Organic Chemistry 5th edition Klein Test Bank

SKU: 9781394189373-TEST-BANK

Organic Chemistry, 5e **(Klein)**
Chapter 1 A Review of General Chemistry: Electrons, Bonds, and Molecular Properties

1) Chemical reactions occur as a result of _____.
A) the attraction between opposite charges
B) the nucleus-nucleus interactions
C) the motion of electrons
D) similar atoms interacting
E) combining two chemicals
Answer: C
Diff: 1
Learning Objective: 1.1 Compare and contrast organic and inorganic compounds
Section: 1.1 Introduction to Organic Chemistry

2) From the following, identify the item which does not contain organic compounds.
A) medicine
B) socks
C) a plant
D) a coin
E) a plastic cup
Answer: D
Diff: 1
Learning Objective: 1.1 Compare and contrast organic and inorganic compounds
Section: 1.1 Introduction to Organic Chemistry

3) What is the difference between inorganic and organic compounds?
A) Organic compounds do not contain carbon.
B) Organic compounds contain carbon.
C) Organic compounds are without pesticides.
D) Inorganic compounds contain carbon.
E) Inorganic compounds are composed exclusively of transition metal elements.
Answer: B
Diff: 1
Learning Objective: 1.1 Compare and contrast organic and inorganic compounds
Section: 1.1 Introduction to Organic Chemistry

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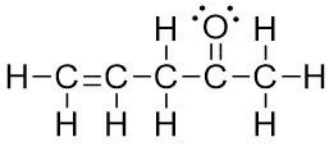
4) Of the following examples, which would be considered organic compounds?

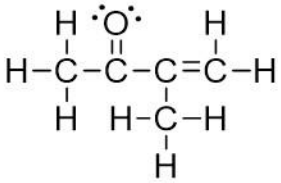
NaCl	CH_3Br	H_2O	CH_3OCH_3
I	II	III	IV

A) I and II
B) II and III
C) III and IV
D) I and III
E) II and IV
Answer: E
Diff: 1
Learning Objective: 1.1 Compare and contrast organic and inorganic compounds
Section: 1.1 Introduction to Organic Chemistry

5) Constitutional isomers do not differ in _____.
A) physical properties
B) atomic connectivity
C) molecular formula
D) name
E) chemical constitution
Answer: C
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

6) What is the relationship between the following compounds?

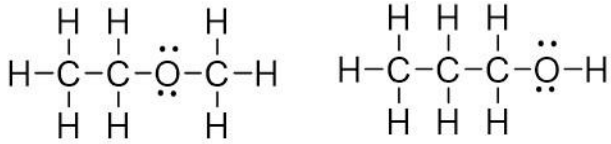




A) isotopes
B) constitutional isomers
C) the same structure
D) composed of different elements
E) There is no relationship.
Answer: B
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

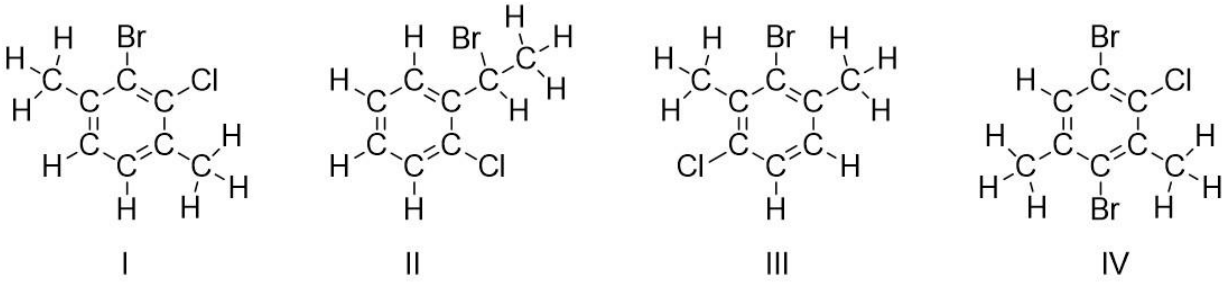
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7) What is the relationship between the following compounds?



A) resonance isomers
B) constitutional isomers
C) empirical isomers
D) isotopes
E) There is no relationship.
Answer: B
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

8) Which of the following compounds are constitutional isomers of each other?

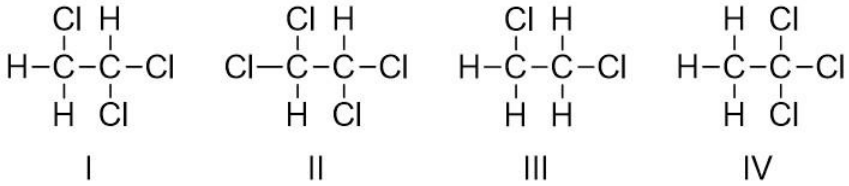


I II III IV

A) I and II
B) III and IV
C) I, II and IV
D) II, III and IV
E) I, II, and III
Answer: E
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

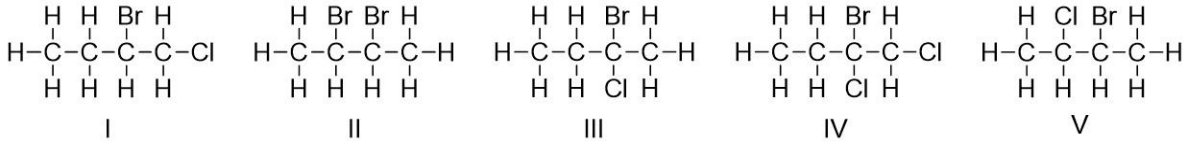
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9) Which of the following compounds are constitutional isomers of each other?



A) I and II
B) II and III
C) III and IV
D) I and IV
E) II and IV
Answer: D
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

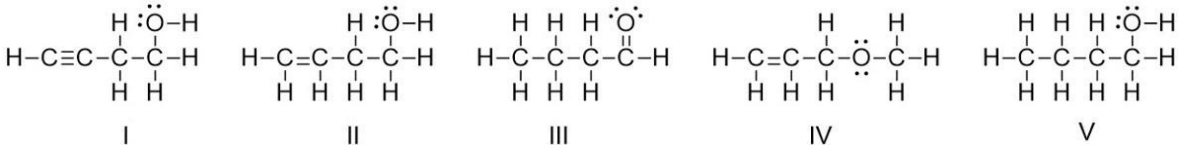
10) Identify three constitutional isomers having the molecular formula C_4H_8BrCl.



A) I, II, and III
B) II, III, and IV
C) III, IV, and V
D) I, III, and V
E) II, III, and V
Answer: D
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

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11) Identify three constitutional isomers having the molecular formula C_4H_8O.



I II III IV V

A) I, II, and III
B) II, III, and IV
C) III, IV, and V
D) I, II, and IV
E) II, III, and V
Answer: B
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

12) Constitutional isomers differ in _____.
A) physical properties
B) atomic connectivity
C) molecular formula
D) A and B
E) B and C
Answer: D
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

13) What is the relationship between the following compounds?



A) isotopes
B) constitutional isomers
C) the same structure
D) composed of different elements
E) no relationship
Answer: B
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

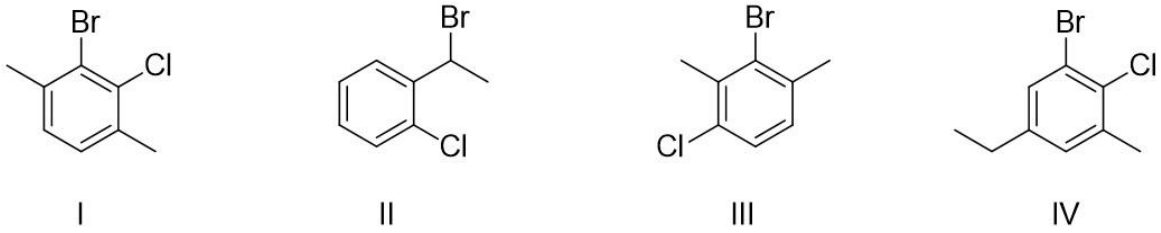
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14) What is the relationship between the following compounds?



A) resonance isomers
B) constitutional isomers
C) empirical isomers
D) isotopes
E) There is no relationship.
Answer: B
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

15) Which of the following compounds are constitutional isomers?

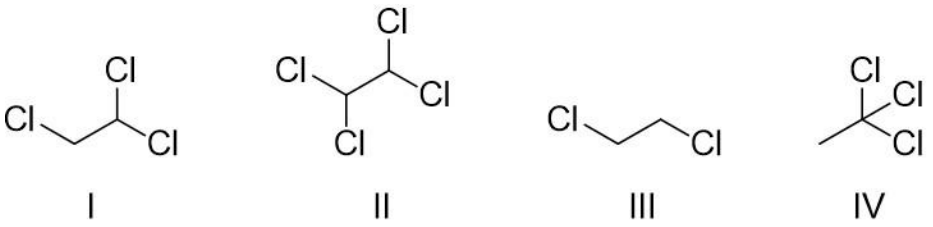


I II III IV

A) I and II
B) I and III
C) I, II and IV
D) II, III and IV
E) I, II, and III
Answer: E
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

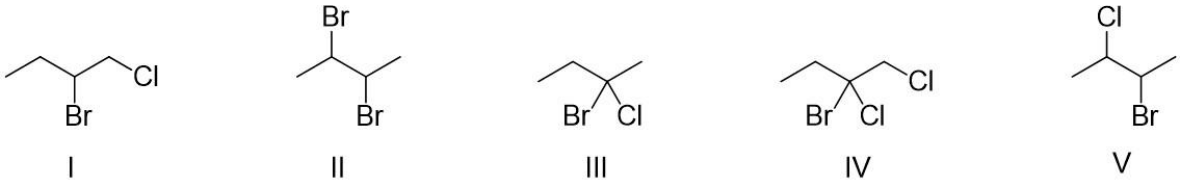
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16) Which of the following compounds are constitutional isomers of each other?



A) I and II
B) II and III
C) III and IV
D) I and IV
E) II and IV
Answer: D
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

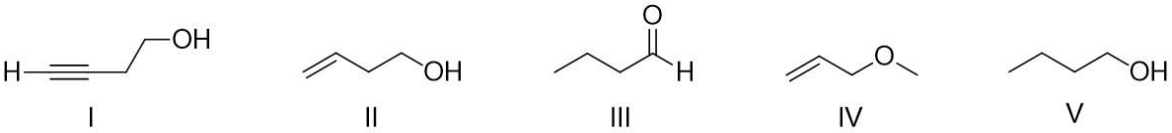
17) Identify three constitutional isomers having the molecular formula C_4H_8BrCl.



A) I, II, and III
B) II, III, and IV
C) III, IV, and V
D) I, III, and V
E) II, III, and V
Answer: D
Diff: 1
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

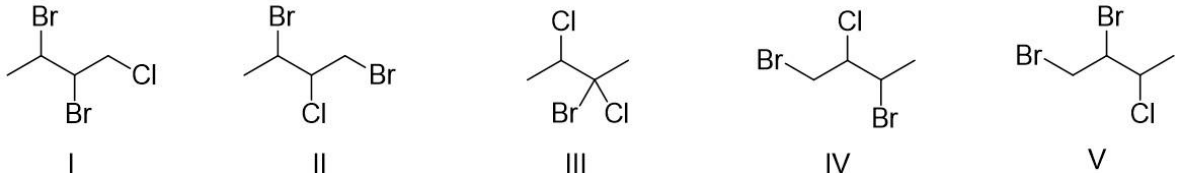
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18) Identify three constitutional isomers having the molecular formula C_4H_8O.



A) I, II, and III
B) II, III, and IV
C) III, IV, and V
D) I, II, and IV
E) II, III, and V
Answer: B
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

19) Which of the following represent identical molecules?



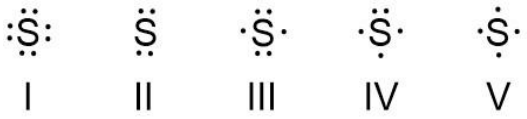
A) I and II
B) II and III
C) III and IV
D) IV and V
E) II and IV
Answer: E
Diff: 2
Learning Objective: 1.2 Describe structural theory of matter, molecular formula and structural formula
Section: 1.2 Constitutional Isomerism

20) Carbon is considered to be _____.
A) tetravalent
B) divalent
C) trivalent
D) monovalent
E) pentavalent
Answer: A
Diff: 1
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

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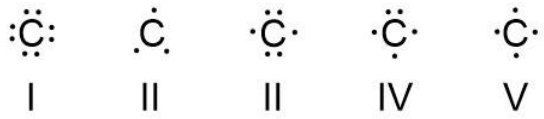
21) What force is *not* considered in the formation of a covalent bond?
A) force of attraction between positively charged nuclei and negatively charged electrons
B) force of attraction between negatively charged electrons
C) repulsion between positively charged nuclei and negatively charged electrons
D) the distance between the atoms' nuclei
Answer: C
Diff: 1
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

22) What is the correct Lewis dot structure for the sulfur atom, S?



