

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
POINTS: 1
QUESTION TYPE: Multiple Choice
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2. How many electrons can the shell with a principal quantum number of 2 hold?

- a. 1
- b. 2
- c. 4
- d. 8

ANSWER: d
POINTS: 1
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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
POINTS: 1
QUESTION TYPE: Multiple Choice
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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

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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
POINTS: 1
QUESTION TYPE: Multiple Choice
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6. What is the ground-state electronic configuration of a sodium cation (sodium: atomic number 11)?

- a. $1s^2 2s^2 2p^6 3s^1$
- b. $1s^2 2s^2 2p^5 3s^1$
- c. $1s^2 2s^2 2p^6$
- d. $1s^2 2s^2 2p^6 3s^2$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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7. Which of the following species has an atom that has an unfilled valence shell of electrons?

- a. molecular hydrogen, H_2
- b. hydroxide anion, HO^-
- c. boron trifluoride, BF_3
- d. water, H_2O

ANSWER: c
POINTS: 1
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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

POINTS:

1

QUESTION TYPE:

Multiple Choice

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9. Which of the following species possesses a formal charge?

- a. BH_3
- b. BH_4
- c. CCl_4
- d. H_2S

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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10. Which of the following species possesses a formal charge?

- a. CCl_4
- b. SiCl_4
- c. AlCl_4
- d. PCl_3

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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11. Which of the following compounds is an aldehyde?

- a. $\text{CH}_3\text{CH}_2\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{CHO}$
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d. $\text{CH}_3\text{CH}_2\text{COCH}_3$

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ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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12. Which of the following compounds is an alcohol?

- a. $\text{CH}_3\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{OCH}_3$
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d. $\text{CH}_3\text{CH}_2\text{CHO}$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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13. Which of the following compounds is a carboxylic acid?

- a. $\text{CH}_3\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{OCH}_3$
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d. $\text{CH}_3\text{CH}_2\text{CHO}$

ANSWER: a
POINTS: 1
QUESTION TYPE: Multiple Choice
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14. Which of the following compounds is a ketone?

- a. $\text{CH}_3\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{CHO}$
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d. CH_3COCH_3

ANSWER: d
POINTS: 1
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15. Which of the following compounds is a ketone?

- a. $\text{CH}_3\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{CHO}$
- c. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$
- d. CH_3COCH_3

ANSWER:

d

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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

- a. $\text{CH}_3\text{CH}_2\text{COOH}$
- b. $\text{CH}_3\text{CH}_2\text{OCH}_3$
- c. $\text{CH}_3\text{CH}_2\text{COOCH}_3$
- d. $\text{CH}_3\text{CH}_2\text{COCH}_3$

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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17. Which of the following is a tertiary alcohol?

- a. $\text{CH}_3\text{CH}_2\text{OCH}_3$
- b. $(\text{CH}_3)_3\text{COH}$
- c. $(\text{CH}_3)_2\text{CHOH}$
- d. $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH}$

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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18. Which of the following is a tertiary amine?

- a. $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_3)_2$
- b. $(\text{CH}_3)_3\text{CNH}_2$

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- c. $\text{CH}_3\text{CH}_2\text{NHCH}_3$
- d. $\text{CH}_3\text{CH}_2\text{NHCH}(\text{CH}_3)_2$

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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19. Which of the following is a primary amine?

- a. $\text{CH}_3\text{CH}_2\text{NHCH}_3$
- b. $\text{CH}_3\text{CH}_2\text{NHCH}(\text{CH}_3)_2$
- c. $\text{CH}_3\text{CH}_2\text{N}(\text{CH}_3)_2$
- d. $(\text{CH}_3)_3\text{CNH}_2$

ANSWER:

d

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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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

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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21. Which of the following molecules is not linear?

- a. H_2O
- b. CO_2
- c. $\text{HC}\equiv\text{CH}$
- d. Cl_2

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

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22. What is the approximate value of the H–C–H bond angles in methane, CH₄?

- a. 90°
- b. 109°
- c. 120°
- d. 180°

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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23. What is the approximate C–C–C bond angle in propene, CH₃CH=CH₂?

- a. 90°
- b. 109°
- c. 120°
- d. 180°

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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24. What is the approximate C–C–C bond angle in propyne, HC≡CCH₃?

- a. 90°
- b. 109°
- c. 120°
- d. 180°

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
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25. What is the approximate H–C–O bond angle in formaldehyde, H₂C=O?

- a. 90°
- b. 109°

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- c. 120°
- d. 180°

ANSWER: c
POINTS: 1
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26. Which of the following elements has the highest electronegativity?

- a. N
- b. C
- c. O
- d. S

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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27. Which of the following elements has the highest electronegativity?

- a. C
- b. P
- c. Si
- d. Cl

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
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28. Which of the following bonds is the most polar?

- a. F-F
- b. H-F
- c. C-H
- d. C-Si

ANSWER: b
POINTS: 1
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29. Which of the following bonds is the most polar?

- a. O-H
- b. C-H
- c. C-C
- d. H-H

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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30. Which of the following bonds is a polar covalent bond?

