

**Organic Chemistry, 8e (Bruice)**

**Chapter 1 Remembering General Chemistry: Electronic Structure and Bonding**

1) Atoms with the same number of protons but different numbers of neutrons are called

\_\_\_\_\_.

Answer: isotopes

Section: 1-1

2) Which of the following elements does this electronic configuration represent?

$1s^2 2s^2 2p^5$

A) F

B) C

C) N

D) Al

E) O

Answer: A

Section: 1-2

3) How many unpaired electrons are present in the isolated carbon atom (atomic number = 6)?

A) none

B) one

C) two

D) three

E) four

Answer: C

Section: 1-2

4) Which of the following is the electronic configuration of the element Fe?

A)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^6$

B)  $1s^2 2s^2 2p^6 3s^2 3p^8 3d^6$

C)  $1s^2 2s^2 2p^8 3s^2 3p^6 4s^2 3d^6$

D)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4d^6$

E)  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 4p^6$

Answer: A

Section: 1-2

5) The atomic number of boron is 5. The correct electronic configuration of boron is

A)  $1s^2 2s^3$ .

B)  $1s^2 2p^3$ .

C)  $1s^2 2s^2 2p^1$ .

D)  $2s^2 2p^3$ .

E)  $1s^2 2s^2 3s^1$ .

Answer: C

Section: 1-2

6) Which of the following statements correctly describes the third electron shell that surrounds the nucleus of an atom?

- A) The third shell contains only *s* and *p* atomic orbitals.
- B) The maximum number of electrons that can occupy the third shell is 18.
- C) The total number of atomic orbitals present in the third shell is 16.
- D) The third shell can contain *f* orbitals.
- E) All third shell elements must have *d* electrons.

Answer: B

Section: 1-2

7) Ar, K<sup>+</sup>, Cl<sup>-</sup> are isoelectronic elements (elements with the same number of electrons). What orbital does the last electron occupy?

Answer: 3p orbital

Section: 1-2

8) Give the electronic configuration for N<sup>-3</sup>.

- A) 1s<sup>2</sup>2s<sup>2</sup>
- B) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>3</sup>
- C) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>4</sup>
- D) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>
- E) 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>1</sup>

Answer: D

Section: 1-2

9) Give the electronic configuration for Ca<sup>+2</sup>.

Answer: 1s<sup>2</sup>2s<sup>2</sup>2p<sup>6</sup>3s<sup>2</sup>3p<sup>6</sup>

Section: 1-2

10) Identify the least electronegative atom.

- A) P
- B) Na
- C) I
- D) B
- E) O

Answer: B

Section: 1-3

11) Give the number of nonbonding lone pairs of electrons in H<sub>2</sub>NOH.

- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

Answer: D

Section: 1-4

12) The compound methylamine,  $\text{CH}_3\text{NH}_2$ , contains a C-N bond. In this bond, which of the following best describes the charge on the nitrogen atom?

- A) +1
- B) slightly positive
- C) uncharged
- D) slightly negative
- E) -1

Answer: D

Section: 1-3

MCAT: 1.2

13) Which of the compounds below have bonds that are predominantly ionic?

- A)  $\text{KCl}$
- B)  $\text{CF}_4$
- C)  $\text{NH}_3$
- D) both A and B
- E) both B and C

Answer: A

Section: 1-3

MCAT: 1.3

14) What type of bonding is most important in  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3$ ?

- A) ionic
- B) hydrogen
- C) covalent
- D) polar

Answer: C

Section: 1-3

MCAT: 1.3

GLO: G2

15) Which of the following contain(s) polar covalent bonds?

- A)  $\text{NH}_3$
- B)  $\text{Na}_2\text{O}$
- C)  $\text{H}_2$
- D)  $\text{KF}$
- E) both A and C

Answer: A

Section: 1-3

MCAT: 1.3

16) Which of the following covalent bonds has the largest dipole moment?

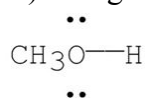
- A) C-C
- B) C-H
- C) C-O
- D) H-N
- E) H-F

Answer: E

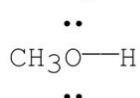
Section: 1-3

MCAT: 2.6, 6.4

17) Using the symbol  $\delta^+$  and  $\delta^-$ , show the direction of the polarity in the indicated bond.



