Dr. Sanjeet Kumar, HOD Physics, MDDM

[#] Addition of Angular Momenta: Clebsch Gordan Coefficients.

Systems in which the total angular momentum is composed of two or more parts, to some approximations independent of each other e.g. the particles with spin (in the non-relativistic limit), systems containing two or more particles such as many electron atoms; the scattering and radiation processes etc.

Correlation between the total angular momentum and its component parts:

Let there be two non-interacting systems (1) & (2) with angular momenta J_1 and J_2 and state vectors ψ_1 and ψ_2. If J represents the sum of J_1 and J_2, then

$$J = J_1 + J_2 \quad \text{— (1)}$$

If the systems (1) and (2) are considered together as a single system, the state vector of combination is

$$\psi = \psi_1 \psi_2 \quad \text{— (2)}$$

Assuming the system of units in which $\hbar = 1$ of defining angular momentum quantum mechanically i.e.

$$\vec{J} = \hbar^{-1} (\vec{r} \times \vec{p}) \quad \text{— (3)}$$

the commutation relation of $\vec{J_1}$ and $\vec{J_2}$ are

$$J_1 \times J_1 = i J_1, \quad J_2 \times J_2 = i J_2 \quad \text{— (4)}$$

From these we obtain

$$\bar{J} \times \bar{J} = (\bar{J}_1 + \bar{J}_2) \times (\bar{J}_1 + \bar{J}_2)$$

$$= \bar{J}_1 \times \bar{J}_1 + \bar{J}_1 \times \bar{J}_2 + \bar{J}_2 \times \bar{J}_1 + \bar{J}_2 \times \bar{J}_2$$

$$= \bar{J}_1 \times \bar{J}_1 + \bar{J}_2 \times \bar{J}_2 \quad \left[\text{since } \bar{J}_1 \text{ commutes with } \bar{J}_2\right]$$

$$= i\bar{J}_1 + i\bar{J}_2 = i(\bar{J}_1 + \bar{J}_2) = i\bar{J} \quad \text{— (5)}$$

Thus $\bar{J}$ follows the same commutation relation (5) as obeyed by $\bar{J}_1$ and $\bar{J}_2$.

घोषणा करता है कि वह ऐसी सोसायटी का सदस्य बनने

तारीख में सदस्यों की संख्या एक करोड 40 लाख से

चुनाव