A) I
B) II
C) III
D) IV
E) V
Answer: C
Diff: 1
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

23) What is the correct Lewis dot structure for the carbon atom, C?

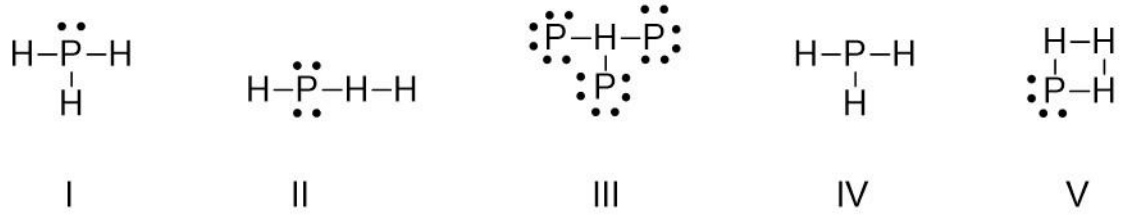


A) I
B) II
C) III
D) IV
E) V
Answer: E
Diff: 1
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

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24) What is the correct Lewis structure for the molecule shown in the box below?

PH_3

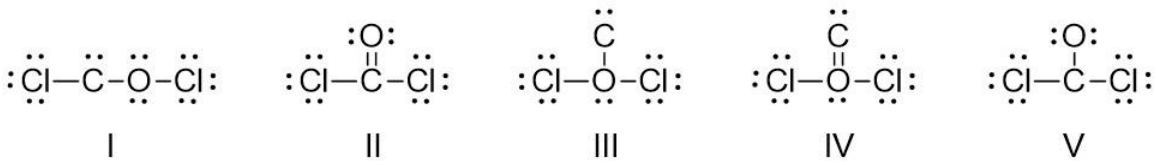


I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 1
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

25) What is the correct Lewis structure for the molecule shown in the box below?

$COCl_2$



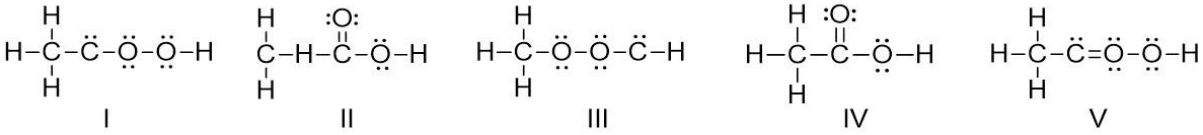
I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 2
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

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26) What is the correct Lewis structure for the molecule shown in the box below?

CH_3CO_2H



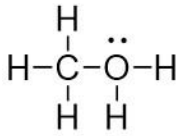
I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: D
Diff: 2
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

27) Which of the following compounds has two lone pairs on the central atom?
A) CO_2
B) SCl_2
C) NF_3
D) CS_2
E) SO_3
Answer: B
Diff: 2
Learning Objective: 1.3 Define covalent bond, valence electrons, octet rule, and lone pair
Section: 1.3 Electrons, Bonds, and Lewis Structures

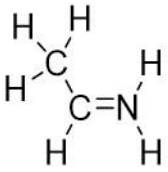
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28) What is the formal charge on oxygen in the following structure?



A) 2-
B) 1-
C) 2+
D) 1+
E) 0
Answer: D
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

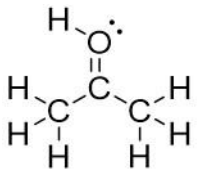
29) What is the formal charge on nitrogen in the following structure?



A) 2-
B) 1-
C) 2+
D) 1+
E) 0
Answer: D
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

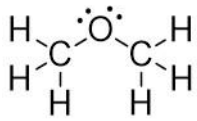
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30) What is the formal charge on oxygen in the following structure?



A) 0
B) 1+
C) 2+
D) 1-
E) 2-
Answer: B
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

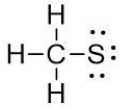
31) What is the formal charge on oxygen in the following structure?

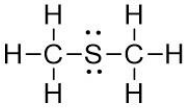


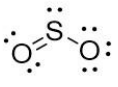
A) 2+
B) 2-
C) 1+
D) 1-
E) 0
Answer: E
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

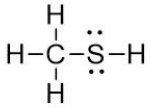
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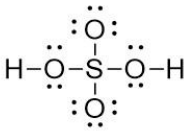
32) Which of the following structures have a formal charge of zero on the sulfur atom?


I


II

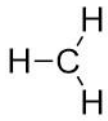

III

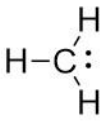

IV

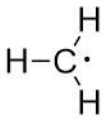

V

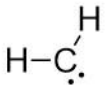
A) I and III
B) II and III
C) III and IV
D) I and IV
E) II and IV
Answer: E
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

33) Which of the following structures have a 1- formal charge on the carbon atom?


I


II

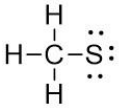

III


IV

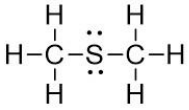
A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

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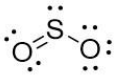
34) Which of the following structures have a 1+ formal charge on the sulfur atom?



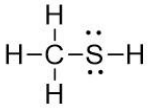
I



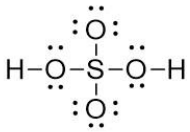
II



III



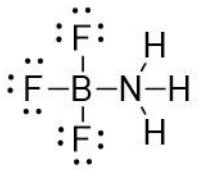
IV



V

A) I
B) II
C) III
D) IV
E) V
Answer: C
Diff: 1
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

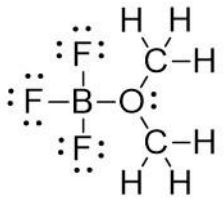
35) What are the formal charges on boron and nitrogen in the following structure?



A) B = 1+, N = 1+
B) B = 1+, N = 1-
C) B = 1-, N = 1-
D) B = 1-, N = 1+
E) B = 1-, N = 0
Answer: D
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

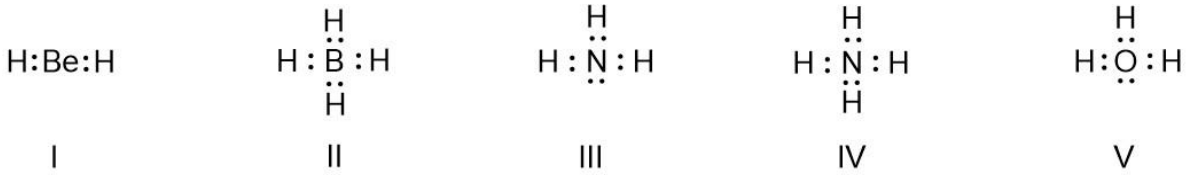
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36) What are the formal charges on boron and oxygen in the following structure?



A) B = 1-, O = 1-
B) B = 1-, O = 1+
C) B = 1+, O = 1+
D) B = 1+, O = 1-
E) B = 1-, O = 0
Answer: B
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

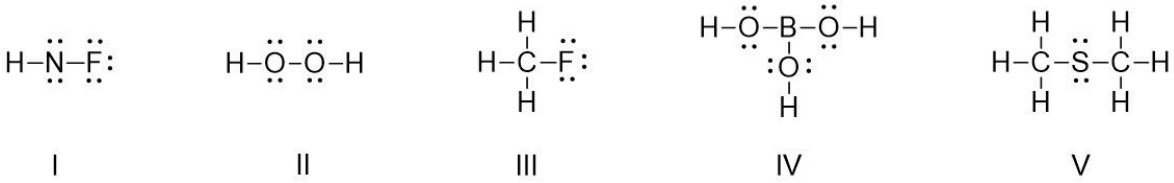
37) Which of the following structures have 1+ formal charge on the central atom?



A) I
B) II
C) III
D) III and V
E) IV and V
Answer: E
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

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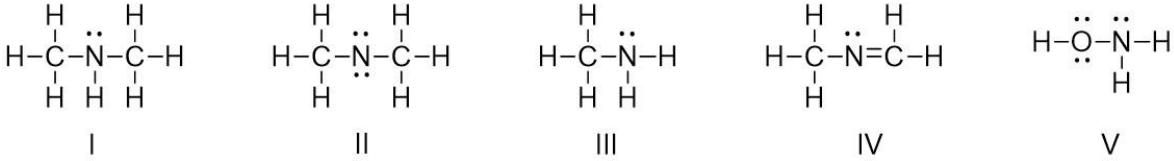
38) Which of the following structures have a formal charge on at least one atom?



I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

39) Which of the following structures have a 1- formal charge on the nitrogen atom?



I II III IV V

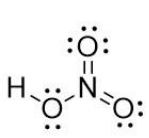
A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

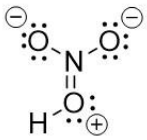
40) The bonding pattern of oxygen with a formal charge of 1- could be described as _____.
A) one lone pair of electrons and three single bonds
B) two lone pairs of electrons and two single bonds
C) three lone pairs of electrons, and one single bond
D) one lone pair of electrons, one single, and one double bond
E) zero lone pairs, and two single and one double bond
Answer: C
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

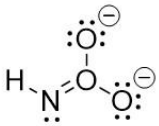
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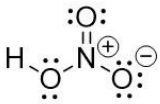
41) What is the correct Lewis structure for the molecule in the box, including the formal charge(s), if any?

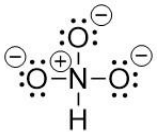
HNO_3


I


II


III

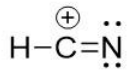

IV

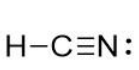

V

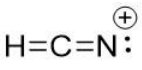
A) I
B) II
C) III
D) IV
E) V
Answer: D
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

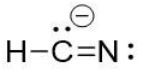
42) What is the correct Lewis structure for the molecule in the box, including the formal charge(s), if any?

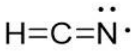
HCN


I


II


III


IV

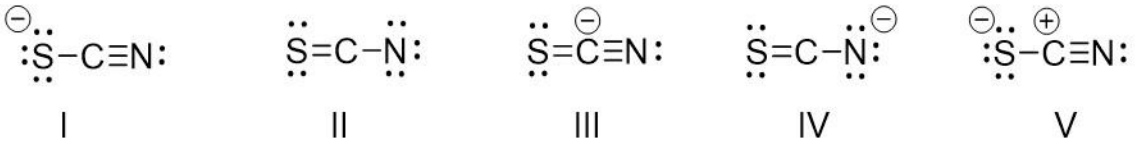

V

A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 3
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

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43) What is the correct Lewis structure for the molecule in the box, including the formal charge(s), if any?

[SCN]$^-$

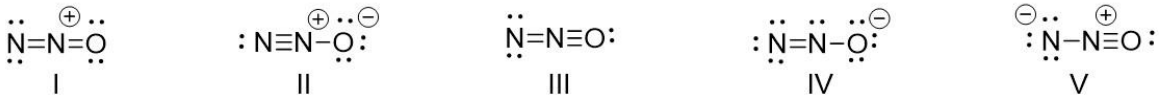


I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 3
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

44) What is the correct Lewis structure for the molecule in the box, including the formal charge(s), if any?

NO_2



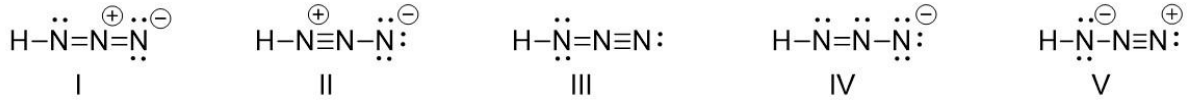
I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 3
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

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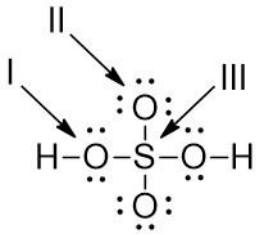
45) What is the correct Lewis structure for the molecule in the box, including the formal charge(s), if any?

HN_3



A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 3
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

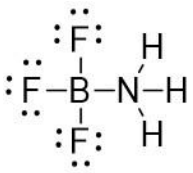
46) What are the formal charges on the atoms indicated for the following structure?



A) I = 0; II = 1+; III = 2+
B) I = 1-; II = 0; III = 1+
C) I = 1+; II = 1-; III = 2+
D) I = 1-; II = 1+; III = 1-
E) I = 0; II = 1-; III = 2+
Answer: E
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

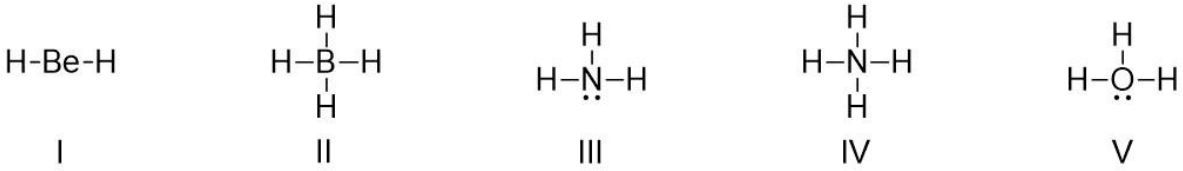
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47) What are the formal charges on fluorine and nitrogen in the following structure?



