

10 • Hybridization & Molecular Orbitals

STUDY QUESTIONS

1. What hybridization is required at the central atom of the following molecules or ions?

(These are the same molecules examined in questions 3, 5, 12, and 13 in Chapter 9.)

Sketch the Lewis electron-dot diagram; state the Steric Number (SN) and then state the hybridization.

a. AlCl_3	f. BCl_3	k. XeO_4	p. NO_2	u. NO_2^+
b. PCl_3	g. ClO_2^-	l. CCl_4	q. XeF_4	v. ClO_4^-
c. PCl_5	h. O_3	m. SCl_2	r. SF_4	w. IF_4^-
d. SiCl_4	i. GaH_3	n. SF_6	s. OCS	x. ClF_2^+
e. NCl_3	j. SO_2Cl_2	o. BeCl_2	t. SO_2	y. BF_3
				z. CO_2

2. In the organic chemistry of carbon, three hybridizations are common. What are they, and why are they limited to three?

3. Copy the two molecules from your study guide for this question. Examine the bonding in the following molecules using valence bond theory. Describe each bond in terms of the orbitals on adjacent atoms that overlap to create the bond:

4. Draw the Lewis electron dot structure of the nitrite ion. Describe the bonding in terms of valence bond theory. Then describe the π bonding in terms of molecular orbital theory.

5. Copy the molecule from the study guide for this question. Describe the hybridization at each atom (other than H) in the following molecule (the anesthetic novocaine).

6. Ignore this study question.
7. Ignore this study question.
8. Using valence bond theory describe the σ and the π bonding in the molecule allene, $\text{CH}_2=\text{C}=\text{CH}_2$.

9. Using valence bond theory to describe the σ bonding and use molecular orbital theory to describe the π bonding in the molecule carbon dioxide, CO_2 .

10. Ignore this study question.
11. Ignore this study question.