Organic Chemistry 9th edition Brown Test Bank

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Name:_____ Class:_____ Date:_____

Chapter 01: Covalent Bonding and Shapes of Molecules

1. How many electrons can the shell with a principal quantum number of 1 hold?
   a. 1
   b. 2
   c. 4
   d. 8

ANSWER: b

2. How many electrons can the shell with a principal quantum number of 6 hold?
   a. 1
   b. 6
   c. 36
   d. 72

ANSWER: d

3. What is the ground-state electronic configuration of a nitrogen atom (nitrogen: atomic number 7)?
   a. $1s^2 2s^1 2p^4$
   b. $1s^2 2s^2 2p^3$
   c. $1s^1 2s^1 2p^5$
   d. $1s^2 2s^2 2p^2$

ANSWER: b

4. What is the ground-state electronic configuration of a fluorine atom (fluorine: atomic number 9)?
   a. $1s^1 2s^1 2p^7$
   b. $1s^2 2s^2 2p^5$
   c. $1s^2 2s^2 2p^6$
   d. $1s^0 2s^2 2p^7$

ANSWER: b

5. What is the ground-state electronic configuration of a fluoride anion (fluorine: atomic number 9)?
   a. $1s^2 2s^2 2p^2$
   b. $1s^2 2s^2 2p^5$
   c. $1s^2 2s^2 2p^6$
   d. $1s^2 2s^2 2p^7$

ANSWER: c

6. What is the ground-state electronic configuration of a lithium cation (lithium: atomic number 3)?
   a. $1s^2 2s^1$
   b. $1s^1 2s^1$
   c. $1s^2$
   d. $1s^2 2s^2$

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ANSWER: c

7. Which of the following species has an atom that has an unfilled valence shell of electrons?
   a. molecular iodine, I_2
   b. calcium cation, Ca^{2+}
   c. aluminum tribromide, $AlBr_3$
   d. water, H_2O

ANSWER: c

8. Which of the following species has an atom that has an unfilled valence shell of electrons?
   a. molecular bromine, Br_2
   b. fluoride anion, F^-
   c. ammonia, NH_3
   d. aluminum trichloride, $AlCl_3$

ANSWER: d

9. Which of the following species is charged?
   a. BH_3
   b. SO_4
   c. CO_2
   d. H_2S

ANSWER: b

10. Which of the following species possesses a formal charge?
   a. CCl_4
   b. $SiCl_4$
   c. $AlCl_4$
   d. PCl_3

ANSWER: c

11. Which of the following compounds is an aldehyde?
   a. $CH_3CH_2CH_2COOH$
   b. CH_3CH_2CHO
   c. $CH_3CH_2CH_2OH$
   d. $CH_3CH_2COCH_3$

ANSWER: b

12. Which of the following compounds is an alcohol?
   a. CH_3CH_2COOH

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b. $CH_3CH_2OCH_3$

c. $CH_3CH_2CH_2OH$

d. CH_3CH_2CHO

ANSWER: c

13. Which of the following compounds is a carboxylic acid?

a. $CH_3CH_2CH_2COOH$

b. $CH_3CH_2OCH_3$

c. $CH_3CH_2CH_2OH$

d. $CH_3CH_2NH_2$

ANSWER: a

14. Which of the following compounds is a ketone?

a. CH_3CH_2COOH

b. CH_3CH_2CHO

c. $CH_3CH_2CH_2OH$

d. CH_3COCH_3

ANSWER: d

15. Which of the following compounds is a ketone?

a. CH_3CH_2COOH

b. CH_3CH_2CHO

c. $CH_3CH_2CH_2OH$

d. CH_3COCH_3

ANSWER: d

16. Which of the following compounds is a carboxylic ester?

a. CH_3CH_2COOH

b. $CH_3CH_2OCH_3$

c. $CH_3CH_2COOCH_3$

d. $CH_3CH_2COCH_3$

ANSWER: c

17. Which of the following is a tertiary alcohol?

a. $CH_3CH_2OCH_3$

b. $(CH_3)_3COH$

c. $(CH_3)_2CHOH$

d. $CH_3CH_2CH_2OH$

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ANSWER: b

18. Which of the following is a tertiary amine?
    a. $CH_3CH_2N(CH_3)_2$
    b. $(CH_3)_3CNH_2$
    c. $CH_3CH_2NHCH_3$
    d. $CH_3CH_2NHCH(CH_3)_2$

ANSWER: a

19. Which of the following is a primary amine?
    a. $CH_3CH_2NHCH_3$
    b. $CH_3CH_2NHCH(CH_3)_2$
    c. $CH_3CH_2N(CH_3)_2$
    d. $(CH_3)_3CNH_2$

ANSWER: d

20. Which of the following is trigonal planar?
    a. boron trifluoride, BF_3
    b. methyl anion, CH_3^-
    c. methane, CH_4
    d. ammonia, NH_3

ANSWER: a

21. Which of the following molecules is not linear?
    a. H_2O
    b. HCl
    c. HC≡CH
    d. Br_2

ANSWER: a

22. What is the approximate value of the H−C−H bond angles in methane, CH_4?
    a. 90°
    b. 109°
    c. 120°
    d. 180°

