

# Some questions

Sourendu Gupta

TIFR Graduate School

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# Questions discussed

- 1 What are Wigner's D matrices?
- 2 How does one compute Clebsch-Gordan coefficients? How does one construct unitary matrices which block-diagonalize the direct product matrices for  $J_+$  and  $J_-$  while keeping  $J_z$  diagonal?
- 3 What are (rotational) vector operators? What are (rotational) tensor operators? How does one rewrite the transformation properties of tensor operators in terms of commutation relations with  $\mathbf{J}$ ?
- 4 How does one solve the radial equation for a general central potential between two particles? If the potential has finite range, then is there always a solution in the form  $\psi_{nl}(r) = r^l p_{nl}(r) \exp(-r/r_n)$ , where  $r_n = \hbar/\sqrt{2ME(n, l)}$ ? When is  $p_{nl}(r)$  a polynomial? If there is no polynomial solution, then how does one solve this problem? Are there upper and lower bounds on the bound state energies? Is the number of bound states large or small? If there is a bound state with zero energy then can one solve the problem for all  $V(r)$ ?
- 5 How does one deal with three interacting particles?