A) F = 1+, N = 1+
B) F = 0, N = 1-
C) F = 1-, N = 1-
D) F = 0, N = 1+
E) F = 1+, N = 1-
Answer: D
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

48) Which of the following have a 1+ formal charge on the central atom?



A) I
B) II
C) III
D) III and V
E) IV and V
Answer: E
Diff: 2
Learning Objective: 1.4 Define formal charge and describe how formal charge is calculated
Section: 1.4 Identifying Formal Charges

49) The electronegativity of elements on the periodic table tends to increase _____.
A) from left to right, top to bottom
B) from right to left, bottom to top
C) from left to right, bottom to top
D) from right to left, top to bottom
E) from upper right to lower left
Answer: C
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

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50) Which of the following is the least electronegative element?
A) B
B) C
C) N
D) O
E) F
Answer: A
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

51) Which of the following is the most electronegative element?
A) B
B) C
C) N
D) O
E) H
Answer: D
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

52) Which of the following is the least electronegative element?
A) P
B) N
C) Na
D) Si
E) K
Answer: E
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

53) Which of the following is the most electronegative element?
A) P
B) N
C) S
D) O
E) F
Answer: E
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

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54) What is the correct order of increasing electronegativity for Rb, F and O?
A) Rb < F < O
B) Rb < O < F
C) O < F < Rb
D) F < Rb < O
E) O < Rb < F
Answer: B
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

55) Which of the following series has the correct order of elements in increasing electronegativity?
A) C < N < B < Br
B) P < N < As < F
C) Li < B < N < F
D) Cl < Cs < C < Co
E) Be < B < Ba < Br
Answer: C
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

56) The Cl–Cl bond is best described as _____.
A) nonpolar covalent
B) polar covalent
C) ionic
D) coordinate covalent
E) none of the answer choices
Answer: A
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

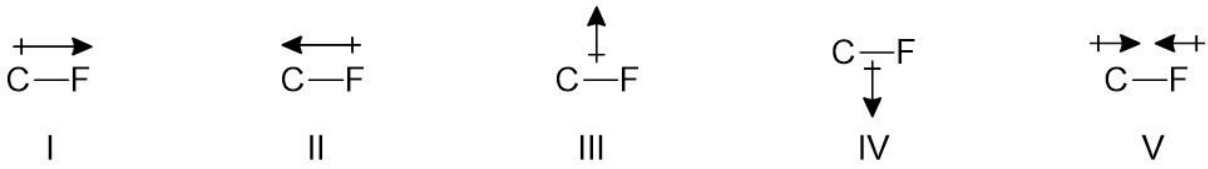
57) The C–Cl bond is best described as _____.
A) nonpolar covalent
B) polar covalent
C) ionic
D) coordinate covalent
E) none of the answer choices
Answer: B
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds
58) The bond that would form between a potassium and an oxygen atom is best described as

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_____.
A) nonpolar covalent
B) polar covalent
C) ionic
D) coordinate covalent
E) none of the answer choices
Answer: C
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

59) The bond between carbon and hydrogen is best described as _____.
A) nonpolar covalent
B) polar covalent
C) ionic
D) coordinate covalent
E) none of the answer choices
Answer: A
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

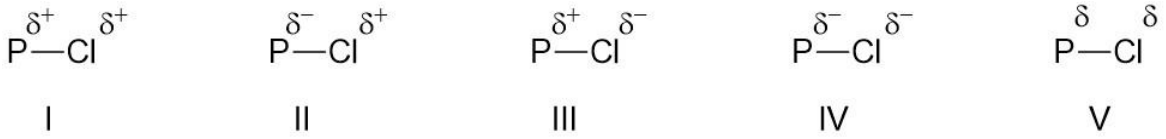
60) Which of the following is the correct depiction of the dipole moment for a C–F bond?



A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

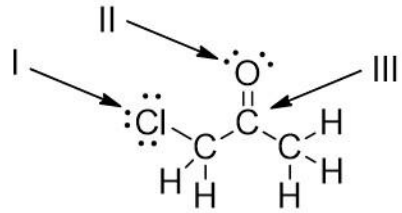
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61) Which of the following illustrates the correct placement of partial charges for a P–Cl bond?



A) I
B) II
C) III
D) IV
E) V
Answer: C
Diff: 1
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

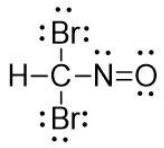
62) Which of the following is the correct representation of partial charges at the indicated atoms?



A) I = δ+; II = δ+; III = δ+
B) I = δ-; II = δ-; III = δ-
C) I = δ+; II = δ+; III = δ-
D) I = δ-; II = δ-; III = δ+
E) I = δ+; II = δ-; III = δ+
Answer: D
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

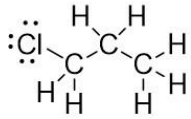
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63) Which atom has the largest δ+ in the following compound?



A) N
B) O
C) Br
D) H
E) C
Answer: E
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

64) Which of the following statements best describes the C–Cl bond in the following compound?



A) nonpolar; no dipole
B) polar; δ+ at carbon and δ- at chlorine
C) polar; δ- at carbon and δ+ at chlorine
D) polar; δ- at carbon and δ- at chlorine
E) ionic
Answer: B
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

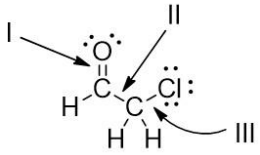
65) Which of the following compounds have both polar covalent and ionic bonds?
A) NH_4Br
B) H_2O_2
C) HCN
D) H_2S
E) CH_4
Answer: A
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

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66) For $NaOCH_3$, identify each bond as polar covalent, nonpolar covalent or ionic.

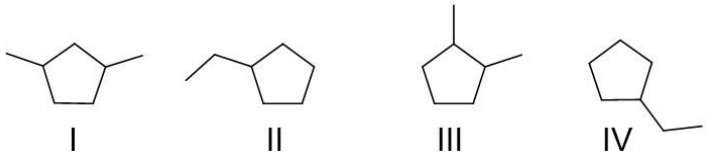
A) NaO = polar covalent; OC = polar covalent; CH = nonpolar covalent
B) NaO = ionic; OC = polar covalent; CH = nonpolar covalent
C) NaO = ionic; OC = ionic; CH = nonpolar covalent
D) NaO = polar covalent; OC = nonpolar covalent; CH = polar covalent
E) NaO = polar covalent; OC = nonpolar covalent; CH = nonpolar covalent
Answer: B
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

67) For the following compound, identify the polar covalent bond(s) from the options provided.



A) I and II
B) II and III
C) I and III
D) I only
E) II only
Answer: C
Diff: 2
Learning Objective: 1.5 Describe the relationship between electronegativity and covalent, polar covalent, and ionic bonds
Section: 1.5 Electronegativity and Polar Bonds

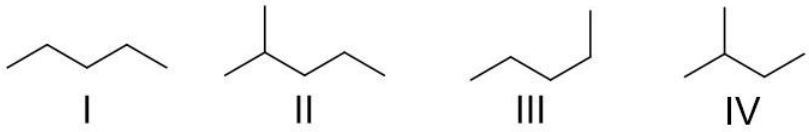
68) Which of the following bond-line structures are of the same compound?



A) I and II
B) II and III
C) III and IV
D) I and III
E) II and IV
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

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69) Which of the following bond-line structures represent the same compound?



A) I and II
B) II and III
C) III and IV
D) I and III
E) II and IV
Answer: D
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

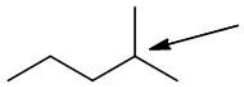
70) How many hydrogen atoms are connected to the indicated carbon atom?



A) one
B) two
C) three
D) four
E) none
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

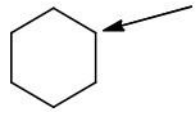
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71) How many hydrogen atoms are connected to the indicated carbon atom?



A) one
B) two
C) three
D) four
E) none
Answer: A
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

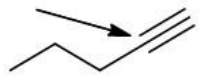
72) How many hydrogen atoms are connected to the indicated carbon atom?



A) one
B) two
C) three
D) four
E) none
Answer: B
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

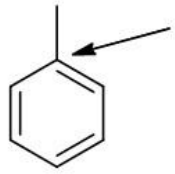
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73) How many hydrogen atoms are connected to the indicated carbon atom?



A) one
B) two
C) three
D) four
E) none
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

74) How many hydrogen atoms are connected to the indicated carbon atom?



A) one
B) two
C) three
D) four
E) none
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

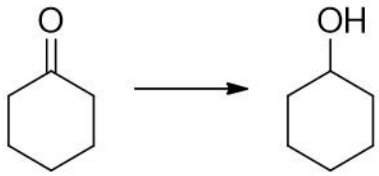
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75) For the following chemical reaction, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: D
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

76) For the following chemical reaction, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: B
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

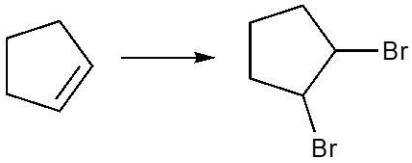
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77) For the following transformation, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

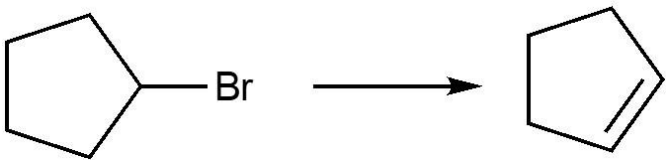
78) For the following equation, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: E
Diff: 1
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

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79) For the following equation, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: C
Diff: 2
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

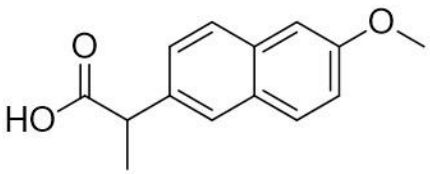
80) For the following equation, how many hydrogen atoms are added or lost?



A) one hydrogen atom added
B) two hydrogen atoms added
C) one hydrogen atom lost
D) two hydrogen atoms lost
E) no change in the number of hydrogen atoms
Answer: E
Diff: 2
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

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81) Naproxen, sold under the trade name Aleve, has the following structure. What is the molecular formula for naproxen?



A) $C_{13}H_{15}O_3$

B) $C_{14}H_{14}O_3$

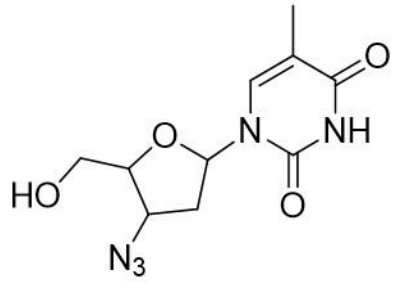
C) $C_{12}H_{16}O_3$

D) $C_{14}H_{16}O_3$

E) $C_{14}H_{18}O_3$

Answer: B
Diff: 2
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

82) AZT, used in the treatment of AIDS, has the following structure. What is the molecular formula for AZT?



A) $C_9H_{14}N_5O_4$

B) $C_9H_9N_5O_4$

C) $C_9H_{12}N_5O_4$

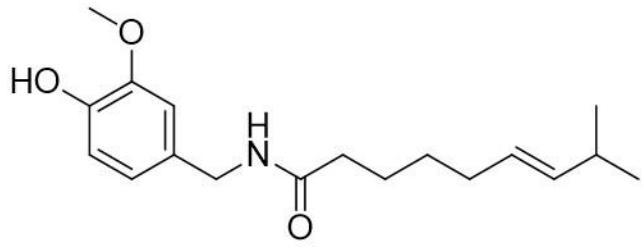
D) $C_{10}H_{13}N_5O_4$

E) $C_{11}H_{12}N_5O_4$

Answer: D
Diff: 2
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

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83) Capsaicin, found in peppers, has the following structure. What is the molecular formula for capsaicin?



A) $C_{18}H_{27}NO_3$

B) $C_{17}H_{25}NO_3$

C) $C_{18}H_{30}NO_3$

D) $C_{19}H_{27}NO_3$

E) $C_{18}H_{24}NO_3$

Answer: A
Diff: 2
Learning Objective: 1.6 Demonstrate how to read and draw bond-line structures through converting other styles of molecular representation into bond-line structures and vice versa
Section: 1.6 Reading Bond-Line Structures

84) Orbitals with the same energy are called _____.
A) quantum orbitals
B) atomic orbitals
C) antibonding orbitals
D) bonding orbitals
E) degenerate orbitals
Answer: E
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

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85) What is the letter designation for the following atomic orbital?



