Chapter 10 Chemical Bonding and Molecular Structure

Multiple Choice

Section 10.1

1. All of the geometries listed below are examples of the five basic geometries for molecules with more than 3 atoms except

   a. planar triangular
   b. octahedral
   c. tetrahedral
   ! d. trihedral
   e. trigonal bipyramidal

Section 10.1

2. Three different values can be observed for the bond angles in which of the following basic molecular structures for simple molecules:

   a. linear
   b. planar triangular
   c. tetrahedral
   ! d. trigonal bipyramidal
   e. octahedral

Section 10.1

3. The basic geometry for molecules in the set below which possesses the smallest bond angles is

   a. linear
   b. planar triangular
   c. tetrahedral
   d. trihedral
   ! e. octahedral

Section 10.1

4. The basic geometry for molecules in the set below which possesses the largest bond angles is

   ! a. linear
   b. planar triangular
   c. tetrahedral
   d. trihedral
   e. octahedral

Section 10.2

5. The concept that electron pairs located in the valence shell of an atom bonded to other atoms tend to stay as far apart as possible so as to minimize repulsions between them is incorporated in the

   a. Pauli principle
   b. Heisenberg uncertainty principle
   ! c. **v**alence **s**hell **e**lectron **p**air **r**epulsion theory
   d. electronegativity and polar bonds theory
   e. Aufbau principle

Section 10.2

6. Which one of the following arrangements would best accommodate three electron domains in the valence shell of a covalently bonded atom?

   ! a. planar triangular
   b. octahedral
   c. tetrahedral
   d. trihedral
   e. trigonal bipyramidal

Section 10.2

7. Which one of the following arrangements would best accommodate five electron domains in the valence shell of a covalently bonded atom?

   a. planar triangular
   b. octahedral
   c. tetrahedral
   d. trihedral
   ! e. trigonal bipyramidal

Section 10.2

11. Based on the Lewis structure, the number of electron domains in the valence shell of the boron atom in the BF_3 molecule is

    a. 1
    b. 2
    ! c. 3
    d. 4
    e. 5

Section 10.2

13. Based on the Lewis structure, the number of nonbonding domains in the CO_2 molecule is

    a. 1
    b. 2
    c. 3
    ! d. 4
    e. 5

Section 10.2

16. Application of the concepts of VSEPR theory leads us to conclude that the shape of the SO_3 molecule is

    a. trigonal pyramidal
    b. square planar
    c. regular tetrahedral
    ! d. triangular planar
    e. distorted tetrahedron

Section 10.2

19. Application of the concepts of VSEPR theory leads to the prediction that the shape of the PH_3 molecule is

    a. bent
    b. linear
    c. regular tetrahedral
    d. triangular planar
    ! e. trigonal pyramidal

Section 10.2
20. The geometry of the CS_2 molecule is best described as

a. bent
! b. linear
c. regular tetrahedral
d. triangular planar
e. trigonal pyramidal

Section 10.2
21. The geometry of the ClF_3 molecule is best described as

a. distorted tetrahedral
b. regular tetrahedral
! c. T-shaped
d. trigonal pyramidal
e. triangular planar

Section 10.2
22. Application of the concepts of the VSEPR theory suggests that the geometric arrangement of the atoms in the carbonate ion, CO_3^{2-} is

a. octahedral
b. square planar
c. regular tetrahedral
! d. triangular planar
e. trigonal pyramidal

Section 10.2
23. Based on conclusions from application of the VSEPR theory, which one of the following species is linear?

a. BF_3
! b. HCN
c. H_2CO
d. H_2S
e. SO_2

Section 10.2
28. The bond angle in Cl_2O is expected to be approximately

a. 90 degrees
! b. 109.5 degrees
c. 120 degrees
d. 145 degrees
e. 180 degrees

Section 10.2
29. The smallest F—S—F bond angle in SF_6 is

! a. 90 degrees
b. 109.5 degrees
c. 120 degrees
d. 145 degrees
e. 180 degrees

Section 10.3

33. Based on observed periodic trends, arrange the following species, HBr, HCl, HF, HI, in order of increasing dipole moment.

a. HF < HCl < HBr < HI
b. HBr < HCl < HF < HI
c. HI < HF < HCl < HBr
! d. HI < HBr < HCl < HF
e. HCl < HBr < HI < HF

Section 10.3

34. Which of the following molecules CO_2, CS_2, NO_2, COS is/are polar?

a. NO_2 only
b. CS_2, NO_2, and COS
c. CO_2 only
! d. COS and NO_2
e. COS only

Section 10.3

36. Which one of the molecules below is a polar molecule?

a. Br_2
b. BF_3
c. CO_2
d. CS_2
! e. IBr

Section 10.5

45. Draw a Lewis structure for the CH_4 molecule. What is the hybrid orbital set used by the carbon atom for bonding?

    a. sp^3d^2
    b. sp
    c. sp^3d
    ! d. sp^3
    e. sp^2

Section 10.5

46. Draw a Lewis structure for the NH_3 molecule. What is the hybrid orbital set used by the nitrogen atom for bonding?

    a. sp^3d^2
    b. sp
    c. sp^3d
    ! d. sp^3
    e. sp^2

Section 10.5

47. Draw a Lewis structure for the C_2H_6 molecule. What is the hybrid orbital set used by either of the carbon atoms for bonding?

    a. sp^3d^2
    b. sp
    c. sp^3d
    ! d. sp^3
    e. sp^2

Section 10.5

48. Draw a Lewis structure for the C_2H_4 molecule. What is the hybrid orbital set used by either of the carbon atoms for bonding?

a. sp^3d^2
b. sp
c. sp^3d
d. sp^3
! e. sp^2

Section 10.6

52. Which one of the following hybrid orbital sets is used by the central atom for σ-bonding in the PCl_3 molecule?

a. sp
b. sp^2
! c. sp^3
d. sp^3d
e. sp^3d^2

Section 10.6

53. Which one of the following hybrid orbital sets is used by the central atom for σ-bonding in the PCl_4^- ion?

a. sp
b. sp^2
c. sp^3
! d. sp^3d
e. sp^3d^2

Section 10.6

54. Which one of the following hybrid orbital sets is used by the central atom for σ-bonding in the SF_6 molecule?

a. sp
b. sp^2
c. sp^3
d. sp^3d
! e. sp^3d^2

Section 10.8

93. What is the total number of π-bonds in the benzene molecule?

a. 0
b. 1
c. 2
! d. 3
e. 4