Answer:



Section: 1-3

MCAT: 2.6

18) Covalent bonds may be polar or nonpolar. What property of the atoms forming a given bond determines this?

Answer: electronegativity

Section: 1-3

MCAT: 1.5

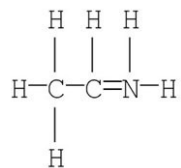
19) Provide the mathematical equation for the dipole moment of a bond, and identify the variables.

Answer:  $\mu = e \times d$ , where  $\mu$  is the bond dipole moment,  $e$  is the amount of charge which is separated, and  $d$  is the distance over which the charge is separated.

Section: 1-3

MCAT: 1.5

20) The formal charge on nitrogen in the compound below is



- A) +2
- B) +1
- C) 0
- D) -1
- E) -2

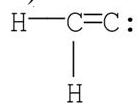
Answer: B

Section: 1-4

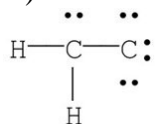
MCAT: 1.2

21) Which of the following is the most likely electronic structure for C<sub>2</sub>H<sub>2</sub>?

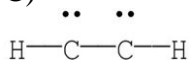
A)



B)

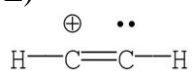


C)



D) H—C≡C—H

E)

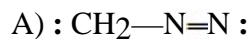


Answer: D

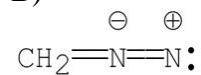
Section: 1-4

MCAT: 1.2, 2.1, 2.2

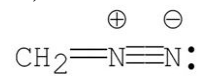
22) Which of the following structures, including formal charges, is correct for diazomethane, CH<sub>2</sub>N<sub>2</sub>?



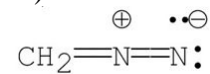
B)



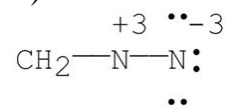
C)



D)



E)

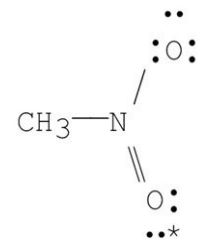


Answer: D

Section: 1-4

MCAT: 1.2, 2.1

23) What are the formal charges on nitrogen and the starred oxygen atom in the following molecule?



A) N = -1, O = 0

B) N = +1, O = -1

C) N = +1, O = +1

D) N = -1, O = -1

E) N = +1, O = 0

Answer: E

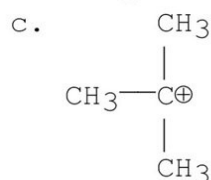
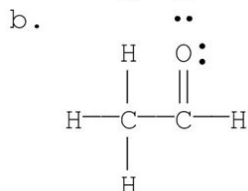
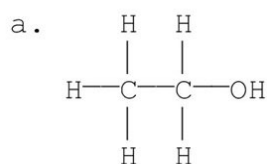
Section: 1-4

MCAT: 2.1

24) Draw the Kekulé structure for each of the following:

a.  $\text{CH}_3\text{CH}_2\text{OH}$    b.  $\text{CH}_3\text{CHO}$    c.  $(\text{CH}_3)_3\text{C}^+$

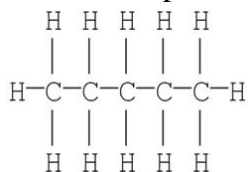
Answer:



Section: 1-4

MCAT: 1.2, 2.1

25) The Kekulé structure of pentane is shown below. Draw the condensed structural formula which corresponds to this Lewis structure.



Answer:  $\text{CH}_3(\text{CH}_2)_3\text{CH}_3$

Section: 1-4

26) Draw condensed structures for the four compounds with formula  $\text{C}_3\text{H}_9\text{N}$ .

Answer:  $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$

$\text{CH}_3\text{CH}_2\text{NHCH}_3$

$(\text{CH}_3)_2\text{CHNH}_2$

$(\text{CH}_3)_3\text{N}$

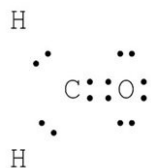
Section: 1-4

MCAT: 1.1

GLO: G2

27) Draw a Lewis structure for the molecule given and show all formal charges.  
 $\text{CH}_2\text{CO}$

Answer:



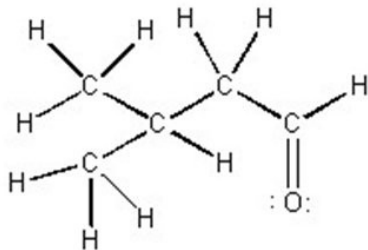
Section: 1-4

MCAT: 1.2, 2.1

28) Expand the condensed structure below to show the covalent bonds and the lone-pair electrons.