ANSWER: b

23. What is the approximate C−C−C bond angle in propene, $CH_3CH{=}CH_2$?
    a. 90°
    b. 109°

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c. 120°
d. 180°

ANSWER: c

24. What is the approximate C−C−C bond angle in propyne, $HC{\equiv}CCH_3$?
a. 90°
b. 109°
c. 120°
d. 180°

ANSWER: d

25. What is the approximate H−C−O bond angle in formaldehyde, $H_2C{=}O$?
a. 90°
b. 109°
c. 120°
d. 180°

ANSWER: c

26. Which of the following elements has the highest electronegativity?
a. N
b. C
c. O
d. S

ANSWER: c

27. Which of the following elements has the highest electronegativity?
a. Rb
b. Bi
c. Ge
d. Br

ANSWER: d

28. Which of the following bonds is the most polar?
a. F−F
b. H−F
c. C−H
d. C−Si

ANSWER: b

29. Which of the following bonds is the most polar?
a. O−H
b. C−H
c. C−C

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d. H−H

ANSWER: a

30. Which of the following bonds is a polar covalent bond?
    a. K−F
    b. C−H
    c. C−F
    d. Br−Br

ANSWER: c

31. Which of the following bonds is a polar covalent bond?
    a. Na−Cl
    b. C−Cl
    c. C−H
    d. Cl−Cl

ANSWER: b

32. Which of the following is an ionic bond?
    a. Br−Br
    b. C−Cl
    c. C−S
    d. Na−O

ANSWER: d

33. Which of the following is an ionic bond?
    a. F−F
    b. C−H
    c. Li−O
    d. C−N

ANSWER: c

34. Which of the following bonds has the smallest dipole moment?
    a. C−N
    b. C−O
    c. C−F
    d. O−H

ANSWER: a

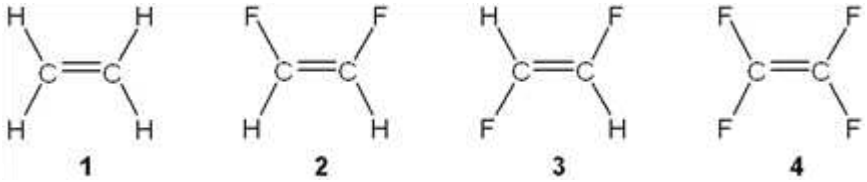
35. Which of the following bonds has the smallest dipole moment?
    a. Li−Cl
    b. C−H
    c. O−H
    d. H−Cl

ANSWER: b

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36. Which of the following molecules has a molecular dipole moment?

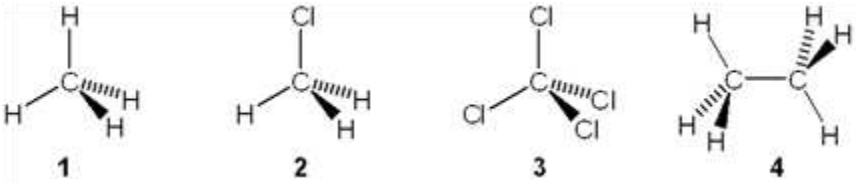


1 **2** **3** **4**

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: b

37. Which of the following molecules has a molecular dipole moment?



1 **2** **3** **4**

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: b

38. Which of the following molecules has a molecular dipole moment?

a. CO_2
b. BF_3
c. NH_3
d. CH_4

ANSWER: c

39. Which of the following molecules has a molecular dipole moment?

a. NBr_3
b. CCl_4
c. HC≡CH
d. Cl_2

ANSWER: a

40. Which of the following best represents the shape of the 2*s* atomic orbital of carbon?

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1 2 3 4

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: a

41. Which of the following best represents the shape of a 2*p* atomic orbital of carbon?



1 2 3 4

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: b

42. Which of the following best represents an sp^2 hybridized atomic orbital of carbon which overlaps with the 1*s* atomic orbital of hydrogen to form a C−H σ bonding molecular orbital in ethene, $H_2C{=}CH_2$



1 2 3 4

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: c

43. Which of the following best represents an sp^3 hybridized atomic orbital containing the lone pair of electrons of ammonia, NH_3?



1 2 3 4

a. **1**
b. **2**
c. **3**

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d. **4**

ANSWER: c

44. Which atomic orbitals overlap to form the C=O bond of acetone, $(CH_3)_2C{=}O$?
    a. C $2sp^3$ + O $2sp^2$
    b. C $2sp^2$ + O $2p$
    c. C $2sp^2$ + O $2sp^2$
    d. C $2sp^3$ + O $2sp$

ANSWER: c

45. Which atomic orbitals overlap to form the C−N bond of dimethylamine, $(CH_3)_2NH$?
    a. C $2sp^3$ + N $2sp^2$
    b. C $2sp^2$ + N $2p$
    c. C $2sp^2$ + N $2sp^2$
    d. C $2sp^3$ + N $2sp^3$

ANSWER: d

46. What is the approximate value of the length of the C=C bond in ethane, $CH_2{=}CH_2$?
    a. 121 pm
    b. 134 pm
    c. 142 pm
    d. 154 pm

ANSWER: b

47. What is the approximate value of the length of the C≡C bond in ethyne, HC≡CH?
    a. 121 pm
    b. 134 pm
    c. 142 pm
    d. 154 pm

