SCHRODINGER WAVE EQUATION

1. The radial probability distribution curve of an orbital of H has '4' local maxima. If orbital has 3 angular node then orbital will be :

(A) 7f (B) 8f (C) 7d (D) 8d

2. Which orbital is represented by the complete wave function, ψ_{420}?

(A) 4s (B) 4p (c) 4d (D) 4f

3. The orbitals amongest the following having three nodal sufaces:

(A) 1s (B) 2s (C) 3s (D) 4s

4. The number of radial nodes of 3s and 2p orbitals are respectively:

(A) 2, 0 (B) 0,2 (C) 1, 2 (D) 2 , 1

5. For an electron, with n = 3 has only one radial node. The orbital angular momentum of the electron Will be:

(A) 0 (B) $\sqrt{6}\frac{h}{2\pi}$ (C) $\sqrt{2}\frac{h}{2\pi}$ (D) $3\left(\frac{h}{2\pi}\right)$

6. How many angular nodes does a d-orbital possess?

(A) 1 (B) 2 (C) 3 (D) 4

7. How many radial nodes does a 3d-orbital possess?

(A) 0 (B) 1 (C) 2 (D) 3

8. The radial part of schrodinger wave equation for hydrogen atom is

$$\psi(r) = \frac{1}{16\sqrt{4}\,a_0^{3/2}}\ (\sigma - 1)\ (\sigma^2 - 8\sigma + 12)\ e^{-\sigma/2}$$

Where a_0 = constant & $\sigma = 2r/na_0$; n = principle quantum number

Select the correct statements :

(A) Distance of nearest radial node from the nucleus is $2a_0$.

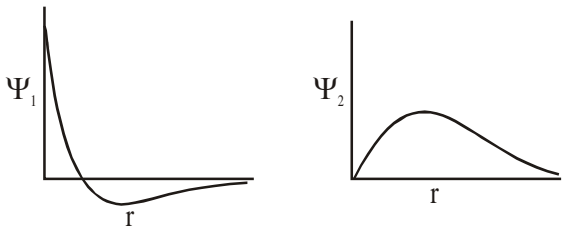
(B) Distance of farthest radial node from the nucleus is $12a_0$.

(C) Number of maxima in the curve $4\pi r^2\psi^2(r)$ vs r are 4.

(D) $\psi(r)$ is for 4p orbital.

9. Observe the following plots carefully :

Orbital-I **Orbital-II**



Identify the correct option (s) -

(A) Ψ_2 may represent a 2p-orbital

(B) Ψ_1 should represent 2s-orbital

(C) Variation of probability with r in each direction is same for orbital-I

(D) Variation of probability with r in each direction is same for orbital-II

10. The schrodinger wave equation for hydrogen atom is

$\psi(r)=\frac{1}{16\sqrt{4}}\left(\frac{Z}{a_0}\right)^{3/2}\left\{\left[(\sigma-1)(\sigma^2-8\sigma+12)\right]e^{-\sigma/2}\right\}$ where a_0 & Z are constant, $\sigma=\frac{2Zr}{a_0}$ then select correct statement.

(A) Minimum distance of radial node from nucleus is $\frac{a_0}{Z}$

(B) Maximum distance of radial node from nucleus is $\frac{a_0}{Z}$

(C) $\psi(r)$ is for 4s-orbital

(D) $\psi(r)$ is for 5p-orbital

11. Which of the following is the nodal plane of d_{xy} orbital ?

(A) XY (B) YZ (C) ZX (D) All

Paragraph for Question 12 to 14

For an orbital of H-like species radial function is :

$$R(r)=\frac{1}{9\sqrt{6}}\left(\frac{Z}{a_0}\right)^{3/2}(4-\sigma)\,\sigma\,e^{-\sigma/2}$$

where $\sigma=\frac{2Zr}{na_0}$; a_0 = 0.5 Å , Z = atomic number of species , r = radial distance from nucleus.

12. Which of the following statements about the orbital whose radial function is given above is **CORRECT**?

(A) This is an s-orbital

(B) This cannot be p-orbital

(C) Principal quantum number (n) of this orbital is 4

(D) This orbital has one radial node.

13. At what distance from the nucleus will this orbital have a radial node in Be^{+3} ion ?

(A) 0.5 Å (B) 2 Å (C) 1 Å (D) 0.75 Å

14. Choose the correct statement among the following

(A) Radial distribution function ($\Psi^2 \cdot 4\pi r^2 dr$) give probability at a particular distance along one chosen direction

(B) $\Psi^2(r)$ give probability density at a particular distance over a spherical surface

(C) For 's' orbitals $\Psi(r,\theta,\phi)$ is dependent on θ and ϕ

(D) '2p' orbital with quantum numbers. n = 2, ℓ = 1, m = 0, also shows angular dependence

Answers

RACE # 30

1. (A) **2.** (C) **3.** (D) **4.** (A) **5.** (C) **6.** (B) **7.** (A) **8.** (ABC)
9. (ABC) **10.** (C) **11.** (C) **12.** (D) **13.** (D) **14.** (D)