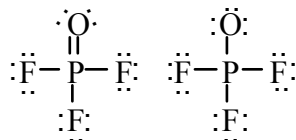


Free Response Practice!

1. Answer the following questions using principles of chemical bonding and molecular structure.
 - a). Consider the carbon dioxide molecule, CO_2 , and the carbonate ion, CO_3^{2-} .
 - (i) Draw the complete Lewis electron-dot structure for each species.
 - (ii) Account for the fact that the carbon-oxygen bond length in CO_3^{2-} is greater than the carbon-oxygen bond length CO_2 .
 - b). Consider the molecules CF_4 and SF_4 .
 - (i) Draw the complete Lewis electron-dot structure for each molecule.
 - (ii) In terms of molecular geometry, account for the fact that the CF_4 molecule is nonpolar, whereas the SF_4 molecule is polar.
2. Answer the following questions that relate to chemical bonding.
 - a). Draw the complete Lewis electron-dot structure for CF_4 , PF_5 , SF_4 .
 - b). On the basis of the Lewis structures drawn above, answer the following questions about the particular molecule indicated.
 - (i) What is the $\text{F}-\text{C}-\text{F}$ bond angle in CF_4 ?
 - (ii) What is the hybridization of the valence orbitals of P in PF_5 ?
 - (iii) What is the geometric shape formed by the atoms in SF_4 ?
 - c). Two Lewis structures can be drawn for the OPF_3 molecule, as shown below.



Structure 1 Structure 2

- (i) How many sigma bonds and how many pi bonds are there in structure 1?
- (ii) Which one of the two structures best represents a molecule of OPF_3 ? Justify your answer in terms of formal charge.