ANSWER: a

48. Which of the following statements is *not* true regarding resonance structures?
    a. All resonance structures must have the same number of electrons
    b. Each atom in all of the resonance structures must have a complete shell of valence electrons
    c. All resonance structures must have the same arrangement of atoms
    d. All resonance structures must be valid Lewis structures

ANSWER: b

49. Which of the following statements is *not* true regarding resonance structures?
    a. Each resonance structure is in rapid equilibrium with all of the other structures
    b. The resonance structures may have different energies

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c. All resonance structures must have the same arrangement of atoms
d. All resonance structures must have the same number of electrons

ANSWER: a

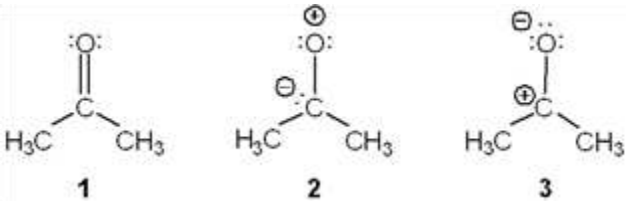
50. Which of the following statements is *not* true about the carbonate anion, CO_3^{2-}?
a. All of the oxygen atoms bear the same amount of charge
b. All of the carbon-oxygen bonds are the same length
c. One carbon-oxygen bond is different from the other two
d. All the carbon-oxygen bonds lie in the same plane

ANSWER: c

51. Which of the following statements is *not* true about the acetate anion, $CH_3CO_2^-$?
a. The oxygen atoms bear the same amount of charge
b. The two carbon-oxygen bonds are the same length
c. The carbon atom bears the negative charge
d. It is basic

ANSWER: c

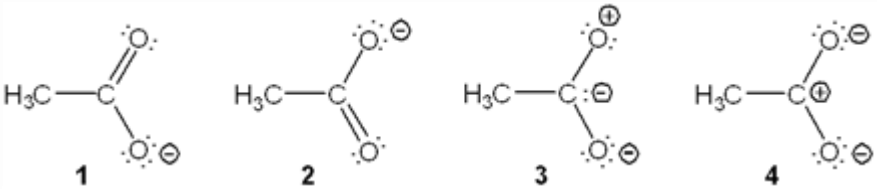
52. Rank the following in order of decreasing importance as a contributing resonance structure to the molecular structure of acetone, CH_3COCH_3 (more important > less important)



a. **1** > **2** > **3**
b. **1** > **3** > **2**
c. **2** > **1** > **3**
d. **3** > **1** > **2**

ANSWER: b

53. Which of the following resonance structures is the least important contributor to the resonance hybrid of the acetate anion, CH_3COO^-?



a. **1**
b. **2**
c. **3**
d. **4**

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ANSWER: c

54. How many electrons are there in the valence shell of the carbon atom of a methyl cation, CH_3^+?
    a. 4
    b. 5
    c. 6
    d. 7

ANSWER: c

55. How many electrons are there in the valence shell of the carbon atom of the methyl anion, CH_3^-?
    a. 2
    b. 4
    c. 6
    d. 8

ANSWER: d

56. How many electrons are there in the valence shell of the sulfur atom of sulfur hexafluoride?
    a. 2
    b. 4
    c. 8
    d. 12

ANSWER: d

57. How many electrons are there in the valence shell of the nitrogen atom of ammonia?
    a. 4
    b. 5
    c. 6
    d. 8

ANSWER: d

58. What is the approximate value of the H−O−C bond angles in a methanol, CH_3OH?
    a. 90°
    b. 120°
    c. 109°
    d. 180°

ANSWER: c

59. What is the approximate value of the H−C−H bond angles in a methyl anion, CH_3^-?
    a. 90°
    b. 109°
    c. 120°
    d. 180°

ANSWER: b

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60. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethane, CH_3CH_3?
    a. C2*p* + H1*s*
    b. C2*sp* + H1*s*
    c. C2sp^2 + H1*s*
    d. C2sp^3 + H1*s*

ANSWER: d

61. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethene, $H_2C{=}CH_2$?
    a. C2*p* + H1*s*
    b. C2*sp* + H1*s*
    c. C2sp^2 + H1*s*
    d. C2sp^3 + H1*s*

ANSWER: c

62. Which atomic orbitals overlap to form the carbon-carbon σ and π bonding molecular orbitals of ethene, $H_2C{=}CH_2$?
    a. C2sp^3 + C2sp^3, and C2*p* + C2*p*
    b. C2sp^2 + C2sp^2, and C2sp^2 + C2sp^2
    c. C2sp^2 + C2sp^2, and C2*p* + C2*p*
    d. C2sp^3 + C2sp^3, and C2sp^2 + C2sp^2

ANSWER: c

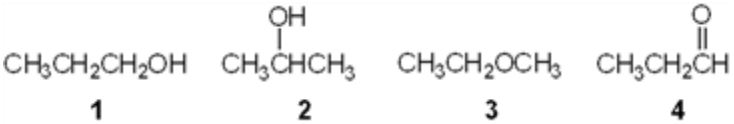
63. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethyne, HC≡CH?
    a. C2*p* + H1*s*
    b. C2*sp* + H1*s*
    c. C2sp^2 + H1*s*
    d. C2sp^3 + H1*s*