- a. Na-F
- b. C-H
- c. C-O
- d. Cl-Cl

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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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

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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32. Which of the following is an ionic bond?

- a. Br-Br
- b. C-Cl
- c. C-S
- d. Na-O

ANSWER:

d

POINTS:

1

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33. Which of the following is an ionic bond?

- a. F-F
- b. C-H
- c. Li-O
- d. C-N

ANSWER: c
POINTS: 1

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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
POINTS: 1

QUESTION TYPE: Multiple Choice
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35. Which of the following bonds has the smallest dipole moment?

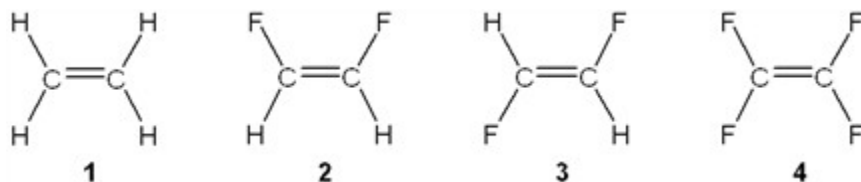
- a. Li-Cl
- b. C-H
- c. O-H
- d. H-Cl

ANSWER: b
POINTS: 1

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

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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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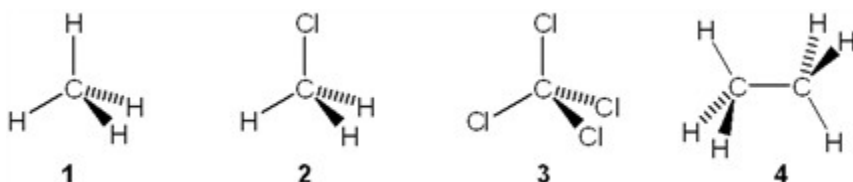
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37. Which of the following molecules has a molecular dipole moment?



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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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

- a. CO₂
b. BF₃
c. NH₃
d. CH₄

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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

- a. H_2O
- b. CO_2
- c. $\text{HC}\equiv\text{CH}$
- d. Cl_2

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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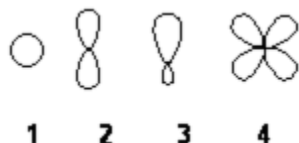
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40. Which of the following best represents the shape of the $2s$ atomic orbital of carbon?



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

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

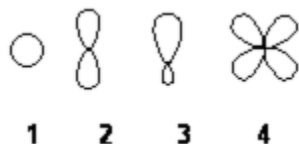
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41. Which of the following best represents the shape of a $2p$ atomic orbital of carbon?



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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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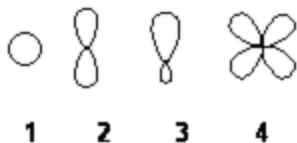
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42. Which of the following best represents an sp^2 hybridized atomic orbital of carbon which overlaps with the $1s$ atomic orbital of hydrogen to form a C-H σ bonding molecular orbital in ethene, $H_2C=CH_2$



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

ANSWER:

c

POINTS:

1

QUESTION TYPE:

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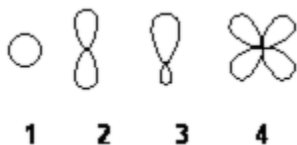
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43. Which of the following best represents an sp^3 hybridized atomic orbital containing the lone pair of electrons of ammonia, NH_3 ?



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

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

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False

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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. $C 2sp^3 + O 2sp$

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ANSWER: c
POINTS: 1
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45. Which atomic orbitals overlap to form the C–O bond of dimethyl ether, $(\text{CH}_3)_2\text{O}$?

- a. $\text{C } 2sp^3 + \text{O } 2sp^2$
- b. $\text{C } 2sp^2 + \text{O } 2p$
- c. $\text{C } 2sp^2 + \text{O } 2sp^2$
- d. $\text{C } 2sp^3 + \text{O } 2sp^3$

ANSWER: d
POINTS: 1
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46. What is the approximate value of the length of the C=C bond in ethane, $\text{CH}_2=\text{CH}_2$?

- a. 121 pm
- b. 134 pm
- c. 142 pm
- d. 154 pm

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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47. What is the approximate value of the length of the $\text{C}\equiv\text{C}$ bond in ethyne, $\text{HC}\equiv\text{CH}$?

- a. 121 pm
- b. 134 pm
- c. 142 pm
- d. 154 pm

ANSWER: a
POINTS: 1
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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
POINTS: 1
QUESTION TYPE: Multiple Choice
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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
- c. All resonance structures must have the same arrangement of atoms
- d. All resonance structures must have the same number of electrons

ANSWER: a
POINTS: 1
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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. The carbon atom bears the negative charge
- d. It is basic

ANSWER: c
POINTS: 1
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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
POINTS: 1
QUESTION TYPE: Multiple Choice

