Exercise 9.1

For ethylene:

1. determine the point group;
2. determine the number and symmetry of the vibrational normal coordinates;
3. determine the spectroscopic activity of each fundamental level.

Solution 9.1

Exercise 9.2

Show on the basis of infra-red and Raman spectra that it is possible to distinguish between the two crown forms of octachlorocyclooctane, one in which the hydrogen atoms are all equatorial ($\mathscr{D}_{4d}$) and the other in which the hydrogen atoms are alternating between axial and equatorial positions ($\mathscr{C}_{4v}$).

Solution 9.2

Exercise 9.3

Discuss how the *cis* and *trans* isomers of N_2F_2 can be distinguished by infra-red and Raman measurements.

Solution 9.3

Exercise 9.4

What will be the infra-red and Raman activity of the four fundamental levels of CO_3^{2-}?

Solution 9.4

Exercise 9.5

Determine χ^0 and carry out the reduction of Γ^0 for the following molecules:

1. NH_3 ($\mathscr{C}_{3v}$) ,
2. $XeOF_4$ ($\mathscr{C}_{4v}$),
3. $PtCl_4^{2-}$ ($\mathscr{D}_{4h}$),
4. *trans*-glyoxal ($\mathscr{C}_{2h}$).

Solution 9.5