ANSWER: b

64. Which atomic orbitals overlap to form the carbon-carbon σ molecular bonding orbital of ethyne, HC≡CH?
    a. C2*p* + C2*p*
    b. C2*sp* + C2*sp*
    c. C2sp^2 + C2sp^2
    d. C2sp^3 + C2sp^3

ANSWER: b

65. Which of the following is a primary (1°) alcohol?



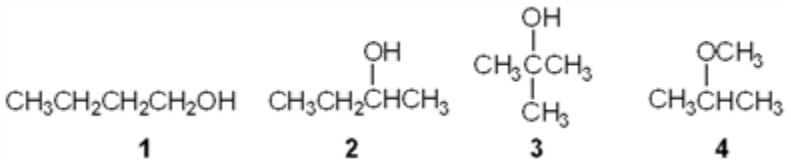
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a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: a

66. Which of the following is a tertiary (3°) alcohol?

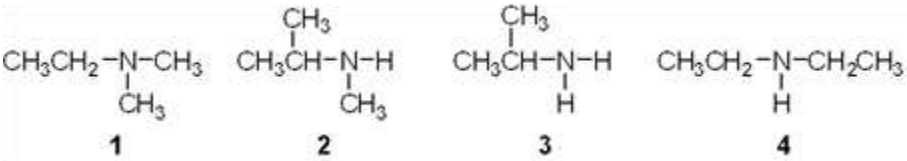


1 **2** **3** **4**

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: c

67. Which of the following is a primary (1°) amine?

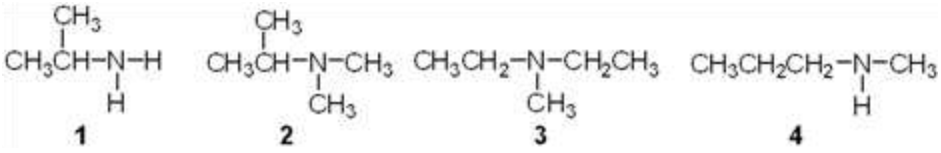


1 **2** **3** **4**

a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: c

68. Which of the following is a secondary (2°) amine?



1 **2** **3** **4**

a. **1**
b. **2**
c. **3**
d. **4**

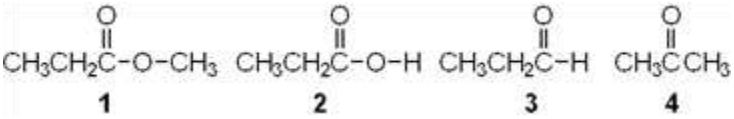
ANSWER: d

69. Which of the following is an carboxylic ester?

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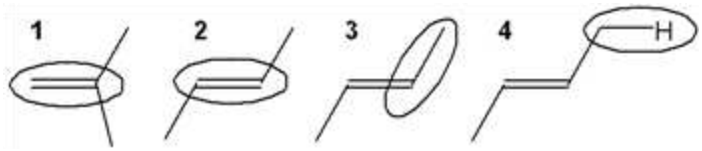
a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: a

70. What is the approximate strength of the C−C bond of ethane?
a. 376 kJ/mol (90 kcal./mol)
b. 422 kJ/mol (101 kcal./mol)
c. 556 kJ/mol (133 kcal./mol)
d. 727 kJ/mol (174 kcal./mol)

ANSWER: a

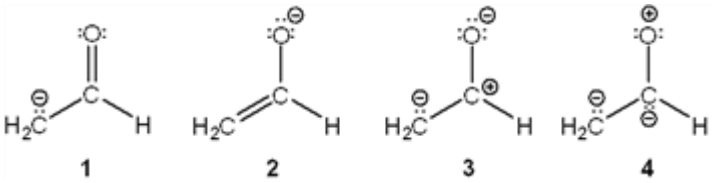
71. Which of the circled bonds is the strongest?



a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: a

72. Which of the following resonance structures makes the largest contribution to the structure of $[H_2CCHO]^-$?



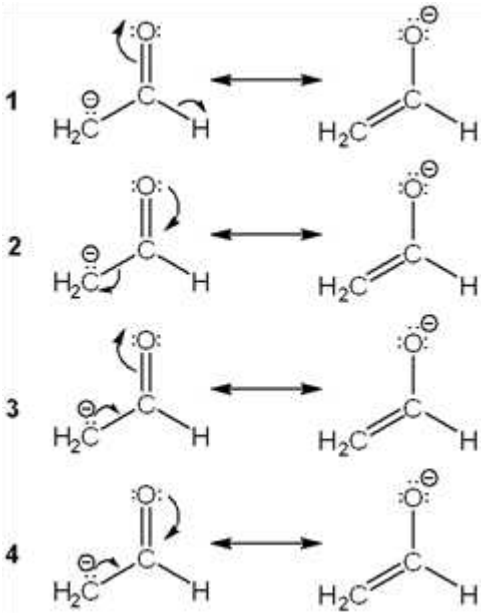
a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: b

73. Which of the following shows curved arrows that correctly accounts for the differences between the two structures?

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a. **1**
b. **2**
c. **3**
d. **4**

ANSWER: c

74. Which of the following statements is not true?

a. The sp^3C−H bond of an alkane is weaker than the *sp*C−H bond of an alkyne.
b. The carbon-carbon triple bond of an alkyne is shorter than the carbon-carbon bond of alkenes.
c. The carbon-carbon triple bond of an alkene is exactly three times as strong as a carbon-carbon single bond of an alkane.
d. The sp^3C−H bond of an alkane is longer than the *sp*C−H bond of an alkyne.