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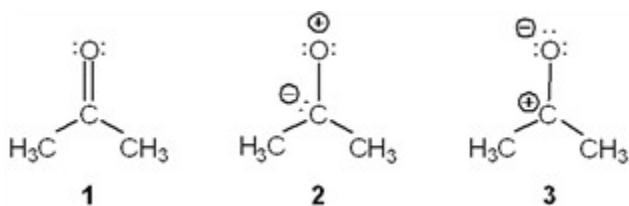
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52. Rank the following in order of decreasing importance as a contributing resonance structure to the molecular structure of acetone, CH_3COCH_3 (more important > less important)



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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

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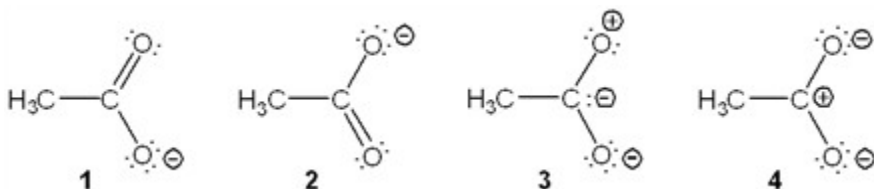
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53. Which of the following resonance structures is the least important contributor to the resonance hybrid of the acetate anion, CH_3COO^- ?



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

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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54. How many electrons are there in the valence shell of the carbon atom of a methyl cation, CH_3^+ ?

- a. 4
b. 5

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- c. 6
- d. 7

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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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
POINTS: 1
QUESTION TYPE: Multiple Choice
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56. How many electrons are there in the valence shell of the oxygen atom of water?

- a. 2
- b. 4
- c. 6
- d. 8

ANSWER: d
POINTS: 1
QUESTION TYPE: Multiple Choice
HAS VARIABLES: False
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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
POINTS: 1
QUESTION TYPE: Multiple Choice
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58. What is the approximate value of the H-C-H bond angles in a methyl cation, CH_3^+ ?

- a. 90°
- b. 109°
- c. 120°
- d. 180°

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

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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

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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60. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethane, CH_3CH_3 ?

- a. $\text{C}2p + \text{H}1s$
- b. $\text{C}2sp + \text{H}1s$
- c. $\text{C}2sp^2 + \text{H}1s$
- d. $\text{C}2sp^3 + \text{H}1s$

ANSWER:

d

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

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61. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethene, $\text{H}_2\text{C}=\text{CH}_2$?

- a. $\text{C}2p + \text{H}1s$
- b. $\text{C}2sp + \text{H}1s$
- c. $\text{C}2sp^2 + \text{H}1s$
- d. $\text{C}2sp^3 + \text{H}1s$

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ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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62. Which atomic orbitals overlap to form the carbon-carbon σ and π bonding molecular orbitals of ethene, $\text{H}_2\text{C}=\text{CH}_2$?

- a. $\text{C}2\text{sp}^3 + \text{C}2\text{sp}^3$, and $\text{C}2p + \text{C}2p$
- b. $\text{C}2\text{sp}^2 + \text{C}2\text{sp}^2$, and $\text{C}2\text{sp}^2 + \text{C}2\text{sp}^2$
- c. $\text{C}2\text{sp}^2 + \text{C}2\text{sp}^2$, and $\text{C}2p + \text{C}2p$
- d. $\text{C}2\text{sp}^3 + \text{C}2\text{sp}^3$, and $\text{C}2\text{sp}^2 + \text{C}2\text{sp}^2$

ANSWER: c
POINTS: 1
QUESTION TYPE: Multiple Choice
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63. Which atomic orbitals overlap to form the carbon-hydrogen σ bonding molecular orbitals of ethyne, $\text{HC}\equiv\text{CH}$?

- a. $\text{C}2p + \text{H}1s$
- b. $\text{C}2\text{sp} + \text{H}1s$
- c. $\text{C}2\text{sp}^2 + \text{H}1s$
- d. $\text{C}2\text{sp}^3 + \text{H}1s$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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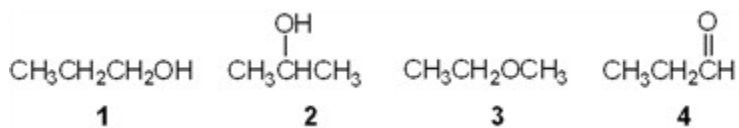
64. Which atomic orbitals overlap to form the carbon-carbon σ molecular bonding orbital of ethyne, $\text{HC}\equiv\text{CH}$?

- a. $\text{C}2p + \text{C}2p$
- b. $\text{C}2\text{sp} + \text{C}2\text{sp}$
- c. $\text{C}2\text{sp}^2 + \text{C}2\text{sp}^2$
- d. $\text{C}2\text{sp}^3 + \text{C}2\text{sp}^3$

ANSWER: b
POINTS: 1
QUESTION TYPE: Multiple Choice
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65. Which of the following is a primary (1°) alcohol?



- | | |
|----|----------|
| a. | 1 |
| b. | 2 |
| c. | 3 |
| d. | 4 |

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

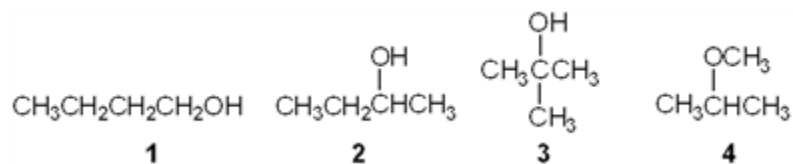
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66. Which of the following is a tertiary (3°) alcohol?