$(\text{CH}_3)_2\text{CHCH}_2\text{CHO}$

Answer:

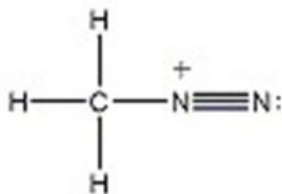


Section: 1-4

MCAT: 1.2, 2.1

29) Draw the Lewis structure for  $\text{CH}_3\text{N}_2^+$ .

Answer:



Section: 1-4

MCAT: 1.2, 2.1

30) Give the formal charge on nitrogen in  $\text{NH}_4$ .

A) -2

B) -1

C) 0

D) +1

E) +2

Answer: D

Section: 1-4

MCAT: 1.2



31) How many distinct and degenerate p orbitals exist in the second electron shell, where  $n = 2$ ?

- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

Answer: D

Section: 1-5

32) Draw the shape of a 2p orbital.

Answer:



Section: 1-5

33) Consider the interaction of two hydrogen 1s atomic orbitals of the same phase. Which of the statements below is an incorrect description of this interaction?

- A) A sigma bonding molecular orbital is formed.
- B) The molecular orbital formed is lower in energy than a hydrogen 1s atomic orbital.
- C) The molecular orbital formed has a node between the atoms.
- D) The molecular orbital formed is cylindrically symmetric.
- E) A maximum of two electrons may occupy the molecular orbital formed.

Answer: C

Section: 1-6

34) Both sigma ( $\sigma$ ) and pi ( $\pi$ ) bonds can be formed by overlapping p orbitals. Describe the difference.

Answer: Sigma bonds are formed from the overlap of atomic orbitals along a circular axis of symmetrical nature, i.e., head-on overlap. All single bonds are sigma bonds.

Pi bonds are formed from the overlap of atomic orbitals along a non-symmetrical (parallel) axis, i.e., side-to-side overlap. Double and triple bonds contain both sigma and pi bonds.

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3, 15.1

35) What kind of molecular orbital ( $\sigma$ ,  $\sigma^*$ ,  $\pi$ , or  $\pi^*$ ) results when the two atomic orbitals shown below interact in the manner indicated?



Answer:  $\sigma^*$

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3

36) What kind of molecular orbital ( $\sigma$ ,  $\sigma^*$ ,  $\pi$ , or  $\pi^*$ ) results when the two atomic orbitals shown below interact in the manner indicated?

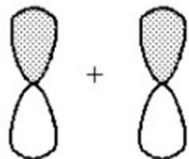


Answer:  $\sigma$

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3

37) What kind of molecular orbital ( $\sigma$ ,  $\sigma^*$ ,  $\pi$ , or  $\pi^*$ ) results when the two atomic orbitals shown below interact in the manner indicated?



Answer:  $\pi$

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3

38) What kind of molecular orbital ( $\sigma$ ,  $\sigma^*$ ,  $\pi$ , or  $\pi^*$ ) results when the two atomic orbitals shown below interact in the manner indicated?

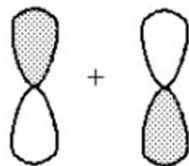


Answer:  $\sigma^*$

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3

39) What kind of molecular orbital ( $\sigma$ ,  $\sigma^*$ ,  $\pi$ , or  $\pi^*$ ) results when the two atomic orbitals shown below interact in the manner indicated?

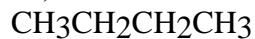


Answer:  $\pi^*$

Section: 1-6

MCAT: 2.7, 7.5, 9.3, 14.3

40) Choose the correct hybridization for the atom indicated in the molecule below.



↑

- A) sp
- B) sp<sup>2</sup>
- C) sp<sup>3</sup>
- D) none of the above

Answer: C

Section: 1-7

MCAT: 2.2

41) What orbitals are used to form the covalent bonds in butane (CH<sub>3</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>3</sub>)?

