

2. Energy of He atom by variation method (taking z -atomic number; E_H - ground state energy of H-atom) is given by

- (a) $-\left(z^2 - \frac{5}{4}z\right)E_H$ (b) $-\left(2z^2 - \frac{5}{4}z\right)E_H$
 (c) $\left(z^2 + \frac{5}{4}z\right)E_H$ (d) $-(2z^2 E_H)$.

3. Transition probability/unit time, when transitions are extended to continuum is given by τ where τ is equal to,

- (a) $2\pi |H_{ml}^1|^2 \rho(E_m)$ (b) $i\hbar |H_{ml}^1|^2 \rho(m)$
 (c) $|H_{ml}^1|^2 \rho(E_m)$ (d) $\frac{2\pi}{\hbar} |H_{ml}^1|^2 \rho(m)$.

4. Eigen value of \hat{J}^2 is

- (a) $\hbar^2 l(l+1)$ (b) $\hbar^2 s(s+1)$
 (c) $\hbar^2 j(j+1)$ (d) $\hbar^2 j(j+1)^2$.

5. Trace of Dirac's matrices is

- (a) +1 (b) zero
 (c) -1 (d) anything (+1 or -1).

Fill in the blanks :

6. If ' C ' is a complex number, and if $|R\rangle = C|A\rangle$ then $\langle R|$ is given by _____.
 7. Best energy of Helium occurs using variation method when z' is _____ rather than z .
 8. The conclusion of sudden approximation when Hamiltonian changes for a very short finite interval of time, the wave function _____.
 9. Eigen value of J_z is \hbar .
 10. The order of Dirac's matrices can be only _____.

Match the following :

11. $\langle A|B\rangle$ (a) $\frac{-i\hbar}{2m}(\psi^* \nabla \psi - \psi \nabla \psi^*) / \psi^2$
 12. Energy of k -order time independent non-degenerate perturbation (b) Collision of gas molecules 13
 13. Application of adiabatic approximation (c) $\pm \hbar J_z$ 14
 14. $[J_z, J_x]$ (d) $\langle \psi_a^* | H^1 | \psi_b \rangle / \psi^2$
 15. Current density in KG equation (e) $\langle B|A\rangle$ 11