- | | |
|----|----------|
| a. | 1 |
| b. | 2 |
| c. | 3 |
| d. | 4 |

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

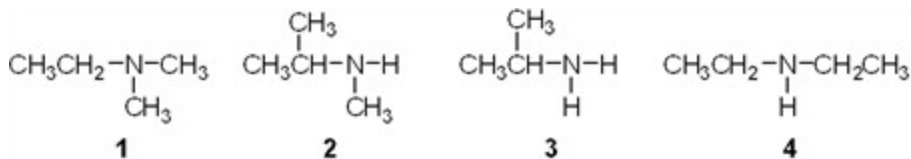
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67. Which of the following is a primary (1°) amine?



- | | |
|----|----------|
| a. | 1 |
| b. | 2 |
| c. | 3 |
| d. | 4 |

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ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

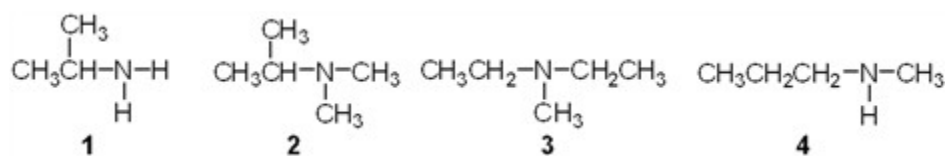
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68. Which of the following is a secondary (2°) amine?



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

ANSWER:

d

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

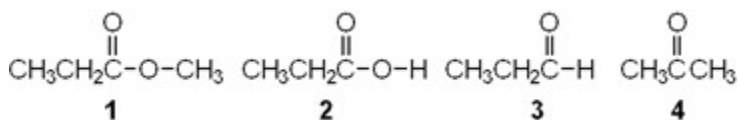
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69. Which of the following is a carboxylic ester?



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

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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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)

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ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

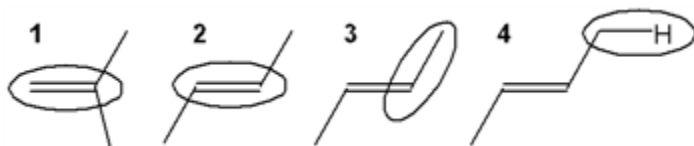
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71. Which of the circled bonds is the strongest?



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

ANSWER:

a

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

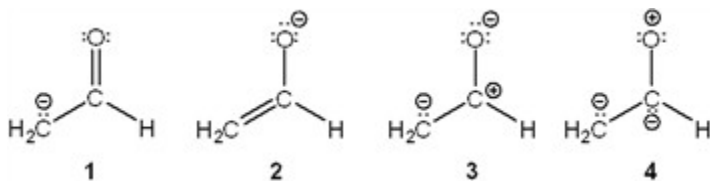
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72. Which of the following resonance structures makes the largest contribution to the structure of $[\text{H}_2\text{CCHO}]^-$?



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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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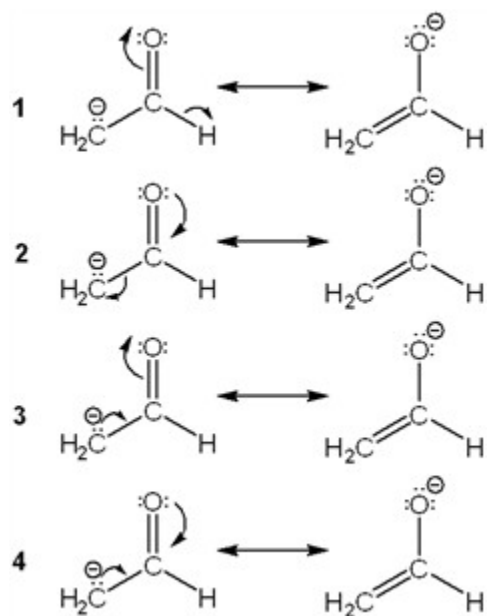
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73. Which of the following shows curved arrows that correctly accounts for the differences between the two structures?

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

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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74. Which of the following statements is not true?

- a. The sp^3C-H bond of an alkane is weaker than the $spC-H$ 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 $spC-H$ bond of an alkyne.

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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75. Which of the following is/are tetrahedral?

1. methane, CH_4
2. methyl carbocation, CH_3^+
3. methyl carbanion, CH_3^-

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4. methyl radical, $\text{CH}_3\cdot$

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

ANSWER:

b

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

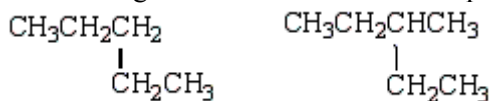
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76. The following two structural formulas represent isomers.



- a. True
- b. False

ANSWER:

False

POINTS:

1

QUESTION TYPE:

True / False

HAS VARIABLES:

False

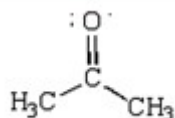
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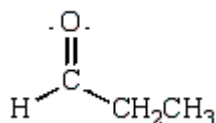
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77. Consider the following structural formula.



