

**CHEM C0200 Inorganic Chemistry**  
**Prof. Glen Kowach**  
**Examination II**  
**4/18/07**

Name: \_\_\_\_\_

1. (18 points) What is the point group for the following molecules:

a.  $\text{CCl}_4$

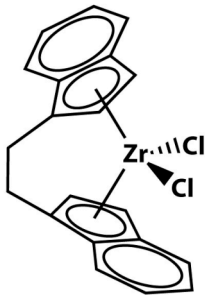
b.  $\text{C}_2\text{H}_2$

c. *trans*- $\text{C}_2\text{H}_2\text{Cl}_2$

d. *cis*- $\text{C}_2\text{H}_2\text{Cl}_2$

e. *mer*- $\text{MX}_3\text{Y}_3$

f. Note both views of molecule.



**20**

Structure 25-20  
Shriver & Atkins Inorganic Chemistry, Fourth Edition  
© 2006 by D. F. Shriver, F. W. Atkins, T. L. Overton, J. P. Rourke, M. T. Weller, and F. A. Armstrong

2. (6 points) Which molecules in problem 1 have a dipole moment? (circle the letters)

a      b      c      d      e      f

3. (8 points) For the point groups below, please indicate which irreducible representations are IR active only, Raman active only, and those which are both.

a.  $C_{4v}$

b.  $D_{4h}$

4. (15 points) Which vibrational modes are observed in IR for  $BrF_5$ ? (Find the reducible representation.)

5. (2 points) What are the two common bonding geometries for coordination compounds with CN=4?

6. (20 points) What is the CN and number and names and structures of the isomers for the following molecules?

a.  $[\text{Mn}(\text{en})_2\text{Cl}_2]$  where en=ethylenediamine

CN = \_\_\_\_\_

isomers

b.  $\text{RhH}(\text{C} \equiv \text{CR})_2(\text{PMe}_3)_3$

CN = \_\_\_\_\_

isomers

7. For the spinel structure...

a. (2 points) What is the general formula?

b. (2 points) What is the coordination of the cations in the case of a normal spinel?

c. (2 points) What is the coordination of the cations in the case of an inverse spinel?

d. (2 points) Give an example of a spinel compound?

e. (6 points) What point defects are possible in the spinel structure?

f. (2 points) How would the electrical properties change if defects were present?

8. (15 points) In 10-15 minutes, please describe the details of a synthesis for a nanostructure.