$\{\Psi_1, \Psi_2, \ldots \Psi_g\}$ — BASIS OF REPRESENTATION Γ OF G

IS IT REDUCIBLE OR IRREDUCIBLE REPR. ?

$$\Gamma = \sum_j a_j \Gamma'_j \quad \text{IRREDUCIBLE REPRESENTATIONS}$$

FOR GIVEN SYMMETRY OPERATION

$$X(\hat{R}) = \sum_j a_j X_j(\hat{R})$$

$$\sum_{\hat{R} \in G} X_s^*(\hat{R}) \Big|$$

$$\sum_{REG} X_s^*(\hat{R}) X(\hat{R}) = \sum_{\hat{R} \in G} \sum_j a_j \underbrace{X_s^*(\hat{R}) X_j(\hat{R})}$$

»ORTHOGONALITY« THEOREM

$$h \, \delta_{sj}$$

$$\sum_{\hat{R} \in G} X_s^*(\hat{R}) X(\hat{R}) = h \, a_s$$

$$a_s = \frac{1}{h} \sum_{\hat{R} \in G} X(\hat{R}) X_s^*(\hat{R}) \quad \text{IRREDUCIBLE REPR.}$$

REDUCIBLE REPR.

HOW MANY TIMES Γ_s IS PRESENT

IN $\Gamma = \sum_j a_j \Gamma_j$ (DECOMPOSITION OF Γ)

PROBLEM: FIND HOW MANY TIMES REPRESENTATION A_2 IS PRESENT IN THE DECOMPOSITION OF REDUCIBLE REPRESENTATION BUILT WITH THE BASIS FUNCTIONS (P_x, P_y, P_z) FOR D_3; HOW MANY TIMES A_1 APPEARS?

APPLICATION: SPLITTING OF ENERGY LEVELS FOR LOWER SYMMETRY THAN SPHERICAL

HOW TO FIND BASIS OF IRREDUCIBLE REPRESENTATION?

$$\Gamma_s: \quad \hat{\Omega}_s = \frac{l_s}{h} \sum_{\hat{R} \in G} X_s^*(\hat{R}) \hat{R} \quad \text{PROJECTION OPERATOR}$$