The following is a resonance structure.



- a. True
- b. False

ANSWER:

False

POINTS:

1

QUESTION TYPE:

True / False

HAS VARIABLES:

False

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



- a.
- b.

True
False

True

1

True / False

False

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ANSWER:

POINTS:

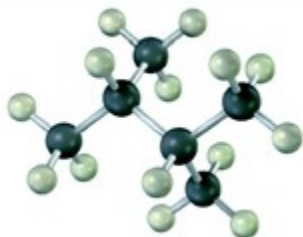
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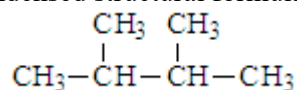
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79. Consider the following molecular model.



The condensed structural formula would be



- a.
- b.

True
False

True

1

True / False

False

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ANSWER:

POINTS:

QUESTION TYPE:

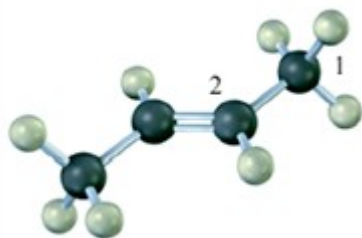
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80. The hybridization on the numbered carbon atoms in the following compound would be Carbon 1 sp^3 and Carbon 2 sp^2 .

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- a. True
b. False

ANSWER:

True

POINTS:

1

QUESTION TYPE:

True / False

HAS VARIABLES:

False

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

- a. True
b. False

ANSWER:

True

POINTS:

1

QUESTION TYPE:

True / False

HAS VARIABLES:

False

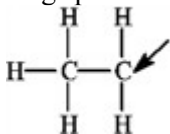
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82. The following species forms during an organic reaction.



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

- a. True
b. False

ANSWER:

True

POINTS:

1

QUESTION TYPE:

True / False

HAS VARIABLES:

False

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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

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ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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84. Consider the structure of urea given below.

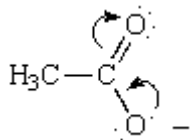


To complete the Lewis structure, six nonbonding electrons should be added, two to each of the nitrogen atoms and two to the oxygen atom.

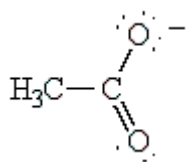
- a. True
b. False

ANSWER: False
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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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
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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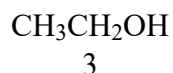
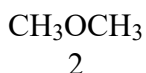
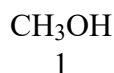
86. The maximum number of electrons that a molecular orbital can contain is four.

- a. True
b. False

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ANSWER: False
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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87. The following molecules all contain the same functional group except 2.



- a. True
b. False

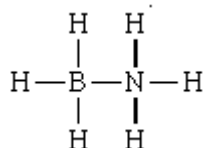
ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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88. The percent s character in an sp^2 hybridized orbital is approximately 33%.

- a. True
b. False

ANSWER: True
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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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
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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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
POINTS: 1
QUESTION TYPE: True / False
HAS VARIABLES: False
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91. Different compounds with the same molecular formula are called _____.

ANSWER: isomers
POINTS: 1
QUESTION TYPE: Completion
HAS VARIABLES: False
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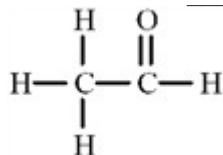
92. The formal charge on carbon in carbon monoxide is _____.

ANSWER: minus one
POINTS: 1
QUESTION TYPE: Completion
HAS VARIABLES: False
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93. The approximate H-C-H bond angle in methane is _____°.

ANSWER: 109.5
POINTS: 1
QUESTION TYPE: Completion
HAS VARIABLES: False
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94. The following molecule contains an _____ functional group.

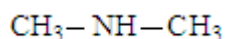


ANSWER: aldehyde
POINTS: 1

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QUESTION TYPE: Completion
HAS VARIABLES: False
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95. The following molecule is classified as a _____ amine.



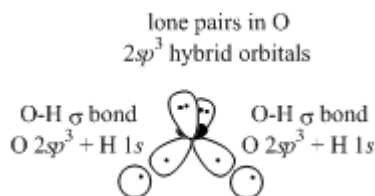
ANSWER: secondary
2°

POINTS: 1

QUESTION TYPE: Completion
HAS VARIABLES: False
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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:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

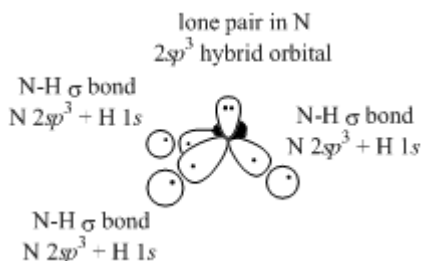
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97. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ammonia (NH_3) and which contain the lone pair of electrons. Label each orbital with its hybridization.

