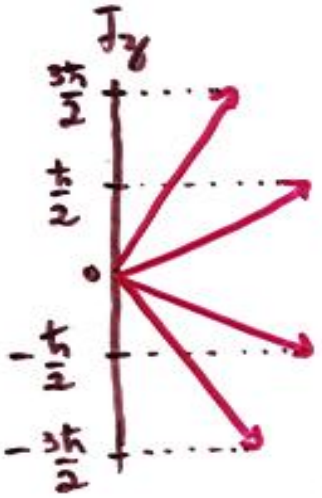
Example

$n = 2 \quad \ell = 1 \Rightarrow j = 1 + \frac{1}{2} = \frac{3}{2} \longrightarrow 2P_{3/2}$ ← $j = \ell + s$

and $j = 1 - \frac{1}{2} = \frac{1}{2} \longrightarrow 2P_{1/2}$ ← $j = \ell - s$ (n, ℓ)

$j = 3/2$



$J = \frac{\sqrt{15}}{2}\hbar$

even number of orientations for $\vec{J}$!

Pauli exclusion principle states that no two electrons in an atom can have the same set of quantum number, that is same n, ℓ, m_ℓ and m_s.

Reason being electrons are identical particles!!!

All known particles are either fermions or bosons.

The wavefunctions for fermions are antisymmetric

$$\Psi(r_1, r_2) = -\Psi(r_2, r_1)$$

The wavefunctions for bosons are symmetric

$$\Psi(r_1, r_2) = \Psi(r_2, r_1)$$