ANSWER: c

75. Which of the following is/are trigonal planar?

1. methane, CH_4
2. methyl carbocation, CH_3^+
3. trichloromethyl radical, $CCl_3^{\cdot}$
4. chloroform, $CHCl_3$

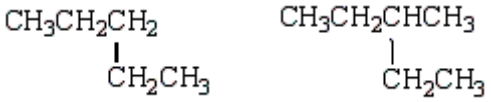
a. only **1** and **2**
b. only **2** and **3**
c. only **1** and **4**
d. only **2** and **4**

ANSWER: b

76. The following two structural formulas represent isomers.

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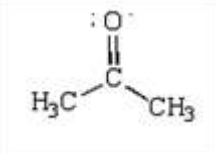
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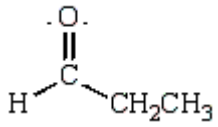
a. True
b. False

ANSWER: False

77. Consider the following structural formula.



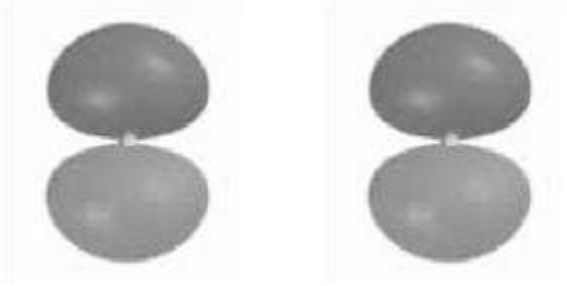
The following is a resonance structure.



a. True
b. False

ANSWER: False

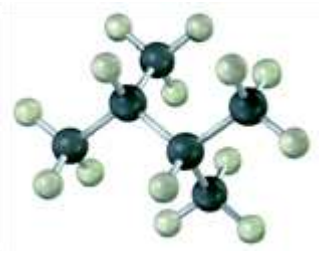
78. Overlap of the two atomic orbitals as shown could result in the formation of a π bond.



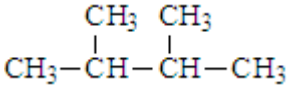
a. True
b. False

ANSWER: True

79. Consider the following molecular model.



The condensed structural formula would be



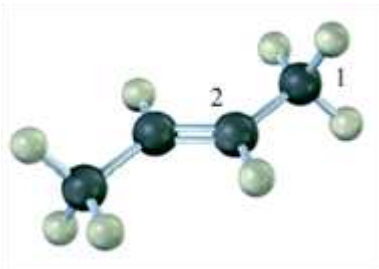
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a. True
b. False

ANSWER: True

80. The hybridization on the numbered carbon atoms in the following compound would be Carbon 1 sp^3 and Carbon 2 sp^2.



a. True
b. False

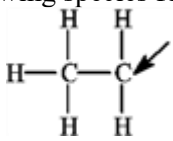
ANSWER: True

81. There are eight valence in a methyl anion, CH_3^-.

a. True
b. False

ANSWER: True

82. The following species forms during an organic reaction.



The formal charge on the carbon atom indicated by the arrow is +1.

a. True
b. False

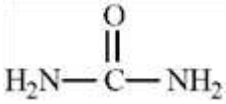
ANSWER: True

83. In drawing the Lewis structure for an organic compound, the carbon atoms should always be shown with eight total electrons.

a. True
b. False

ANSWER: True

84. Consider the structure of urea given below.



To complete the Lewis structure, six nonbonding electrons should be added, two to each of the nitrogen atoms and two to the oxygen atom.

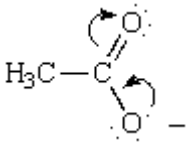
a. True

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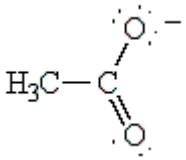
b. False

ANSWER: False

85. The curved arrows in the resonance structure for the acetate ion shown below



indicate the following alternative resonance structure for the acetate ion.



a. True

b. False

ANSWER: True

86. The maximum number of electrons that a molecular orbital can contain is four.

a. True

b. False

ANSWER: False

87. The following molecules all contain the same functional group except 2.

CH_3OH	CH_3OCH_3	CH_3CH_2OH	$CH_3CH(OH)CH_3$
1	2	3	4

a. True

b. False

ANSWER: True

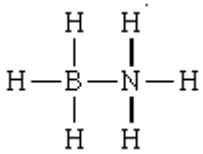
88. The percent *s* character in an sp^2 hybridized orbital is approximately 33%.

a. True

b. False

ANSWER: True

89. The formal charges in the complex should below are 0 on each H, –1 on N, and +1 on B.



a. True

b. False

ANSWER: False

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Chapter 01: Covalent Bonding and Shapes of Molecules

90. The most electronegative elements in the periodic table are generally found toward the right in a horizontal row and toward the top in a column.

a. True

b. False

ANSWER: True

91. Different compounds with the same molecular formula are called _____.

ANSWER: isomers

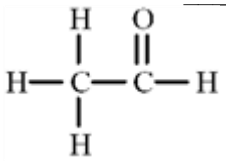
92. The formal charge on carbon in carbon monoxide is_____.