ANSWER:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

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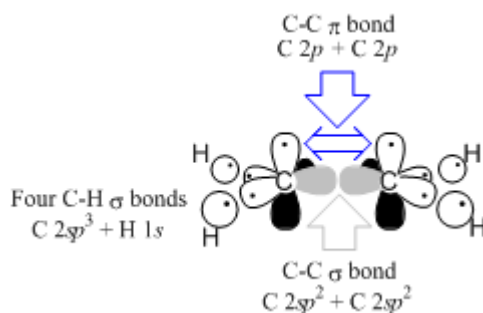
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98. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethene (ethylene,

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$\text{H}_2\text{C}=\text{CH}_2$). Label each bond (e.g., C–H σ bond) and indicate which atomic orbitals contribute to this bond (e.g., C $2sp^3$ + H $1s$).

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

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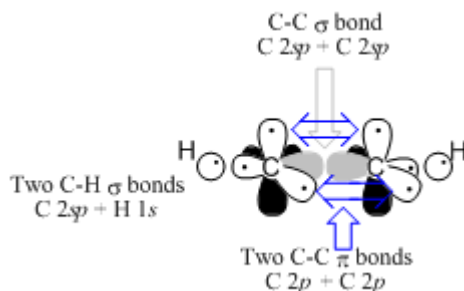
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99. Provide a neatly drawn figure to show the atomic orbitals that overlap to form each of the bonds in ethyne (acetylene, $\text{HC}\equiv\text{CH}$). Label each bond (e.g., C–H σ bond) and indicate which atomic orbitals contribute to this bond (e.g.,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

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

DATE CREATED:

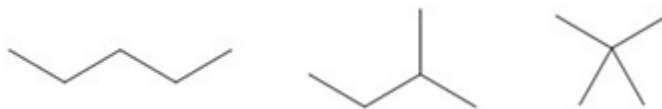
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100. Draw bond-line structures of all of the alkanes that have the formula C_5H_{12} .

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

DATE CREATED:

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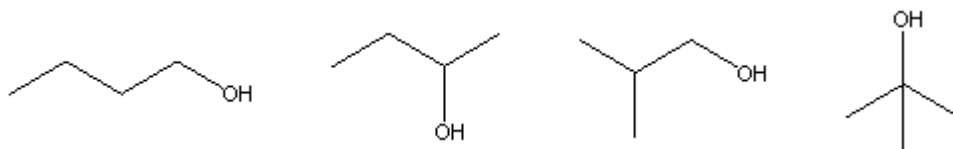
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101. Draw bond-line structures of all of the alcohols that have the formula $\text{C}_4\text{H}_{10}\text{O}$.

Chapter 01 - Covalent Bonding and Shapes of Molecules

ANSWER:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

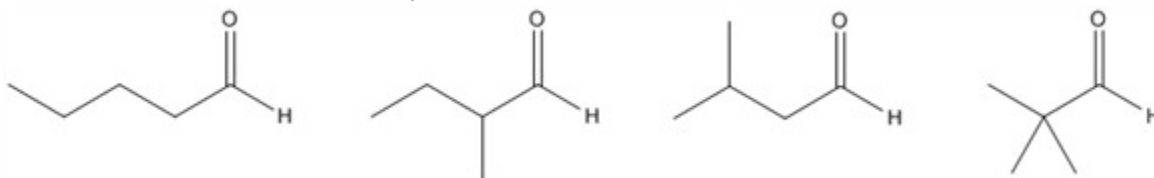
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102. Draw bond-line structures of all of the aldehydes that have the formula $C_5H_{10}O$.

ANSWER:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

TYPE:

HAS VARIABLES: False

LES:

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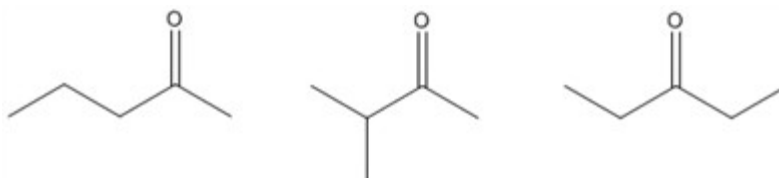
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103. Draw bond-line structures of all of the ketones that have the formula $C_5H_{10}O$.

ANSWER:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

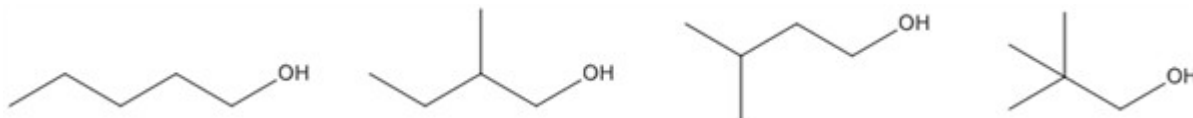
HAS VARIABLES: False

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

ANSWER:



POINTS: 1

QUESTION TYPE: Subjective Short Answer

TYPE:

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HAS VARIABLE False

LES:

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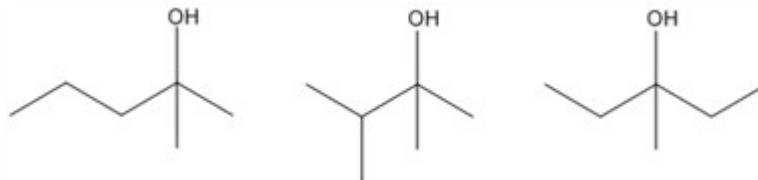
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105. Draw bond-line structures of all of the tertiary (3°) alcohols that have the formula C₆H₁₄O.

