

**Chem 370 - Spring, 2019**  
**Assignment 2**

**Reading Assignment**

Read all of chapter 4, then continue with chapter 5.

**Homework Assignment**

Do the following problems for Discussion on Monday, February 11<sup>th</sup>.

1. Given the set of operations  $[E, C_4, \sigma_h]$ , determine the other operations that must be present to form a complete point group. [*Hint*: Consider all the products of the given elements with themselves and with each other.] Identify the point group for the complete set of operations. What is the order of the group?
2. Aside from the trivial group  $C_1$ , the point group formed from the complete set of operations from problem 1 (above) has six subgroups. Identify the subgroups, list their operations, and give the order of each.
3. Cyclic groups are formed by taking the series of powers on a single element up to the order of the group, such that  $G = [X, X^2, \dots, X^h = E]$ . Taking each of the following operations as the base element of a cyclic group, determine the series of all operations that constitutes the group, identify the group, and develop its multiplication table: (a)  $C_3$ , (b)  $C_6$ , (c)  $S_4$ . Identify all subgroups of these cyclic groups.
4. Develop the multiplication table for the group  $C_{2h}$ , which consists of the operations  $E, C_2, i$ , and  $\sigma_h$ . [*Hint*: Determine the effects of the operations on an arbitrary point whose initial coordinates are  $x, y, z$ .] Is this group Abelian?
5. Do the following end-of-chapter problems from the text (4<sup>th</sup> edition equivalents are given in brackets): 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 a-h, 4.7, 4.8, 4.11. [4.1, 4.2, 4.3, 4.4, 4.5, 4.6, 4.7 (problem i is a different literary character, but the point group is the same), 4.8, 4.11.]