ANSWER: minus one
-1

93. The approximate H–C–H bond angle in methane is _____°.

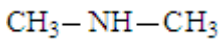
ANSWER: 109.5
109

94. The following molecule contains an _____functional group.



ANSWER: aldehyde

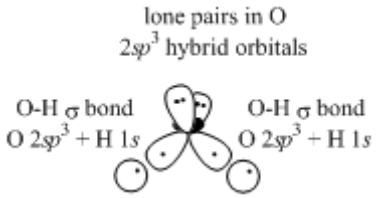
95. The following molecule is classified as a _____amine.



ANSWER: secondary
2°

96. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in water (H_2O) and which contain the lone pair of electrons. Label each orbital with its hybridization.

ANSWER:



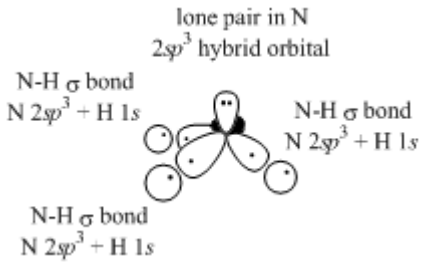
97. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ammonia (NH_3) and which contain the lone pair of electrons. Label each orbital with its hybridization.

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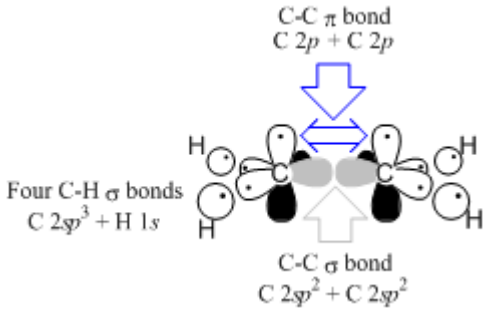
Chapter 01: Covalent Bonding and Shapes of Molecules

ANSWER:



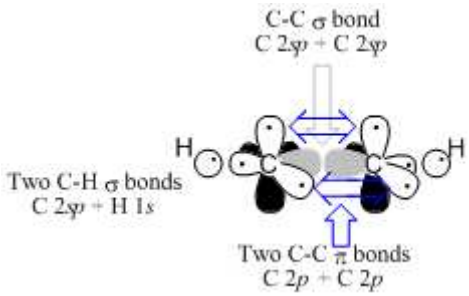
98. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethene (ethylene, $H_2C{=}CH_2$). Label each bond (e.g., C–H σ bond) and indicate which atomic orbitals contribute to this bond (e.g., C $2sp^3$ + H 1*s*).

ANSWER:



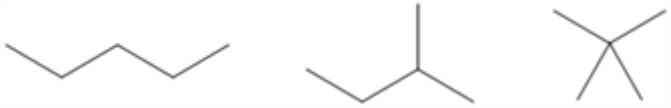
99. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethyne (acetylene, HC≡CH). Label each bond (e.g., C–H σ bond) and indicate which atomic orbitals contribute to this bond (e.g., C $2sp^3$ + H 1*s*).

ANSWER:



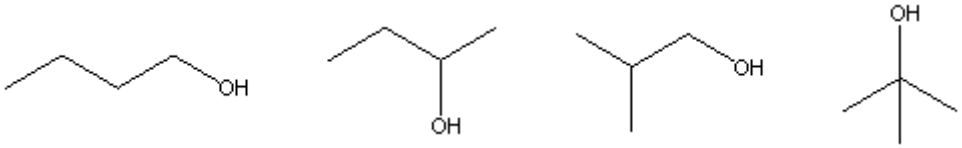
100. Draw bond-line structures of all of the alkanes that have the formula C_5H_{12}.

ANSWER:



101. Draw bond-line structures of all of the alcohols that have the formula $C_4H_{10}O$.

ANSWER:



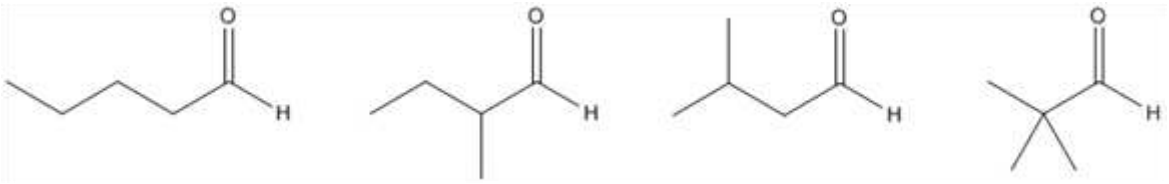
102. Draw bond-line structures of all of the aldehydes that have the formula $C_5H_{10}O$.