A) *s*
B) *p*
C) *d*
D) *f*
E) *g*
Answer: B
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

86) In quantum mechanics a node (nodal surface or plane) is the _____.
A) location where ψ is negative
B) location where ψ is positive
C) location where ψ^2 is positive
D) location where ψ^2 is negative
E) location where ψ is zero
Answer: E
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

87) Which of the following principle states that "Each orbital can accommodate a maximum of two electrons with opposite spin"?
A) Aufbau principle
B) Pauli exclusion principle
C) Hund's Rule
D) Heizenberg Uncertainty principle
E) Le Chatelier's principle
Answer: B
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

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88) Which of the following principle states "When orbitals of equal energy are available, every orbital gets one electron before any gets two electrons"?
A) Aufbau principle
B) Pauli exclusion principle
C) Hund's Rule
D) Heizenberg Uncertainty principle
E) Le Chatelier's principle
Answer: C
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

89) Which of the following represents the ground state electron configuration for a phosphorous atom?
A) $1s^2 2s^2 2p^6 3s^1 3p^4$
B) $1s^2 2s^2 2p^6 3s^2 3p^4$
C) $1s^2 2s^2 2p^6 3s^2 3p^3$
D) $1s^2 2s^2 2p^6 3s^2 3p^2$
E) $1s^2 2s^2 2p^6 3s^2 3p^5$
Answer: C
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

90) The atomic number for nitrogen is 7. Which of the following represents the ground state electron configuration for a nitrogen atom?
A) $1s^2 2s^1 2p^4$
B) $1s^2 2p^5$
C) $2s^2 2p^5$
D) $1s^2 2s^2 2p^3$
E) $1s^2 2s^2 3s^3$
Answer: D
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

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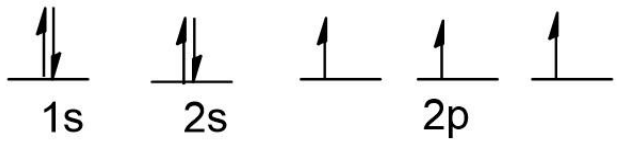
91) Which element has the ground state electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^5$?
A) oxygen
B) fluorine
C) sulfur
D) chlorine
E) bromine
Answer: D
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

92) Which element has the ground state electron configuration of $1s^2 2s^2 2p^6 3s^2 3p^4$?
A) Cl
B) S
C) P
D) Al
E) N
Answer: B
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

93) What is the electronic configuration for the magnesium ion with a 2+ charge?
A) $1s^2 2s^2 2p^6 3s^2$
B) $1s^2 2s^2 2p^6$
C) $1s^2 2s^2 2p^4$
D) $1s^2 2s^2 2p^6 3s^1$
E) $1s^2 2s^2 2p^6 3s^2 2p^2$
Answer: B
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

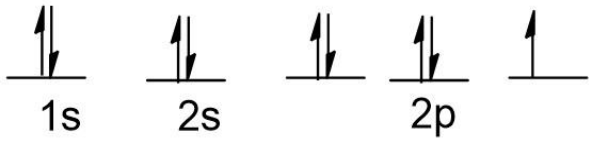
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94) Which element has the following electronic configuration?



A) boron
B) carbon
C) silicon
D) nitrogen
E) fluorine
Answer: D
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

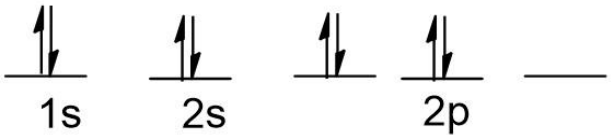
95) Which element has the following electronic configuration?



A) boron
B) carbon
C) silicon
D) nitrogen
E) fluorine
Answer: E
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

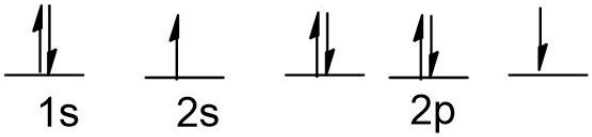
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96) The following ground state electron configuration violates _____.



A) the Aufbau principle
B) the Pauli Exclusion principle
C) Hund's Rule
D) Heisenberg's Uncertainty principle
E) none of these
Answer: C
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

97) The following ground state electron configuration violates _____.



A) the Aufbau principle
B) the Pauli Exclusion principle
C) Hund's Rule
D) Heisenberg's Uncertainty principle
E) none of these
Answer: A
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

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98) The following ground state electron configuration violates _____.



A) the Aufbau principle
B) the Pauli Exclusion principle
C) Hund's Rule
D) Heisenberg's Uncertainty principle
E) none of these
Answer: B
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

99) Ar, K^+, and Cl^- have equal numbers of electrons, and are considered isoelectronic. Select the correct ground state electron configuration for them.
A) $1s^2 2s^2 2p^6 3s^2 3p^6$
B) $1s^2 2s^2 2p^6 3s^6$
C) $1s^2 2s^2 2p^2 3s^2 3p^5$
D) $1s^2 2s^2 2p^6 3s^1 3p^6 4s^1$
E) $1s^2 2s^2 2p^6 3s^2 3p^2$
Answer: A
Diff: 2
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

100) Which of the following principle states "The lowest energy orbital is filled first"?
A) Aufbau principle
B) Pauli exclusion principle
C) Hund's Rule
D) Heizenberg Uncertainty principle
E) Le Chatelier's principle
Answer: A
Diff: 1
Learning Objective: 1.7 Describe the shape and phase of s and p atomic orbitals and the process of filling orbitals with electrons
Section: 1.7 Atomic Orbitals

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101) Constructive interference of waves results in _____.
A) a wave with smaller amplitude
B) a wave with larger amplitude
C) cancellation of both waves
D) formation of a node
E) cancellation of both waves and formation of a node
Answer: B
Diff: 1
Learning Objective: 1.8 Define a bond in terms of valence bond theory
Section: 1.8 Valence Bond Theory

102) Destructive interference of waves results in _____.
A) a wave with smaller amplitude
B) a wave with larger amplitude
C) cancellation of both waves
D) formation of a node
E) cancellation of both waves and formation of a node
Answer: E
Diff: 1
Learning Objective: 1.8 Define a bond in terms of valence bond theory
Section: 1.8 Valence Bond Theory

103) All single bonds can be classified as _____.
A) nonpolar covalent
B) polar covalent
C) ionic
D) sigma bonds
E) pi bonds
Answer: D
Diff: 1
Learning Objective: 1.8 Define a bond in terms of valence bond theory
Section: 1.8 Valence Bond Theory

104) Which bonding type has circular symmetry with respect to the bond axis?
A) sigma bond
B) pi bond
C) delta bond
D) covalent bond
E) ionic bond
Answer: A
Diff: 2
Learning Objective: 1.8 Define a bond in terms of valence bond theory
Section: 1.8 Valence Bond Theory

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105) Which best describes the difference between valence bond theory and molecular orbital (MO) theory?
A) Valence bond theory requires the linear combination of atomic orbitals.
B) MO theory requires the linear combination of atomic orbitals.
C) Valence bond theory considers only individual atomic orbitals.
D) Valence bond theory requires the linear combination of atomic orbitals and MO theory requires the linear combination of atomic orbitals.
E) MO theory requires the linear combination of atomic orbitals and valence bond theory considers only individual atomic orbitals.
Answer: E
Diff: 2
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

106) How many molecular orbitals are formed when the 1*s* orbitals of two hydrogen atoms combine to form a hydrogen molecule?
A) 1
B) 2
C) 3
D) 4
E) 5
Answer: B
Diff: 2
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

107) Which molecular orbitals are formed when the 1*s* orbitals of two hydrogen atoms combine to form a hydrogen molecule?
A) two bonding molecular orbitals
B) only one bonding molecular orbital
C) one bonding molecular orbital and one antibonding molecular orbital
D) two antibonding molecular orbitals
E) only one antibonding orbital
Answer: C
Diff: 2
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

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108) How are electrons distributed in the molecular orbitals when the 1*s* orbitals of two hydrogen atoms combine to form a hydrogen molecule?
A) two electrons in the bonding molecular orbital
B) one electron in the bonding molecular orbital, one electron in the non-bonding molecular orbital
C) one electron in the bonding molecular orbital, one electron in the antibonding molecular orbital
D) two electrons in the antibonding molecular orbital
E) two electrons in the non-bonding molecular orbital
Answer: A
Diff: 2
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

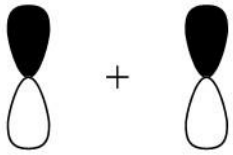
109) According to molecular orbital theory the highest energy molecular orbital that is occupied with an electron is referred to as _____.
A) degenerate
B) antibonding
C) the LCAO
D) the LUMO
E) the HOMO
Answer: E
Diff: 1
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

110) According to molecular orbital theory the lowest energy molecular orbital that is not occupied by an electron is referred to as _____.
A) degenerate
B) antibonding
C) the LCAO
D) the LUMO
E) the HOMO
Answer: D
Diff: 1
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

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111) Identify the incorrect statement in regards to the overlap of 1*s* atomic orbitals of two hydrogen atoms resulting in constructive interference.
A) A sigma bonding molecular orbital is formed.
B) The bonding molecular orbital formed is lower in energy than the 1*s* atomic orbital.
C) The bonding molecular orbital formed has a node between the atoms.
D) The bonding molecular orbital formed has circular symmetry.
E) A maximum of two electrons may occupy the bonding molecular orbital.
Answer: C
Diff: 3
Learning Objective: 1.9 Compare and contrast molecular orbital theory and valence bond theory, molecular orbitals and atomic orbitals, and bonding MOs and antibonding MOs
Section: 1.9 Molecular Orbital Theory

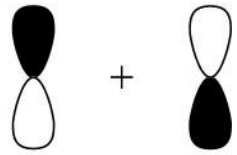
112) Interaction of the following two atomic orbitals in the orientation shown results in what kind of molecular orbital?



A) A sigma bonding molecular orbital is formed.
B) A pi bonding molecular orbital is formed.
C) A sigma antibonding molecular orbital is formed.
D) A pi antibonding molecular orbital is formed.
E) Destructive interference occurs so no molecular orbital is formed.
Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

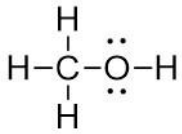
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113) Interaction of the following two atomic orbitals results in what kind of molecular orbital, in the orientation shown?



A) A sigma bonding molecular orbital is formed.
B) A pi bonding molecular orbital is formed.
C) A sigma antibonding molecular orbital is formed.
D) A pi antibonding molecular orbital is formed.
E) Constructive interference occurs so no molecular orbital is formed.
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

114) What is the hybridization of the oxygen atom in the following compound?



A) sp
B) sp^2
C) sp^3
D) sp^{3d}
E) s^{2p}
Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

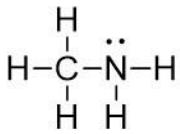
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115) What is the hybridization of the carbon atom in CO_2?

A) sp
B) sp^2
C) sp^3
D) sp^{3d}
E) s^{2p}

Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

116) What is the hybridization of the nitrogen atom in the following compound?

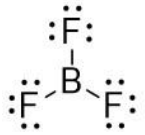


A) sp
B) sp^2
C) sp^3
D) sp^{3d}
E) s^{2p}

Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

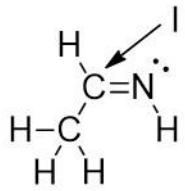
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117) What is the hybridization of the boron atom in the following compound?



A) *sp*
B) sp^2
C) sp^3
D) sp^{3d}
E) s^{2p}
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

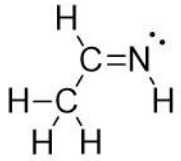
118) What is the hybridization of the carbon (I) atom in the following compound?



A) *sp*
B) sp^2
C) sp^3
D) sp^{3d}
E) sp^{3d2}
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

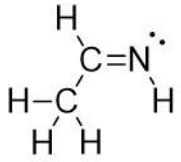
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119) What is the hybridization of the nitrogen atom in the following compound?



A) *sp*
B) sp^2
C) sp^3
D) sp^4
E) s^2p
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

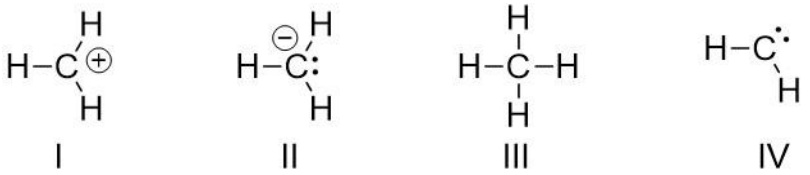
120) The lone pair of electrons on the nitrogen atom in the following compound are located in which atomic orbital?



