1. Determine the point group for each of the following molecules and items. Draw a clear picture of each molecule or item and show or clearly describe ALL the symmetry elements necessary to determine the point group. NOTE: Only the connectivity of the atoms determines symmetry, not the bond order between atoms.

a) phosphorus pentafluoride, PCl5 b) selenium tetrafluoride, SeF4

c) triiodide ion, I3– d) ethane (eclipsed conformation)

e) nitrate ion, NO3– f) hydrochloric acid, HCl

g) trans–SF4Cl2  h) cis–SF4Cl2 

i) sulfur pentafluoride monochloride, SF5Cl j) a thumb tack

k) sulfuryl chloride, SCl2O2, 

l) Projection of the *f*x(x2–3y2) orbital. Assume the lobes of the orbital are coplanar and the z axis is perpendicular to the page.



m) nitrosyl chloride, NOCl n) hexacyanocobaltate (III) anion, [Co(CN)6]3–

o) bis(benzene)chromium in a staggered ring conformation, (C6H6)2Cr