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

DATE CREATED:

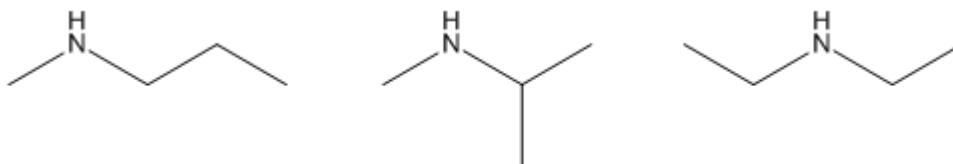
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106. Draw bond-line structures of all of the secondary (2°) amines that have the formula C₄H₉N.

ANSWER:



POINTS:

1

QUESTION TYPE: Subjective Short Answer

HAS VARIABLES: False

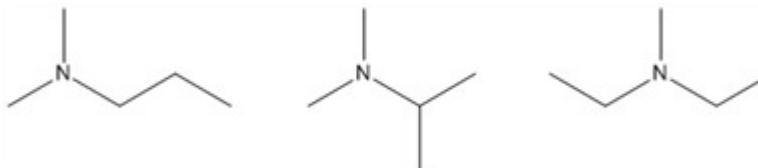
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107. Draw bond-line structures of all of the tertiary (3°) amines that have the formula C₅H₁₁N.

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

DATE CREATED:

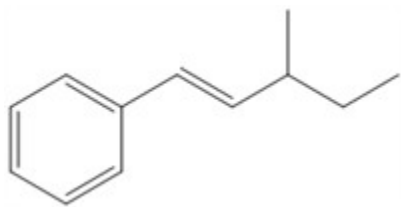
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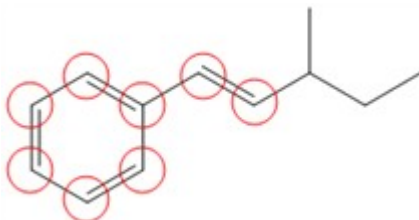
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108. Circle all of the sp^2 hybridized atoms in the following molecular structure.

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ANSWER:



POINTS:

QUESTION TYPE:

HAS VARIABLES:

DATE CREATED:

DATE MODIFIED:

1

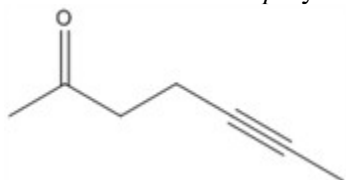
Subjective Short Answer

False

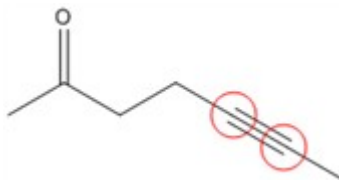
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109. Circle all of the sp hybridized atoms in the following molecular structure.



ANSWER:



POINTS:

QUESTION TYPE:

HAS VARIABLES:

DATE CREATED:

DATE MODIFIED:

1

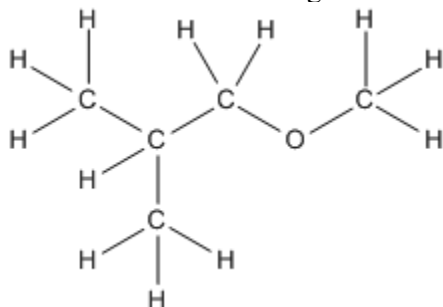
Subjective Short Answer

False

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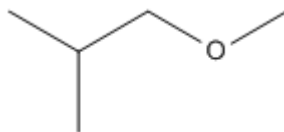
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110. Convert the following structure into a bond-line drawing.



Chapter 01 - Covalent Bonding and Shapes of Molecules

ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

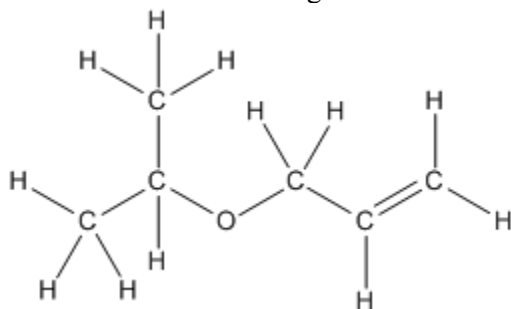
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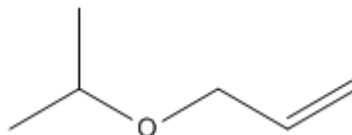
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111. Convert the following structure into a bond-line drawing.



ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

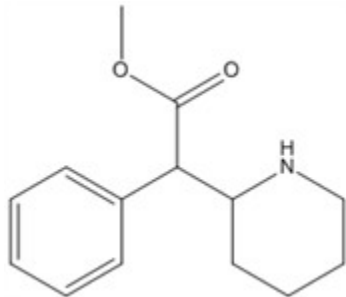
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112. What is the molecular formula of Ritalin, shown below?



