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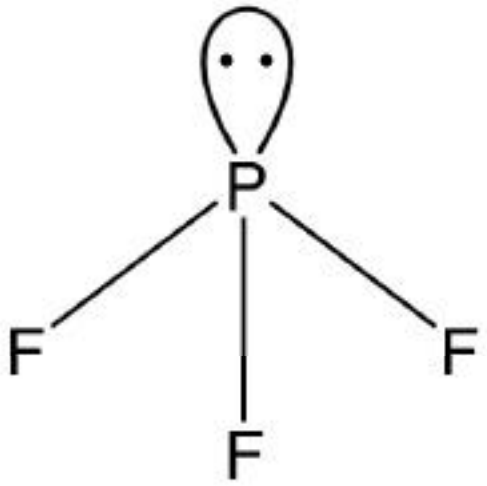
Homework Assignment 4

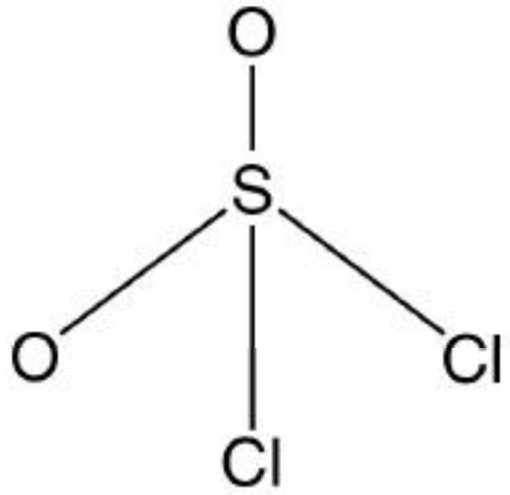
Solution to Even Numbered Problem 3.42

Problem 3.42:

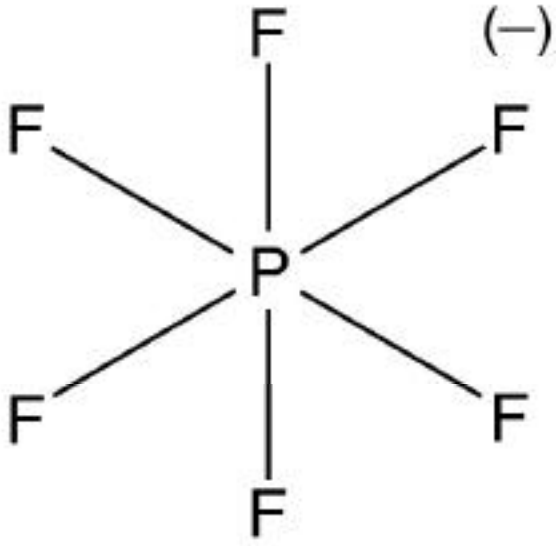
a) Phosphorous trifluoride has a central P atom with SN 4. The molecule is trigonal pyramidal, like NH_3 (See Oxtoby text Figure 14-17) [P has 5 valence electrons 3 of which are used to complete the shell of 3 F atoms. The remaining 2 valence electrons on P go to the lone pair.]



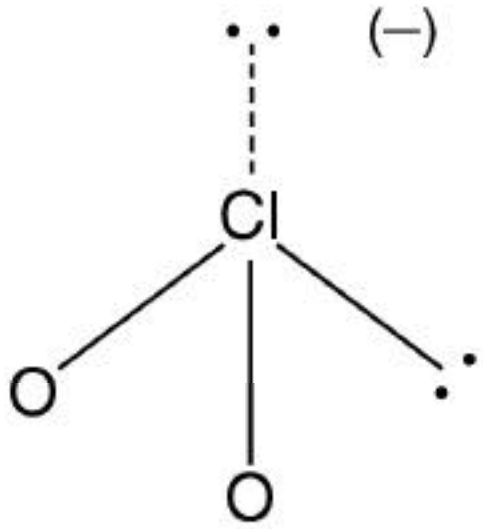
b) Sulfuryl chloride has a central S with SN 4. The molecule is close to tetrahedral, but somewhat distorted because of the different steric requirements of the O's and the Cl's. [S has 6 valence electrons, 2 of which are used to complete the shell of 2 Cl atoms. The remaining 4 valence electrons on S go to complete the shell of each O atom, each of which needs 2 electrons to form an octet.]



c) The PF_6^- anion has a central P with SN 6. The anion is octahedral. [P has 5 valence electrons and the negative charge makes 6 electrons to complete the shells of 6 F atoms.]



d) The ClO_2^- anion has a central Cl with SN 4. The anion is bent. [Cl has 7 valence electons and the negative charge makes 8. Each O atom needs 2 electrons to complete its shell. This leaves 4 electrons for two sets of lone pairs.]



e) Germanium hydride has a central Ge with SN 4. It is tetrahedral. [Ge has 4 valence electrons, all of which go to complete the 1s shell of the H atom. GeH_4 is the 4th row analog of CH_4]