

Applications of Group Theory

PD Dr. Andrea Donarini

Lectures

Exercises

H33, Mondays, 14:15

H34, Thursdays, 14:15

5.0.21, Wednesdays, 13:15

Sheet 3

1. Trivial representations

Show that every symmetry operator for every group can be represented by the (1×1) unit matrix. Is it also true that every symmetry operator for every group can be represented by the (2×2) unit matrix? If so, does such a representation satisfy the Wonderful Orthogonality Theorem? Why?

2. Representations of the permutation group $P(3)$

Consider the group of permutations of 3 elements $P(3)$.

1. Prove that the group $P(3)$ is isomorphic to the point group C_{3v} .
2. List the classes of C_{3v} .
3. Which are the possible dimensionalities of the irreducible representations of $P(3)$?

3. Symmetry operations

Consider the molecule AB_4 , where the B atoms lie at the corners of a square and the A atom is at the center and is not coplanar with the B atoms.

1. Determine the symmetry operations for this molecule and the associated point group.
2. Find its multiplication table.
3. List the subgroups.
4. List the classes.

Frohes Schaffen!