A) sp^2
B) sp^3
C) *sp*
D) *s*
E) *p*
Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

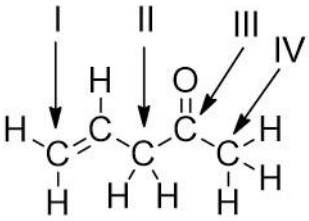
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121) Which of the following structures have a carbon atom with sp^2 hybridization?



A) I and II
B) III and IV
C) I and III
D) II and IV
E) I and IV
Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

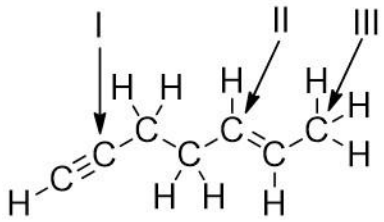
122) Which of the indicated carbon atoms are sp^2 hybridized?



A) I and II
B) III and IV
C) II and III
D) I and III
E) II and IV
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

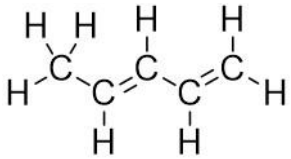
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123) What is the correct hybridization for the indicated carbon atoms in the following compound?



A) I = sp^3, II = sp^2, III = sp
B) I = sp^2, II = sp, III = sp^2
C) I = sp, II = sp^2, III = sp^3
D) I = sp, II = sp^2, III = sp
E) I = sp^2, II = sp^3, III = sp^2
Answer: C
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

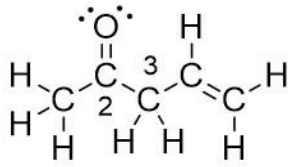
124) How many s–sp^2 sigma bonds are in the following compound?



A) 2
B) 3
C) 4
D) 5
E) 6
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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125) The C2–C3 bond in the following compound results from the overlap of which orbitals?



A) sp–sp^2

B) sp–sp^3

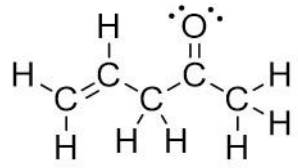
C) sp^2–sp^2

D) sp^2–sp^3

E) sp^3–sp^2

Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

126) The sigma bond in the C=C in the following compound results from the overlap of which orbitals?



A) sp–sp^2

B) sp–sp^3

C) sp^2–sp^2

D) sp^2–sp^3

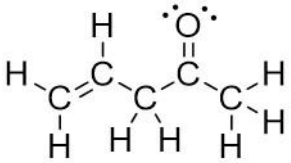
E) sp^3–sp^2

Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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127) The C–C sigma bond in ethyne (H–C≡C–H) results from the overlap of which orbitals?
A) *sp*–*sp*
B) *sp*–sp^3
C) sp^2–sp^2
D) *sp*–*s*
E) *p*–*p*
Answer: A
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

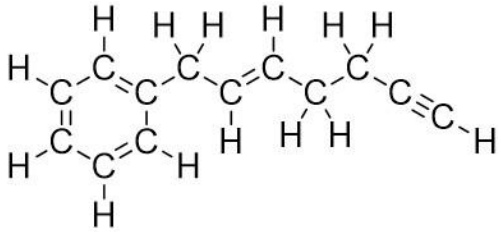
128) How many pi bonds are present in the following compound?



A) one
B) two
C) three
D) four
E) five
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

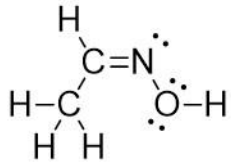
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129) How many pi bonds are present in the following compound?



A) two
B) three
C) four
D) five
E) six
Answer: E
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

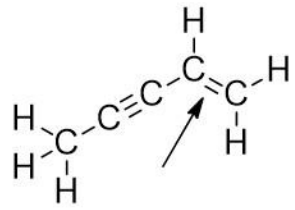
130) The sigma bond that is part of C=N in the following compound results from the overlap of which orbitals?



A) sp^2–sp^2
B) sp–sp
C) sp^2–sp^3
D) sp^3–sp^3
E) sp^3–sp^2
Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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131) The bonds of the alkene functional group indicated by the arrow in the following compound results from the overlap of which orbitals?



A) sp^2–sp^2

B) sp^3–sp^3

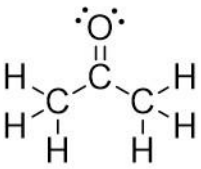
C) p–p

D) both sp^2–sp^2 and sp^3–sp^3

E) both sp^2–sp^2 and p–p

Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

132) Which orbitals are involved in the C–O sigma bond in acetone, shown below?



A) C_{sp^2}–O_{sp^2}

B) C_{sp^3}–O_{sp^3}

C) C_{sp}–O_{sp}

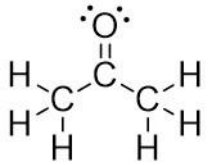
D) C_p–O_p

E) C_{sp}–O_p

Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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133) Which of the following best describes the orbitals involved in the formation of the C=O bond in acetone, shown below?



A) σ = Csp^2 - Osp^2 and π = Csp^2 - Osp^2

B) σ = Csp^2 - Osp^2 and π = C_p - O_p

C) σ = Csp^3 - Osp^2 and π = C_p - O_p

D) σ = C_p - O_p and π = Csp^2 - Osp^2

E) σ = C_{sp} - O_{sp} and π = C_p - O_p

Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

134) The C–H bond in the methyl cation, CH_3^+, results from the overlap of which orbitals?

A) sp^3–sp^2

B) sp^3–s

C) sp^2–s

D) sp^3–p

E) p–s

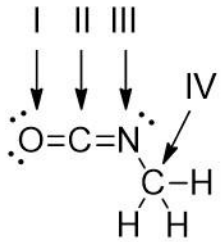
Answer: C
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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135) The lone pair of electrons in the methyl anion, CH_3^-, resides in which orbital?

A) s^2
B) p
C) sp
D) sp^3
E) sp^2
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

136) What is the hybridization of the indicated atoms in the following compound?

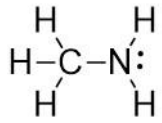


A) I = sp; II = sp^2; III = sp^3; IV = sp^2
B) I = sp^2; II = sp; III = sp^2; IV = sp^3
C) I = sp^3; II = sp^2; III = sp; IV = sp^2
D) I = sp^2; II = sp^3; III = sp^2; IV = sp
E) I = sp^2; II = sp^2; III = sp^2; IV = sp^3
Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

137) The carbon and oxygen atoms in carbon monoxide are connected by which type of bond(s)?
A) a sigma (σ) bond
B) two sigma (σ) bonds
C) a pi (π) bond
D) two pi (π) bonds
E) both a sigma (σ) bond and two pi (π) bonds
Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

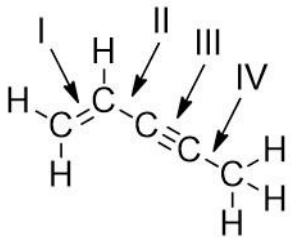
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138) The N–H bond in the following compound is a _____ and is formed from the _____.



A) σ bond; sp^2 – s orbital overlap
B) σ bond; sp^3 – s orbital overlap
C) π bond; sp^3 – s orbital overlap
D) π bond; sp^2 – p orbital overlap
E) π bond; p – p orbital overlap
Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

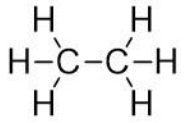
139) Identify the shortest bond in the following compound.



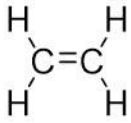
A) I
B) II
C) III
D) IV
E) I and III have the same length
Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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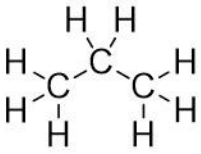
140) Which of the following compounds has the shortest carbon-carbon bond?



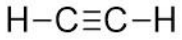
I



II



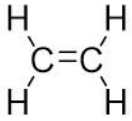
III



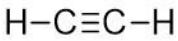
IV

A) I
B) II
C) III
D) IV
E) All the carbon bonds are equal in length.
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

141) Which of the statements best describes the carbon-carbon bond length and strength for the following compounds?



I

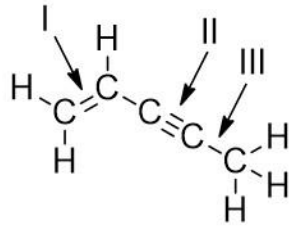


II

A) The shortest and strongest bond is found in compound I.
B) The shortest and strongest bond is found in compound II.
C) The shortest and weakest bond is found in compound I.
D) The shortest and weakest bond is found in compound II.
E) The shortest bond is found in compound I and the weakest bond in compound II.
Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

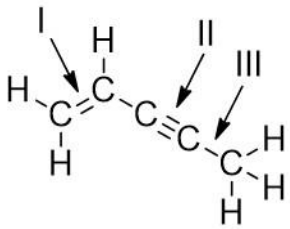
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142) Identify the longest C–C bond(s) in the following compound.



A) I
B) II
C) III
D) I and III
E) I and II
Answer: C
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

143) Rank the indicated C–C bonds in order of increasing bond length.



A) I < II < III
B) II < III < I
C) III < I < II
D) II < I < III
E) I < III < II
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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144) Identify the compound with the strongest carbon – nitrogen bond.
A) $CH_3CH_2CH{=}NH$

B) $CH_3CH_2NH_2$

C) $CH_3CH_2C{\equiv}N$

D) $(CH_3)_3N$

E) The strength of the carbon-nitrogen bonds are the same.
Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

145) Identify the compound with the longest carbon – nitrogen bond.
A) $CH_3CH_2CH{=}NH$

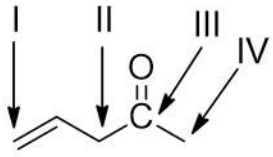
B) $CH_3CH_2NH_2$

C) $CH_3CH_2C{\equiv}N$

D) $CH_3CH{=}NCH_3$

E) The length of all the carbon-nitrogen bonds are the same.
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

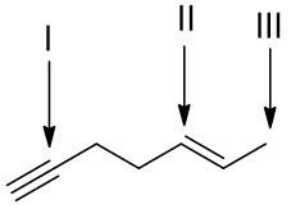
146) Which of the indicated carbon atoms in the following compound are sp^2 hybridized?



A) I and II
B) III and IV
C) II and III
D) I and III
E) II and IV
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

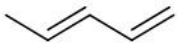
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147) What is the hybridization for each of the indicated carbon atoms in the following compound?



A) I = sp^3, II = sp^2, III = sp
B) I = sp^2, II = sp, III = sp^2
C) I = sp, II = sp^2, III = sp^3
D) I = sp, II = sp^2, III = sp
E) I = sp^2, II = sp^3, III = sp^2
Answer: C
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

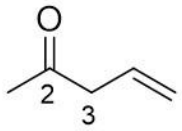
148) How many s–sp^2 sigma bonds are in the following compound?



A) 2
B) 3
C) 4
D) 5
E) 6
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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149) The C_2–C_3 bond in the following compound results from the overlap of which orbitals?



A) sp–sp^2

B) sp–sp^3

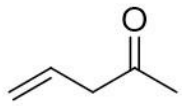
C) sp^2–sp^2

D) sp^2–sp^3

E) sp^3–sp^2

Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

150) The sigma bond that is part of C=C in the following compound results from the overlap of which orbitals?



A) sp–sp^2

B) sp–sp^3

C) sp^2–sp^2

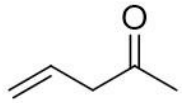
D) sp^2–sp^3

E) sp^3–sp^2

Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

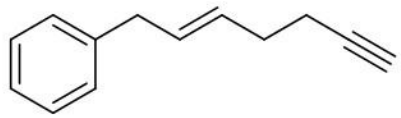
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151) How many pi bonds are present in the following compound?



A) one
B) two
C) three
D) four
E) five
Answer: B
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

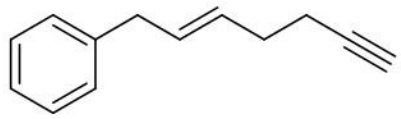
152) How many pi bonds are present in the following compound?



A) two
B) three
C) four
D) five
E) six
Answer: E
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

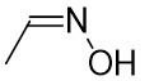
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153) How many sigma bonds are present in the following compound?



A) 20
B) 22
C) 24
D) 25
E) 27
Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

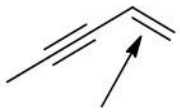
154) The sigma bond that is part of C=N in the following compound results from the overlap of which orbitals?



A) sp^2–sp^2
B) sp–sp
C) sp^2–sp^3
D) sp^3–sp^3
E) sp^3–sp^2
Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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155) The bonds indicated by the arrow in the following compound results from the overlap of which orbitals?



A) sp^2–sp^2

B) sp^3–sp^3

C) p–p

D) both sp^2–sp^2 and sp^3–sp^3

E) both sp^2–sp^2 and p–p

Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

156) Which orbitals are involved in the C–O sigma bond in acetone, shown below?



