46.(A) de-Broglie verified the dual nature of electron by justifying the quantization of angular momentum of electron in Bohr's orbit.

47.(D) From uncertainty principle

$$\Delta x \cdot \Delta p = \frac{h}{4\pi} \qquad \Rightarrow \qquad \Delta x = \frac{6.634 \times 10^{-34}}{4 \times 3.14 \times 1 \times 10^{-5}} \approx 5.27 \times 10^{-30} \, m$$

48.(D) K-shell contains only one sub-shell, i.e. s type sub-shell. It contains only one orbital which indicates two electrons can be placed with opposite spin. So, spin quantum number is different for s-sub-shell electrons.

49.(B) Number of orbitals in a shell $= n^2 = 4^2 = 16$ orbitals & 4 subshells i.e. 4s, 4p, 4d, 4f

50.(A) Calcium has Z = 20 $\qquad\qquad\qquad \therefore \qquad 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$

Fourth shell is valence shell, so, 2 electrons are present.

51.(C) According to Hund's rule, degenerate orbitals are filled singly by same spin electron first, coupling start only after half filling by opposite spin electrons.

52.(B) Z = 28 for nickel

$\therefore \qquad Ni \equiv 1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^8$

$Ni^{2+} \equiv 1s^2 2s^2 2p^6 3s^2 3p^6 4s^0 3d^8$

$3d^8 \equiv$ $\qquad \therefore \qquad$ 2 unpaired e^{-s}

53.(A) $\lambda = \dfrac{h}{mv} = \dfrac{h}{\sqrt{2m\,K.E.}}$

$\lambda_e = \dfrac{h}{\sqrt{2m_e \cdot 16E}}$; $\lambda_p = \dfrac{h}{\sqrt{2 \times 1836 m_e \cdot 4E}}$; $\lambda_\alpha = \dfrac{h}{\sqrt{2 \times 4 \times 1836\,m_e \times E}}$

(Since $m_\alpha \approx 4\,m_p$) $\qquad\qquad \Rightarrow \qquad \lambda_e > \lambda_p > \lambda_\alpha$

54.(B) Higher the value of (n + ℓ) higher is the energy of orbital. If (n + ℓ) values are same then the orbital having more value of n indicates higher energy level.

55.(A) Radial nodes are given by : $n - \ell - 1$, so for 3s radial nodes $= 3 - 0 - 1 = 2$

For 2s, radial nodes $= 2 - 0 - 1 = 1$

56. (B) $r = 8.46 A° = 0.53 \dfrac{n^2}{Z} A° \qquad \Rightarrow \qquad n = 4$

Max. e^-s in n = 4 $\to 2n^2 = 32$

57.(B) It is equal to principle quantum number (n). $\qquad\qquad$ **58.(A)** learn the formula.

59.(C) Value of ℓ for given n is 0 to (n – 1) and value of m for given $\ell = -\ell$ to $+\ell$

60.(C) For K(Z = 19) we have $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$

$\therefore \qquad$ Outermost e^- is $4s^1$

$4, 0, 0, + \dfrac{1}{2}$ or $4, 0, 0, \dfrac{-1}{2}$.