

Review Questions
Molecular Geometry and VSEPR Theory

1. What is the change in hybridization on the phosphorus in the following reaction?
 $\text{PCl}_3 + \text{Cl}_2 \rightarrow \text{PCl}_5$

2. The general formula AX_3E_2 is consistent with which molecular geometry?

3. Use orbital box diagrams to show the initial, promoted and hybridized state of carbon in CO_2 .

4. Which of the following molecules are polar?



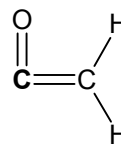
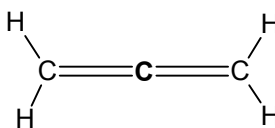
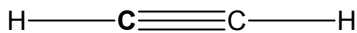
5. Of the following molecules, which are consistent with a central atom with three hybridized orbitals and one unhybridized p-orbital?



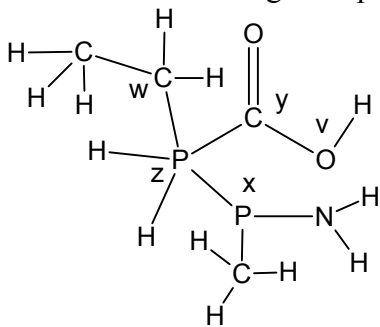
6. Give the molecular geometry and approximate bond angle(s) for each of the molecules in question 5.

7. Of the three fluoro-sulfides, SF_2 , SF_4 and SF_6 , which are polar?

8. How (if at all) are the hybridizations on the boldface carbons in the following molecules different?



9. Give the bond angles at positions v, w, x, y and z



10. Determine the formal charge with respect to the phosphorus atoms at both positions x and z from question 9.

11. Explain whether or not NH_2^- is a linear molecule and why.

12. State how the hybridization on the central atom in a Lewis dot structure can be determined.

13. Briefly explain why water has such a high melting and boiling point relative to molecules similar in molecular structure to water, such as H_2S .

14. Briefly explain how a molecule can have polar bonds but be nonpolar overall. Can the opposite ever be true?

15. Determine the net charge, if any, on the following species:

