Name STUDMAN Key Date Class

8.3 BONDING THEORIES

23 possible

Section Review

Objectives

- Identify the difference between atomic and molecular orbits
- Describe how VSEPR theory helps predict the shapes of molecules
- Identify the ways in which orbital hybridization is useful in describing molecules

Vocabulary

- molecular orbitals
- bonding orbital
- sigma bond
- pi bond
- tetrahedral angle
- VSEPR theory
- hybridization

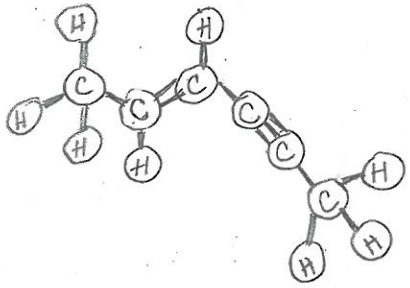
Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

The quantum mechanical model of bonding assumes that atomic orbitals overlap to produce __1__. A molecular orbit that can be occupied by two electrons of a covalent bond is called a __2__, whose energy is __3__ than that of the atomic orbitals from which it formed. When two atomic orbitals combine to form a molecular orbital that is symmetrical around the axis connecting two atomic nuclei, a __4__ bond is formed. When atomic orbitals overlap side by side, they produce __5__ bonds.

Electron dot structures fail to reflect the __6__ shapes of molecules. __7__ states that because electron pairs repel, molecular shape adjusts so the valence-electron pairs are as far apart as possible. Another way to describe molecules that provides information about both molecular bonding and molecular shape is __8__.

1. hybrid orbitals or molecular orbitals
2. bonding orbital
3. lower
4. sigma (σ)
5. pi (π)
6. 3-D or geometrical
7. VSEPR
8. orbital hybridization



Name Date Class

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

AT 9. Unshared pairs of electrons affect the shape of molecules.

ST 10. Molecular orbitals involve pi bonding.

NT 11. A bonding orbital is a molecular orbital whose energy is higher than that of the atomic orbitals from which it is formed.

AT 12. With hybridization, several atomic orbitals overlap to form the same total number of equivalent hybrid orbitals.

ST 13. Sigma and pi bonds are found in the same molecule.

AT 14. The methane molecule has four orbitals with tetrahedral angles of 109.5°. (CH_4)

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A	Column B
d 15. sigma bond	a. states that because electron pairs repel, molecules adjust their shapes so that valence-electron pairs are as far apart as possible
e 16. pi bond	b. a process in which several atomic orbitals overlap to form the same number of equivalent hybrid orbitals
a 17. VSEPR theory	c. a term used to describe the shape of certain molecules such as CO_2
b 18. hybridization	d. a bond formed when two atomic orbitals combine to form a molecular orbital that is symmetrical along the axis connecting the two atomic nuclei
c 19. linear molecule	e. a bond in which the bonding electrons are most likely to be found in the sausage-shaped regions above and below the nuclei of the bonded atoms

Part D Questions and Problems

Answer the following in the space provided.

20. Indicate the hybrid orbitals used by each carbon atom in the following compound.