CL23_Q1. Electrons in hydrogen are described by four numbers, *n*, *l*, *m* and *ms*. What restrictions (if any) are there on these four numbers?

Ans:

The principal quantum number *n* is a positive integer, *n*=1,2,3,…… The integer *l* is a non-negative integer smaller than *l*, so *l*=0,1,2,…,*n*-1. The integer *m* is one of magnitude no greater than *l*, so *m=-l, -l+1,-l+2,….,l* . Finally, m_s takes on the values $m_s = \pm\frac{1}{2}$

CL23_Q2. In the analysis of Schrodinger's equation for a hydrogen atom using spherical polar coordinates, elaborate the azimuthal and polar wave function. Also comment on the possible values of magnetic quantum number.

Ans:

Azimuthal wave equation, $\frac{d^2\Phi}{d\varphi^2} + {m_\ell}^2\Phi = 0$

Polar wave equation, $\frac{1}{\sin\theta}\frac{d}{d\theta}\left(\sin\theta\frac{d\Theta}{d\theta}\right) + \left[\ell(\ell+1) - \frac{{m_\ell}^2}{\sin^2\theta}\right]\Theta = 0\Phi$, the component of the complete wave function ψ must obey that it has a single value at a given point in space. The solution will satisfy this only when, magnetic quantum number m_l is zero or a positive or negative integer