Chapter 9 Focus Questions

Section 1

1. Why in methane would using existing orbitals for carbon result in 2 different types of C-H bonds?
2. Why is this a problem?
3. Why would the *p* orbitals result in 90˚ bond angles? Why is this a problem?
4. What is hybridization?
5. Why is the hybridized idea a better explanation than the original "native" orbitals? In other words – why does sp^3 hybridization make sense in terms of orbital shape, geometry, and energy?
6. Look at Figure 9.5. If the hybridized orbitals represent higher energy than the "native" *2s* orbital, why would they occur?
7. What determines whether an atom will use native or hybridized orbitals?
8. Double bonds affect shape how?
9. Why does sp^3 hybridization not work for ethylene?
10. How many orbitals are hybridized to achieve the required geometry of ethylene? How many are not hybridized?
11. What is a sigma (σ) bond and how does it form?
12. What is a pi (π) bond and what is its geometry in relation to the σ bond? What part of the ethylene Lewis structure does it represent?
13. σ bonds form from orbitals that _____ each other. π bonds form from _____ orbitals.
14. A double bond is formed from _____ σ and _____ π bonds. A triple bond is formed from _____ σ and _____ π bonds. A single bond is formed from _____ σ and _____ π bonds.
15. What is the general principle of the sp^2 orbital?
16. For CO_2, how is the 180˚ bond angle satisfied with hybridization?
17. In CO_2, the O's undergo _____ hybridization and the single C undergoes _____ hybridization.
18. How many hybridized orbitals does C have? How many unhybridized orbitals?
19. How are the 2 double bonds achieved in by the single C in CO_2?
20. What is the geometric orientation of the two π bonds that carbon has in CO_2? How is this achieved by the unhybridized orbitals?
21. N_2 has _____ σ and _____ π bonds based on its Lewis structure. It undergoes _____ hybridization. Each N atom has _____ hybridized orbitals and _____ unhybridized orbitals.
22. How is nitrogen able to achieve its triple bond with another nitrogen in N_2?
23. Why are 5 orbitals needed in order to achieve trigonal bipyramidal orientation of the PCl_5 molecule? What hybridization is this called?
24. In PCl_5, the P undergoes _____ hybridization, while each Cl undergoes _____ hybridization. In the total molecule, there are _____ σ and _____ π bonds.
25. For SF_6, hybridization must explain the _____ shape of the molecule. What is this hybridization called? How many orbitals (and which ones) are hybridized? How many are unhybridized?

26. What is the general plan for determining the localized electron model of hybridization?
27. What is the general correlation between stearic number, VSEPR shape, bond angle, and hybridization for each type of structure that we have studied?
28. Read through sample exercises 9.1 through 9.5. Then do problems #21, 23, and 25 on page 442.

Sections 9.2-9.4

I suggest reading them to enhance your knowledge, but I will not be assigning focus questions for these sections. In understanding these sections (and all sections really) – focus on the figures. Use the text to understand what the figures are attempting to illustrate for you.