) Optical resonator

26. The energy state which has a longer life time than excited state is known as

(a) Metastable state (b) tetrastable state

(c) Gigastable state (d) Hexastable state

27. Davisson and Germer experiment relates to

(a) Interference (b) Polarisation

(c) Electron diffraction (d) Phosphorence

28. The crystal plane (110) is parallel to

(a) X axis (b) Y axis (c) Z axis (d) X axis and Z axis

29. The wavelength of matter waves is independent of

(a) Mass (b) Velocity (c) Momentum (d) Charge

30. Compton effect is associated with

(a) Visible light (b) X-rays (c) β - rays (d) α -rays

31. The total probability of finding the particle in space must be

(a) zero (b) double (c) unity (d) infinity

32. What is the value of $|\Psi|^2$?

(a) $|\Psi|^2 = \Psi\Psi^*$ (b) $|\Psi|^2 = \Psi\Psi$

(c) $|\Psi|^2 = \Psi / \Psi^*$ (d) $|\Psi|^2 = \Psi^* / \Psi$

33. All microscopic physical entities that have both wave and particle properties is called the wave particle……

(a) singularity (b) duality (c) traingularity (d) nullity

34. The wave function of the particle in a box of length 'L' lies in which region?

(a) $0 > x < L$ (b) $x < 0 > L$ (c) $0 < x < L$ (d) $x > L > 0$

35. In three dimensional Schrödinger wave equation, the operator ∇^2 is called

(a) Hamiltonian (b) vector (c) Laplacian (d) Poisson

36. In the equation $H\psi_n = En\psi_n$, ψ_n is

(a) Eigen Vectors (b) Eigen Functions (c) Operators (d) Eigen Values

37. Niels Bohr used quantum mechanics to describe which element?

(a) Hydrogen (b) Helium (c) Carbon (d) Zinc

38. Unit cells for most of the crystals are

(a) Parallelopiped (b) Spherical (c) Elliptical (d) Hyperbolic

39. The axial relationship of a monoclinic crystal system is given as

(a) a = b = c (b) $a = b \neq c$ (c) $a \neq b = c$ (d) $a \neq b \neq c$

40. The coefficient of restitution (e) for perfectly elastic collision is

(a) 0<e<1 (b) e= 0.5 (c) e= 1 (d) e= 0

41. Angular momentum L is conserved when

(a) Force (F) has infinite value

(b) Position vector (r) parallel to force (F)

(c) position vector(r) has finite value

(d) position vector (r) perpendicular to force(F)

42. All circular motion requires

(a) Centripetal force (b) Centrifugal force

(c) Coriolis force (d) Central force

43. The laws of Newton are applicable in

(a) Rotating frame (b) Inertial frame

(c) Accelerated frame (d) Non-inertial frame

44. Which of the following is a crystalline solid?

(a) Glass bottle (b) Polythene bag

(c) Copper wire (d) Rubber ball

45. The packing density of Face Centered Cubic is

(a) 0.74 (b) 0.074 (c) 0.0704 (d) 70.4

46. What is the atomic radius of a Body centered cubic crystal structure?

(a) a/4 (b) a/2 (c) $a\sqrt{3}/4$ (d) $a\sqrt{2}/4$

47. According to Heisenberg uncertainty principle

(a) $\Delta x \times \Delta p > h/4\pi$ (b) $\lambda = h/p$

(c) $\Delta x \times \Delta p = h/6\pi$ (d) $E = mc^2$

48. The mass of a moving photon is

(a) h*v/c^2 (b) h*v/c (c) h*v (d) h*v*0

49. For a quantum wave particle,

(a) $E = \hbar k$ (b) $E = \hbar\omega$ (c) $E = \hbar\omega/2$ (d) $E = \hbar k/2$

50. The Schrödinger is a

(a) differential equation (b) partial differential equation

(c) partial integral equation (d) integral equation

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