A) C_{sp^2}–O_{sp^2}

B) C_{sp^3}–O_{sp^3}

C) C_{sp}–O_{sp}

D) C_p–O_p

E) C_{sp}–O_p

Answer: A
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

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157) Which of the following best describes the orbitals involved in the formation of the C=O bond in acetone, shown below?



A) $\sigma = C_{sp^2} - O_{sp^2}$ and $\pi = C_{sp^2} - O_{sp^2}$

B) $\sigma = C_{sp^2} - O_{sp^2}$ and $\pi = C_p - O_p$

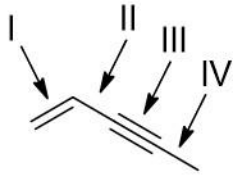
C) $\sigma = C_{sp^3} - O_{sp^2}$ and $\pi = C_p - O_p$

D) $\sigma = C_p - O_p$ and $\pi = C_{sp^2} - O_{sp^2}$

E) $\sigma = C_{sp} - O_{sp}$ and $\pi = C_p - O_p$

Answer: B
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

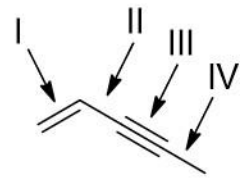
158) Identify the shortest bond in the following compound.



A) I
B) II
C) III
D) IV
E) I and III are of equal length
Answer: C
Diff: 1
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

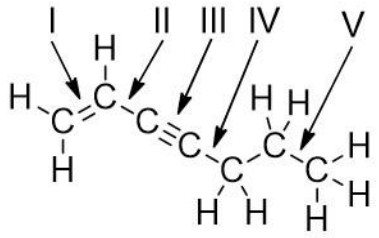
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159) Identify the longest C–C bond(s) in the following compound.



A) I
B) II
C) III
D) IV
E) II and IV are of equal length.
Answer: D
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

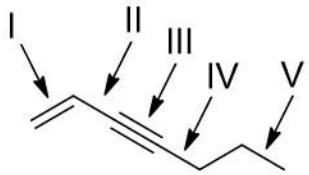
160) Identify the longest C–C bond(s) in the following compound.



A) I
B) II
C) III
D) IV
E) V
Answer: E
Diff: 2
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

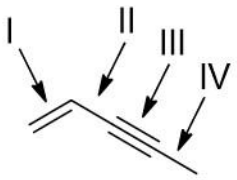
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161) Identify the longest C–C bond(s) in the following compound.



A) I
B) II
C) III
D) IV
E) V
Answer: E
Diff: 3
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

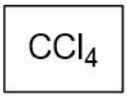
162) Rank the indicated C–C bonds in increasing order of bond length.



A) I < II < III < IV
B) II < IV < III < I
C) III < I < IV < II
D) III < I < II < IV
E) IV < II < I < III
Answer: D
Diff: 3
Learning Objective: 1.10 Explain how pi bonds and sp3, sp2, and sp hybrid orbital sets are formed
Section: 1.10 Hybrid Atomic Orbitals

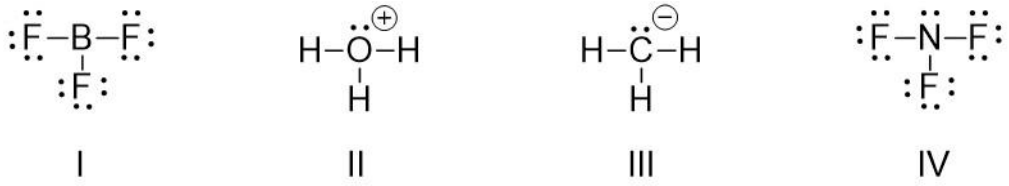
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163) What is the molecular geometry of the central atom in the following compound?



A) tetrahedral
B) trigonal planar
C) trigonal pyramidal
D) square planar
E) linear
Answer: A
Diff: 1
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

164) Which of the following compound(s) have trigonal planar molecular geometry?

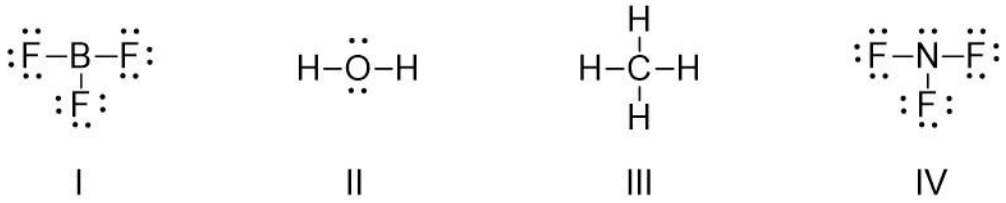


I II III IV

A) I
B) II
C) III
D) IV
E) I and IV
Answer: A
Diff: 1
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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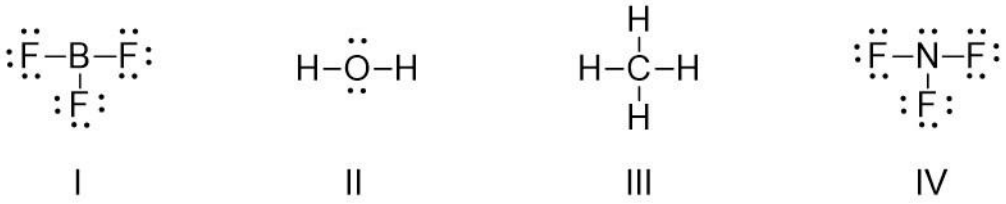
165) Which of the following compound(s) have trigonal pyramidal molecular geometry?



I II III IV

A) I
B) II
C) III
D) IV
E) I and IV
Answer: D
Diff: 1
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

166) Which of the following compound(s) have bent molecular geometry?

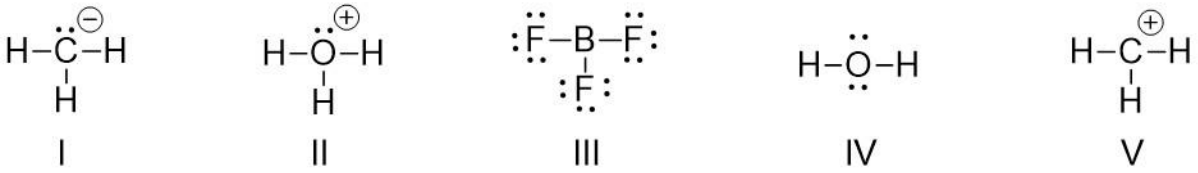


I II III IV

A) I
B) II
C) III
D) IV
E) I and IV
Answer: B
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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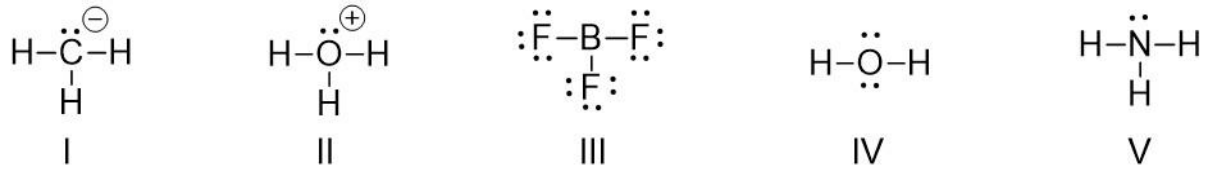
167) Which of the following compound(s) have trigonal planar molecular geometry?



I II III IV V

A) I, II and III
B) II and III
C) III and V
D) V only
E) all of the answer choices
Answer: C
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

168) Which of the following compound(s) have a tetrahedral arrangement of electron pairs?

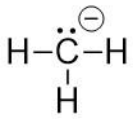


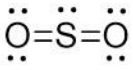
I II III IV V

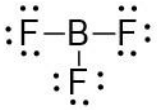
A) I, II and III
B) I, II, IV and V
C) III and IV and V
D) IV and V
E) all of the answer choices
Answer: B
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

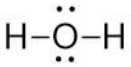
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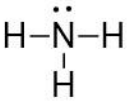
169) Which of the following compounds have trigonal planar arrangement of electron pairs?


I


II


III


IV


V

A) I, II and III
B) I, II, IV and V
C) III and IV and V
D) II and III
E) all of the answer choices
Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

170) What is the molecular geometry at the central atom in in the molecule shown in the box?

CH_2Br_2

A) trigonal planar
B) trigonal pyramidal
C) square planar
D) tetrahedral
E) none of the answer choices
Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

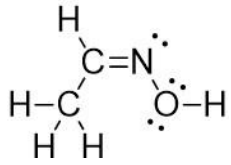
171) What is the molecular geometry at the central atom in the molecule shown in the box?

Cl_2CO

A) trigonal planar
B) trigonal pyramidal
C) square planar
D) tetrahedral
E) bent
Answer: A
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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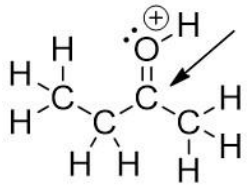
172) What is the molecular geometry at the nitrogen atom in the following compound?



A) trigonal planar
B) trigonal pyramidal
C) linear
D) tetrahedral
E) bent
Answer: E
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

173) Which compound does *not* have a linear molecular geometry?
A) CO_2
B) H_2O
C) $BeCl_2$
D) HCN
E) C_2H_2
Answer: B
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

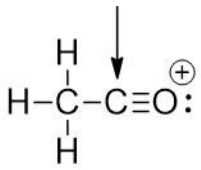
174) What is the approximate bond angle around the indicated carbon atom?



A) 60°
B) 90°
C) 109.5°
D) 120°
E) 180°
Answer: D
Diff: 1
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

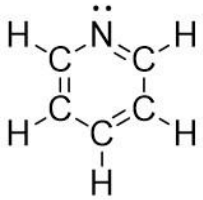
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175) What is the approximate bond angle around the indicated carbon atom?



A) 60°
B) 90°
C) 109.5°
D) 120°
E) 180°
Answer: E
Diff: 1
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

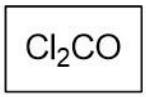
176) What is the approximate bond angle around the nitrogen atom?



A) 90°
B) 109.5°
C) 120°
D) 180°
E) 100°
Answer: C
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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177) What is the approximate bond angle around the carbon atom in the following molecule?



A) 90°
B) 109.5°
C) 105°
D) 120°
E) 180°
Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

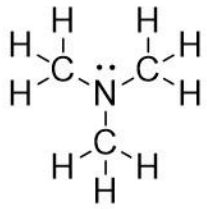
178) What is the hybridization and approximate bond angle around the carbon atom in the following molecule?



A) sp^2, 120°
B) sp, 180°
C) sp^3, 109.5°
D) sp^3, 120°
E) sp, 120°
Answer: B
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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179) What is the hybridization state and approximate bond angle around nitrogen in the following compound?



A) sp^2, 109.5°

B) sp^2, 107°

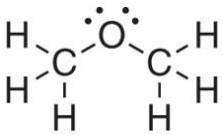
C) sp^3, 109.5°

D) sp^3, 107°

E) sp^2, 120°

Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

180) What is the hybridization state and approximate bond angle around oxygen in the following compound?



A) *sp*, 109.5°

B) sp^2, 109.5°

C) sp^3, 109.5°

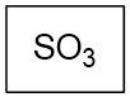
D) sp^2, 120°

E) *sp*, 180°

Answer: C
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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181) What is the hybridization state and molecular geometry around the sulfur atom in the molecule shown in the box?



A) sp^2, tetrahedral

B) sp^2, trigonal planar

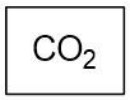
C) sp^3, tetrahedral

D) sp^3, trigonal pyramidal

E) sp^2, trigonal pyramidal

Answer: B
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

182) What is the hybridization state and molecular geometry around the carbon atom in the molecule shown in the box?