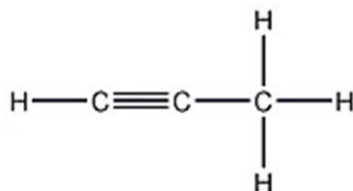
Answer: The carbon-carbon  $\sigma$  bonds are formed by the overlap of two carbon sp<sup>3</sup> hybrid atomic orbitals. The carbon-hydrogen  $\sigma$  bonds are formed by the overlap of a carbon sp<sup>3</sup> hybrid atomic orbital and a hydrogen s orbital.

Section: 1-7

MCAT: 2.7, 7.5, 9.3, 14.3

GLO: G2

42) How many carbon-carbon sigma bonds are in the molecule shown?



- A) 1
- B) 2
- C) 3
- D) 4

Answer: B

Section: 1-9

MCAT: 2.7, 7.5, 9.3, 14.3

43) A molecule of acetonitrile CH<sub>3</sub>CN contains \_\_\_\_\_ sigma bonds and \_\_\_\_\_ pi bonds.

- A) 5, 2
- B) 4, 3
- C) 4, 2
- D) 2, 2
- E) 4, 0

Answer: A

Section: 1-9

MCAT: 2.7, 7.5, 9.3, 14.3



48) Which of the following is an  $sp^2$  hybridized carbon?

A)



B)  $\cdot CH_3$

C)



D) A and B

E) A, B and C

Answer: A

Section: 1-18

MCAT: 2.2, 4.2

49) What is the predicted shape, bond angle, and hybridization for  $^+CH_3$ ?

A) trigonal planar,  $120^\circ$ ,  $sp^2$

B) trigonal planar,  $120^\circ$ ,  $sp^3$

C) trigonal planar,  $109.5^\circ$ ,  $sp^2$

D) trigonal pyramidal,  $120^\circ$ ,  $sp^2$

E) trigonal pyramidal,  $109.5^\circ$ ,  $sp^2$

Answer: A

Section: 1-10

MCAT: 2.2

50) What orbitals overlap to create the H-C bond in  $CH_3^+$ ?

A)  $sp^3-sp^3$

B)  $sp^2-sp^3$

C) s-p

D) s- $sp^2$

E) s- $sp^3$

Answer: D

Section: 1-10

MCAT: 4.2

51) The lone-pair electrons of the methyl anion occupy a(n) \_\_\_\_\_ orbital.

A) s

B) p

C) sp

D)  $sp^2$

E)  $sp^3$

Answer: E

Section: 1-10

MCAT: 2.2, 2.7, 7.5, 9.3, 14.3

52) Give the shape of the methyl radical.

- A) trigonal pyramidal
- B) tetrahedral
- C) bent
- D) linear
- E) trigonal planar

Answer: E

Section: 1-10

MCAT: 2.2

53) The N-H single bond in methyl amine ( $\text{CH}_3\text{NH}_2$ ) is a \_\_\_\_\_ bond formed by the overlap of a(n) \_\_\_\_\_ orbital on N and a(n) \_\_\_\_\_ orbital on H.

- A)  $\sigma$ ;  $\text{sp}^2$ ; s
- B)  $\sigma$ ;  $\text{sp}^3$ ; s
- C)  $\pi$ ;  $\text{sp}^3$ ; s
- D)  $\pi$ ;  $\text{sp}^2$ ; p
- E)  $\pi$ ; p; p

Answer: B

Section: 1-11

MCAT: 2.2, 2.7, 7.5, 9.3, 14.3

54) Triethylamine [ $(\text{CH}_3\text{CH}_2)_3\text{N}$ ] is a molecule in which the nitrogen atom is \_\_\_\_\_ hybridized and the CNC bond angle is \_\_\_\_\_.

- A)  $\text{sp}^2$ ,  $>109.5^\circ$
- B)  $\text{sp}^2$ ,  $<109.5^\circ$
- C)  $\text{sp}^3$ ,  $>109.5^\circ$
- D)  $\text{sp}^3$ ,  $<109.5^\circ$
- E) sp,  $109.5^\circ$

Answer: D

Section: 1-11

MCAT: 2.2, 2.7, 7.5, 9.3, 14.3

55) The N-H bond in the ammonium ion,  $\text{NH}_4^+$ , is formed by the overlap of what two orbitals?