ANSWER:

C₁₄H₁₉NO₂

POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

DATE CREATED:

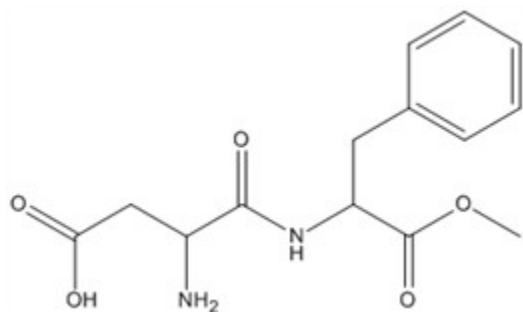
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113. What is the molecular formula of aspartame, shown below?

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ANSWER:

$C_{14}H_{18}N_2O_5$

POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

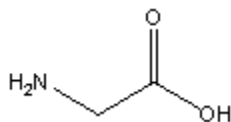
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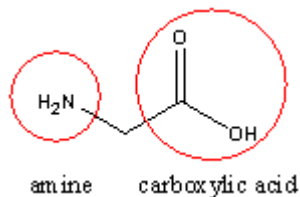
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114. Circle and name the functional groups in the following molecule.



ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

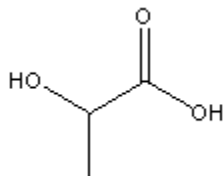
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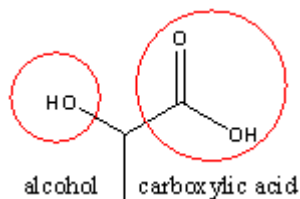
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115. Circle and name the functional groups in the following molecule.



ANSWER:



POINTS:

1

QUESTION TYPE:

Subjective Short Answer

HAS VARIABLES:

False

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Chapter 01 - Covalent Bonding and Shapes of Molecules

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Match the following compounds with their appropriate molecular geometry.

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

QUESTION TYPE:

Matching

HAS VARIABLES:

False

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116. Linear

ANSWER:

c

POINTS:

1

117. Tetrahedral

ANSWER:

a

POINTS:

1

118. Bent

ANSWER:

e

POINTS:

1

119. Trigonal Planar

ANSWER:

b

POINTS:

1

120. Trigonal Pyramidal

ANSWER:

d

POINTS:

1

Match the following compounds with their appropriate bond type.

- | | |
|---|------------------|
| a. $\text{H}_3\text{N} \rightarrow \text{BF}_3$ | b. HCl |
| c. KBr | d. CH_4 |

QUESTION TYPE:

Matching

HAS VARIABLES:

False

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121. Ionic Bond

ANSWER:

c

POINTS:

1

122. Dative Bond

ANSWER:

a

POINTS:

1

Chapter 01 - Covalent Bonding and Shapes of Molecules

123. Covalent Bond

ANSWER:

d

POINTS:

1

124. Polar Covalent Bond

ANSWER:

b

POINTS:

1

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.

ANSWER:

c

POINTS:

1

QUESTION TYPE:

Multiple Choice

HAS VARIABLES:

False

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126. How many resonating structures are shown by aniline?

- a. 3
- b. 4
- c. 5
- d. 6

ANSWER: c

POINTS: 1

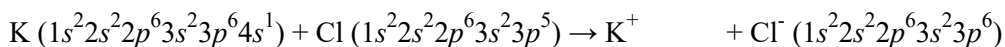
QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

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127. Fill the appropriate electronic configuration in the blank.



- 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

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

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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

POINTS: 1

QUESTION TYPE: Multiple Choice

HAS VARIABLES: False

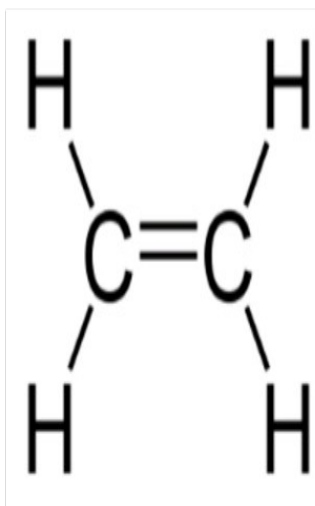
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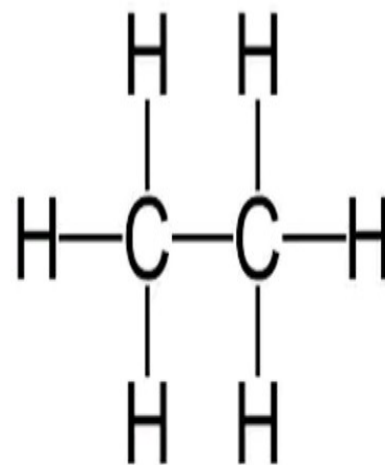
129. Which of the 3 structures shown below has the shortest bond length? Justify your answer.



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.

POINTS: 1

QUESTION Objective Short Answer

TYPE:

HAS VARIA False

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