A) sp, linear

B) sp^2, trigonal planar

C) sp^3, tetrahedral

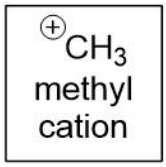
D) sp^3, trigonal pyramidal

E) sp^2, trigonal pyramidal

Answer: A
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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183) Identify the hybridization state, molecular geometry and approximate bond angle for the species shown in box below.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

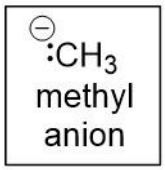
C) sp^3, tetrahedral, 109.5°

D) sp^3, trigonal pyramidal, 120°

E) sp^2, trigonal pyramidal, 180°

Answer: B
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

184) Identify the hybridization state, molecular geometry and approximate bond angle for the species shown in box below.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

C) sp^3, tetrahedral, 109.5°

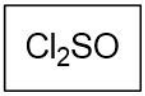
D) sp^3, trigonal pyramidal, <109.5°

E) sp^2, trigonal pyramidal, 180°

Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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185) Identify the hybridization state, molecular geometry and approximate bond angle around the sulfur atom for the following molecule.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

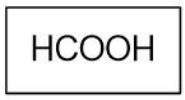
C) sp^3, tetrahedral, 109.5°

D) sp^3, trigonal pyramidal, <109.5°

E) sp^2, trigonal pyramidal, 180°

Answer: D
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

186) Identify the hybridization state, molecular geometry and approximate bond angle around the carbon atom for the molecule shown in box below.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

C) sp^3, tetrahedral, 109.5°

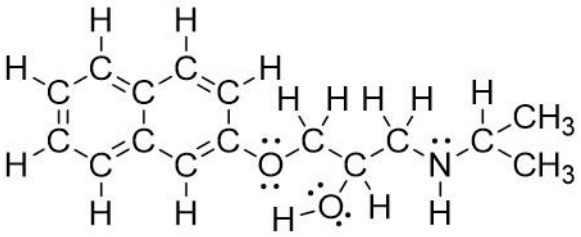
D) sp^3, trigonal pyramidal, <109.5°

E) sp^2, trigonal pyramidal, 180°

Answer: B
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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187) Following is the structure for Propranolol, an antihypertensive drug. Identify the hybridization state, molecular geometry and approximate bond angle at the nitrogen atom in Propranolol.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

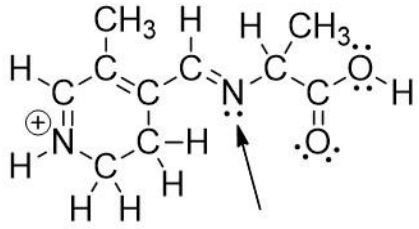
C) sp^3, tetrahedral, 109.5°

D) sp^3, trigonal pyramidal, ~107°

E) sp^2, trigonal pyramidal, 180°

Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

188) Identify the hybridization state, molecular geometry and approximate bond angle at the indicated nitrogen atom in the following compound.



A) sp^2, bent, 109°

B) sp^2, bent, 120°

C) sp^3, tetrahedral, 109.5°

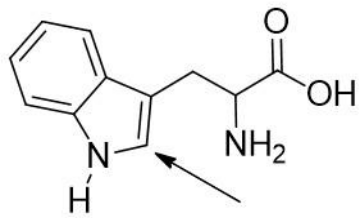
D) sp^3, trigonal pyramidal, ~109.5°

E) sp^2, trigonal pyramidal, 120°

Answer: B
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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189) Tryptophan is an essential amino acid that is important in the synthesis of the neurotransmitter serotonin. Identify the hybridization state, molecular geometry and approximate bond angle at the indicated carbon atom.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

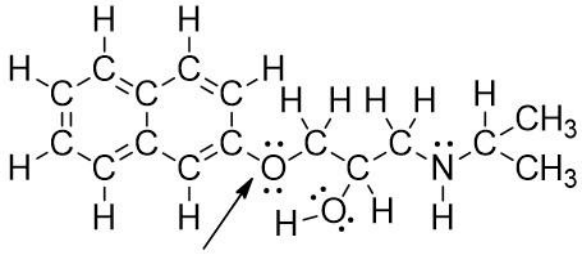
C) sp^3, tetrahedral, 109.5°

D) sp^3, trigonal pyramidal, ~109.5°

E) sp^2, trigonal pyramidal, 180°

Answer: B
Diff: 3
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

190) Following is the structure for Propranolol, an antihypertensive drug. Identify the hybridization state, molecular geometry and approximate bond angle at the indicated oxygen atom in Propranolol.



A) sp^2, tetrahedral, 109°

B) sp^2, bent, 120°

C) sp^3, tetrahedral, 109.5°

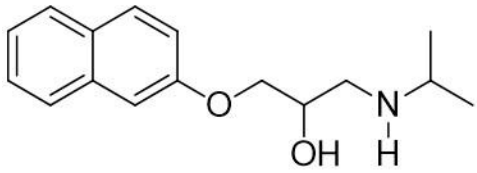
D) sp^3, bent, ~109.5°

E) sp^2, bent, 180°

Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

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191) Following is the structure for Propranolol, an antihypertensive drug. Identify the hybridization state, molecular geometry and approximate bond angle at the nitrogen atom in Propranolol.



A) sp^2, tetrahedral, 109°

B) sp^2, trigonal planar, 120°

C) sp^3, tetrahedral, ~109.5°

D) sp^3, trigonal pyramidal, ~109.5°

E) sp^2, trigonal pyramidal, 180°

Answer: D
Diff: 2
Learning Objective: 1.11 Describe VSEPR theory
Section: 1.11 Predicting Molecular Geometry: VSEPR Theory

192) Which of the following covalent bonds has the largest dipole moment?
A) C–C
B) C–H
C) C–O
D) N–H
E) H–F
Answer: E
Diff: 1
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

193) Which of the following compounds has no dipole moment?
A) CH_4

B) NH_3

C) HF
D) HCl
E) HBr
Answer: A
Diff: 1
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

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194) Which of the following compounds has polar covalent bonds?
A) NH_3

B) Na_2O

C) H_2

D) KF
E) CH_4

Answer: A
Diff: 1
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

195) Which of the following compounds have a net dipole moment?
A) CBr_4

B) CO_2

C) CH_4

D) H_2O

E) C_2H_4

Answer: D
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

196) Which of the following compounds does *not* have a dipole moment?
A) HCl
B) NCl_3

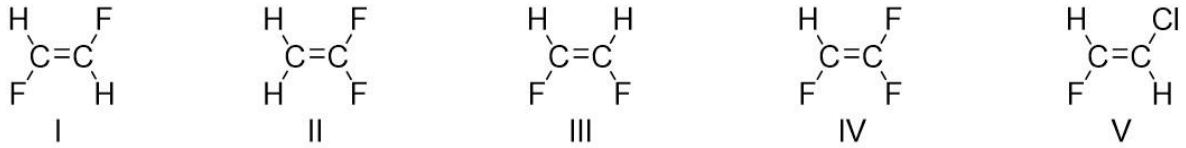
C) CO
D) BF_3

E) H_2O

Answer: D
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

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197) Which of the following compounds has a net dipole moment of zero?



A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

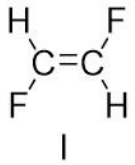
198) Identify the following compound(s) having a dipole moment.



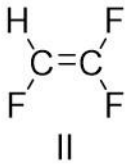
A) II
B) III
C) II and III
D) I, II and III
E) II, III and IV
Answer: E
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

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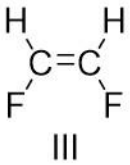
199) Rank the following compounds in order of decreasing dipole moment.



I



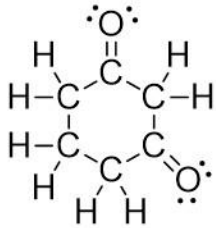
II



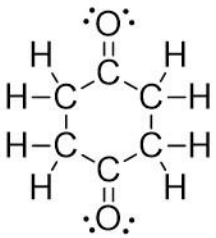
III

A) I > II > III
B) II > III > I
C) I > III > II
D) III > II > I
E) II > I > III
Answer: D
Diff: 3
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

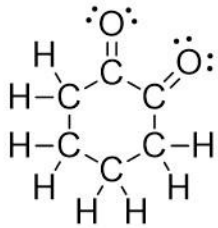
200) Rank the following compounds in order of decreasing dipole moment.



I



II

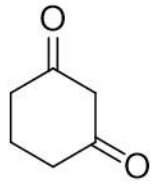


III

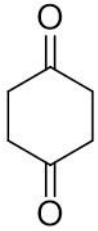
A) I > II > III
B) II > III > I
C) I > III > II
D) III > I > II
E) II > I > III
Answer: D
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

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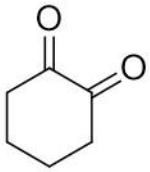
201) Rank the following compounds in order of decreasing dipole moment.



I



II



III

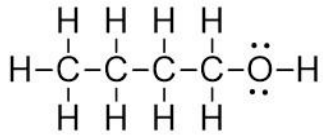
A) I > II > III
B) II > III > I
C) I > III > II
D) III > I > II
E) II > I > III
Answer: D
Diff: 2
Learning Objective: 1.12 Describe how dipole moment is used in calculating the ionic character of a bond
Section: 1.12 Dipole Moments and Molecular Polarity

202) Which of the intermolecular forces listed below is generally considered the strongest?
A) London dispersion forces
B) fleeting dipole-dipole interactions
C) dipole-dipole interactions
D) hydrogen bonding
E) the vital force
Answer: D
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

203) Which intermolecular force is generally considered the weakest?
A) ion-dipole interactions
B) London dispersion forces
C) dipole-dipole interactions
D) hydrogen bonding
E) covalent bonding
Answer: B
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

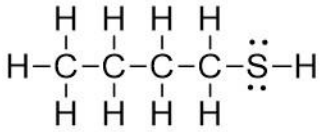
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204) What is the strongest intermolecular force possible between molecules of the following structure?



A) ion-dipole interactions
B) London dispersion forces
C) dipole-dipole interactions
D) hydrogen bonding
E) covalent bonding
Answer: D
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

205) What is the strongest intermolecular force possible between molecules of the following structure?

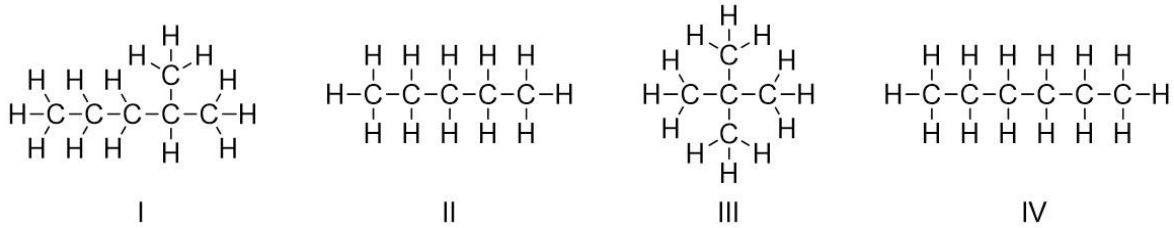


A) ion-dipole interactions
B) London dispersion forces
C) dipole-dipole interactions
D) hydrogen bonding
E) covalent bonding
Answer: C
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

206) Which of the following statements best explains the following observation: hydrogen fluoride has the highest boiling point of all the hydrogen halides?
A) The fluorine in HF is the smallest atom for all of the halogens.
B) Fluorine is the most electronegative of the atoms.
C) Hydrogen fluoride can participate in hydrogen bonding.
D) HF is very reactive and can react and dissolve glass.
E) HF is a weak acid and doesn't completely dissociate.
Answer: C
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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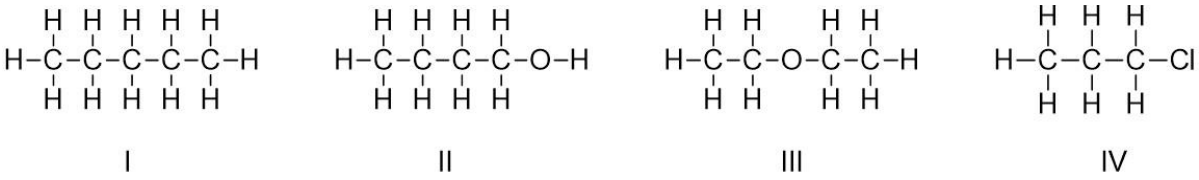
207) Identify the compound that has the greatest London dispersion forces between like molecules.



I II III IV

A) I
B) II
C) III
D) IV
Answer: D
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

208) Identify the compound that has the highest boiling point.

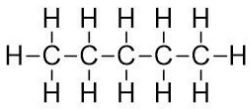


I II III IV

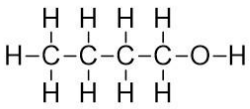
A) I
B) II
C) III
D) IV
E) All compounds have similar boiling points.
Answer: B
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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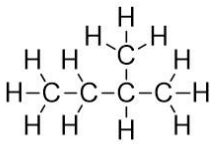
209) Identify the compound that has the lowest boiling point.