- A)  $\text{sp}^3$ - $\text{sp}^3$
- B)  $\text{sp}^3$ - $\text{sp}^2$
- C)  $\text{sp}^2$ - $\text{sp}^2$
- D)  $\text{sp}^2$ -s
- E)  $\text{sp}^3$ -s

Answer: E

Section: 1-11

MCAT: 2.2, 2.7, 7.5, 9.3, 14.3

56) Which of the following is closest to the C-O-C bond angle in CH<sub>3</sub>-O-CH<sub>3</sub>?

- A) 180°
- B) 120°
- C) 109.5°
- D) 90°
- E) 160°

Answer: C

Section: 1-14

MCAT: 2.2

57) Each lone pair of electrons on the O atom in methanol (CH<sub>3</sub>OH) occupies a(n) \_\_\_\_\_ orbital.

- A) s
- B) p
- C) sp
- D) sp<sup>2</sup>
- E) sp<sup>3</sup>

Answer: E

Section: 1-12

MCAT: 2.2

58) Among the hydrogen halides, the strongest bond is found in \_\_\_\_\_ and the longest bond is found in \_\_\_\_\_.

- A) HF, HF
- B) HF, HI
- C) HI, HF
- D) HI, HI
- E) HCl, HBr

Answer: B

Section: 1-13

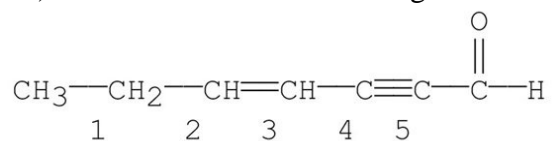
59) The hydrogen-halogen bond becomes \_\_\_\_\_ and \_\_\_\_\_ as the size (atomic weight) of the halogen increases.

- A) longer, weaker
- B) longer, stronger
- C) shorter, weaker
- D) shorter, stronger

Answer: A

Section: 1-13

60) Which bond in the following molecule is the shortest?

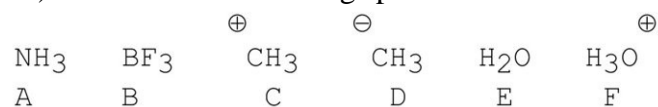


- A) bond 1
- B) bond 2
- C) bond 3
- D) bond 4
- E) bond 5

Answer: E

Section: 1-15

61) Which of the following species have tetrahedral bond angles?



- A) A, D and E
- B) A, D, E and F
- C) A and E
- D) D only
- E) A, B and E

Answer: B

Section: 1-14

MCAT: 2.2, 4.2

62) The carbon-carbon double bond in ethene is \_\_\_\_\_ and \_\_\_\_\_ than the carbon-carbon triple bond in ethyne.

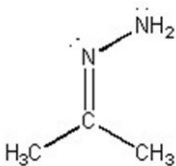
- A) stronger; shorter
- B) stronger; longer
- C) weaker; shorter
- D) weaker; longer
- E) stronger; more polar

Answer: D

Section: 1-15



63) What is the CNN bond angle in the compound shown below?



- A) ~60°
- B) ~90°
- C) ~110°
- D) ~120°
- E) ~180°

Answer: D

Section: 1-14

MCAT: 2.2

64) Draw the structure of a molecule which contains only carbon and hydrogen atoms (only three of which are carbon) and in which two of the carbons are  $sp^2$  hybridized and the other is  $sp$  hybridized.

Answer:  $H_2C=C=CH_2$

Section: 1-15

MCAT: 2.2, 2.7, 7.5, 9.3, 14.3

GLO: G2

65) Why is the C—H bond in ethene ( $H_2C=CH_2$ ) shorter and stronger than the C—H bond in ethane ( $CH_3CH_3$ )?

Answer: The length and strength of a C—H bond depends on the hybridization of the carbon atom. The more  $s$  character in the hybrid orbital used by carbon to form the bond, the shorter and stronger the bond. This is because an  $s$  orbital is closer to the nucleus than is a  $p$ . Ethene uses carbon  $sp^2$  hybrid orbitals ( $1/3 s$  character) to make its carbon-hydrogen bonds while ethane uses carbon  $sp^3$  ( $1/4 s$  character).

Section: 1-15

GLO: G2

66) How many nonbonding electron pairs, bonding electron pairs, pi bonds, and sigma bonds are present in  $CO_2$ ?

Answer: 4 nonbonding electron pairs, 4 bonding electrons pairs, 2 pi bonds, 2 sigma bonds

Section: 1-15

67) Identify the hybridization of carbon in  $\text{H}_2\text{CO}$ .