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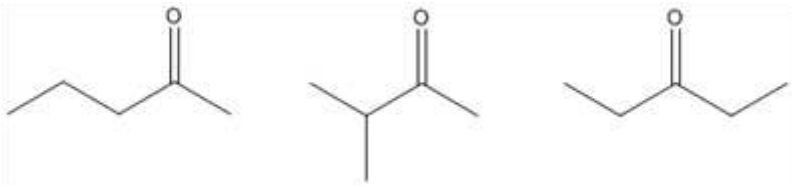
Chapter 01: Covalent Bonding and Shapes of Molecules

ANSWER:



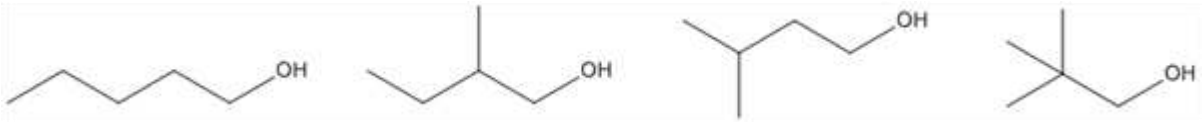
103. Draw bond-line structures of all of the ketones that have the formula $C_5H_{10}O$.

ANSWER:



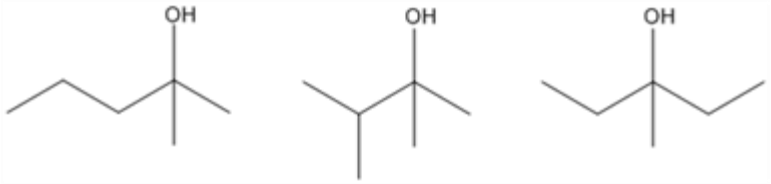
104. Draw bond-line structures of all of the primary (1°) alcohols that have the formula $C_5H_{12}O$.

ANSWER:



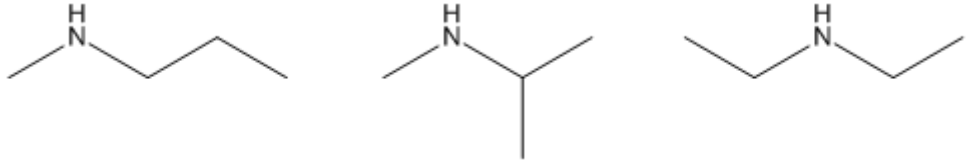
105. Draw bond-line structures of all of the tertiary (3°) alcohols that have the formula $C_6H_{14}O$.

ANSWER:



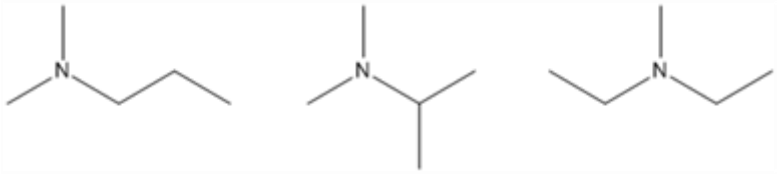
106. Draw bond-line structures of all of the secondary (2°) amines that have the formula C_4H_9N.

ANSWER:

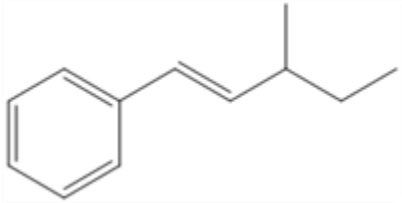


107. Draw bond-line structures of all of the tertiary (3°) amines that have the formula $C_5H_{11}N$.

ANSWER:



108. Circle all of the sp^2 hybridized atoms in the following molecular structure.

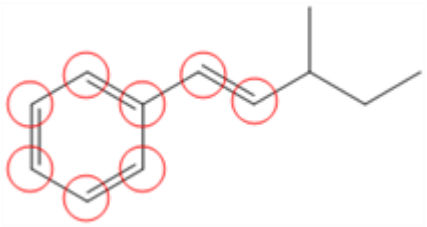


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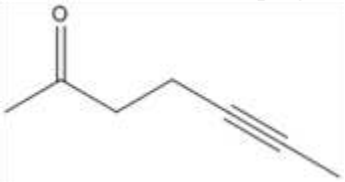
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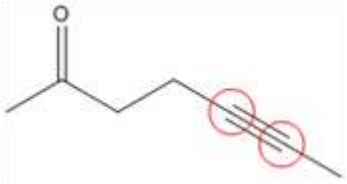
ANSWER:



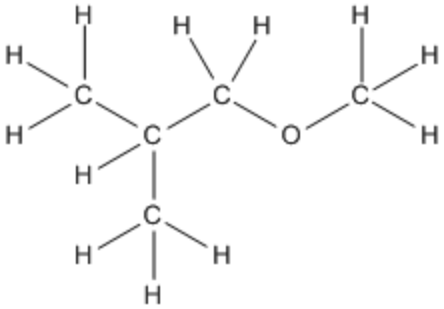
109. Circle all of the *sp* hybridized atoms in the following molecular structure.



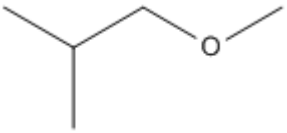
ANSWER:



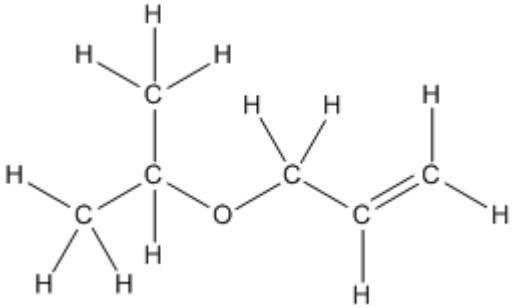
110. Convert the following structure into a bond-line drawing.



