Ph. D.PHYSICS

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1. The wave function of a Gaussian wave packet is given by (x)=A exp[ikx$-\frac{x^2}{2a^2}$]. The value of factor A is
   (a) $\frac{1}{\sqrt{\pi a}}$ (b) $\frac{1}{\pi a}$ (c) $\frac{1}{\sqrt{\pi\sqrt{a}}}$ (d) $\frac{1}{\sqrt{a\sqrt{\pi}}}$
2. The de Broglie wave length for an electron of energy 54 eV is
   (a) 0.67 Å (b) 1.67 Å (c) 2.67 Å (d) 3.67 Å
3. Which one is correct for a photon
   (a) finite rest mass and spin ½ (b) finite rest mass and spin 1
   (c) zero rest mass and spin ½ (d) zero rest mass and spin 1
4. Energy operator for a quantum system is
   (a) $i\hbar\frac{\partial}{\partial x}$ (b) $i\hbar\frac{\partial}{\partial p}$ (c) $i\hbar\frac{\partial}{\partial t}$ (d) $-i\hbar\frac{\partial}{\partial t}$
5. The product of uncertainty in two conjugate variables has the dimension of
   (a) force (b) energy (c) angular momentum (d) torque
6. Which of the following wave functions is acceptable in quantum mechanics
   (a) tan x (b) cot x (c) cosec x (d) sin x
7. If the ground state energy of a one dimensional finite potential well is E_0, what will be its energy in the third energy state?
   (a) E_0 (b) 3 E_0 (c) 16 E_0 (d) 9 E_0
8. When a particle of total energy greater than the potential energy of a single step barrier is incident on it, which of the following will not happen
   (a) reflection (b) transmission
   (c) reflection and transmission (d) transmission but no reflection
9. If a generalized co-ordinate is cyclic, which quantity is conserved?
   (a) torque (b) energy (c) momentum (d) mass
10. The conservation of angular momentum in a central force field leads to conservation of
    (a) energy (b) areal velocity (c) linear momentum (d) time period
11. The Lagrangian of a system is given by
    (a) T+V (b) T-V (c) H+V (d) H-V
12. If a generalized coordinate has the dimension of momentum, the generalized velocity will have the dimension of
    (a) torque (b) force (c) acceleration (d) velocity
13. For attractive inverse square law of force, which is not the shape of the orbit
    (a) elliptic (b) parabolic (c) hyperbolic (d) straight line
14. For a system of two bodies with masses in the ratio 1:2, the reduced mass of the system is
    (a) $\frac{1}{3}$ (b) $\frac{2}{3}$ (c) 1 (d) $\frac{4}{3}$
15. For a homogeneous cube of density d, mass M and sides a, the moment of inertia coefficients are
    (a) $\frac{1}{3}$ b (b) $\frac{2}{3}$ b (c) b (d) $\frac{4}{3}$ b
    (Given b=Ma^2)