University of Regensburg Summer Term 2013

Applications of Group Theory

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Lectures 9.2.01, Mondays, 14:15
Exercises 7.1.21, Fridays, 10:15

Sheet 3

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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 isomorphous to the point group C_{3v}.
2. List the classes of C_{3v}.
3. Which are the possible dimensionalities of the irrreducible 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!