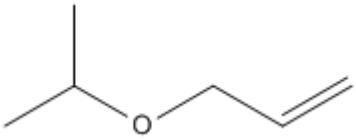
ANSWER:



111. Convert the following structure into a bond-line drawing.

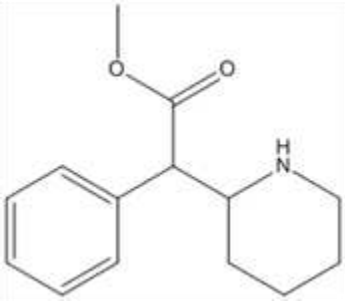


ANSWER:



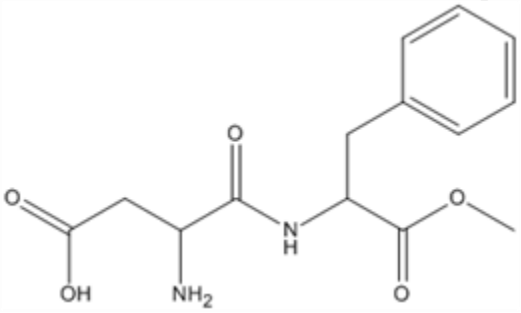
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112. What is the molecular formula of Ritalin, shown below?



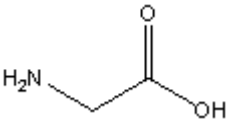
ANSWER: $C_{14}H_{19}NO_2$

113. What is the molecular formula of aspartame, shown below?

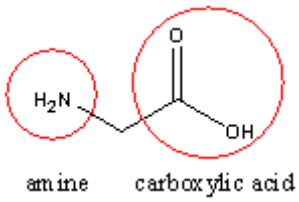


ANSWER: $C_{14}H_{18}N_2O_5$

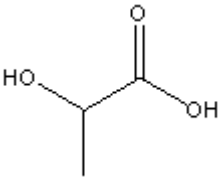
114. Circle and name the functional groups in the following molecule.



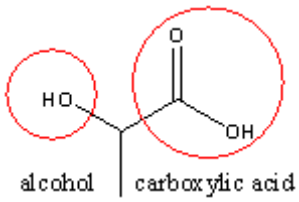
ANSWER:



115. Circle and name the functional groups in the following molecule.



ANSWER:



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Chapter 01: Covalent Bonding and Shapes of Molecules

Match the following compounds with their appropriate molecular geometry.

a. Ethane
b. Formaldehyde
c. Thiocyanate (SCN^-)
d. Hydronium Ion
e. Ozone

116. Linear
ANSWER: c

117. Tetrahedral
ANSWER: a

118. Bent
ANSWER: e

119. Trigonal Planar
ANSWER: b

120. Trigonal Pyramidal
ANSWER: d

Match the following compounds with their appropriate bond type.

a. $H_3N{\rightarrow}BF_3$
b. HCl
c. KBr
d. CH_4

121. Ionic Bond
ANSWER: c

122. Dative Bond
ANSWER: a

123. Covalent Bond
ANSWER: d

124. Polar Covalent Bond
ANSWER: b

125. In the given ion given, what is the formal charge of nitrogen, carbon, and sulfur, respectively?



a. -2, +1, and 0.
b. 0, -2, and +1.
c. -2, 0, and +1.
d. +1, 0, and -2.

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ANSWER: c

126. How many resonating structures are shown by carbonate anion?
   a. 5
   b. 4
   c. 3
   d. 2

ANSWER: c

127. Fill the appropriate electronic configuration in the blank.

K ($1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$) + Cl ($1s^2 2s^2 2p^6 3s^2 3p^5$) → K^+ _____ + Cl^- ($1s^2 2s^2 2p^6 3s^2 3p^6$)
   a. ($1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$)
   b. ($1s^2 2s^2 2p^6 3s^2 3p^6 5s^1$)
   c. ($1s^2 2s^2 2p^6 3s^2 3p^6$)
   d. ($1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$)

ANSWER: c

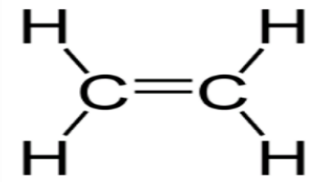
128. The energy released on the addition of an electron to an atom or a molecule is called _____.
   a. electron affinity
   b. ionization energy
   c. resonance energy
   d. delocalization

ANSWER: a

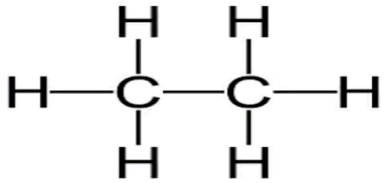
129. Which of the 3 structures shown below has the shortest bond length? Justify your answer.



1



2



3

ANSWER: Structure 1 has the shortest bond length. It is an alkyne that possesses *sp* hybrid orbitals. As the percent *s*-character of *sp* hybridized orbitals in alkynes is close to 50%, the bond length of the alkyne is the shortest. This is the reason the bonds are shorter and stronger.

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