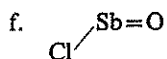
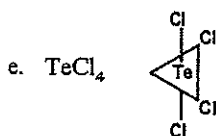
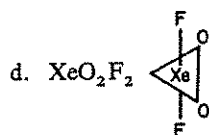
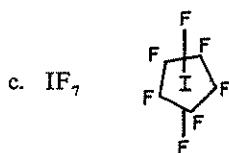


CHE 450G Problem Set 1 (HW 1)
September 4, 2007

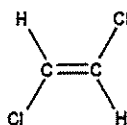
Name: _____

1, Assign each molecule below to the proper point group.

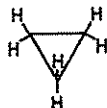
- a. $\text{O}=\text{C}=\text{C}=\text{C}=\text{O}$ (linear) b. HF



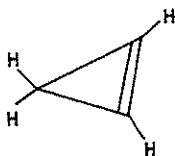
- g. *trans*-dichloroethylene



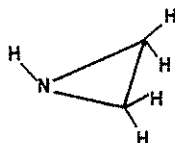
- h. cyclopropane



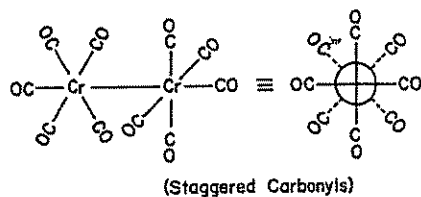
- i. cyclopropene



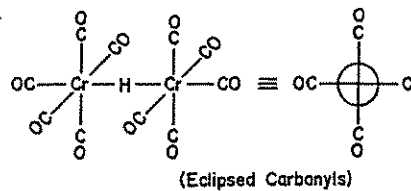
- j. aziridine



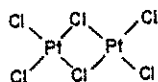
- k. $\text{Cr}_2(\text{CO})_{10}^{2-}$



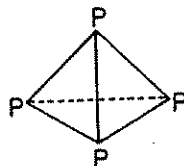
- l. $\text{HCr}_2(\text{CO})_{10}^{-}$



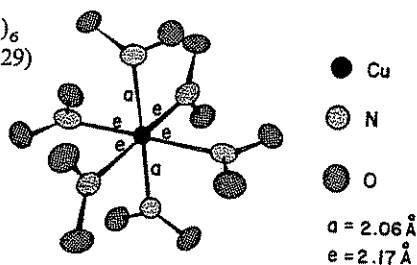
- m. $\text{Pt}_2\text{Cl}_6^{2-}$



- n. white phosphorus, P_4

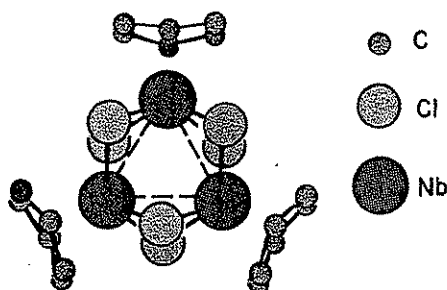


- q. $\text{Cu}(\text{NO}_2)_6^{4-}$ in $\text{Rb}_2\text{PbCu}(\text{NO}_2)_6$
(not the same structure as Fig. 1-29)



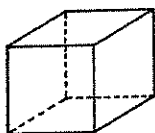
(Structure redrawn from S. Takagi, M.D. Joesten, and P.G. Lenhert, *J. Amer. Chem. Soc.*, 97, 444 [1975].)

- r. $[(\text{CH}_3)_6\text{C}_6]^{+}\text{Nb}_3\text{Cl}_6^{+}$

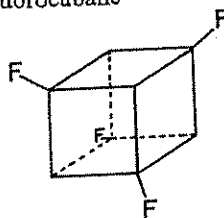


(M.R. Churchill and S.W.-Y. Chang, *Chem. Commun.*, 1974, 248.)

- o. cubane, C_8H_8



- p. tetrafluorocubane



2.

Determine the products:

a. $\begin{bmatrix} 4 & 1 & 4 \\ -1 & -2 & -1 \\ 2 & -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 \\ -1 \\ 0 \end{bmatrix}$ b. $\begin{bmatrix} 4 & 1 & 4 \\ -1 & -2 & -1 \\ 2 & -1 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 0 & 1 \\ -1 & 2 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

3.

Write a three dimensional (i.e., 3×3) matrix representation of each of the operations of the point group D_{2h} which are: $C_2(z)$, $C_2(x)$, $C_2(y)$, E , i , $\sigma(xz)$, $\sigma(yz)$, and $\sigma(xy)$.