Dronacharya Group of Institutions, Gr. Noida

Department of Applied Sciences (First Year)

Even Semester (2020-2021)

Objective Question Bank

Subject Name & Code: ENGINEERING PHYSICS & KAS-201T

Unit No.& Unit Name: 3rd & Quantum Mechanics

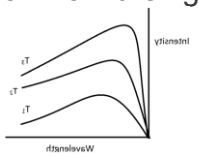
1. As the wavelength of the radiation decreases, the intensity of the black body radiations _____
a) Increases
b) Decreases
c) First increases then decrease
d) First decreases then increase

2. The radiations emitted by hot bodies are called as _____
a) X-rays
b) Black-body radiation
c) Gamma radiations
d) Visible light

3. An iron rod is heated. The colors at different temperatures are noted. Which of the following colors shows that the iron rod is at the lowest temperature?
a) Red
b) Orange
c) White
d) Blue

4. A black body is defined as a perfect absorber of radiations. It may or may not be a perfect emitter of radiations.
a) True
b) False

5. From the figure, what's the relation between T_1, T_2, and T_3?



a) $T_1 > T_2 > T_3$
b) $T_3 > T_2 > T_2$
c) $T_3 > T_1 > T_2$
d) $T_2 > T_1 > T_3$

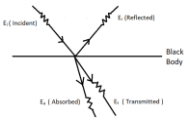
6. Electromagnetic wave theory of light could not explain Black Body radiations.
a) True
b) False

7. The unit of absorptive power is _____
a) T
b) Ts^{-1}
c) Ts
d) No unit

8. For an object other than a black body, it's emissivity, e is _____
a) 1
b) $0 < e < 1$
c) $e > 1$
d) $e = 0$

9. What relation between emissivity, e, and Absorptive Power, a, is given by Kirchhoff's law?
a) $e < a$
b) $e > a$
c) $e = a$
d) no specific relation

10. What is the relation between the Energies as shown in the figure?



a) $E_r = 0$
b) $E_a = 0$
c) $E_t = E_i$
d) $E_i = E_r$

11. Which of the following is the correct expression for the Schrödinger wave function?
a) $i\hbar\,(d\psi/dt) = -i(\hbar/2m)\partial\Psi/\partial x + U\Psi$
b) $i\hbar\,(d\Psi/dt) = -i(\hbar/2m)\partial^2\Psi/\partial x^2 + U\Psi$
c) $i\hbar\,(d\Psi/dt) = -i(\hbar_z/2m)\partial\Psi/\partial x + U\Psi$
d) $i\hbar\,(d\Psi/dt) = -i(\hbar_z/2m)\partial^2\Psi/\partial x^2 + U\Psi$

12. For a quantum wave particle, E = _____
a) $\hbar$ k
b) $\hbar$ ω
c) $\hbar$ ω/2
d) $\hbar$ k/2

13. Schrodinger Wave equation can be derived from Principles of Quantum Mechanics.
a) True
b) False

14. Which of the following can be a wave function?
a) tan x
b) sin x

c) cot x
d) sec x

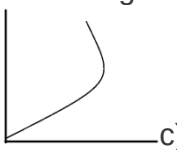
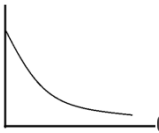
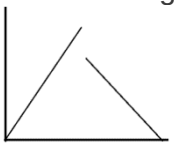
15. Which of the following is not a characteristic of wave function?
a) Continuous
b) Single valued
c) Differentiable
d) Physically Significant

16. Find the function, f(x), for which X f(x) = $-i\hbar a^2 p_x f(x)$, where a is the real quantity.
a) ke^{-x^2}
b) $ke^{-x^2/2a}$
c) $ke^{-x^2/2a^2}$
d) $ke^{-x^2/2a}$

17. $d\Psi/dx$ must be zero.
a) True
b) False

18. Any wave function can be written as a linear combination of _____
a) Eigen Vectors
b) Eigen Values
c) Eigen Functions
d) Operators

19. The Schrödinger is a differential equation.
a) True
b) False

10. Which of the following can be a solution of Schrodinger equation?
a)  b)  c)  d) 

20. The walls of a particle in a box are supposed to be _____
a) Small but infinitely hard
b) Infinitely large but soft
c) Soft and Small
d) Infinitely hard and infinitely large

21. The wave function of the particle lies in which region?
a) x > 0
b) x < 0
c) 0 < X < L
d) x > L

22. The particle loses energy when it collides with the wall.
a) True
b) False

23. The Energy of the particle is proportional to _____
a) n
b) n^{-1}
c) n^2
d) n^{-2}

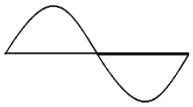
24. For a particle inside a box, the potential is maximum at x = _____
a) L
b) 2L
c) L/2
d) 3L

