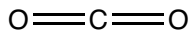


Point Group Assignment Problems

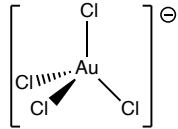
Assign the point group of the following compounds

- a. CO_2
- b. $[\text{AuCl}_4]^-$
- c. CH_2Cl_2
- d. $[\text{Pt}(\text{CO})\text{Cl}_3]^-$
- e. $\text{Mn}(\text{CO})_5\text{Br}$
- f. $\text{cis-M}(\text{CO})_4\text{Cl}_2$
- g. $\text{B}_2\text{Cl}_4\text{Br}_2$ (Br bridging)

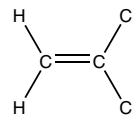
(a) CO_2
 linear: yes
 centre of inversion: yes
 $D_{\infty h}$



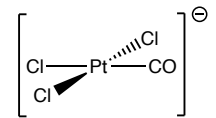
(b) $[\text{AuCl}_4]^-$
 linear: no
 O_h or T_d : yes $\rightarrow T_d$
 T_d



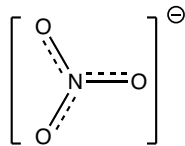
(c) CH_2Cl_2
 linear: no
 O_h or T_d : no
 C_n : yes, C_2
 $2C_2$ perpendicular to C_2 : no
 σ_h : no
 $2\sigma_v$: yes
 C_{2v}



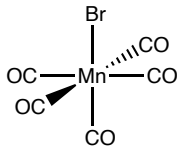
(d) $[\text{Pt}(\text{CO})\text{Cl}_3]^-$
 linear: no
 O_h or T_d : no
 C_n : yes, C_2
 $2C_2$ perpendicular to C_2 : no
 σ_h : yes
 $2\sigma_v$: yes
 C_{2v}



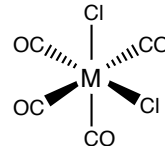
(h) $[\text{NO}_3]^-$
 linear: no
 O_h or T_d : no
 C_n : yes, C_3
 $3C_2$ perpendicular to C_3 : yes
 σ_h : yes
 $3\sigma_v$: yes
 D_{3h}



(e) $\text{Mn}(\text{CO})_5\text{Br}$
 linear: no
 O_h or T_d : no
 C_n : yes, C_4
 $4C_2$ perpendicular to C_4 : yes
 C_4 : no
 σ_h : no
 $4(\sigma_v + \sigma_d)$: yes
 C_{4v}



(f) cis- $\text{M}(\text{CO})_4\text{Cl}_2$
 linear: no
 O_h or T_d : no
 C_n : yes, C_2
 $2C_2$ perpendicular to C_2 : no
 σ_h : no
 $2\sigma_v$: yes
 C_{2v}



(g) $\text{B}_2\text{Cl}_4\text{Br}_2$ (Br bridging)
 linear? no
 O_h or T_d : no
 C_n : yes, C_2
 $2C_2$ perpendicular to C_2 : yes
 σ_h : yes
 $2\sigma_v$: yes
 D_{2h}

