S.Y.B. Sc. (SEM IV)

PHYSICS PAPER -II

SAMPLE QUESTIONS

1) A large value of $|\psi|^2$ means the …….. probability of particle's existence.
   a) weak b) strong c) zero d) intermediate

2) A particle in a stationary quantum state ----------
   a) is at rest b) has only potential energy c) has only kinetic energy
   d) has constant total energy.

3) Which of the following is not a physical requirement for a wave function to be valid
   a) single valued b) continuous in a given region c) time independent
   d) all a, b and c obeyed.

4) For a stationary state the probability density is -----
   a) function of time b) independent of time
   c) independent of space coordinate d) none of these.

5) A momentum operator in one dimensional is----------
   a) $-i\hbar\frac{d}{dx}$ b)$i\hbar\frac{d}{dx}$ c)$i\hbar\frac{d}{dt}$ d) $h\frac{d}{dx}$

6) For a stationary state the probability density is ----
   a) function of time b) independent of time c) independent of space coordinate
   d) none of these

7) Which of the following wave function represent free particle
   a) A sin (kx-ωt) b) A cos (kx-ωt) c) $Ae^{-i\,(kx-\omega t)}$ d) $Ae^{i\,(kx-\omega t)}$

8) The propagation of wave in a medium move with --------
   a) space b) time c) space and time d) none of these

9) Angular momentum operator $\widehat{L_y}$ = ----
   a) $-i\hbar(y\frac{\partial}{\partial z} - z\frac{\partial}{\partial y})$ b) $-i\hbar(z\frac{\partial}{\partial x} - x\frac{\partial}{\partial z})$ c) $-i\hbar(x\frac{\partial}{\partial y} - y\frac{\partial}{\partial x})$ d) $i\hbar(y\frac{\partial}{\partial x} - z\frac{\partial}{\partial y})$

10) In case of cubical box the first excited state is----------
   a) non generate b) 2 fold degenerate c) 3 fold degenerate d) 6 fold degenerate

11) A particle of energy E approaches a potential step of height V greater than E. According to quantum mechanics,
   a) the particle is always reflected b) the particle is always transmitted
   c) the particle may be reflected or transmitted d) the particle stops.

12) The penetration depth of a particle of energy E incident on a potential step of height V, (E < V) depends on,
a) only the mass of the particle b) only the energy of the particle.
c) only mass and energy of the particle d) neither mass nor energy of the particle

13) Wave function ψ_n for a particle in one dimensional box has ---------
a) (n +1) nodes b) n nodes c) (n – 1) nodes d) infinite nodes

14) Different quantum states of a system having the same energy eigenvalues are called ----------
a) Non-degenerate states b) excited states c) free states d) degenerate states

15) If L be the length of one dimensional closed box in which particle is enclosed, then its energy is proportional to ------
a) L b) $\frac{1}{L}$ c) L^2 d) $\frac{1}{L^2}$

16) The energy of a particle in the n^{th} quantum state in one dimensional box is proportional to -----
a) n b) $\frac{1}{n}$ c)n^2 d)$\frac{1}{n^2}$

17) In the case of one dimensional deep potential well, the principal quantum number n cannot have the value
a)0 b)1 c)2 d)3

18) A free particle moving along +ve x axis, whose wave function is represented by ----------
a) A sin (kx-ωt) b) A cos (kx-ωt) c) A$e^{-i\,(kx-\omega t)}$ d) A$e^{i\,(kx-\omega t)}$

19) The ground state energy for a particle in 3-D cubical box of each side equal to L is E_{111} and for a particle in 1-D box of length L is E_1 then ----------
a) $E_1 = E_{111}$ b) $E_1 = E_{111}/2$ c) $E_1 = E_{111}/3$ d) $E_1 = 3\,E_{111}$

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) A quantum mechanical oscillator at 0^0K has ---------- energy.
a) zero b) negative c) positive d) infinite

22) A particle of total energy E is greater than the height of the potential barrier on which it is incident. The kinetic energy of the particle everywhere is ----------
a) negative b) positive c) imaginary d) zero

23) A particle of total energy E is less than the height of the potential barrier on which it is incident. Its momentum inside the barrier is ----------
a) negative b) positive c) imaginary d) zero

24) In the coordinate representation, the eigenvalues of the one dimensional harmonic oscillator can be written in terms of -------
a) Legendre polynomials b) Hermite polynomials c) Bessel function
d) Hankel function