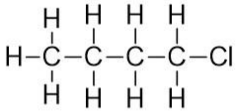
I



II



III



IV

A) I
B) II
C) III
D) IV
E) All compounds have similar boiling points.
Answer: C
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

210) Which of the following compounds has the lowest boiling point?
A) CH_3Cl

B) CH_2Cl_2

C) CH_4

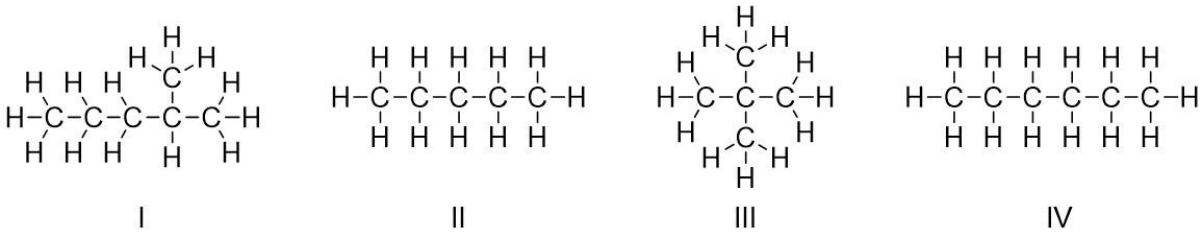
D) $CHCl_3$

E) CCl_4

Answer: C
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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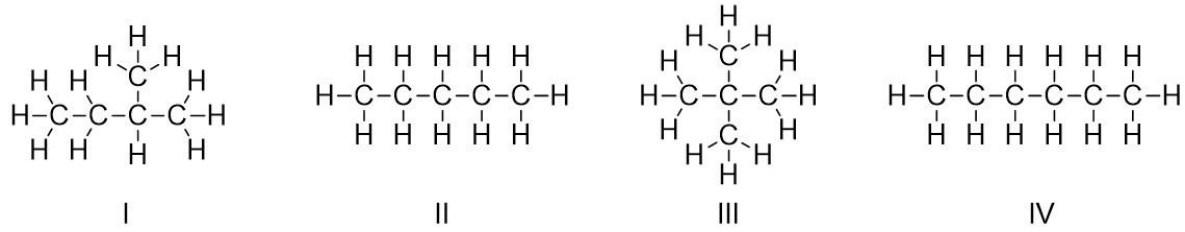
211) Identify the compound that has the lowest boiling point.



I II III IV

A) I
B) II
C) III
D) IV
E) All compounds have similar boiling points.
Answer: C
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

212) Rank the following compounds in order of decreasing boiling point.

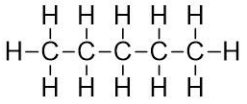


I II III IV

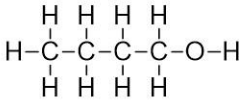
A) III > I > IV > II
B) II > I > IV > III
C) III > I > II > IV
D) IV > II > I > III
E) I > III > II > IV
Answer: D
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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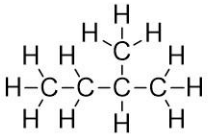
213) Rank the following compounds in order of decreasing boiling point.



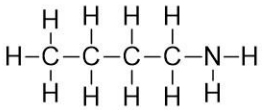
I



II



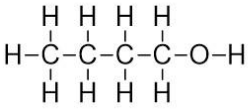
III



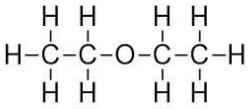
IV

A) III > I > IV > II
B) II > IV > I > III
C) III > I > II > IV
D) IV > II > I > III
E) I > III > II > IV
Answer: B
Diff: 3
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

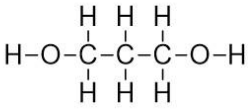
214) Rank the following compounds in order of decreasing boiling point.



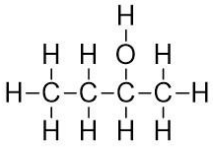
I



II



III

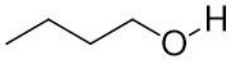


IV

A) III > I > IV > II
B) II > IV > III > I
C) III > I > II > IV
D) IV > II > I > III
E) I > III > II > IV
Answer: A
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

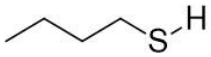
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215) What is the strongest intermolecular force possible between molecules of the following structure?



A) ion-dipole interactions
B) London dispersion forces
C) dipole-dipole interactions
D) hydrogen bonding
E) covalent bonding
Answer: D
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

216) What is the strongest intermolecular force possible between molecules of the following structure?



A) ion-dipole interactions
B) London dispersion forces
C) dipole-dipole interactions
D) hydrogen bonding
E) covalent bonding
Answer: C
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

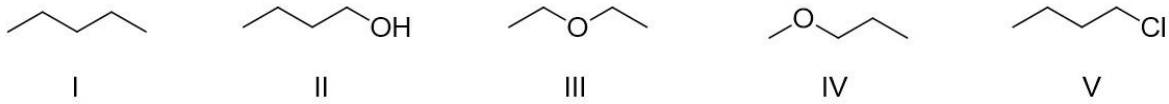
217) Which of the following compounds has the greatest London dispersion forces between like molecules?



A) I
B) II
C) III
D) IV
E) V
Answer: D
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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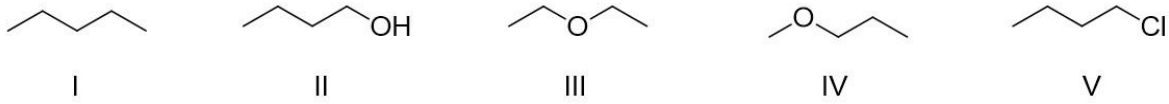
218) Which of the following compounds is expected to have the highest boiling point?



I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

219) Which of the following compounds is expected to have the lowest boiling point?



I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 1
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

220) Identify the following compound expected to have the lowest boiling point.

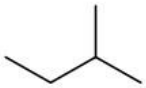


I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: C
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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221) Rank the following compounds from highest boiling point to lowest point.



I



II



III



IV

A) III > I > IV > II
B) II > I > IV > III
C) III > I > II > IV
D) IV > II > I > III
E) I > III > II > IV
Answer: D
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

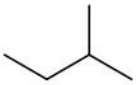
222) Rank the following compounds from highest boiling point to lowest point.



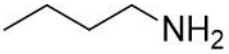
I



II



III

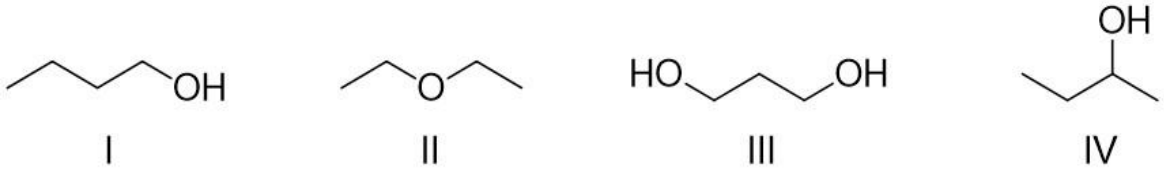


IV

A) III > I > IV > II
B) II > IV > I > III
C) III > I > II > IV
D) IV > II > I > III
E) I > III > II > IV
Answer: B
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

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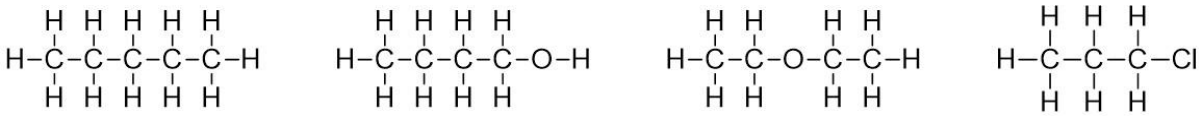
223) Rank the following compounds from highest boiling point to lowest point.



I II III IV

A) III > I > IV > II
B) II > IV > III > I
C) III > IV > I > II
D) IV > II > I > III
E) I > III > II > IV
Answer: A
Diff: 2
Learning Objective: 1.13 Describe the basic nature of all intermolecular forces
Section: 1.13 Intermolecular Forces and Physical Properties

224) Identify the compound expected to be the most soluble in water.

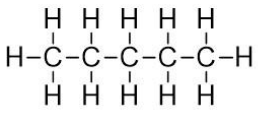


I II III IV

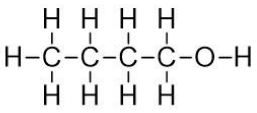
A) I
B) II
C) III
D) IV
E) None of the compounds are soluble in water.
Answer: B
Diff: 1
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

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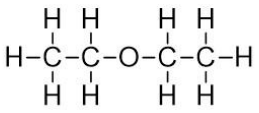
225) Identify the compound expected to be the most soluble in butane, $CH_3CH_2CH_2CH_3$.



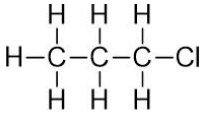
I



II



III



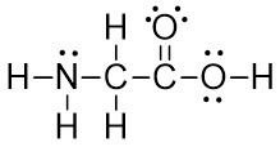
IV

A) I
B) II
C) III
D) IV
E) None of the compounds are soluble in butane.
Answer: A
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

226) For soap molecules to remove and dissolve oil in water, what molecular feature(s) are needed?
A) One end of the molecule must be polar.
B) The compound must contain oxygen atoms.
C) One end of the molecule must be nonpolar.
D) Both one end of the molecule must be polar and one end of the molecule must be nonpolar.
E) All of the answer choices.
Answer: D
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

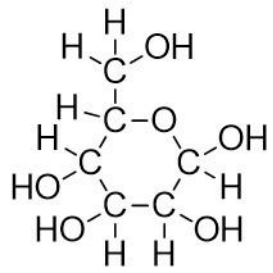
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227) Amino acids are the building blocks of proteins. Which statement best describes the physical properties of the following amino acid?



A) high melting point and low solubility in water
B) large dipole moment and no hydrogen bonding
C) high melting point and large dipole moment
D) low solubility in water and small dipole moment
E) small dipole moment and hydrophobic
Answer: C
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

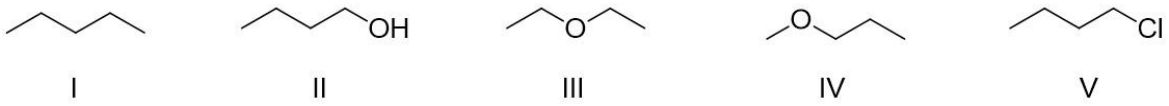
228) Which statement best describes the physical properties of the following sugar?



A) high melting point and high solubility in water
B) large dipole moment and no hydrogen bonding
C) low melting point and large dipole moment
D) low solubility in water and large dipole moment
E) small dipole moment and hydrophobic
Answer: A
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

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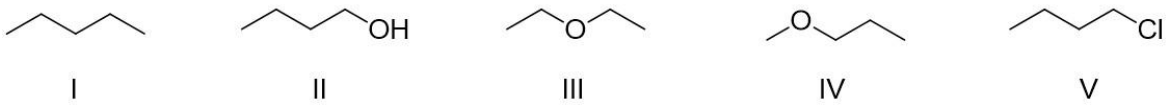
229) Identify the following compound expected to be the most soluble in water.



I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: B
Diff: 1
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

230) Identify the following compound expected to be the most soluble in butane, $CH_3CH_2CH_2CH_3$.

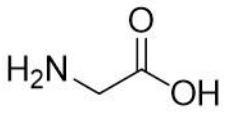


I II III IV V

A) I
B) II
C) III
D) IV
E) V
Answer: A
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

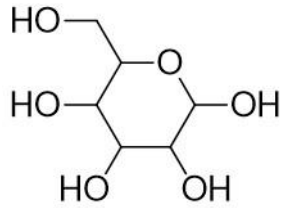
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231) Amino acids are the building blocks of proteins. Which statement best describes the physical properties of the following amino acid?



A) high melting point and low solubility in water
B) large dipole moment and no hydrogen bonding
C) high melting point and large dipole moment
D) low solubility in water and small dipole moment
E) small dipole moment and hydrophobic
Answer: C
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

232) Which statement best describes the physical properties of the following sugar?



A) high melting point and high solubility in water
B) large dipole moment and no hydrogen bonding
C) low melting point and large dipole moment
D) low solubility in water and large dipole moment
E) small dipole moment and hydrophobic
Answer: A
Diff: 2
Learning Objective: 1.14 Compare the actions of soap and dry cleaning in removing oil or grease from clothing, including a statement of the basic principle involved in solubility
Section: 1.14 Solubility

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233) Thinking about drug-receptor interactions, the drug-receptor docking process typically involves nonbonding interactions such as _____.
A) hydrogen bonding
B) London dispersion forces
C) covalent bond formation
D) both hydrogen bonding and London dispersion forces
E) none of the answer choices
Answer: D
Diff: 1
Learning Objective: 1.15 Explain how drugs and receptors bind together
Section: 1.15 Drug-Receptor Interactions

234) Thinking about drug-receptor interactions, which statement below best explains the induced-fit model?
A) Both the drug and the receptor are flexible, constantly changing their shapes.
B) The drug must be the exact shape to fit into the receptor.
C) Only the drug is flexible and changes shape to fit into the receptor.
D) Only the receptor is flexible and changes shape to fit the shape of the drug exactly.
E) All of the answer choices.
Answer: A
Diff: 1
Learning Objective: 1.15 Explain how drugs and receptors bind together
Section: 1.15 Drug-Receptor Interactions

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