- A)  $sp$
- B)  $sp^2$
- C)  $sp^3$
- D)  $sp^4$
- E)  $s^3p$

Answer: B

Section: 1-14

MCAT: 9.3

68) Give the H-C-H bond angle in  $\text{H}_2\text{CO}$ .

- A) 60
- B) 90
- C) 109.5
- D) 120
- E) 180

Answer: D

Section: 1-15

69) Identify the hybridization of the oxygen in  $\text{CH}_3\text{OCH}_3$ .

- A)  $sp$
- B)  $sp^2$
- C)  $sp^3$
- D)  $sp^4$
- E)  $sp^5$

Answer: C

Section: 1-15

70) Give the hybridizations of the carbons, from left to right, in  $\text{CH}_3\text{CH}=\text{CHCl}$ .

Answer:  $sp^3$ ,  $sp^2$ ,  $sp^2$

Section: 1-15

71) Give the hybridization, shape, and bond angle for the carbon in  $\text{CO}_2$ .

Answer:  $sp$ , linear, 180

Section: 1-15

72) Give the hybridization, shape, and bond angle for each carbon in  $\text{CH}_3\text{CN}$ .

Answer:  $\text{CH}_3$  -  $sp^3$ , tetrahedral, 109.5; C -  $sp$ , linear, 180

Section: 1-14

73) Identify the compound with the weakest bond.

- A) H<sub>2</sub>
- B) HF
- C) HCl
- D) HBr
- E) HI

Answer: E

Section: 1-15

74) Identify the hybridization of the nitrogen atom in the molecule (CH<sub>3</sub>)<sub>3</sub>N.

Answer: sp<sup>3</sup>

Section: 1-15

MCAT: 2.2

75) In what type of orbital are the lone pair electrons of methoxide (CH<sub>3</sub>O<sup>-</sup>) found ?

- A) s
- B) p
- C) sp
- D) sp<sup>2</sup>
- E) sp<sup>3</sup>

Answer: E

Section: 1-15

MCAT: 2.2

GLO: G2

76) Which of the following molecules does not exhibit a net dipole moment of zero?

- A) CO<sub>2</sub>
- B) CH<sub>4</sub>
- C) CCl<sub>4</sub>
- D) H<sub>2</sub>O
- E) SO<sub>3</sub>

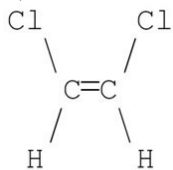
Answer: D

Section: 1-16

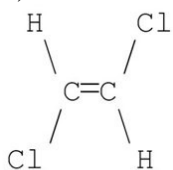
MCAT: 2.6

77) Which of the following molecules has a net dipole moment of zero?

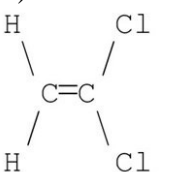
A)



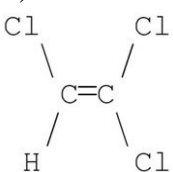
B)



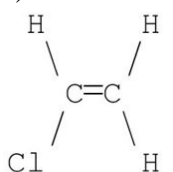
C)



D)



E)



Answer: B

Section: 1-16

MCAT: 2.6

78) Which of the following molecules has the smallest dipole moment?

A) Br<sub>2</sub>

B) NH<sub>3</sub>

C) HCl

D) HBr

E) HI

Answer: A

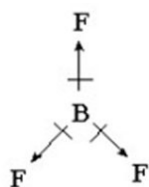
Section: 1-16

MCAT: 2.5, 6.4

GLO: G2

79)  $\text{BF}_3$  has a dipole moment of zero. Propose a structure for  $\text{BF}_3$  that is consistent with this information.

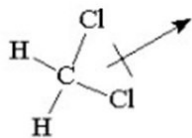
Answer:  $\text{BF}_3$  is trigonal planar.



Section: 1-16

MCAT: 2.2, 2.5

80) Draw the Kekulé structure and show the direction of the dipole moment for  $\text{CH}_2\text{Cl}_2$ .



Answer:

Section: 1-16

MCAT: 2.2, 2.5

81) Identify the compound(s) that have a nonzero dipole moment. You may choose more than one answer.

