CHEM106: Assignment 10

Point Group for Molecule

1. Understanding symmetry elements and symmetry operations is essential to learning group theory of molecules.

A. What is a symmetry element? What is its relation to the symmetry operation?

B. For all the symmetry elements listed in the following table, define the corresponding symmetry operation and its notation.

|  |  |  |
| --- | --- | --- |
| **Symmetry Element** | **Symmetry Operation** | **Symbol** |
| Identity |  |  |
| Symmetry plane |  |  |
| Inversion center |  |  |
| Proper rotation axis |  |  |
| Improper rotation axis |  |  |

1. The C2h group contains a C2 axis that transforms the (x, y, z) coordinate to

(–x, –y, –z). Define the three-dimensional matrix representation for the C2 operation.

3. Identify all the symmetry elements in the chloroform (CHCl3) molecule, and assign its point group.

4. Determine the symmetry group for the following molecules.

1. NH3
2. CCl4
3. Planar BF3
4. H2C=CBr2
5. C6H6