25. The Eigen value of a particle in a box is _____
a) L/2
b) 2/L
c) $\sqrt{L/2}$
d) $\sqrt{2/L}$
26. Particle in a box can never be at rest.
a) True
b) False

27. What is the minimum Energy possessed by the particle in a box?
a) Zero
b) $\pi^2\hbar^2/2mL^2$
c) $\pi^2\hbar^2/2mL$
d) $\pi^2\hbar/2mL$

28. The wave function of a particle in a box is given by _____
a) $\sqrt{2/L}\ (\sin nx/)\ L$
b) $\sqrt{2/L}\ (\sin n\pi/xL)$
c) $\sqrt{2/L}(\sin x/L)$
d) $\sqrt{2/L}(\sin \pi x/L)$

29. The wave function for which quantum state is shown in the figure?



a) 1
b) 2
c) 3
d) 4

30. Calculate the Zero-point energy for a particle in an infinite potential well for an electron confined to a 1 nm atom.
a) 3.9 X 10^{-29} J
b) 4.9 X 10^{-29} J
c) 5.9 X 10^{-29} J
d) 6.9 X 10^{-29} J

31. In a finite Potential well, the potential energy outside the box is _____
a) Zero

b) Infinite
c) Constant
d) Variable

32. The Schrodinger for the particle inside a finite potential well becomes _____
a) x > 0
b) x < 0
c) 0 < X < L
d) x > L

33. When the particle strikes the wall of the well, it bounces off completely.
a) True
b) False

34. The Energy of the particle is proportional to _____
a) n
b) n^{-1}
c) n^2
d) n^{-2}

35. For a particle inside a box of finite potential well, the particle is most stable at what position of x?
a) x > L
b) x < 0
c) 0 < x < L
d) Not stable in any state

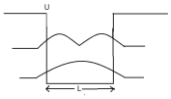
36. When the Schrodinger equation is solved for $E > V_o$, the solutions will be _____
a) Non-oscillatory
b) Oscillatory Inside
c) Oscillatory Outside
d) Oscillatory inside as well as outside

37. Particle in a box of finite potential can never be at rest.
a) True
b) False

38. What is the minimum Energy possessed by the particle in a box?
a) Zero
b) $\pi^2\hbar^2/2mL^2$
c) $\hbar^2/2m$
d) $\pi^2\hbar/2m$

39. The wave function of a particle in a box is given by _____
a) A sin(kx)
b) A cos(kx)
c) Asin(kx) + Bcos(kx)
d) A sin(kx) – B cos(kx)

40. What does the following figure shows?



a) Wave function for Infinite Potential Well
b) Wave function for Finite Potential Well
c) Probability Density function for Infinite Potential Well
d) Probability Density function for Finite Potential Well

41. Which of the following is the characteristic of a black body?
a) A perfect absorber but an imperfect radiator
b) A perfect radiator but an imperfect absorber
c) A perfect radiator and a perfect absorber
d) A perfect conductor

42. The energy distribution is not uniform for any given temperature in a perfect black body.
a) True
b) False

43. Rayleigh-Jean’s law holds good for which of the following?
a) Shorter wavelength
b) Longer wavelength
c) High temperature
d) High energy

44. Wien’s displacement law holds good only for shorter wavelength.
a) False
b) True

45. Which of the following does not affect the photon?
a) Magnetic or electric field
b) Light waves
c) Gravity
d) Current

46. What is Compton shift?
a) Shift in frequency
b) Shift in charges
c) Shift in radiation
d) Shift in wavelength

47. Compton shift depends on which of the following?
a) Incident radiation
b) Nature of scattering substance
c) Angle of scattering
d) Amplitude of frequency

48. Which of the following is called as non-mechanical waves?
a) Magnetic waves
b) Electromagnetic waves
c) Electrical waves

d) Matter waves

49. Which of the following is associated with an electron microscope?
a) Matter waves
b) Electrical waves
c) Magnetic waves
d) Electromagnetic waves

50. A radio station broadcasts its programme at 219.3 metre wavelength. Determine the frequency of radio waves if velocity of radio waves is 3×10^{8} m/s.
a) 7.31×10^{-7} Hz
b) 1.954×10^{-6} Hz
c) 1.368×10^{6} Hz
d) 6.579×10^{10} Hz

51. Calculate the de-Broglie wavelength of an electron which has been accelerated from rest on application of potential of 400volts.
a) 0.1653 Å
b) 0.5125 Å
c) 0.6135 Å
d) 0.2514 Å

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