A)  $\text{CH}_3\text{NH}_2$

B)  $\text{CO}_2$

C)  $\text{CH}_3\text{OCH}_3$

D)  $(\text{CH}_3)_2\text{C}=\text{C}(\text{CH}_3)_2$

E)  $\text{BCl}_3$

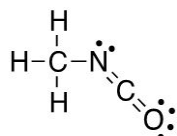
Answer: A, C

Section: 1-16

MCAT: 2.2, 2.5

82) In 2015, the European Space Agency's Philae Lander detected the presence of methylisocyanate  $\text{CH}_3\text{NCO}$  on the comet 67P. Draw the Lewis structure of this compound, showing all lone pairs.

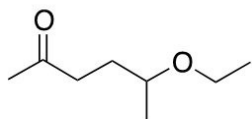
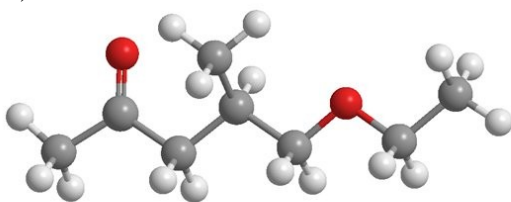
Answer:



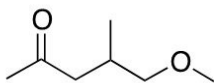
Section: 1-4

MCAT: 2.2

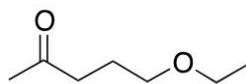
83) Convert the model below into skeletal structure.



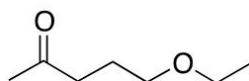
I



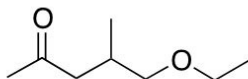
II



III



IV



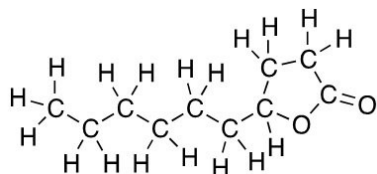
V

- A) I
- B) II
- C) III
- D) IV
- E) V

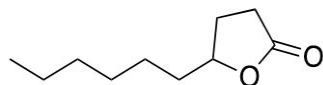
Answer: E

Section: 1-4

84) Several volatile compounds are responsible for the aroma of plums. One of these compounds is  $\gamma$ -decalactone whose Kekulé structure is shown below. Convert it into a skeletal structure.



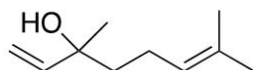
Answer:



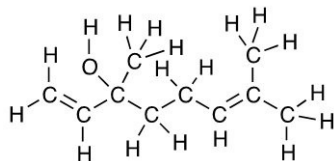
Section: 1-4

GLO: G7

85) Several volatile compounds are responsible for the aroma of plums. One of these compounds is linalool whose skeletal structure is shown below. Convert it into Kekulé structure.



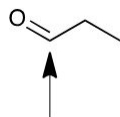
Answer:



Section: 1-4

GLO: G7

86) Propanal is a compound detected on the surface of comet 67P by the Philae Lander. How many hydrogen atoms are present at the indicated carbon?



A) 0

B) 1

C) 2

D) 3

E) 4

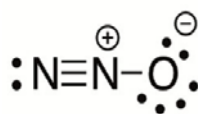
Answer: B

Section: 1-4

MCAT: 2.2

87) Nitrous oxide  $N_2O$ , also known as laughing gas is often used in surgery and dentistry for its anesthetic and analgesic effects. Draw its Lewis structure?

Answer:



Section: 1-4

MCAT: 2.2

GLO: G7

88) The lobes of the p-orbital are often designated by "+" and "-" signs as shown. What do these signs represent?

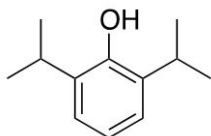


- A) opposite charges
- B) phases of the orbital
- C) positive indicates the location of protons and negative indicates the location of electrons
- D) that the orbital has polarity
- E) all of the above

Answer: B

Section: 1-5

89) The structure of a widely used anesthetic propofol is given below. How many  $sp^3$  hybridized atoms are in this molecule?



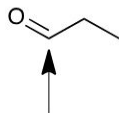
- A) 1
- B) 3
- C) 5
- D) 6
- E) 9

Answer: D

Section: 1-15

MCAT: 2.2

90) Propanal is a compound detected on the surface of comet 67P by the Philae Lander. How many  $sp^2$  hybridized atoms are in this molecule?



- A) 0
- B) 1
- C) 2
- D) 3
- E) 4

Answer: C

Section: 1-15

MCAT: 2.2